

Great Barrier Reef water quality and its links to regional natural resource management planning

Ann Peterson¹, Michelle Walker^{*2}, Mary Maher³

Abstract

The Great Barrier Reef Water Quality Protection Plan 2003 (the Reef Plan) aims to halt the decline in water quality entering the reef and in the reef lagoon within ten years. The Reef Plan places responsibility on the regional natural resource management bodies (regional bodies) within the adjacent reef coastal catchments to implement several actions towards achieving this outcome. In 2006, the Australian and Queensland governments commissioned an evaluation of how funded regional body activities are contributing to the achievement of the Reef Plan actions and objectives. This evaluation applied several criteria to determine the scope, adequacy and likely effectiveness of the funded regional body activities; identified a range of 'good news stories' exemplifying successful and innovative approaches; and identified gaps, constraints and opportunities.

The evaluation showed significant variation in the level of achievement, ranging from the implementation of mainly pilot projects to a comprehensive level of achievement where several initiatives are underway and delivering good outcomes. The main initiatives were the development of water quality improvement plans, regional wide monitoring of water quality, and a strong reliance on self-management approaches, education and extension, incentives, partnerships, and research and development. The main challenges were in moving to more comprehensive, coordinated and multi-scaled approaches, that include improved data capture and management, identification of priorities (e.g. high risk catchments and 'hot spots') and targets, sharing the lessons learned, engaging Traditional Owners and other stakeholders in the process, developing more effective incentives and improving public policy frameworks and responses. We concluded that regional natural resource planning was appropriate for addressing complex, multi-scale problems such as water quality, but that the process must quickly move to a higher level of commitment and application.

This paper outlines the major findings of the evaluation including some examples of the 'big initiatives' being undertaken by regional bodies and the 'big insights' regarding the progress and the constraints to achieving the Reef Plan actions.

¹ School of Geography, Planning and Architecture, The University of Queensland, St Lucia Qld 4072, Australia. email: a.peterson@uq.edu.au

² Michelle Walker & Associates, PO Box 5496 West End Qld 4101, Australia email: mail@michellewalker.com.au

³ Mary Maher & Associates, 17 Katrine St, West End Qld 4101, Australia email: mail@marymaher.com.au

* Michelle Walker will be presenting this paper on behalf of the authors.

1. INTRODUCTION

Water quality in coastal reefs is declining globally (McWilliams 2006; Ronnberg and Bonsdorff 2004). In Australia, the Great Barrier Reef Water Quality Protection Plan (Reef Plan), (State of Queensland and Commonwealth of Australia 2003) is being implemented as part of a comprehensive strategy to improve the quality of water entering the reef within ten years. Land based activities within the Great Barrier Reef catchments were identified as key contributors to declining water quality (Fitzroy Basin Association 2004; FNQ NRM Ltd 2004; Burdekin Dry Tropics Board 2005; Burnett Mary Regional Group 2005; Mackay Whitsunday NRM Group Inc. 2005) and hence it was necessary to integrate the management of adjacent reef catchments within the Reef Plan to ensure improved water quality outcomes.

In conjunction with this reef planning process, the Commonwealth and State governments, since the late 1990s, have devolved natural resource management (NRM) responsibilities to regional natural resource management bodies (regional bodies) (Australian Government 2005). In the state of Queensland, the regional bodies are community based, not for profit, incorporated organizations that include a range of stakeholders (e.g. agriculture and industry sectors, conservation groups, local government and Traditional Owners). The Reef Plan gave responsibility to the regional bodies, with catchments adjacent to the Great Barrier Reef, to implement several of its actions, including the setting of water quality targets and implementing management actions to achieve those targets.

Regional bodies in Queensland have developed regional natural resource management plans, with funding for the initiatives identified in these plans provided primarily through the Natural Heritage Trust Extension (NHT2), National Action Plan for Salinity and Water Quality (NAPSWQ) and Coastal Catchments Initiative (CCI). Regional bodies have developed investment strategies to implement their priority actions, including those related to improving reef water quality.

Against this background, the important question that we address in this paper is, "Are the regional NRM plans delivering on the Reef Plan's water quality objectives and actions?" Comprehensive plan evaluation is critical given the move towards regional NRM planning in Australia (Peterson et al. in review; McAlpine et al. accepted 2006; McAlpine et al. 2005; McDonald et al. 2005; Paton 2004; Bellamy et al. 2001) and the need to integrate planning processes to achieve comprehensive outcomes for the environment. Hence, the objectives were to:

- (a) evaluate the scope, adequacy and likely effectiveness of the funded regional body activities in achieving Reef Plan actions and objectives;
- (b) identify the main initiatives that are exemplifying successful and innovative approaches to achieving the Reef Plan's outcomes; and
- (c) analyse the gaps, constraints and opportunities for improving regional NRM plans and related initiatives to achieve the Reef Plan's outcomes.

This evaluation is important at two levels. First, at a practical level, it can inform the next iteration of the Reef Plan and investment in the reef catchment NRM plans and related projects and second, at a more theoretical level, the evaluation can contribute to the developing theory of new regionalism (Söderbaum and Shaw 2003) and to planning approaches which can more holistically integrate economic, environmental and social concepts into planning.

2. BACKGROUND

The input of sediment and nutrients from land-based sources was an important stimulus for Reef Plan, which was released in December 2003. Its two objectives are to: reduce the load of pollutants from diffuse sources in the water entering the reef; and rehabilitate and conserve areas of the reef catchment that have a role in removing water borne pollutants (State of Queensland and Commonwealth of Australia 2003). The Reef Plan⁴ identifies nine strategies and 65 actions to address reef water quality, with regional bodies having sole or shared primary responsibility for implementing ten actions and a supporting responsibility for a further 23 actions.

Within Queensland, 14 NRM regions have been identified and most have accredited regional NRM plans. All regional NRM plans have identified their asset base, developed 'regional profiles' which address the 'condition' and 'trend' in key assets, such as water, identified pressures and risks to their assets and collaboratively developed their regional vision, and strategic approach to NRM. For the regional NRM plans within the Reef catchment, there is a requirement that there is consistency with the Reef Plan. Targets provide the basis for the identification of actions and priorities to be undertaken in each region within specified timeframes. The priority actions are those that will receive early funding by the regional bodies. Each regional NRM plan is accompanied by a regional investment strategy (RIS), which provides a mechanism for governments and other agencies to invest in the implementation of the plan.

3. METHODS

3.1 Study regions

While six regional bodies have been identified as part of the Great Barrier Reef catchment, only five were examined in this evaluation⁵: Far North Queensland Natural Resource Management Ltd (Wet Tropics region); Burdekin Dry Tropics Board; Mackay Whitsunday Natural Resource Management Group; Fitzroy Basin Association; and Burnett-Mary Regional Group for Natural Resource Management. It also should be noted that two of the regions investigated – Far North Queensland and Mackay Whitsunday - were funded largely through the NHT2, while the remaining three regions (i.e. Burnett Mary, Fitzroy Basin Association and Burdekin Dry Tropics) received additional funding through the NAPSWQ program, thus providing them with larger total funding from the Australian and State Governments.

3.2 Key steps

Desktop evaluation of funded regional NRM actions were conducted of the five regional NRM plans and the main activities or themes, broad resource condition targets and specific management action targets that related to Reef Plan were identified. The evaluation examined the activities that were funded under the NHT2, NAPSWQ, CCI and

⁴ See <http://www.reefplan.qld.gov.au/about/rwqpp.shtm> for full list of Reef Plan strategies and actions.

⁵ The Cape York Community Engagement Group was not evaluated as its regional NRM plan was not accredited at the time of this review.

other sources up to March 2006. The criteria used to assess the alignment of the funded actions to the Reef Plan included:

- a) Scope – Is the scope of the regional NRM plan’s water quality-related initiatives appropriate and adequate? What is the degree of consistency between the Reef Plan and the initiatives in the regional NRM plans? Are there large inconsistencies or omissions?
- b) Adequacy – Are the initiatives in the regional NRM plans relating to water quality improvement funded and prioritised for action?
- c) Scale – Are the initiatives in the regional NRM plans funded and prioritised adequately to be effective for Reef Plan objectives?
- d) Effectiveness – Given the current level of knowledge regarding causal relationship between management actions and resource condition response, are the initiatives likely to deliver the required outcomes for Reef Plan?

Regional body consultative workshops with regional body staff and other key stakeholders followed the preliminary desktop analysis in order to validate the desk top assessment, building on this assessment to identify solutions to improve alignment and identify examples of innovative thinking.

4. RESULTS

The achievements of the regional bodies in relation to the Reef Plan actions for which they have primary and secondary responsibility are briefly described below.

4.1 Self-management approaches

All regional bodies were highly proactive in promoting the uptake of best management practices (Reef Plan, Strategy A). While they had formal responsibility for implementing only two Reef Plan actions (i.e. Actions A4 and A5), they were funding initiatives or providing advice and support in all six actions. The regional bodies saw the implementation of self management approaches as a cost effective method of delivering water quality outcomes, for while land managers received advice and some financial assistance to implement improved practices, they were also required to contribute to the initiatives, either financially or in kind. Therefore, investment was multiplied through the contributions of landholders.

4.2 Education and extension

Environmental education and extension were key components of almost all programs funded by the regional bodies to deliver improved information, technologies, capacity and skills and ultimately to improve water quality outcomes for the reef. These programs were based, where possible, on integrating a range of knowledge systems, including the best available science, local knowledge and Traditional Owner knowledge, and involvement was voluntary, allowing recipients to focus on the activities and management strategies that suited their circumstances.

4.3 Incentives for water quality outcomes

All regional bodies actively promoted the adoption of incentive schemes to encourage landholders to implement sustainable management practices and property level planning (Reef Plan, Action C1). The somewhat low profitability of many farm enterprises

contributed to the regional bodies' enthusiasm in developing incentive packages, which they unanimously viewed as a cost effective mechanism for achieving improved NRM outcomes. The focus was on achieving a high level of voluntary uptake of best management practices by land managers, particularly those engaged in grazing, cane production and other cropping activities.

In all regions the incentive schemes required co-contributions from the landholders (e.g. money or labour), in recognition of the private benefit gained by landholder participation over and above the public benefit that was delivered. In the Mackay Whitsunday region, land managers received funding for 10 to 40 percent of the project cost, while those in priority areas usually received 40 percent of the costs involved. In this way the incentive funds were used to encourage broad implementation of best management practices and also to focus activity on priority areas through the scaled devolution of funds. In the Fitzroy Basin region, the Priority Neighbourhood Catchments were the focus of the incentive schemes.

4.4 Research and development into water quality issues

Research and development efforts varied significantly across the five regions. In the Burdekin Dry Tropics and Wet Tropics, research and resource condition assessment played a major role in guiding planning and on-ground works. Several cooperative research projects were well funded in these two regions. In the other three regions, although research was valued, the regional bodies were less successful in attracting research funding and projects.

4.5 Water Quality Improvement Plans (WQIPs)

All regions were making progress in the preparation and implementation of WQIPs, which were to assist the regions in understanding water quality issues, identify environmental values, water quality objectives and targets, and define priority actions to address risks (Reef Plan, Action D4). However, progress varied. Douglas Shire's WQIP (FNQ) had commenced in advance of other regions and was near completion with funding focused on implementing actions under the plan. Development of WQIPs was seen by the regional bodies as an important mechanism for delivering on a range of Reef Plan actions and cross-regional cooperation was enabling the learning from the Douglas WQIP to inform plan development in the other regions.

4.6 Focus on wetland and riparian management

All regions placed a high priority on the identification and improved management of wetlands and riparian areas. Extant natural wetlands were generally seen as a high priority for conservation and rehabilitation. For example, in Far North Queensland efforts were directed to increasing community awareness of the importance of riparian vegetation and incentives were offered to landholders to protect and rehabilitate wetland and riparian areas as part of the broader sustainable landscapes program (e.g. fencing).

4.7 Partnerships

Regional bodies are recognized under Reef Plan (Strategy G, Partnerships) one of its most critical partners and all regional bodies were creating strong and enduring partnerships with: universities, research institutions and industry to develop best practice models and guidelines, water quality modelling tools (e.g. SedNet) and the development of

WQIPs; Queensland and Australian government agencies; local governments, although linkages were in their initial stages of development; and Traditional Owners.

5. CONCLUSIONS (& TAKE HOME MESSAGES)

The regional bodies used a diversity of approaches in delivering on the outcomes identified as their responsibilities of in the Reef Plan. Some insights into these approaches derived from the evaluation include:

- The **regional approach** works well for water quality – regional bodies are able to focus on the roles that they are best at delivering at a workable scale based on catchment boundaries.
- Regional bodies and their associated stakeholders were committed to and enthusiastic about implementing their Reef Plan responsibilities. It was stressed that regional bodies fulfil a necessary role of engaging landholders and other regional stakeholders on water quality related initiatives through a diversity of approaches, particularly in relation to **self-management** at the property level.
- Regional funding priorities were highly reflective of the attitudes and values of the stakeholders, the historical evolution of their regional institutional arrangements and their regional infrastructure and services. Thus, while similar problems existed in several catchments, the regional priorities frequently varied.
- Evidence of **co-operative approaches**, co-funding and institutional capacity building among agencies responsible for marine, fresh water and terrestrial issues. Linkages with local government were in most regions in the process of being established, although considered of high importance.
- Questions relating to the overall **effectiveness** of the efforts that were being employed by the regional bodies are difficult to answer at this stage. In many cases, the knowledge and science regarding the links between actions and outcomes are in preliminary stages.

Regional body efforts in relation to Reef Plan strategies and actions are along a continuum of achievement from an initial level (e.g. usually preliminary and pilot projects), to a comprehensive level of achievement, where a solid foundation exists (e.g. capacity, understanding, partnerships and resources). This continuum reflects, to some extent, the varying starting points of regional bodies in this planning process. Key challenges, gaps and opportunities for delivering on Reef Plan's water quality outcomes that were identified include:

- A key challenge facing all regions is the critical gaps in resource condition information.
- There is a current reliance by regional bodies on an '**end-of-catchment, best practice approach**' is working at this initial stage. A comprehensive picture of reef lagoon imperatives in relation to resource condition protection and rehabilitation will need to be translated and transferred to regional bodies for their planning.
- The Reef Plan's geographic emphasis on high-risk catchments was not evident in the regional NRM plans and investment strategies at this stage. Critical gaps in resource condition information limited the ability of regional bodies to develop

meaningful and measurable resource condition and management action targets for water quality and related issues.

- A fundamental issue for **water quality improvement plans** is their pilot nature (e.g. limited aerial extent, undertaken as a learning process, limitations in the availability of monitoring results and lack of mature partnerships etc).
- Regional bodies need to move beyond the **pilot project** and **working with the willing** in the second phase of implementation.
- Economic incentives are a key mechanism for gaining co-contributions by stakeholders, however this approach is vulnerable, particularly to the vagaries of major climatic events e.g. cyclones, floods and droughts.
- Regional bodies were concerned about the lack of state level policies relating to, for example, NRM (e.g. wetlands, waterways and biodiversity).

The team's review of the five NRM regional plans and their links to Reef Plan has revealed that all regions were working hard to address their Reef Plan responsibilities and that a diversity of approaches to improving water quality was in place, with some regions more advanced than others. Information sharing had begun and cooperative research partnerships between the regional bodies, government agencies, research institutions, universities and other stakeholders were developing. More effective water quality target setting is needed, as is the identification of priority catchments as a mechanism to guide NRM investment. Most were grappling with the science and information demands of prioritising and implementing initiatives at the finer scale. In the next planning stage, significant effort is to be directed through WQIPs to obtain that finer scale of planning and engagement for at least one catchment per region. In the absence of a scientific framework for reef condition that is appropriate to inform regional body planning, end-of-catchment best management practice models are the best available approach for directing the efforts of regional bodies.

Most regions were making good progress on engaging with partners for specific challenges, for example research and development or building collaboration with local governments and Traditional Owners. All saw engagement as the vehicle for delivering the level of change required and were directing efforts at capacity building to ensure engagement was possible. Future efforts will need to move beyond the pilot project to more substantial and on-going funded initiatives. However, this research has identified an impressive range and level of activity that is being funded and that the regional bodies are, in the main, covering their wide spectrum of their responsibilities as identified in the Reef Plan and in many instances are achieving well beyond their stated responsibilities.

Acknowledgements

This evaluation was part of a project funded by the Queensland Department of Natural Resources, Mines and Water on behalf of the Queensland and Australian Governments. The comments from the steering committee overseeing this project were valuable.

REFERENCES

- Australian Government (2005) About Natural Resource Management (NRM), [Cited 15 January 2006], Available from URL: <http://www.nrm.gov.au/about-nrm.html>.
- Bellamy J.A., Walker D.H., McDonald G.T. & Syme, G.J. (2001) A systems approach to the evaluation of natural resource management initiatives. *Journal of Environmental Management*. **63**, 407-423.
- Burdekin Dry Tropics Board (2005). Burdekin Dry Tropics Natural Resource Management Plan.
- Burnett Mary Regional Group (2005). Country to Coast - a healthy sustainable future. Brunett Mary Regional Group, np.
- Fitzroy Basin Association Inc. (FBA) (2004) Central Queensland Strategy for Sustainability – 2004 and Beyond. Fitzroy Basin Association Inc, Rockhampton. Same as for DCQ
- FNQ NRM Ltd. (2004). Sustaining the Wet Tropics - A Regional Plan for Natural Resource Management 2004-2008.
- McAlpine, C.A., Heyenga, S., Taylor, B., Peterson, A., McDonald, G. (in press) Regional Planning in Queensland's Rangelands: Challenges and Prospects for Biodiversity Conservation, *Geographical Studies*
- McAlpine C.A., Peterson A.T. and Norman, P.L. (2005) The South East Queensland Forests Agreement: Lessons for Biodiversity Conservation, *Pacific Conservation Biology*, **11**, 3-13.
- McDonald G.T., Taylor B., Bellamy J., Robinson C., Walker M., Smith T., Hoverman, S., Peterson A., McAlpine C. & Dawson, S. (2005) *Benchmarking Regional Planning Arrangements for Natural Resource Management 2004-05: Progress, constraints and future directions for regions*. Project Milestone Report No. 3, Healthy Savanna Planning Systems Project Tropical Savannas Management CRC Project 3.3.5.
- Mackay Whitsunday Natural Resource Management Group Inc. (2005). The Mackay Whitsunday Natural Resource Management Plan 2005.
- McWilliams, D., Roth, C. H., Reichelt, R., Ridd, P., Rayment, G.E., Larcombe, P., Brodie, J., Pearson, R., Wilkinson, C., Talbot, F., Furnas, M., Fabricius, K., McCook, L., Hughes, T., Hough-Gulberg, O., Done, T. (2006) The current level of scientific understanding on impacts of terrestrial run-off on the Great Barrier Reef World Heritage Area. Available at http://www.reef.crc.org.au/discover/threats/waterquality_consensus.html [5 October 2006]
- Paton S., Curtis A., McDonald G. & Woods, M. (2004) Regional NRM – is it sustainable?. *Australasian Journal of Environmental Management*. **11**, 259-267.
- Peterson A., McAlpine C., Ward D., and Rayner S. (In review) New regionalism and nature conservation: lessons from South East Queensland (Australia). *Landscape and Urban Planning*.
- Ronnberg C, Bonsdorff E. 2004. Baltic Sea eutrophication: area-specific ecological consequences. *Hydrobiologia* **514**:227-241
- Söderbaum F. & Shaw T.M. (2003) Conclusion: What Futures for New Regionalism? In Söderbaum, F. & Shaw, T.M., (Eds.), *Theories of New Regionalism*. Palgrave Macmillan, Hampshire, 211-225.
- State of Queensland and Commonwealth of Australia (2003). Reef Water Quality Protection Plan: For catchments adjacent to the Great Barrier Reef World Heritage Area, Queensland Department of Premier and Cabinet, Brisbane