Sharing stakeholder knowledge in water resource management across boundaries and interfaces: experiences from Australian and New Zealand UNESCO HELP basins

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ABSTRACT

"Nurturing the opportunities for cooperation in water management among all stakeholders and improving the comprehension of the challenges and benefits of water cooperation can help build mutual respect, understanding and trust among countries and promote peace, security and sustainable economic growth." (UN Water 2012). This paper discusses experiences from three UNESCO-IHP HELP program basins. At the Ord HELP Basin, northwestern Australia, an irrigation expansion project and investment in regional social infrastructure is driving the need for comprehensive water and development planning processes that incorporate new knowledge and a new set of economic, social and ecological values. In the lower Burdekin HELP Basin, northeastern Australia, sugar cane farming predominates and irrigators are looking to address current and future pressure to reduce their impact on adjacent wetlands and the Great Barrier Reef. And in the Motueka HELP Basin, on the south island of New Zealand, an 11 year Integrated Catchment Management program was seeking solutions to the impacts of upstream land use on downstream water quality, with very positive results. While none of these rivers cross international boundaries, it is clear that many of the challenges experienced at the international scale are replicated at other scales: across internal jurisdictional borders, through institutional confines, across environmental interfaces, between economic sectors and around a range of social norms. Through the lens of three HELP basins, this paper draws lessons from some recent approaches aimed at harnessing stakeholder knowledge as a critical input at the policy-stakeholder-science interface for improved management of transboundary waters.

KEY WORDS: *Transboundary water management, UNESCO HELP, Ord River, Burdekin River, Motueka River*

INTRODUCTION

There are numerous definitions of transboundary water resources. The International Water Association´s WaterWiki (2013), for example, considers that *"A transboundary waterway is defined as all territory which contributes to a stream, at least one of the tributaries of which crosses a boundary."* The University Partnership for Transboundary Waters, on the other hand, provides a much broader explanation: *"The term "transboundary waters" refers to sources of freshwater that are shared among multiple user groups, with diverse values and different needs associated with water use. In this way, water crosses boundaries - be they those of economic sectors, legal jurisdictions, or political interests. From sets of individual irrigators and environmental advocates, to urban versus rural uses, to nations that straddle international waterways, essentially, all freshwater is transboundary water, and is important to society at local, national, regional, and international scales."* (University Partnership for Transboundary Waters, 2013).

It is widely understood that all aspects of our societies, from the economy to culture, depend at least in part on safe, stable access to water resources. It is also understood that increasing stress on freshwater systems around the world, from population growth, land degradation, and rapid urbanization, is increasing social and political tensions when diverse interests compete for a shared water source (Ibid). However, "*competition for water resources can create tension and conflict, but more often serve as a platform for cooperation and communication. The benefits of cooperative frameworks for managing shared water resources can be realized at multiple scales, from local watersheds, to larger catchments shared among rural, municipal and industrial users within a single nation"* (Ibid).

Established in 1999, the Hydrology for Environment, Life and Policy (HELP) program is a cross cutting and transdisciplinary initiative led by the International Hydrological Programme (IHP) of UNESCO that establishes an international network of 91 river basins in 67 countries to improve the links between hydrology and the needs of society. HELP aims to deliver social, economic and environmental benefits to stakeholders through research towards the sustainable and appropriate use of water. This is accomplished by deploying hydrological science in support of improved integrated catchment management, including improving the complex relationships between hydrological processes, water resources management, ecology, socio-economics and policy-making. The ultimate goal is to help scientists and stakeholders break through the traditional paradigm lock that separates them from integrated solutions (UNESCO, 2013).

This paper builds from the University Partnership on Transboundary Waters' broad definition to examine the relationship between transboundary water resources, conflict and cooperation, and specifically the role of knowledge sharing, in three river basins, two in Australia and one in New Zealand, that are part of the HELP network.

THE ORD HELP BASIN

At the Ord River, in the East Kimberley region of Australia´s northwest (Fig 1), a Government-led irrigation expansion and investment in regional social infrastructure is driving the need for comprehensive water and development

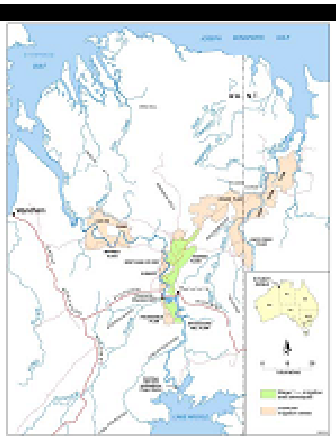

Figure 1: Ord River basin, northwestern Australia (Source: DoW, 2006)

planning processes that incorporate new knowledge and a new set of economic, social and ecological values.

The Ord River has a catchment of 46,100km^2 and at 650 km long is one of Western Australia's (WA) major river systems. It had a mean annual pre-dam streamflow of 4,500GL, a largest recorded flow of 30,800m^3/sec in 1956 and drains into Cambridge Gulf (Trayler *et al.,* 2006). The climate is semi-arid to arid monsoonal with two distinct warm dry and hot wet seasons (DoW, 2006). Lakes Argyle and Kununurra (created by the Ord River Dam and Kununurra Diversion Dam respectively) and the Ord River Floodplain are listed under the Ramsar Convention on Wetlands of International Importance (Ayre, 2008).

The lower Ord River is used to provide water to irrigated agricultural lands, hydro-electric power generation, water-based tourism, recreational fishing, boating and flying, watering cattle, as an inspiration to residents of region and visitors and is the homeland and kin of Aboriginal people. The East Kimberley has a high level of welfare dependency and a population age profile that suggests the problem will increase substantially if something is not done to improve Indigenous employment (Government of WA, 2009).

The Ord has been a UNESCO HELP basin since 2009, and, using the UNESCO Spiral of Integrated Water Resource Management (IWRM), Camkin (2011) summarised key development milestones at the Ord River. Changes to the Ord River hydrology began with construction of the Kununurra Diversion Dam (1963), but the most significant changes occurred after construction of the Ord River Dam in 1971 (DoW, 2006). In ecological terms, the lower Ord was transformed from a dry-tropics to a wet-tropics river (Trayler *et al*, 2006). Since regulation the strongly seasonal flows are more evenly distributed and the lower Ord now flows continuously during the dry season in response to releases from Lake Argyle for hydropower, irrigation and environmental water provisions (EWP, DoW, 2006). In 1999 the WA Environmental Protection Authority (EPA) reviewed a draft water allocation plan for the Ord River and recognized that a modified riverine ecology had established along the lower Ord in response to altered flows. The EPA advised a revised EWP regime should be developed to protect the modified, post-dam, environment, providing clear guidance to water planners.

The Miriuwung Gajerrong (MG) people are the Traditional Owners in the Ord River region. In December 2003, Australia's Federal Court ratified an agreement between the WA Government and the MG and Balangarra people recognizing their traditional rights and Native Title within WA (Ayre, 2008). A 2005 Ord Final Agreement (OFA) acknowledges that developments since the 1960's had extinguished native title rights and interests of the MG people and that they had not been compensated for the extinguishment, nor for other effects of the developments on them (Government of WA, 2009). The OFA resolved Native Title and Aboriginal heritage issues over land proposed to become irrigated farmland in WA, while enshrining the right of Aboriginal people to participate in, and benefit from, investment associated with irrigation expansion. The OFA includes a range of initiatives to develop the capacity of the MG people to engage in the local economy and benefit from future development, and includes financial support for improved land management in conjunction with them (Ibid).

A 2008 Ord-East Kimberley Development Plan provides the framework for Commonwealth and WA Government investment of Aus$415 milliion in development at the Ord *"to create a stronger, vibrant and sustainable community in the East Kimberley"* (Government of WA, 2009). The Development Plan seeks to couple together the use of available water and land for irrigation development with improvement in social, community and common-use infrastructure. According to the WA Government it *"...provides a unique opportunity to balance cultural, social, environmental and economic values to meet the challenges of climate change and increasing scarcity of water in other areas of Australia"* (Ibid). The Development Plan demonstrates acceptance of the need to address important environmental, social and cultural values that were either not recognized in previous decisions (e.g. aboriginal cultural values and ecotourism) or have emerged as a result of previous water resource development (e.g. Ramsar wetlands, eco-tourism and year-round navigation).

In accordance with the Development Plan, a new draft water allocation plan for the Ord River was released in 2012, the major irrigation distribution channel is operating, a preferred tenderer for land development has been identified, and there has been substantial development of social infrastructure, including for indigenous health, education and housing. There is now renewed interest from the neighbouring NT Government with the Premier of the NT and the Federal Minister for Regional Australia signing a memorandum of understanding on the proposed extension of the Ord irrigation area into the NT in November 2012. In a press release, the NT Government (2012) announced funding and the establishment of a cross-agency taskforce to get development underway, and recognized that *"the possibility of expansion of the Ord River Irrigation Scheme into the NT has been triggered by the investment of the WA and Australian Government's in irrigation channels, roads and supporting social infrastructure in the East Kimberley region."* This represents a clear example of the area of influence of water infrastructure development extending beyond jurisdictional boundaries and, consistent with the definition of the University Partnership for Transboundary Waters, the Ord is a transboundary water.

THE LOWER BURDEKIN HELP BASIN

At the lower Burdekin (LB) in northeastern Australia, farmers are looking to address current challenges managing groundwater levels and future pressure to reduce their

Figure 2. Burdekin River basin, northeastern Australia

impact on the adjacent wetlands and the Great Barrier Reef, the world´s largest tropical reef.

The lower Burdekin (Fig. 2), a UNESCO HELP Basin since 2004, is northern Australia's largest and most established irrigation area with a long history of growing sugarcane and 80,000 ha of land currently under cultivation. Irrigation first commenced in the 1860's on the fertile Burdekin River Delta (Petheram 2008). In the late 1980's and early 1990's, the area under irrigation doubled with the establishment of the Burdekin Haughton Water Supply Scheme (BHWSS) on the upstream alluvial floodplains. The LB is a conjunctive use scheme (i.e. water is sourced from both surface and groundwater), though the Delta region uses mainly groundwater (80-90%) and the BHWSS uses mainly surface water (80%) (CSIRO, 2013).

The older part of the irrigation area is within the Burdekin delta system, which lies closer to the coast on both the north and south side of the Burdekin River, collectively forming the Burdekin River Irrigation Area (BRIA). These areas are managed by the North Burdekin Water Board (formed in 1965) and the South Burdekin Water Board (formed in 1966), respectively (Ibid). Bowling Green Bay, which accounts for more than half of the Burdekin Shire's coastline, is listed under the Ramsar Convention on Wetlands of International Importance. The wetlands are managed through riparian agreements with landowners and a commitment to reducing the impact of development on coastal ecosystems (Burdekin Shire Council, 2012).

In a Document of Discovery to inform the management of groundwater in the LB, Williams (2007) noted that the water boards, along with the BHWSS, all have groundwater issues that must be addressed. He found that *"…BRIA stakeholders have not worked together in the past to deliver coordinated quality natural resource management (NRM)"* and that *"it is unlikely this or any of the natural resource problems occurring in the BRIA will improve if stakeholders continue to operate as they have in the past."* Williams also noted *"there was no mechanism to allow the community to become engaged in decisions on management of the natural resources in the BRIA"*, decisions that have implications for nearby sites with high community value.

Burdekin Water Futures (BWF) was established in 2006 to help manage the complex institutional problem of multiple entities being responsible for water and NRM. The BWF mission is to support a long-term, strategic, whole-of-system approach to understanding and managing the LB water resources and associated systems, and thereby deliver long-term economic, social and environmental outcomes that ensure the region's sustainability (CSIRO, 2009).

In his Document of Discovery, Williams (2007) also noted there was *"a vast amount of knowledge about the BRIA held by the key stakeholders"* but that the knowledge *"tends to stay within the groups who generate it either because there is no forum for it to be shared, it is not in a form that can be easily used or it is withheld by choice."* He found there was *"no coordinated information management approach between the stakeholders within either the BRIA or the LB in general"* and that stakeholders must find a way to manage information and ensure it is readily available to inform decision makers. The Northern Australia Irrigation Futures project (2003-2010), delivered through CSIRO and the Cooperative Research Centre for Irrigation Futures, developed new knowledge, tools and processes to support debate and decision-making regarding irrigation in northern Australia. Working with the BWF, Northern Australia Irrigation Futures created a prototype Lower Burdekin Knowledge Platform (LBKP) to support knowledge transfer and capacity building in the LB, in order to achieve more comprehensive, transparent and consistent planning and decision making (Camkin *et al*, 2007).

Development of the LBKP (Fig. 3) recognised that catchment communities can better understand how their catchments operate through: (i) improved use of existing catchment knowledge; (ii) enhanced methods for transferring experiences across catchments; and (iii) new understandings about learning models and about how and when individuals search for and share their knowledge (Camkin *et al*, 2007). The LBKP sought to provide on-line access to knowledge and expertise relevant to decisions about water and NRM in the LB. Core to this approach was a flexible and responsive content framework which allowed documents, audio files, video, presentations, online reports or live data feeds to be uploaded and used in different contexts. These rich media types, which can include, for example, interviews and personal stories, have more immediacy and impact than documents alone.

Consistent with the definition of transboundary waters, the water and NRM challenges of the LB transcend a complicated set of institutional boundaries, making the sharing of knowledge and dealing with complex management challenges difficult. Several initiatives, including the establishment of the LBF and development of the LBKP have attempted to reduce the impact of institutional and operational boundaries to support more cohesive water and natural resource management.

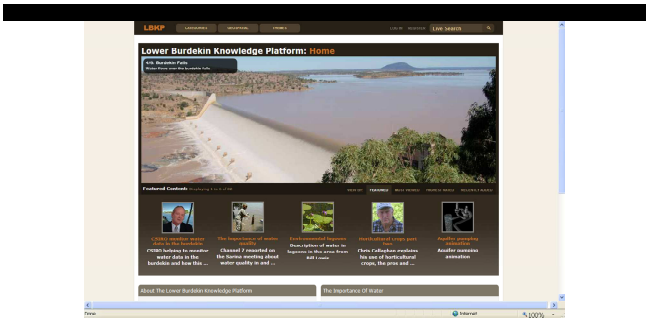

Figure 3. Lower Burdekin Knowledge Platform

THE MOTUEKA HELP BASIN

At the Motueka basin, New Zealand, an 11 year Integrated Catchment Management (ICM) multi-disciplinary, multi-stakeholder research program aimed to provide information and knowledge to improve the management of land, freshwater and near-coastal environments in catchments with multiple, interacting, and potentially conflicting land uses (Landcare Research, 2013). With a focus on understanding how catchments function *"From ridge tops to the sea"*, the program delivered substantial new insights into the role of stakeholder knowledge in water resource management across boundaries and interfaces.

The Motueka River, a UNESCO HELP Basin since 2004, drains an area of 2,180km^2 of the Tasman District in the north of New Zealand's South Island (Fig. 4). Over only 110 km the Motueka falls from its alpine headwaters at 1,800 m and delivers 62% of the freshwater inflow to Tasman Bay. Average annual precipitation is between 1,040 and 4,030 mm across the catchment. The Motueka starts in rugged mountainous terrain, passes through flat alluvial terraces in the upper basin valleys, rolling and steep hill country in the lower basin to flat alluvial plains at the mouth at sea level (Landcare Research 2013). Indigenous forest and tussock land makes up 55% of the catchment land area with exotic forestry 25% and sheep and beef farming at 19%. The major resource management issues in the catchment are competition for water and the impact of water use on instream values, impact of deposition of sediments on life in streams and coastal waters, high concentrations of pathogenic organisms at times in the lower catchment and high water temperature and poor aquatic habitat (Tasman District Council, 2013).

Several research outcomes are key to consideration of the Motueka as a transboundary water. For example, one focus of the research was how to manage land and freshwater resources to protect and manage marine resources. River outflows to the coast affect the stability, productivity and ecosystem health of the river delta and this has a flow on effect on marine fisheries and aquaculture potential. This research program showed that the Motueka 'Catchment' *"effectively extended offshore, encompassing more than 400 km^2 of the marine environment of Tasman Bay"* (Gillespie *et al*, 2011a, 2011b). Of that 400 km^2, *"180 km^2 of seabed has a demonstrable terrestrial signature arising from the river outwelling plume"* and *"naturally high heavy metals (Ni, Cr, Cu) within the sediment flushed from the Red Hills at the head of the catchment may be affecting marine and freshwater life*". The implications of these findings are clear. Management of coastal ecosystems, fish and freshwater resources must take into account activities across the entire land/sea continuum within the redefined and extended catchment, constituting *"a major deviation from current coastal management practice"* (Ibid). Understanding how near-shore marine ecosystems and development activities such as aquaculture are impacted by water quality and flow changes caused by upstream land use can greatly assist integrated management and social cohesion throughout a catchment.

Incorporation of stakeholder knowledge was a strong feature of the Motueka ICM research. The program recognised that management is a distinctly human process (Allen *et al*, 2011) and that understanding and building human capital and facilitating community action were appropriate components of an integrated, transdisciplinary research program. A range of community engagement processes, including ICM Annual Meetings, encouraged active community contributions over the course of the program. An ICM Community Reference Group provided guidance on the research direction and findings, and established a forum for "vigorous debate" on interactions between upstream and downstream catchment activities (Landcare Research, n.d.). *Watershed Talk* explored how people cared about the catchment and practices or values underpinned individuals wanting to leave the catchment in better shape (Atkinson *et al*, 2009). The Motueka ICM program built a strong relationship with Motueka iwi Te Atiawa, Ngãti Rarua and Ngãti Tama and developed guidelines for iwi consultation (Landcare Research, 2013). Working with the iwi (meaning peoples or nations) researchers developed new indicators of river ecosystem health. Comparative work between scientific and iwi cultural indicators of river health is ongoing, but shows that scientifically and culturally-based monitoring and assessment can provide an enriched and complementary understanding of freshwater systems. Each approach offers a slightly different worldview and can be used side by side (Landcare Research, 2013).

The most effective of all the social learning methods designed and trialled with stakeholders and catchment groups was the art-science collaboration *Mountains to the Sea* (Atkinson *et al*, 2004). From this work a *Travelling River* (Fig. 5) exhibition built understanding of ICM science and encouraged people to think about how their environment has been modified by human and natural actions. Travelling River included over 250 community photographs, science images and stores from 60 contributors in the Motueka catchment attracted over 2,500 visitors.

According to the Tasman District Council the ICM

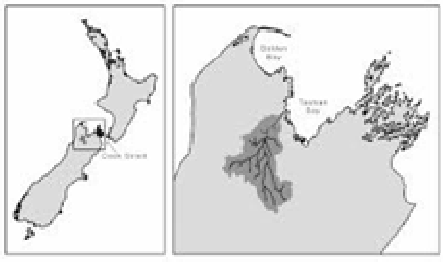

Figure 4. Motueka River basin, South Island, New Zealand

Figure 5. Travelling River (Source: Landcare Research)

research *"yielded considerable information, not only about geophysical and ecological aspects, but also social and economic aspects"* of the Motueka catchment (Tasman District Council, 2013).

LESSONS LEARNT

One hundred years ago a common vision of northern Australia was one of agricultural development and a populated north to address a perceived threat of invasion. Consistent with changing community attitudes, development objectives at the Ord River have broadened over time to include regional development, retention of new values and optimising the use of available resources to achieve the dual objectives of increasing economic activity and addressing social disadvantage. There is now a much broader mix of social, economic, cultural and environmental objectives than at any point in the history of development of the Ord (Camkin, 2011). Influential in this change was the development of national policy directions for water (eg the National Water Initiative and associated reforms at the state level), regional development (eg WA Government's Royalties for Regions policy) and improving health, life expectancy and educational attainment for Indigenous people (eg Australian Government's Closing the Gap policy). Critical to effective local implementation of these policies was the incorporation of new knowledge, especially local and Indigenous knowledge, through a range of stakeholder engagement initiatives and scientific research.

At the lower Burdekin, the institutional framework for water and natural resource management is complex and the challenges stretch beyond the spatial and jurisdiction responsibility of individual organisations. Nevertheless, these organisations are increasingly recognizing their collective obligation to address these challenges and are attempting to do so through more collaborative mechanisms, such as the Lower Burdekin Futures group. The Northern Australian Irrigation Futures project concluded that decisions about the future of irrigation in northern Australia are primarily about people and relationships. It found that it is possible to support catchment communities and governments by developing knowledge, tools and processes that improve the use of available knowledge, assist in the transfer of experiences within and between catchments, and create understanding about how and when individuals and organisations search for and share their knowledge.

From the Motueka we see clearly the importance of sharing knowledge between scientific disciplines and across scientific and not scientific interests. The prolonged sharing of scientific and stakeholder knowledge, including Indigenous knowledge, over the 11 year research program created a lasting legacy. The redefinition of the Motueka catchment itself, to include the near-shore marine environment, brought into the ICM framework a new set of stakeholders whose activities in the near-shore marine environment can be impacted, positively or negatively, by distant and very different on-land activities in the upper reaches of the catchment. Improved understanding of the land-freshwater-marine linkages, and the subsequent redefinition of the catchment and its stakeholders, opened up new possibilities for more integrated catchment management, improved economic productivity and reduced social tension across a range of previous boundaries.

CONCLUSIONS

Through the lens of three UNESCO HELP basins, this paper has sought to draw lessons from some recent approaches aimed at harnessing stakeholder knowledge as a critical input to the management of water resources. It is clear that the zone of influence of a river can traverse a wide range of different boundaries, even if the river physically doesn't. The Ord demonstrates how rivers can have an economic and social zone of influence well beyond the catchment. The Burdekin demonstrates how water management challenges cross institutional boundaries. And the Motueka demonstrates how rivers and water management issues go across scientific disciplinary boundaries and how multi-disciplinary research and transdisciplinary thinking can support a much more integrated understanding of ecological, social and economic processes within a catchment. Together, these three examples show how rivers, and by extension other water resources, provide social, economic and environmental services which cross a diverse range of boundaries, highlighting the need to ensure that thinking about transboundary water resources remains broad and inclusive.

The Ord, lower Burdekin and Motueka HELP Basins also demonstrate the importance stakeholder knowledge in addressing transboundary water management challenges. At the Ord River, indigenous knowledge has been increasingly incorporated into water planning and desired indigenous outcomes into overall decision making. At the Burdekin, in recognition of the challenges of multiple responsible entities, the BWF is helping to share stakeholder knowledge across institutional boundaries. And in the Motueka, sharing of knowledge between iwi and scientists, between different scientific disciplines, and between all catchment stakeholders, produced a much richer understanding of the catchment, resulting in its redefinition, facilitating greater community understanding of interactions between catchment activities and providing a mechanism to reduce social tension.

While none of the three UNESCO HELP Basins discussed in this paper physically cross an international or internal national boundary, the Ord, Burdekin and Motueka can all be considered transboundary waters. These examples show that many of the challenges experienced in relation to international transboundary resources are replicated at other scales: across internal borders, through institutional confines, across environmental interfaces, between economic sectors and around a range of social norms. Sharing knowledge across these boundaries is critical to developing the comprehensive mutual understanding necessary to support the management of shared water resources.

LITERATURE CITED

Allen, W. J., *et al*., 2011. Building collaboration and learning in integrated catchment management: the importance of social process and multiple engagement approaches. *New Zealand Journal of Marine and Freshwater Research* 45(3): 525-539.

Atkinson, M., Kilvington, M. & Fenemor, A, 2009. Watershed Talk – the cultivation of ideas and action. Manaaki Whenua Press. 45pp.

Atkinson, M., *et al*., (eds), 2004. Travelling River – a collaboration of artists, scientists and the people of the Motueka River catchment. Catalogue for the Travelling River exhibition. Published the Mountains-to-the-Sea project, Landcare Research, Nelson.

Ayre, M., 2008. Collaborative Water Planning in the Ord River, Report to the Tropical Rivers and Coastal Knowledge (TRaCK) program, Land & Water Australia, Canberra.

Burdekin Shire Council, 2012. Burdekin Shire Community Plan 2012 – 2022. http://www.burdekin.qld.gov.au/ Accessed online 11 February 2013.

Burdekin Shire Council, n.d. Burdekin Water Futures. http://www.burdekin.qld.gov.au/council/publications-and-reports/lower-burdekin-water-futures/. Accessed online 11 February 2013.

Camkin, J.K., 2011, Adapting to changing hydrology, ecology and community attitudes to water at the Ord River, Northwestern Australia, *Journal of Hydrologic Environment*, 17(11) 17-30.

Camkin, J.K., Story, J. & Bristow, K.L., 2007. An Ecologically Sustainable Development component system to support irrigation decision-making in northern Australia. CSIRO Land and Water Science Report No.78/07, CRC for Irrigation Futures Technical Report No. 10/07.

CSIRO, 2009. Northern Australia Irrigation Futures Lower Burdekin case study. http://www.clw.csiro.au/naif/. Accessed online 11 February 2013.

Department of Water (DoW), 2006. Ord River Water Management Plan, Department of Water, Government of Western Australia, Water Resource Allocation Planning Series Report No WRAP 15.

Environmental Protection Authority (EPA), 1999. Draft Interim Water Allocation Plan, Ord River. Advice from EPA to the Minister for the Environment under Section 16(e) of the Environmental Protection Act 1986, EPA Bulletin 965, Environmental Protection Authority, Perth. December 1999.

Government of Western Australia, 2009. Ord-East Kimberley Development Plan, Government of Western Australia, 2009.

Gillespie, P. A., *et al*., 2011a. Spatial delineation of the depositional footprint of the Motueka River outwelling plume in Tasman Bay, NZ. *NZ Journal of Marine and Freshwater Research,* 45, 455-476.

Gillespie, P., *et al*.., 2011b. Variation in nutrient loading from the Motueka River into Tasman Bay, New Zealand, 2005-2009: implications for the river plume ecosystem. *NZ Journal of Marine and Freshwater Research,* 45, 497-512.

IWA WaterWiki. 2013. International Water Association. http://www.iwawaterwiki.org/. Accessed online 10 February 2013.

Landcare Research, n.d. Integrated Catchment Management for the Motueka River. A Summary of Outcomes and selected formal publications from the Integrated Catchment Management (ICM) research programme: 2000 – 2011. Landcare Research. http://icm.landcareresearch.co.nz/. Accessed online 11 February 2013.

Northern Territory (NT) Government, 2012. Ord Development Project Media release. http://www.nt.gov.au/d/Primary_Industry/. Accessed online 11 February 2013.

Petheram, C., *et al*., (2008). Analysis of the Lower Burdekin, Ord and Katherine-Douglas-Daly Irrigation Areas: Implications to future design and management of tropical irrigation, CRC for Irrigation Futures Technical Report No. 05/08 / CSIRO Land and Water Science Report 19/08.

Tasman District Council, 2013. Motueka River Catchment. http://www.tasman.govt.nz/ Accessed online 11 February 2013.

Trayler, K., *et al*., 2006. Environmental values, flow related issues and objectives for the lower Ord River Western Australia, Department of Water, Government of Western Australia, Environmental Water Report Series, Report No. 1, July 2006.

UNESCO, 2013. Hydrology for the Environment, Life and Policy (HELP). HELP programme website. http://www.unesco.org/new/en/natural-ciences/environment/water/ihp/ihp-programmes/help/. Accessed online 10 February 2013.

University Partnership for Transboundary Waters, 2013. Frequently Asked Questions. http://waterpartners.geo.orst.edu/faq.html. Accessed online 10 February 2013.

UNWater, 2012. Water Cooperation. International Decade for Action 'Water for life' 2005-2015. UN Department of Economic and Social Affairs (UNDESA). http://www.un.org/waterforlifedecade/water_cooperation.shtml. Accessed online 10 February 2013.

Western Australian Government, 2013. Ord-East Kimberley Project: FAQs. http://www.rdl.wa.gov.au/publications/Documents/Ord-East-Kimberley-Expansion-Project-Frequently-Asked-Questions.pdf Accessed online 11 February 2013.

Williams, J., 2007. Document of Discovery: To Inform the Management of Groundwater in the Burdekin River Irrigation Area. Weeetangera. John Williams Scientific Services, Nov. 2007. 44p.