The potential contribution of the Queensland Wet Tropics Region Natural Resource Plan to river improvement and water quality

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Abstract This paper reports on work in progress on the new Wet Tropics Regional Natural Resource Management Plan and its potential to deliver river management and water quality outcomes. The plan is being prepared in accordance with the guidelines of the Nation Action Plan for Salinity and Water Quality/Natural Heritage Trust (NAP/NHT2). In particular the paper discusses the technical basis for priorities, target setting and implementation and the most effective instruments for achieving river improvement and water quality outcomes in the region.

Keywords Regional natural resource management plans; river improvement; water quality; Wet Tropics

Introduction

The Wet Tropics is recognised as a special region in Australia. It has the highest rainfall and some of the most spectacular scenery in the country and is also one of the country’s most biologically diverse and productive regions. Whilst existing plans such as the Far North Queensland Regional Plan (FNQ RPAC, 2000), the Wet Tropics Regional Strategy for Natural Resource Management (NRMB, 2000), integrated catchment (ICM) plans for all rivers and the Great Barrier Reef Water Quality Action Plan, review the state of the environment and the threats and proposed actions that need to be taken to protect the region’s natural values, further work is required to create a plan that will meet new planning guidelines for the Natural Heritage Trust (NHT2) and the emerging Reef Protection Plan.

In the past, government resource and environmental programs, programs of support for community-based programs such as ICM and the NHT have been criticised for being ad hoc and not necessarily focused on strategic resource management priorities. The community-based programs have also been criticised for being too bureaucratic for local people and not responsive enough to local issues and needs. Recent changes in natural resource management (NRM) policy have addressed these criticisms and changed from a program and project approach to one that emphasises strategic investment at a regional scale.

This paper discusses the requirements for a more strategically focused regional plan for the Wet Tropics, reviews current progress and identifies important information and implementation needs. The work reported here is a progress report on the work of a consortium of the NRM Board and the Rainforest CRC (Cooperative Research Centre) formed to prepare the new plan under State and Commonwealth guidelines. Whilst the plan covers all major resource and environmental issues, this paper is concerned mostly with the landcare and rivercare components of the plan within that general framework.

For rivers and water quality there are concerns about the ecological health of the region’s rivers and in particular the impacts that land based activities have on the Great Barrier Reef lagoon.
The criteria of the National Accreditation Guidelines require regional bodies to demonstrate that their plans:

- cover the full range of NRM issues (see below);
- are underpinned by scientific analysis of natural resource conditions, problems and priorities;
- have effective involvement of all key stakeholders in plan development and implementation;
- focus on addressing the underlying causes rather than symptoms of problems;
- include strategies to implement agreed NRM policies to protect the natural resource base;
- demonstrate consistency with other planning processes and legislative requirements;
- set targets at the regional scale, consistent with the national framework for NRM standards and targets;
- identify strategic, prioritised and achievable actions to address the range of NRM issues and achieve the regional targets: this includes an evaluation of the wider social, economic and environmental impacts of such actions;
- provide for continuous development, monitoring, review and improvement of the plan.

The Wet Tropics Regional Plan with special reference to river improvement and water quality

Background to the plan

The Queensland Government defines the Wet Tropics region for planning purposes to include those local government areas from Douglas Shire in the north to Hinchinbrook in the south extending west to include the Atherton Tableland. For the purposes of the new NRM Plan, the regional boundary is based on the catchment management units of the Daintree/Mossman, Barron, Russell/Mulgrave, Johnstone, Tully/Murray and Herbert Rivers as well as Trinity Inlet.

In November 2001, two organisations with a major interest in natural resource management (NRM) in the Wet Tropics region, the Natural Resource Management Board (Wet Tropics) Inc (NRMB), a confederation of catchment and landcare groups with wide representation, and the North Queensland Afforestation Association (NQAA), an association of all local governments in the region, met to form a single regional NRM body, which together represents all major groups involved in NRM in the Wet Tropics. They resolved to prepare a new regional Natural Resource Management Plan that would build on existing plans and studies and conform to new Commonwealth and State guidelines. At the time of writing, an interim six-person executive of the new regional body is managing the process. Indigenous people have formed an Indigenous Working Group (IWG), with representation on the interim regional body and on the plan steering group.

The structure of the plan and advisory process is shown in Figure 1. The core elements of the plan will focus on the NAP/NHT2 themes, namely, biodiversity conservation, sustainable natural resource use and capacity building. In keeping with past terminology and to organise research and consultation, the program areas for the plan are bushcare, coastcare, landcare and rivercare, linked and integrated in the plan.

Linkages/integration with other relevant planning processes

Apart from the NRMB’s strategy and the FNQ Regional Plan, there are more than a hundred plans and strategies prepared for coasts, catchments, endangered species, local government areas, world heritage areas, national parks and so on in the Wet Tropics. However, none provides an adequate guide for investment in NRM in the region. What is needed is a regional NRM plan with integrated NRM outcomes, the actions of which could be funded from a range of sources including the NHT2 but also potentially other government programs and private and philanthropic investment.
This new NRM plan will identify and incorporate the range of existing strategies, targets and objectives into a single document with integrated NRM targets, the actions. To achieve the targets of the regional NRM Plan, it is necessary to determine what gaps exist in the current management arrangements, and how these gaps might best be filled.

There are many more plans not reviewed here, including the coastal management plans, pest plant and animal management plans, species recovery plans and licensing regimes for environmentally relevant activities under the Environmental Protection Act. In addition many studies such as those for fisheries and biodiversity conservation assess environmental conditions, priority needs and propose actions.

Due to the existence of a multitude of relevant plans and other studies undertaken for the Wet Tropics region, much of the necessary background work required for the NRM Plan has already been documented. The challenge is to identify, collect, collate, and most importantly, synthesise this information into an integrated plan.

**Regional overview**

During the development of the NRMB’s regional strategy, a working group consisting of representatives from the community and local and state agencies defined what it considered to be the top regional issues:

- vegetation loss, degradation and fragmentation, particularly in the coastal lowlands;
- loss and decline of native species and biodiversity;
- insufficient representation of specific natural community types in the region’s protected area network;
- riparian and in-stream degradation through encroaching adjacent land uses, clearing, flooding and sedimentation and natural erosion processes;
- inadequate management and allocation of surface and ground waters;
- land management practices on individual properties which do not accommodate the protection of natural values;

![Wet Tropics NRM planning flowchart](https://iwaponline.com/wst/article-pdf/48/7/25/423579/25.pdf)

Figure 1 Wet Tropics NRM planning flowchart
• failure to implement best practices in primary industry production;
• pest animal and plant impacts on natural ecosystems and primary production;
• declining water quality due to sedimentation and other forms of diffuse pollution, in addition to disturbance of acid sulphate soils, point source pollution and salt water intrusion;
• inadequate standards enforced to ensure best practice in waste management;
• many more issues of regional importance were identified during the FNQ 2010 Regional Planning Project. In fact, 132 major regional issues were identified under 11 strategy areas for the environment and 165 major regional issues under 16 strategy areas for natural resources in the FNQ Regional Plan.

The above threats to the natural resource values of the Wet Tropics region will be considered in the development of the new plan, as will any others identified during the course of the planning and consultation processes. As required by the guidelines for the production of NRM plans, attention will be given to the causes of the threats and not just the symptoms.

The main management areas influencing rivers and water quality in this plan are:
• catchments – hill slope erosion, river sedimentation, flow regime changes, and non-point source pollution. This includes urban catchments and storm water runoff but is mostly concentrated on rural catchments and agricultural practices;
• riparian zones – stream channels and their adjacent banks which are considered to be critical landscape elements for river health and water quality, as well as ecosystem function and biodiversity;
• wetlands and floodplain – the condition of natural floodplain and associated fresh and salt water wetlands are essential components of river systems and condition their impacts on adjacent coastal and marine areas;
• point source emissions of water – especially waste water treatment plants, aquaculture and industrial sources.

The condition of the region’s catchments, rivers and water quality outcomes has been assessed in many projects. A short summary of the most important follows:

National Land and Water Resources Audit. The most comprehensive assessment of the rivers and catchments of the region is presented in the recently released report of the National Land and Water Resources Audit, 2002: Australian Catchment, River and Estuary Assessment 2002. The assessment used standardised criteria and indicators for application throughout the country for environmental assessment. Results for the Wet Tropics rivers show the water condition to be of good quality in the Daintree, Mossman and Murray Rivers (index 2) compared with the Barron, Mulgrave, Johnstone and Tully (index 4). Suspended sediment ratings and riparian vegetation vary similarly, with the Barron, Mulgrave and Johnstone the more polluted rivers in the region. In addition to these summary indicators, the National Land and Water Resources Audit (NLWRA) assessments provide relatively detailed mapping of the condition of stream segments for each of the main indicators.

FNQ 2010 Regional Planning Study. The technical support documents for the FNQ2010 plan review the status and trends in stream flows and water quality, riparian zones, wetlands, floodplains and sediments. The coverage is for the region as a whole and at sub-district/catchment scale. The report does not delve below that aggregate scale to localities and stream segments but relies on more detailed planning actions taken by local government and state agencies.

State of the rivers assessments. For many of the region’s rivers, detailed river assessments have been undertaken by the Queensland Department of Natural Resources, often in con-
juncture with the river improvement trusts or catchment management groups, including the Herbert, Johnstone and Tully. The most recent survey for the Tully River for example, (Australian Groundwater Consultants, 2001) for the Cardwell Shire River Improvement Trust, provides a very detailed audit of the middle reaches of the Tully River in terms of its drainage and flooding conditions, ecological and economic values. The audit is presented on an interactive GIS at a scale that identifies sub-reaches of the river at property ownership scale. The report also presents a detailed tabulation of the priorities and investment needs for those sub-reaches of the river requiring treatments including structural works (rock reinforcement) and vegetation plantings.

The Queensland Department of Primary Industries, Fisheries branch has conducted a series of reports covering most of the rivers in the Plan area which provide an environmental audit of the rivers encompassing stream ecology and water quality, monitor the impacts of various land use and management practices on stream environment and water quality. Attributes covered in the most recent of these for the Barron River include: in-stream habitat assessment, riparian vegetation, sedimentation, and stream structure, fish habitat types, invasive grasses, wetlands, land use, water quality and fish resources (see for example, Russell et al., 2000). The reports include detailed mapping of all stream sections condition on these attributes.

Testing the waters. This involves routine monitoring of river water quality. This data will be analysed and compared with water quality targets in preparing the plan.

AIMS river monitoring data. This involves routine monitoring of off-shore water quality. This data is used in the Great Barrier Reef Water Quality Action Plan and calibrating sediment and nutrient emission models.

The Great Barrier Reef Water Quality Action Plan. The release of the Great Barrier Reef Water Quality Action Plan in late 2001 caused substantial community reaction in the coastal areas of Queensland. This report provided estimates of the sediment and nutrient emissions for rivers in the Great Barrier Reef catchment and more controversially, targets for water quality improvement. The estimates of non-point source pollution were based on modelling following the NLWRA process (Table 1).

<table>
<thead>
<tr>
<th>Catchment name</th>
<th>1850 Sediment export (000 t/y)</th>
<th>1850 Sediment export (t/km²)</th>
<th>Current Sediment export (t/y)</th>
<th>Current Sediment export (t/km²)</th>
<th>Current divided by 1850</th>
<th>Sediment risk group</th>
<th>Sediment target reduction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daintree</td>
<td>23,000</td>
<td>18,254</td>
<td>94,132</td>
<td>74,603</td>
<td>4.1</td>
<td>L</td>
<td>1</td>
</tr>
<tr>
<td>Mosman</td>
<td>3,000</td>
<td>5,085</td>
<td>15,131</td>
<td>25,424</td>
<td>5.0</td>
<td>L</td>
<td>1</td>
</tr>
<tr>
<td>Barron</td>
<td>18,000</td>
<td>22,222</td>
<td>145,877</td>
<td>180,247</td>
<td>8.1</td>
<td>M</td>
<td>0.67</td>
</tr>
<tr>
<td>Mulgrave-Russell</td>
<td>37,000</td>
<td>10,165</td>
<td>222,425</td>
<td>60,989</td>
<td>6.0</td>
<td>M</td>
<td>0.67</td>
</tr>
<tr>
<td>Johnstone</td>
<td>10,000</td>
<td>2,141</td>
<td>305,142</td>
<td>65,310</td>
<td>30.5</td>
<td>H</td>
<td>0.5</td>
</tr>
<tr>
<td>Tully</td>
<td>15,000</td>
<td>4,559</td>
<td>88,084</td>
<td>26,748</td>
<td>5.9</td>
<td>M</td>
<td>0.67</td>
</tr>
<tr>
<td>Murray</td>
<td>3,000</td>
<td>2,830</td>
<td>17,098</td>
<td>16,038</td>
<td>5.7</td>
<td>M</td>
<td>0.67</td>
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<tr>
<td>Herbert</td>
<td>83,000</td>
<td>20,698</td>
<td>664,787</td>
<td>165,835</td>
<td>8.0</td>
<td>M</td>
<td>0.67</td>
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<tr>
<td>Total Wet Tropics</td>
<td>192,000</td>
<td>1,552,676</td>
<td>1,152,676</td>
<td>8.0</td>
<td>0</td>
<td>6</td>
<td></td>
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<tr>
<td>Other GBR rivers</td>
<td>1,094,000</td>
<td>5,771,471</td>
<td>28,90</td>
<td>5.0</td>
<td>0</td>
<td>–6</td>
<td></td>
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<tr>
<td>Wet Tropics %</td>
<td>17.55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,286,000</td>
<td>7,324,147</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Source: GBRMPA (2001)
This report provides a general regional and catchment specific assessment of the condition and risks created by the region’s rivers. What is required to maximize the value of this research for the regional NRM plan is more detailed spatially specific assessment of catchment conditions, area specific hillslope erosion rates and the risks to downstream areas, river reach specific estimates of bedload and bank erosion and high resolution riparian zone assessments. Such extension of the modeling capacity of the NLWRA system has been applied to the Burdekin (Prosser et al., 2001).

Assessments of conservation values
The conservation values of the Wet Tropics World Heritage area have been assessed by a study that assigned conservation values for all waterways within or flowing through the WHA (Natural Resource Assessments et al., 1999). The study assessed 328 subcatchments in terms of ecosystem function values, aquatic plants, the diversity of aquatic vertebrates and crustaceans, freshwater fish, frogs, turtles, regional ecosystems of specific interest and distinctive flow regime types and/or flow needs. Goosem has identified the conservation status of Wet Tropics regional ecosystems and classified those that are endangered or of concern. Amongst those ecosystems are a number that depend on sustained stream flows and water supplies for wetlands. Most of these are lowland systems, including those in poorly drained coastal environments but most of the heavily impacted lowland riparian and fertile lowland systems (Goosem et al., 1998).

Vision, objectives/goals, principles
Increasingly, plans incorporate the principles of sustainable development, including considering economic, social and ecological objectives as well as a commitment to community involvement, equity and capacity building activities. In dealing with river and water quality issues, potentially all elements of the existing 100+ plans are therefore relevant. Even for the more significant plans such as the FNQ2010 and NRMB plans and associated catchment management plans, the range of objectives and principles embedded in the plans is huge. For the FNQ2010 plan there are several hundred objectives in the plan as a whole, and a significant proportion of these deal with rivers and water quality either directly or indirectly. Similarly, for the existing Regional NRM Strategy, the principles and objectives cover the range of water and river management.

Targets
Targets will be set by regional bodies as a core element of integrated regional NRM plans. Targets can be aspirational targets, achievable resource condition targets, and targets for management actions. In many cases, a reasonable period of monitoring will be required to establish baselines or trends. Hence, many regions will not be in a position to set specific achievable targets for natural resource condition at the time their regional plans are put forward for accreditation. Commonwealth and State agencies are rapidly releasing targets for use by regional planning groups but these are very recent and yet to be assimilated into the planning process. (See for example Environment Australia’s Water Quality Targets, June 2002.)

For the Wet Tropics, few of the existing plans are based on or even mention targets or specifically quantifiable objectives. Exceptions include the Johnstone River Catchment strategy which includes management action targets, and of course the GBR Water Quality Action Plan (Table 1). Plans do however refer to targets or standards defined broadly in legislation such as ANZECC water quality standards, biodiversity conservation standards etc. or defer to those used by environmental agencies without actually specifying them.

There is substantial work to be done in this area if the new plan is to be based on specific
resource condition targets. In the first “edition” it is unlikely that work will be done and the targets will be aspirational and management actions.

**Priority actions for regional investment**

Current plans address priorities in general terms, although the kinds of actions that need to be taken to improve rivers and water quality in the region are well-known and widely debated. Some of the more detailed plans do define issue and locationally specific priorities such as the ICM and river improvement plans (e.g. for the Tully), but the regional level plans do not rank and define the site specific nature of priorities (this is the purpose of the new generation of plans). In the planning process we will assemble the set of existing priorities but the challenge will be to integrate them and make more specific these priorities at the regional level to answer the question – where should we focus our action and investments?

Aggregate river degradation and pollution arises from point sources impacts, especially industrial emissions and waste water treatment plants, and from non-point sources, especially urban stormwater and agricultural run-off. An optimal regional plan would consider the best combination of actions to address both point and non-point sources considering their relative contributions and the costs of reducing pollution loads. From an economic point of view, the goal is to **maximise the benefits of resource use taking into account the costs of pollution**. The efficient allocation is one where the marginal cost of emission reductions equals the expected marginal benefit of reduced pollution damages. More commonly, policy makers prefer predefined environmental targets, standards, or objectives to determine policy – the path taken by Australian agencies for the new NRM planning programs. The planning problem then is to find the most cost-effective way of meeting the targets, either

- minimising the costs of meeting target sediment loads from the region’s rivers; or,
- maximising sediment load reduction subject to a budget constraint.

The information requirements for determining the cost-effectiveness of alternative actions and identifying preferred program priorities are onerous. The core data requirements are:

- the contribution of current land use management practices to sediment loads, that is the quantity of sediment resulting from each specific land use management practice in each unique landscape element;
- the cost of implementing improved land use practices relative to the observed present land use in landscape elements.

We will need to be able to populate Table 2 with data. For example for sediment management there are a number of options for reducing emissions:

- restore riparian zones – which ones, how much, how;
- improving watersheds – cultivation and residue management practices in agriculture, grazing pressure, vegetation management, infrastructure designs etc;
- water control – run-off control, extraction rates, structures.

Unfortunately we are well short of being in a position to determine the optimal resource management activities because the answer to these questions in technical and economic terms is not well enough known, at least, not yet. Recently, some substantial steps have been taken in terms of the technical understanding of land management practices and resources outcomes arising from the NLWRA (Prosser, 2001) or from specific and intensive river studies, for example the Tully River (Australian Groundwater Consultants, 2002). As good as these studies are, they do not provide comprehensive answers and provide relatively little on the economic aspects. The NRM Board itself is in the process of finalizing a data base of funded resource management projects to provide a baseline for costing resource management investments (Catterall and Dorrington, 2002).
The problem of defining priorities and optimal actions is further exacerbated by the multi-criteria character of many resource outcomes. River and riparian quality is not only an issue of external pollution or water supply, but they each have substantial contributions to biodiversity conservation and to the use value of rivers for recreation, flood protection, aesthetic and other values. These benefits would also need to be included in the data above.

So if we are well short of having spatially specific data to optimise resource investments, what can we do? We know enough to take no-regrets actions and to rank management practices and localities based on the existing inventories and experience of local land holders, landcare and catchment groups and local science and agency people. The existing data bases adequately define threats, values and resource conditions. The actions that meet these criteria could include:

• riparian zone restoration using tested techniques in high risk stream reaches;
• watershed rehabilitation in high risk catchments using reforestation and water retention techniques;
• refinement and promotion of best management practices for agriculture, aquaculture, grazing, and infrastructure corridors for landscape management, fertiliser and vegetation management. (See for example Primary Green.)

Conclusions
The technical problems at the present time are:

• priority assessment is not at consistent detail across the region;
• condition targets not defined and agreed;
• actions to achieve targets may have been identified, including BMPs, but they are not assessed for site specific conditions;
• actions to achieve targets have not been assessed in terms of cost-effectiveness or social impact.

The political and administrative environment is dynamic and uncertain. Recent policy initiatives affecting the Wet Tropics plan include:

• Establishment of the Reef Taskforce following the 2000 State election to provide a whole of government approach to the problem. There has been little output yet.
• Commissioning of a scientific advisory panel to review the state of knowledge about the reef water quality problem, the major contributing factors and advice on policy.
• Signing of a Memorandum of Understanding by the Commonwealth and Queensland Governments (13 August 2002) to develop a Reef Protection Plan that identifies practical actions to improve water quality and reduce impacts on the Reef’s marine environment, due for completion at the end of 2002. This is very significant for the Regional Plan given that it is identified as one of the main mechanisms for achieving protection for the Reef (Commonwealth and Queensland Governments, 2002).
• The Queensland and Commonwealth Governments have yet to sign the bi-lateral agreement to establish NHT2. While it is expected to be signed soon, the financial allocations are not known. Further, the new arrangements incorporate changes that may complicate
plan making and implementation – for example, World Heritage Area land management projects are to be funded from the regional allocation not core funding as in the past (for pest control etc).

• Commencement of a Productivity Commission inquiry that is to report on the economic importance of the Reef and its dependent industries and analyse the costs and benefits of policy options to improve water quality in the Reef lagoon. The Wet Tropics is a significant component of the reef drainage basin.

• The regional vegetation management plan under the Vegetation Management Act is under construction and will not be completed for at least a year or more.

• There are on-going uncertainties in local politics and variable levels of cooperation of local governments in the regional planning process.

• New local government plans are to be completed by March 2003.

• The sugar industry is experiencing substantial economic difficulties and is not in a position to make full commitments to improved resource management. The industry is the subject of a major restructuring package, reported to have $100 m allocated to it. Hopefully the restructuring may take natural resource management issues into account in determining a sustainable solution.

The Wet Tropics region is in a good position to move forward in locally managed strategic planning. There are information gaps as noted above, but the biggest challenge in preparing the plan is to integrate the wide range of data that is available and to guide delivery through diverse means.

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