Incorporating Social, Traditional and Biophysical Values into a Water Quality Objectives Framework for the Wet Tropics

Authors: **Julie H. Tsatsaros[abcd], Jon E. Brodie[a], Iris C. Bohnet[bc] , Peter Valentine[b]**

[a]Australian Centre for Tropical Freshwater Research, James Cook University, Townsville, Queensland, Australia, 4811
[b]School of Earth and Environmental Sciences, James Cook University, Townsville, Queensland, Australia, 4811
[c]CSIRO Ecosystem Sciences, PO Box 12139, Earlville BC, Cairns, Queensland 4870, Australia

[d]Corresponding author. Email: Julie.tsatsaros@jcu.edu.au; 61(0)7 4059-5004 (phone); 61 (0) 7 4055 6338 (fax); James Cook University-Cairns Campus, Australian Tropical Forest Institute (E2) Building, P.O. Box 12139, Earlville BC, Cairns, Queensland, Queensland, Australia, 4870

INTRODUCTION

The Wet Tropics of northern Queensland occupies less than 1% of Queensland (Goosem et al.1999), forms a belt approximately 50 km wide, and stretches approximately 500 km along the north-eastern coast of Queensland between Townsville and Cooktown (Bohnet and Smith 2007). World heritage status was established in this region in 1988, covering approximately 900,000 ha of rainforest (48% of the region)(McDonald and Lane 2000). The Wet Tropics region is also significant for its proximity to the near shore reef systems of the Great Barrier Reef (GBR)(Mackay et al. 2010). The GBR is inscribed on the World Heritage List and borders the Wet Tropics region creating a distinctive area where these two world heritage areas (WHAs) meet (McDonald and Lane 2000).

Plans, Programs, Frameworks and Policies

In 1992, the Australian and New Zealand Governments initiated a national plan called the National Water Quality Management Strategy Framework (NWQMSF)(DSEWPC 1992; Bohnet and Kinjun 2009; Jackson 2006). This plan is designed to work with States to provide policies and national guidelines to help regional communities identify environmental values (EVs), and develop water quality management programs to improve water quality resources. In Queensland, the NWQMSF is embedded in the 1997 Environmental Protection Water Policy (Bohnet and Kinjun 2009). The NWQMSF identifies three levels of protection for waterways with different aquatic ecosystem values: these values include high ecological value, slightly to moderately disturbed, and highly disturbed. This allows local communities to identify waterways with high ecological values to be protected. A complete assessment of the environmental values of Wet Tropics waterways and aquatic ecosystems has not yet been completed, although such an analysis has been completed for the rest of northern Australia excluding the Wet Tropics (Kennard 2010).

A fundamental challenge in many Wet Tropics catchments is translating EVs into Water Quality Objectives (WQOs) and management actions. National and State guidelines provide a framework to establish EVs and set WQOs, however, the practical application of community participation remains challenging as there is no consensus on who should be involved and why (Bohnet and Kinjun 2009). Generally, water quality policies specify objectives (i.e. standards) for individual water quality parameters, and these standards are ideally not to be exceeded

(Wong 2010). Identifying the steps needed to integrate scientific and non-scientific (i.e. local) knowledge into the development of Wet Tropics WQOs is challenging.

Reef Plan 2003 (revised in 2009) forms the basis for water quality management in the GBR and its adjacent catchments. One element of Reef Plan is the Federal Government's Reef Rescue Program (a $200 million, 5 year (2008-2013) voluntary, incentive based management scheme). The second element is the Queensland Reef Protection Amendment Act (a 2009 State regulatory plan focused on improving water quality conditions specific to Wet Tropics catchments). A large percentage of Reef Rescue funds (approximately $146 million) target on-the- ground actions to improve water quality, and other funds from this program focus on improving catchment monitoring, research, and engaging Traditional Owners (Waterhouse et al. 2010).

STUDY AREA

The Tully Basin

The Tully Basin is in close proximity to the GBR, and was recently identified as one of the top ten pollution hot spots in the GBR lagoon (Terrain NRM 2008). Agricultural production is a major economic livelihood in this area. Basin issues include in-stream water quality degradation in freshwater reaches.

The Tully Basin was chosen as a case study for this research as it is biophysically and economically representative of other Wet Tropics catchment areas in the region, and is in close proximity to the GBR. This Basin generally represents the wet tropical climate of the region (Devlin and Schaffelke 2009). The Tully River is also the least variable river in the Wet Tropics with respect to annual discharge, and allows for accurate and defined water quality trends (Faithful et al. 2008). The river floods regularly, one to four times per year, with riverine discharge extending into adjacent marine waters (Devlin and Schaffelke 2009). Approximately 65% of the Tully Basin is in the Wet Tropics WHA (Faithful and Finlayson 2005 Terrain NRM 2008).

This research project focuses mainly on the Tully Basin defined as the area of the Tully River Catchment Area, Hull River, coastal tributaries, and the Murray River. The Tully and Murray Rivers are the two main waterways in this basin that export sediment and nutrients to the GBR lagoon. The Tully Basin includes subcatchment waterway areas and downstream environments, including the GBR. The principal stream in this Basin is the Tully River with a total length of 130km; major tributaries include the Jarra, Echo, Davidson and Banyan Creeks.

The Tully Basin is characterised by high, summer-dominant rainfall (average 2000-4082 mm), and covers an area of 2787km^2 , draining wet tropical rainforest in its upper reaches (Webster et al. 2009). The basin's middle and lower reaches contain beef grazing, and a large coastal floodplain is comprised of wetlands modified to support sugarcane and banana production as well as urban areas (Brodie et al. 2009; Devlin and Schaffelke 2009; Faithful and Finlayson 2005; Terrain NRM 2008).

Three Aboriginal Traditional Owner groups live in the area including the Girramay, Jirrbal and Gulnay people (Terrain NRM 2008). Girringun Aboriginal Corporation represents these traditional owner groups. The Aboriginal Corporation has expressed a desire to recognize the

Tully Basin as an Indigenous Protected Area (IPA), thereby creating opportunities for Traditional Owners to be involved in monitoring, protecting, co-managing water resources (freshwater and marine), assisting with enforcement measures, and creating future research opportunities in the Basin.

Tully Water Quality Improvement Plan and Water Quality Issues in the Basin

Water Quality Improvement Plans (WQIPs) are being developed for individual river basins associated with the GBR Water Quality Protection Plan. According to Brodie et al. (2009), WQIPs include marine ecosystem targets linked to end of river pollutant load targets and farm level management practice targets.

In 2007, a WQIP was developed for the Tully Basin to reduce sediment, nutrient and pesticide loads for waters entering the GBR. This plan was endorsed by the local community (Terrain NRM 2008). The WQIP was developed with industry and community members (including Traditional Owners) over a three-year time period to establish local environmental values (EVs), and WQOs targeted for estuarine, marine and selected freshwater parameters in the Tully WQIP area. These WQOs included relevant State and Federal water quality, drinking water, and recreational water quality guidelines. The EVs and WQOs were consistent with the National Water Quality Management Strategy Framework (NWQMSF), embedded in the 1997 Queensland Environmental Protection Policy (QEPP), and approved by EPA and GBRMPA (Terrain NRM 2008).

The 2007 Tully WQIP identified effective and economic ways to reduce pollution levels in the Tully Basin by 2013 (Terrain NRM 2008). In addition to developing realistic targets for water quality improvement, the Plan also provided baseline information for regional, local and cultural heritage planning (Bohnet et al. 2007).

Through the WQIP community consultation process, several local water quality issues of concern (relevant to freshwater reaches) were identified. These concerns included the safety of drinking water, limited or no access to areas of cultural and spiritual significance, and loss of local waterbodies including wetlands, lagoons and small streams. During the Tully WQIP process, various interview and workshop activities supported setting WQOs for the freshwater reaches in the Basin to protect the community's EVs and uses. The WQIP recommended additional consultation was needed with the community to develop freshwater WQOs, as the Tully WQIP was focused mainly on developing downstream WQOs for estuarine and marine environments including the GBR (Terrain NRM 2008).

The Tully WQIP (2007) mainly had a downstream focus aimed at protecting the GBR. The WQIP focused on reducing sediment, nutrient and pesticide loads in waters entering the GBR, and developing WQOs to protect it. WQOs for freshwater reaches in the Basin (except pesticides) were not considered. Therefore, for most freshwater quality parameters, no regional Wet Tropics WQOs were developed in the WQIP.

Currently, ANZECC (2000) guidelines remain the principal source of freshwater quality guidance for in-stream protection. These guidelines provide default general water protection guidelines for ecosystem protection for freshwaters in Australia and New Zealand. However, these water quality guidelines do not take into account local or regional water quality conditions, or cultural and spiritual EVs. ANZECC (2000) guidelines recommend locally relevant guidelines should be

developed whenever possible, and where appropriate, local authorities should use their own tools to better refine these national water quality guidelines, either by developing regional guidelines or developing specific WQOs (ANZECC 2000).

Results from interviews and community workshops indicated the freshwater reaches in the Tully Basin were extensively used and valued through a wide range of activities, and these uses and values were at risk. Stakeholders declared that some of their freshwater uses and values in the Basin have disappeared (Bohnet and Kinjuin 2009).

Stakeholder uses and values of freshwaters provide the basis for setting stringent WQOs for this Basin (Bohnet and Kinjuin 2009). Setting WQOs for freshwater reaches could help protect, restore, and potentially re-establish community water uses and values in this Basin.

MAIN RESEARCH QUESTION

How can local EVs from a Wet Tropics community be incorporated into a comprehensive water quality objectives framework for a Wet Tropics Basin, and how is this methodology developed?

This research project is expected to assist in providing positive steps in determining essential processes or components necessary to develop a successful stakeholder based water quality improvement strategy in the Wet Tropics. This study will also examine the premise that underlies the NWQMSF, National Water Initiative (NWI), and relevant social science research that states that community involvement is necessary for successful water quality management in Australia.

Following the community involvement principals outlined in the NWQMSF and National Water Initiative (NWI), this project is investigating the importance of including community future desired uses and EVs in the establishment of WQOs for freshwater reaches (including in-stream water quality), and waters entering the GBR. An examination and analysis of the diverse local water/land uses and EVs in the Basin and adjacent marine environment is currently being conducted.

This study will integrate the main EV sets in this Basin to compare and contrast EVs that may be in conflict, and may cause complex challenges in establishing WQOs for the Basin. Some EVs may have more internal conflict than others.

METHODS

A selection of tools from biophysical and social science is being used. The research methodology consists of four main linked steps, these include:

Step 1: Document and verify EVs from all user groups in the Tully Basin (previously identified in the Tully WQIP 2007);

Step 2: Design a local community driven water quality monitoring program to provide additional local water quality knowledge to fill in water resources gaps;

Step 3: Outline the steps needed to interpret EVs and water quality information into the development of Wet Tropics regionally derived WQOs;

Step 4: Identify factors supporting or inhibiting the establishment of regional WQOs in the Basin.

Community workshops were recently held in the sub-basins of the Tully Basin in May 2011. These workshops focused on verifying EVs from all user groups in the Basin, documenting EVs not previously identified, discussing current water quality monitoring programs in the Basin, and providing an opportunity for stakeholders to provide local WQ knowledge (including priority water quality areas of concern and additional water quality parameters for future sampling efforts).

The May 2011 workshops were conducted in each of the sub-basins to verify past, current, and future water uses, and EVs associated with spatial locations. Workshop participants represented different views and interests, and workshop sizes were designed to stay small to allow maximum opportunities for participants to communicate. A series of basin maps were used, with previous EVs identified for each reach. As well, maps showed corresponding land use information and locations of existing water quality monitoring stations. These workshop maps and spatial locations of EVs were linked to identify EVs to rivers, creeks, swamps, wetlands, etc. The workshops were tape recorded, and this data will be put into Nvivo, a qualitative data software tool for further analysis.

The Next Step

From October to December 2011, a series of qualitative semi-structured one-on-one interviews will be held with representative stakeholder groups (i.e. local residents, farmers, growers, graziers, foresters, Traditional Owners, conservation representatives, tourism operators etc). It is anticipated these interviews will provide additional information regarding stakeholders connection to the Basin and provide water quality information through this process. These interviews may also be important as some individuals may not want to share their views with wider group (i.e. in a workshop environment).

DISCUSSION

Determining a framework to develop water quality objectives and gaining support for management actions to achieve these objectives is challenging. This study will aim to provide a conceptual model to integrate biophysical, social and institutional information at a basin scale in refining Wet Tropics water quality objectives.

Coastal catchments and adjacent marine aquatic ecosystems are intricately connected through hydrological, ecological, and socioeconomic processes (Kroon 2009). Currently, there are few practical examples integrating research across all scales and disciplines resulting in tangible outcomes for catchment management and ecosystem health (Kroon 2009). The integration of these processes may result in benefits that include scientifically validated, cost effective, and socially acceptable water quality management actions for water quality improvement (Kroon 2009).

TAKE HOME MESSAGES

Water quality management in the Wet Tropics is complex and dynamic, with involvement needed from local, regional, State, national and international stakeholders (Kroon and Brodie 2009). The Wet Tropics and Great Barrier Reef are both World Heritage listed areas and there are conventions to adequately manage these sites and engage stakeholders to better protect these World Heritage Areas.

Regionally specific water quality objectives should be developed in the Wet Tropics to reflect local conditions that conserve, protect and improve water quality for the freshwater reaches draining to the GBR. We expect this participatory research approach will lead to a common set of environmental values and water quality objectives supported by the local Basin community. We also hope this research could be a case study of a bigger analysis, of how this methodology could be extended to other Wet Tropics catchments, or more generally to other northern Australia catchments.

Acknowledgements

This publication was supported by a grant from the Marine and Tropical Sciences Research Facility (MTSRF), a component of the Commonwealth Environment Research Facilities Program (CERF), an initiative of the Australian Government.

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