

Improving waterway management outcomes through collaborative research: insights from the Melbourne Waterway Research-Practice Partnership

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Key Points

- Better waterway management requires researchers and practitioners to exchange knowledge.
- Competing drivers and expectations remain impediments to establishing collaborative programs that meet short-term needs while advancing deeper system understanding.
- The Melbourne Waterway Research-Practice Partnership (MWRPP) has emerged as an effective model of engagement that overcomes these impediments.
- Success of the MWRPP depends on the commitment of researchers to communicate outcomes and of practitioners to develop research programs.
- Success criteria include awareness and impact of research projects and outcomes, and documented examples where research findings have influenced policy, planning and practice.
- Sufficient investment of time to help build a high degree of trust and understanding between the collaborators is critical.

Abstract

Waterway managers invest substantial funds in research to better understand the systems they manage and improve management effectiveness. The need to manage and understand complex systems such as waterways have led to collaborative cross-disciplinary research ventures involving both managers and scientists, but reports on the effectiveness of such ventures are rare. The Melbourne Waterway Research-Practice Partnership (primarily between Melbourne Water and the University of Melbourne) is a new model for waterway management research, focussing on both applied research and knowledge exchange. The Partnership is distinguished from other Melbourne Water research by its responsiveness to short-term needs and rapid implementation of research findings. An emphasis on active knowledge exchange ensures uptake of outcomes and builds a shared understanding of management problems and opportunities. Knowledge exchange is supported through co-development of the research program, workshops to support business activities, training courses, seminars, newsletters and co-location of the researchers and managers. Critical to the success of the Partnership is the need to balance a strategic research program with short-term business needs. Two years after the Partnership commenced, there are several examples where rapid research adoption within Melbourne Water has occurred, including waterway investment planning scenarios for Melbourne Water's five-year funding submission, stream flow recommendations for urban growth areas, and more cost-effective approaches to riparian revegetation.

Keywords

Collaborative research, long-term partnerships, knowledge exchange, research adoption.

Introduction

Since the 1990s waterway management activities in Melbourne (and many other urban areas across Australia) have shifted from a focus on flood protection and water quality improvement to broader waterway ecosystem objectives (Coleman and Pettigrove 1999). This shift in management focus has coincided with an evolution of systems thinking in river science, building on a broad agreement among the disciplines of geomorphology, hydrology and ecology on how river ecosystems function (Benda *et al.*, 2002). These two developments have helped bridge the interests and aims of managers and scientists, aiding the growth of collaborative cross-disciplinary research ventures involving both managers and researchers (Boulton *et al.*, 2008). Australian waterway management authorities invest many millions of dollars annually in research activities aiming to better understand aquatic ecosystems and how best to manage them, but there are few accounts of the successes and failures in development of research programs (Webb *et al.*, 2012).

Two recurring themes in considerations of the challenges of integrating scientific research and river management are a perception of mismatches in attitudes of scientists and managers, and the need for effective exchange of knowledge (Cullen 1990; Boulton *et al.*, 2008). The former concern in part draws an unnecessarily binary distinction between scientists (most of whom put a high priority on the application and adoption of their findings) and managers (many of whom are scientists themselves). Differences in opinion on the most critical questions and means of communication can be resolved if managers and scientists begin by sharing fundamental tenets on the importance and nature of cross-disciplinary river science (Boulton *et al.*, 2008). If the parties agree on the fundamentals, then the challenges fall to conducting high quality science and effectively sharing and communicating its findings.

In this paper, we report on a collaborative research program that was founded on such a shared understanding between researchers and managers: the Melbourne Waterway Research-Practice Partnership (MWRPP). The partnership places a strong emphasis on focussed research programs of relevance to Melbourne Water's strategic needs, and the rapid communication and adoption of findings arising from the research program. We aim here to describe the genesis of the partnership and the aspects of its governance and operation that have contributed to early successes.

Filling a gap in Melbourne Water's research program

Melbourne Water's waterways and wetlands research program builds a knowledge base that supports management responses to pressures such as population and urban growth, climate change and economic uncertainty. This knowledge base informs and refines strategic decision-making and policy development, and improves the efficiency of actions to protect and improve waterways and wetlands, monitor investment outcomes and respond to risks and opportunities. Research priorities are identified, with a range of government agencies and stakeholders, in management strategies, such as the Healthy Waterways and Stormwater Strategies, Better Bays and Waterways and Western Port Science review (Melbourne Water 2009; 2011; 2013a; 2013b). These priorities are principally directed towards activities where there is a high level of investment, but low level of confidence in how to most effectively undertake the activity, or a low level of understanding of the expected outcomes. Research priorities are also determined based on whether a project: fulfils a business obligation (e.g. statutory compliance); assists in achieving the business' strategic direction; meets multiple business needs; cost versus potential benefit; urgency to support business activities; opportunity (e.g. collaboration and leverage opportunity with industry and research partners); and research risk (i.e. likelihood of a clear outcome) relative to the potential benefit.

The research program outsources most of its projects through collaboration with researchers and other natural resource management agencies. This approach gives Melbourne Water the flexibility to access a broad base of expertise, the capacity to undertake a higher volume of research across a diversity of research

themes, greater agility to respond to future risks and opportunities, and opportunities for co-funding. Melbourne Water is able to address diverse knowledge gaps by investment both in large-scale research collaborations that focus on national priorities and industry direction (e.g. cooperative research centres [CRCs]), and in collaborations that can be more responsive to local research needs (Fig. 1). Long-term research relationships, through which trust, respect and a common understanding of needs and opportunities have been established (e.g. Prosser et al., 2015), have helped to improve the quality and breadth of the program.

Melbourne Water’s Healthy Waterways and Stormwater Strategies (Melbourne Water, 2013a, b) identified gaps in understanding of responses of stream ecosystems to human activities in the region that were not being addressed by existing research collaborations, but were a natural extension of the research being conducted by a group of researchers with a long history of collaboration with Melbourne Water. The MWRPP was born out of beliefs shared by researchers and managers in the value of rigorous interdisciplinary scientific research coupled with effective communication as an efficient means of improving management practices and the health of waterways.

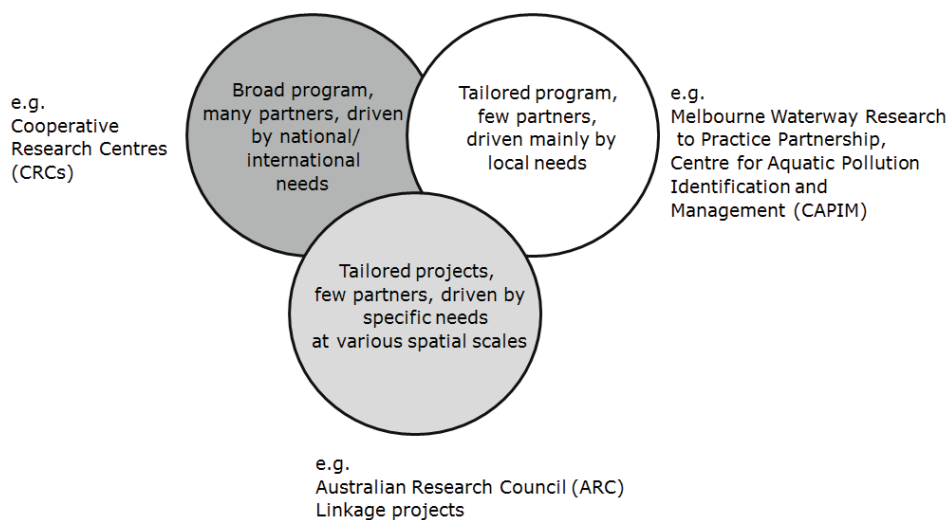


Figure 1: Structure of Melbourne Water Waterways and Wetlands Research program to meet a diversity of research needs at the national and local level

The partnership

Aims and raison d'être

The MWRPP between Melbourne Water and the Waterway Ecosystems Research Group (WERG) at the University of Melbourne is a new approach to waterway management research within the Port Phillip and Westernport region. It has a dual focus of 1) applied research to underpin the improved management of urban and rural waterways, and 2) knowledge exchange that integrates research findings and broader science with Melbourne Water activities (and those of other stakeholders). It seeks to better understand the drivers of waterway ecosystem condition in urban and rural environments, and the prioritisation and design of interventions at catchment and in-stream scales that best protect and restore waterway health.

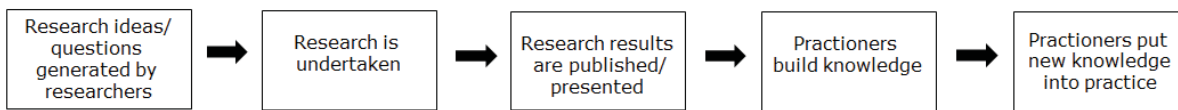
The research program was designed to be flexible and responsive, to directly support Melbourne Water’s day-to-day activities. The MWRPP also provides direct and easy access to expert advice for Melbourne Water, through co-location of staff (at both the Melbourne Water and university offices) and regular informal interaction opportunities between researchers and waterway managers. In addition, the MWRPP is an open

framework for other collaborations, and actively seeks opportunities for integrated and complementary projects with other research groups and industry organisations. Specifically, the partnership's aims are to:

1. Undertake timely and relevant research to improve the efficiency and effectiveness of waterway management across the region and inform future waterway management strategies;
2. Develop targeted activities to actively integrate findings from the research into policy and practice;
3. Develop formal and informal opportunities for staff development and exchange between Melbourne Water and universities, through secondments, exchange programs and student research projects;
4. Facilitate independent peer review of scientific and technical reports for Melbourne Water.

In order to achieve these aims, it was necessary to establish a collaborative research model founded on two-way knowledge exchange between researchers and practitioners at all stages – from research idea development through to changed business practices (Fig. 2b). This contrasts with a traditional research model in which idea generation and research delivery is largely undertaken independently of practitioners. Under such a model, knowledge adoption by practitioners primarily relies on technical publications and conference presentations (Fig. 2a). We argue that the traditional research model limits knowledge building and adoption by practitioners because of a potential mismatch in the perceived importance of research needs, timing of and nature of research outputs, and expectations for knowledge exchange activities. On the other hand, a collaborative research model such as the MWRPP, is expected to result in increased knowledge adoption and value for investment by practitioners.

a) Typical research model



b) Collaborative research model

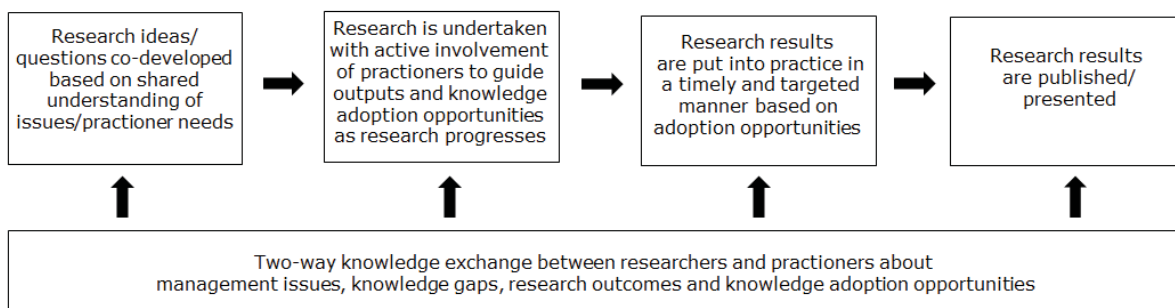


Figure 2: Contrasting research models for project development, research delivery and knowledge adoption

Research program development

The MWRPP research prospectus developed from an initial research project prioritization workshop with representatives from The University of Melbourne, Griffith University and Melbourne Water. Potential projects for the MWRPP were identified by mapping knowledge gaps identified in Melbourne Water’s Healthy Waterways and Stormwater strategies against existing research already being undertaken by other research groups in partnership with Melbourne Water (e.g. CRC for Water Sensitive Cities, Victorian Centre for Aquatic Pollution Identification and Management, Arthur Rylah Institute). Research priorities not already being addressed became the focus for the MWRPP. It was then necessary to develop project proposals that

translated high-level statements in relevant strategies into research questions to be addressed; broad methods to answer research questions, potential research collaborators and desired outputs for knowledge dissemination. Importantly, these proposals included a clear statement of potential benefit to Melbourne Water through supporting specific business activities, including milestones that demonstrated alignment of research outputs with business needs. The emphasis on documenting the links between research outputs and business helps ensure that the research outputs are timely, which is critical to knowledge exchange and adoption. That is, in a business environment where staff are typically inundated with information from a variety of areas and often have to be selective in their attention, effective knowledge transfer is more likely to occur where there is a strong desire for the information because it aligns with their priorities and timelines.

Project proposals were co-developed by researchers and Melbourne Water staff over a 6-month period through meetings and dissemination of draft research proposals. This allowed refinement of the objectives, methods and outputs before the research program formally commenced. In the first year the research program identified 20 integrated projects, of which 14 were implemented. These projects were grouped into five main research themes: 1) ecological response models, 2) flow and water quality management, 3) stream management interventions, 4) catchment-scale restoration and 5) community engagement (Fig. 3).

Projects were structured to allow the program some flexibility on an annual basis in the event of unforeseen waterway management problems or to enable new opportunities to be seized. Existing projects are reviewed, and new projects included yearly through a project proposal document, co-developed by project teams, and endorsed by the research management committee.

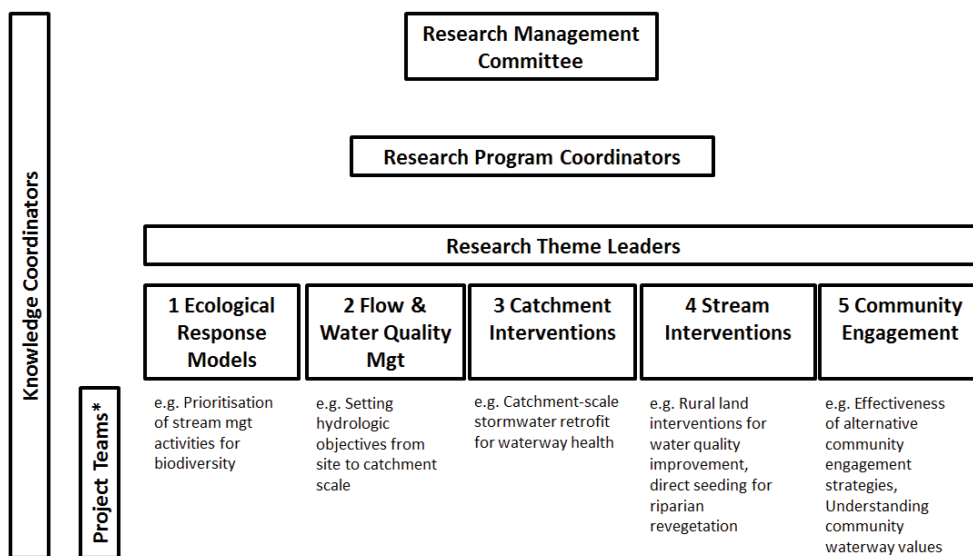


Figure 3: Melbourne Waterways Research to Practice Partnership governance structure

*Project teams = Research leader, key researchers and Melbourne Water stakeholders

Governance

The MWRPP is governed and guided by the Research Management Committee (RMC), comprising selected senior Melbourne Water managers, research Program Leaders and Knowledge Brokers from The University of Melbourne, Griffith University and Melbourne Water (Fig. 3). The RMC meets quarterly to ensure the research aligns with Melbourne Water’s strategic knowledge needs, endorse the annual research program, identify and resolve any problems (e.g. resourcing, health and safety), discuss research opportunities, and plan knowledge exchange initiatives. The RMC is also responsible for reviewing progress against milestones and performance targets such as number of internal and external stakeholder presentations, workshops or

training courses, dissemination of research publications, co-location days of researchers and Melbourne Water staff.

The two research co-ordinators (Coleman and Fletcher) have responsibility for overseeing partnership activities, while theme Leaders (from either organization) are responsible for co-ordination of projects within each research theme. At the project level, there are project teams comprising a research leader, researchers and Melbourne Water team members. Project teams help shape and guide the research as it progresses and ensure outputs are timely and relevant; enable input of management perspectives and insights, and support the exchange and adoption of knowledge. A dedicated knowledge broker at the University of Melbourne leads the development and implementation of a Knowledge Exchange Plan (see '*Knowledge Exchange*' section below). This role is supported within Melbourne Water by a research knowledge broker.

Knowledge exchange

Rather than an afterthought when research projects are completed, knowledge exchange is incorporated early in the research project development and implementation process. Whilst everyone in the MWRPP has a recognized role to play, knowledge exchange activities are planned and delivered with strategic oversight and coordination by the two knowledge brokers, who are also responsible for developing a Knowledge Exchange Plan (KEP) that guides key activities on an annual basis.

The KEP provides a framework for all communication activities undertaken as part of the MWRPP to ensure that knowledge exchange activities support the goals of the Partnership, in particular ensuring researchers and practitioners share and adopt knowledge. It recognises that knowledge exchange activities are not simply the 'communication' or 'translation' of research ideas, but the active integration into policy and practice. To achieve this, the plan gives consideration to the development of formal strategies and activities to integrate findings from the research into Melbourne Water's policy and practice, and formal opportunities for staff development and exchange between Melbourne Water and University staff. The plan also provides a template for preparing communications briefs for each of the partnership's research projects and identifies important dates for timely input into policy development and practices.

The purposes of knowledge exchange activities undertaken as part of the MWRPP are to: 1) promote the ways that the MWRPP can support waterway management, 2) build awareness and understanding of research projects, 3) encourage stakeholder engagement (including other agencies and research institutions), 4) establish a culture of knowledge sharing between researchers and practitioners, 5) generate a shared understanding of waterway management processes and context in which research will be adopted (including timeframes), 6) encourage integration of research findings into industry practice and 7) communicate the value of the research program in supporting Melbourne Water's operations.

A range of informal and formal knowledge exchange tools for communicating with internal and external stakeholders have been applied and are evolving with feedback from Melbourne Water staff. The selection of a particular tool is governed by what stage the research project is at and the nature of the project's objectives, target audience and outcomes. Informal communications are typically personal communications that help facilitate an effective exchange of ideas and play a vital role in the partnership's knowledge exchange activities. This is especially true for internal stakeholders during the inception phase for research projects (preparing of research objectives), that not only helps ensure that research outcomes are relevant and understood but also fosters a sense of project ownership: both are expected to be important for research adoption. Informal communications are difficult to plan for or schedule but are encouraged through actions such as 'hot desking' (i.e. reciprocal opportunities for investigators to sit within the offices of Melbourne Water and The University of Melbourne), meeting attendance (by investigators at relevant Melbourne Water or WERG meetings) and project participation (active involvement of stakeholders in the research project,

from inception to conclusion). Informal communications can also be strengthened through time: as relationships are built along with trust, respect and an understanding of needs and opportunities.

Formal communications tailored to specific audiences have included workshops, training courses, lunchtime seminars, conferences, field/demonstration days, email newsletters (promotion of projects and outcomes to specific interest groups), and technical publications/ journal articles. Research findings of interest and relevance to the wider community may also be formally communicated through the MWRPP website (www.mwrpp.org), the Melbourne Water intranet, technical notes (short 1–2 page document summarizing findings) and newspaper articles. The website provides a central contact point for the partnership including a repository for reports/articles, updates on projects, and contact details for investigators.

Importantly, the KEP documents research outcomes and anticipated timelines. For each project, the KEP identifies internal and external stakeholders who need to be engaged at various stages and the appropriate forms of engagement ('Collaborate', 'Involve', 'Consult' or 'Inform') based on the IAP2 public participation spectrum (e.g. IAP2 2015). Knowledge exchange tools are continually refined and new tools tested. Annual surveys that seek feedback from Melbourne Water staff on the success of the MWRPP program as a whole, and targeted surveys after knowledge exchange activities, have been important for understanding the effectiveness of activities. Based on this feedback, knowledge exchange appeared to be most successful when it does not rely on a single tool i.e. research messages need to be delivered on multiple occasions using multiple, complementary tools. Knowledge exchange is particularly strong through active involvement of practitioners in the research (e.g. helping to frame research questions, interpreting research implications for management and identifying knowledge adoption opportunities). Co-location and easy access to researchers is also important for opportunistic, informal knowledge exchange.

Determining program success

The success of the Partnership depends on the commitment of the researchers in communicating outcomes, and the commitment of stakeholders, principally Melbourne Water staff, to work with the researchers to adopt and use the research outcomes. Formal measures of success include attainment of research milestones and performance targets documented in research agreements, with these milestones tracked by the RMC (see 'Governance'). In addition to these metrics, which tend to focus on progress towards research milestones or the composition and number of knowledge exchange activities, success of the MWRPP is evaluated by the extent to which: 1) there is broad internal/external awareness of research projects and outcomes, 2) there are tangible examples of research findings directly influencing business activities, and 3) by the number of collaborative industry research projects.

Since the establishment of the MWRPP, key outputs include: two annual research update seminars to Melbourne Water staff; five internal presentations for Melbourne Water and eight external presentations to industry; development of a dedicated website; development and delivery of two stormwater management training courses (1 internal, 1 external); 19 technical reports; 30 journal articles; and three on-line decision support tools (macroinvertebrate predictions for streams, and two for calculating and plotting streamflow statistics). Knowledge transfer was also supported through the direct availability of researchers for more than 80 days of co-location, a total of 227 internal meetings and 90 external meetings, as well as the opportunity for Melbourne Water staff to attend a regular WERG Discussion Group. The extent of these additional supporting activities have involved >2,800 hours of researcher time, reflecting the emphasis of the Partnership on knowledge exchange and the value of the Partnership model beyond the research program itself.

The early integration of research findings with Melbourne Water activities is becoming increasingly evident, as indicated by the results of 2015 annual survey where 30% of respondents answered 'yes' to the question 'has any of the information provided by or knowledge generated through the MWRPP supported you in

fulfilling your role at Melbourne Water to date?'. This includes substantial contributions to several Melbourne Water strategic projects e.g. waterway investment planning scenarios to support business funding justification over the next five years, stream flow recommendations to protect waterway health in urban growth areas, and improved approaches to riparian revegetation.

The partnership research program has spurred further collaborations and leveraging of Melbourne Water's investment by attracting matching funding from external sources. These collaborations included partners from both industry (e.g. government agencies, local government) and research institutions (e.g. Griffith University, Monash University).

Conclusions

By beginning with a foundation of trust and respect developed from past collaborations and a shared set of tenets like those propounded by Boulton *et al.* (2008), the partnership was strongly placed to meet the challenges posed by Cullen (1990) to do better and more relevant science and to effectively broker the resulting scientific knowledge. To date the model of intertwining of knowledge exchange with research activities through formal and informal interactions, particularly the participation of Melbourne Water practitioners at all stage of research projects has shown promise as an effective means of accelerating the adoption of scientific knowledge into waterway management, and calming the interface that many of our predecessors have found to be a turbulent one.

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8ASM Full Paper

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