Sustaining the Wet Tropics

Background Report

Rainforest CRC

FNQ NRM LTD

A Regional Plan for NRM

Volume 1

SUSTAINING THE WET TROPICS:

A REGIONAL PLAN FOR NATURAL RESOURCE MANAGEMENT

VOLUME 1 BACKGROUND TO THE PLAN

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Rainforest CRC

Natural Heritage Trust
Helping Communities Helping Australia
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Bottom: Quicksilver at Agincourt Ribbon Reef.

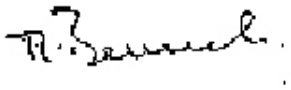
PREFACE

Managing natural resources for sustainability and ecosystem health is an obligation of stakeholders at all levels. At the State and Commonwealth government level, there has been a shift over the last few years from the old project-based approach to strategic investment at a regional scale. To oversee this investment, regional natural resource management (NRM) bodies have been established across Queensland and Australia. The new NRM Board for the Wet Tropics region, called FNQ NRM Ltd, was appointed in late 2003. The aim of this community-based Board is to take the Wet Tropics to the forefront of conservation and sustainable use of natural resources through strengthened community participation.

One of the first tasks of the new Board is the preparation of a new NRM Plan for the Wet Tropics to strategically focus investment while incorporating the outcomes of previous planning in the region. The new Board welcomes the Cooperative Research Centre for Tropical Rainforest Ecology and Management (Rainforest CRC) as a partner in this venture and this report is the first of a series of documents (see Introduction to this report) that will be co-produced as supporting information to the Plan. It provides a background to the new NRM Plan and associated technical documents by providing a biophysical and socio-economic overview of the region and outlining the new policy environment, as well as summarising some of the relevant planning processes that have come before and will inform the new Plan.

The principal authors of this report were Geoff McDonald from CSIRO Sustainable Ecosystems and Nigel Weston from the Rainforest CRC. The authors wish to acknowledge the significant contribution made by others, including those who reviewed the document as organisational representatives. The Commonwealth and State governments should also be thanked for their support through the extension of the NHT Program.

This report is designed to be used by planners and decision-makers involved in the development of the Wet Tropics NRM Plan. It should also be of use to others involved in NRM in the private sector and at the local, State and Commonwealth government levels. Indigenous and community groups, students and the public generally should also find the report, and those that follow, a valuable resource. I take pleasure in presenting it to the regional community.



Mike Berwick
Chair, FNQ NRM Ltd

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ACTFR	Australian Centre for Tropical Freshwater Research
AFFA	Department of Agriculture, Fisheries, Forestry (Australia)
AIMS	Australian Institute of Marine Science
AHD	Australian Height Datum
ANCA	Australian Nature Conservation Agency
ANZECC	Australian and New Zealand Environment and Conservation Council
AQIS	Australian Quarantine Inspection Service
ASS	Acid Sulfate Soil
ATSIC	Aboriginal and Torres Strait Islander Commission
BMP	Best Management Practice
BOM	Bureau of Meteorology
BVG	Broad Vegetation Group
CAFNEC	Cairns and Far North Environment Centre
C4	Community for Cassowary and Coastal Conservation
CMA	Cooperative Management Agreement
COTS	Crown-of-Thorns Starfish
CPA	Cairns Port Authority
CRC	Cooperative Research Centre
CRRP	Community Rainforest Restoration Program
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVA	Conservation Volunteers Australia
CYPLUS	Cape York Peninsula Land Use Study
DOGIT	Deed of Grant in Trust
DCILGPS	Queensland Department of Communication, Information, Local Government, Planning and Sport (now DLGP)
DEH	Queensland Department of Environment and Heritage (now EPA)
DLGP	Queensland Department of Local Government and Planning
DNR	Queensland Department of Natural Resources (now NR&M)
DPA	Dugong Protection Area
DPI	Queensland Department of Primary Industries
DSD	Queensland Department of State Development
EIU	Einasleigh Uplands
EPA	Queensland Environmental Protection Agency
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
ESD	Ecologically Sustainable Development
FHA	Fish Habitat Area
FNQROC	Far North Queensland Regional Organisation of Councils
FNQ 2010	Far North Queensland Regional Planning Project
FNQ RPAC	Far North Queensland Regional Planning Advisory Committee
GBR	Great Barrier Reef
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation of Australian
IDAS	Integrated Development Assessment System
IGA	Intergovernmental Agreement
ILUA	Indigenous Land Use Agreement
IPCC	International Panel for Climate Change

IUCN	International Union for the Conservation of Nature
IMCRA	Interim Marine and Coastal Regionalisation for Australia
IMO	International Maritime Organisation
IUCN	International Union for Conservation of Nature (now World Conservation Union)
IPA	*Integrated Planning Act 1997* (Qld)
JCU	James Cook University
LGA	Local Government Authority
LGAQ	Local Government Association of Queensland Inc
LIPS	Low Isles Protection Society
MoU	Memorandum of Understanding
NAP	National Action Plan for Salinity and Water Quality
NCA	*Nature Conservation Act 1992* (Qld)
NHT	Natural Heritage Trust
NLWRA	National Land and Water Resources Audit
NOAA	National Oceanic and Atmospheric Administration (US)
NP	National Park
NRM	Natural Resource Management
NR&M	Queensland Department of Natural Resources and Mines
OECD	Organisation for Economic Cooperation and Development
OESR	Office of Economic and Statistical Research
PSSR	Particularly Sensitive Sea Area
QFMA	Queensland Fisheries Management Authority
QFPS	Queensland Forest Practices System
QFRI	Queensland Forest Research Institute
QFS	Queensland Fisheries Service
QPWS	Queensland Parks and Wildlife Service
RCMP	Regional Coastal Management Plan
RE	Regional Ecosystem
RPAC	Regional Planning Advisory Committee
RVMP	Regional Vegetation Management Plan
SF	State Forest
SLATS	Statewide Landcover and Trees Study
SPP	Stet Planning Policy
SoE	State of Environment
TKMG	Tree Kangaroo and Mammal Group
RVMP	Regional Vegetation Management Plan
TREAT	Trees for the Evelyn and Atherton Tableland
UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organisation
USL	Unallocated State Land
VMA	*Vegetation Management Act 1999* (Qld)
WHA	World Heritage Area
WPSQ	Wildlife Preservation Society of Queensland
WRP	Water Resource Plan
WTMA	Wet Tropics Management Authority
WTWHA	Wet Tropics World Heritage Area
WWF	Worldwide Fund for Nature

1. BACKGROUND TO THE PLAN

1.1. INTRODUCTION

A region's natural resources include its land, water and biological assets. Natural resources are more than these elements alone – they are the combination that forms living ecosystems and landscapes to support farming and grazing activities, provide for residential lifestyles and underpin tourism attraction. These resources have been central to Aboriginal peoples' spirituality, culture, social organisation and economic use, (including food, medicines and tools) for thousands of years (Review Steering Committee, 1998). They are fundamental to the economy and quality of life in a region and need to be carefully managed to ensure that future generations can enjoy lifestyles and a quality of life at least as good as today.

The Wet Tropics is a unique region in Australia, due in part to its spectacular scenery, where 'rainforest meets the reef'.

The Wet Tropics is a unique region in Australia because of the, climate, spectacular scenery, biological diversity, cultural values (both Indigenous and non-Indigenous) and economic productivity. While the region is seen as a desirable place in which to live, visit and invest, increasing human activity threatens the natural environment and associated cultural values. Over one hundred plans and strategies have been prepared for coasts, catchments, endangered species, local government areas, world heritage areas and so on in the Wet Tropics. By and large, these have helped identify the major threats and actions that need to be taken. The challenge of this natural resource management (NRM) process is to integrate this previous work into a single, coordinated action plan that can improve the condition of natural resources in the Wet Tropics.

Recent changes in national and state policy have promoted strategic investment at a regional scale to ensure that programs are responsive to local needs and address key priorities. In 2001 two regional bodies, the Natural Resource Management Board (Wet Tropics) Inc (NRM Board) and the North Queensland Afforestation Association (NQAA) resolved to prepare a new Regional Plan for Natural Resource Management (NRM Plan) capable of:

- Identifying regional priorities;
- Adding value to existing planning and information frameworks; and
- Conforming to new Commonwealth and State requirements for accreditation and regional investment.

A new regional NRM body, FNQ NRM Ltd, has since replaced the two organisations mentioned above and committed to finalising the new NRM Plan by mid 2004. This Plan (in preparation) will identify mechanisms to help create a shift toward sustainable use and management of natural resources within the Wet Tropics. It will establish a framework of actions capable of making positive impacts on the condition and trend of natural and cultural resources. It will aim to get people and organisations within the region working together towards a shared vision of the future, rather than competing or duplicating activities.

The Plan has a broad scope that includes the following main themes in natural resources:

- Biodiversity, including terrestrial, freshwater, marine and estuarine ecosystems;
- Environmental Weeds, Pests and Diseases;
- Global Carbon;
- Indigenous Cultural and Natural Resources;
- Land Resources, including native pastures and forests; and
- Water Resources, Waterways and Fisheries.

The NRM Plan will give regional direction to future funding and prioritise investment from a range of sources, especially the $1 billion Natural Heritage Trust (NHT) extension. Key elements of this extension are:

- Regional empowerment and ownership through the formation of regional, community-based NRM bodies;
- An integrated regional planning approach to natural resource management;
- Funding that will focus on the natural resource management outcomes to be achieved;
- Establishing measurable and achievable resource condition and management action targets; and
- Actions based on sound science.

The whole planning project comprises a wide range of government, scientific, Traditional Owner and community inputs. The main formal outputs of this project are:

Volume 1	*Background to the Plan* (this volume);
Volume 2	*Condition Reports*
	A *Biodiversity Conservation*
	B *Sustainable Use*
	C *Capacity Building and Institutional Change;*
Volume 3	*An Indigenous (Bama) Plan for Cultural and Natural Resource Management in the Wet Tropics;*
Volume 4	*A Regional Plan for Natural Resource Management; and*
Volume 5	*An Investment Strategy.*

There are several reports and papers supporting the development of the plan, which may be downloaded from the Rainforest CRC website (http://www.rainforest-crc.jcu.edu.au).

1.2 THIS REPORT

The purpose of this report is to provide a background to, and context for, the new NRM Plan and associated technical documents. The information is arranged under the following headings:

- The Region and its Assets;
- Natural and Cultural Resource Management in the Wet Tropics; and
- The Policy Environment for the New Plan.

1.3. REPORT PREPARATION

The principal authors were Geoff McDonald from CSIRO Sustainable Ecosystems, St Lucia, and Nigel Weston from the Rainforest CRC, Cairns. Many people contributed to the completion of this report. We are grateful for the valuable input of Libby Larsen (Rainforest CRC), Lex Cogle, John Armour and Georgie Pitt (NR&M, Mareeba), David Temple-Smith (CSIRO, Brisbane), Peter Horne and Geoff Mills (NR&M, Cairns). We thank members of the new regional NRM body who provided comment and guidance as well as those who reviewed the report as organizational representatives, especially Peter Gilbey and Helen McLaughlin (NR&M, Townsville) who assisted with revisions of the final draft. Jann O'Keefe and Shannon Hogan (Rainforest CRC) assisted with production of the final report.

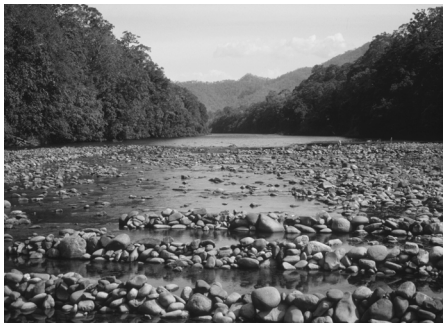
2. THE REGION AND ITS ASSETS

2.1. THE REGIONAL BOUNDARY

The Wet Tropics Region is generally defined as including 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 planning units of the Daintree/Mossman (incorporating the Bloomfield), Barron, Russell/Mulgrave, Johnstone, Tully/Murray and Herbert Rivers as well as Trinity Inlet (Map 1). The seaward boundary of the region extends into the Coral Sea from the Bloomfield River south to Crystal Creek. The region includes most of the Wet Tropics of Queensland World Heritage Area, and part of the Great Barrier Reef World Heritage Area and Great Barrier Reef Marine Park. More information on boundary issues is provided below.

CATCHMENTS

The NRM boundaries are based on 'catchment management planning units'. Catchments can be defined as 'the area within which rainfall contributes to runoff to a particular water body' (EPA, 1999) or more simply as 'an area of land that can be defined as a natural drainage area' (Sinclair 1997, p 23). All land is within a catchment (= river basin) and all uses of the land will have an impact on the catchment. It is also important to recognise that a catchment is made up of many smaller catchments or sub-catchments (Sinclair, 1997). Catchments can have varying and different landforms that form the boundaries – hills, ridges and mountains, sloping and flat land – and catch the water that flows to a low point. This can be a river, lake or the sea.



Catchments are 'an area of land that can be defined as a natural drainage area'.

Catchments provide examples of natural systems where links between system components can be readily identified. For example, soil erosion on the land surface in the upper catchment may ultimately affect the quality of water that flows to the lower catchment and in turn the ecology of biological communities living within the estuary at the bottom of the catchment (National Land & Water Resources Audit, 2002). The catchments that make up the Wet Tropics NRM Region are the Barron, Daintree/Mossman, Herbert, Johnstone, Russell/Mulgrave and Tully/Murray as well as Trinity Inlet (Map 1). The Bloomfield catchment is included within the larger Daintree/Mossman catchment area for planning purposes.

BIOREGIONS

While catchments are useful geographical units for managing natural resources in a holistic way, Regional Ecosystems (REs) are now used as the primary basis for planning the conservation of biodiversity in Queensland. They have also been adopted as the basis for vegetation management under the *Vegetation Management Act 1999* (Qld), administered by the Department of Natural Resources and Mines. Regional Ecosystems are defined within a hierarchical framework commencing with the classification of Queensland into biogeographic regions (or bioregions). Bioregions are defined as 'a complex area (land/sea) composed of a cluster of interacting ecosystems that are repeated in similar form throughout. Region descriptions seek to describe the dominant land/seascape in terms of a hierarchy of interacting biophysical attributes. Bioregions vary in size, with larger regions found where areas have more subdued environmental gradients. These are defined and delineated at the meso-scale' (Thackway and Cresswell, 1998, p 27). It should be noted that the Wet Tropics NRM Region is <u>not</u> the same as the Wet Tropics bioregion, as currently reported in the scientific literature and defined under state legislation.

Thackway and Cresswell (1995) identified approximately sixty bioregions across the country in their Interim Bioregionalisation of Australia (IBRA). This work was actually modeled on work undertaken in 1977 by Stanton and Morgan who first described Queensland's bioregions ('natural regions') together with their major vegetation communities. The IBRA incorporated the thirteen Stanton and Morgan (1977)

bioregions but recognised that parts of some regions were extensions of bioregions in adjacent States and the Northern Territory, and that some within Queensland required splitting based on significant geological and climatic variation. In total, nineteen bioregions have now been recognised as occurring in Queensland in whole or part (Sattler and Williams, 1999).

Two bioregions converge within the Wet Tropics NRM Region, namely the Wet Tropics and the Einasleigh Uplands (Map 2). These regions are vastly different in terms of their broad landscape patterns. Further, the plan area contains a marine component that includes at least four marine and coastal regions (after Thackway and Cresswell, 1998). More information on the bioregional classification of the plan area (both terrestrial and marine) is provided in the Biodiversity Conservation Condition Report (Volume 2A of this series).

OTHER PLANNING REGIONS

The Wet Tropics NRM Region includes about 91% of the Wet Tropics World Heritage Area (WTWHA) (Map 2). Although the seaward boundary of the region had not been officially defined at the time of writing (January 2004), it also takes in part of the Great Barrier Reef World Heritage Area (GBRWHA) and Great Barrier Reef Marine Park. For the purpose of this report it encompasses, with the exception of the Palm Island Group, all State coastal islands and waters between the Bloomfield River and north of Crystal Creek (i.e. the northern boundary of Douglas Shire and southern boundary of Hinchinbrook Shire respectively). This means that the coastal zone is consistent with the Queensland coastal planning units of the Wet Tropical Coast and Cardwell-Hinchinbrook (Map 2). Draft regional plans have been prepared for these areas that, once adopted, will have the effect of State policy along with the State Coastal Plan under the *Coastal Protection and Management Act 1995 (Qld)*.

There are also socio-political boundaries that must be considered when reading this document. These include part or all of eleven local government areas (LGAs) and two Aboriginal Community Councils (Map 3). This means that the Wet Tropics NRM Region is larger than the Far North Queensland region, as recognised in the FNQ Regional Plan, which is centred on Cairns and generally extends north to Cape Tribulation, west to Herberton and south to Cardwell.

There are major implications for some of the Traditional Owner groups because the traditional country of various groups lies within two NRM regions. For example, *Eastern Kuku Yalanji* country lies within the Cape York and Wet Tropics NRM regions, and *Bar Barrum* country covers both the Wet Tropics and the Southern Gulf NRM regions. Additionally it is important to understand that the traditional estates or country of many Aboriginal Traditional Owner groups in the region encompasses more than one LGA and planning areas.

Finally, it is important to note that in terms of the biophysical environment, there are small areas of overlap with surrounding NRM regions. This is especially the case in those areas that fall outside the plan area but are contained within the Wet Topics bioregion. Examples include the Black Trevethan Range to the north, closed forest communities of the upper Mitchell sub-catchment to the northwest, and the Paluma Range to the south. Discussions have been held with representatives from the relevant regional bodies (i.e. Burdekin Dry Tropics, Cape York and Northern Gulf) and joint administrative arrangements are being developed for these ‘areas of dual interest’.

2.2. BIOPHYSICAL ENVIRONMENT

CLIMATE

Climate is one of the dominant driving forces behind the diversity found in the Wet Tropics NRM region (Turton et al., 1998). Rainfall is one of the major distinguishing characteristics and it is no coincidence that the word ‘wet’ appears in the region’s name. Mean annual rainfall across the Wet Tropics is 1,580 mm (SD=800 mm), far exceeding the long-term continental average of 472 mm (BOM Website). This rainfall is seasonal

and dominated by major events such as rain depressions, monsoons or cyclones during the summer-wet season. For the wettest quarter (January-March) mean rainfall is 1,092 mm (SD=397 mm), while for the driest quarter (July-September) it is only 116 mm (SD=77 mm) (Turton et al. 1999).

The wettest areas are the Daintree lowlands, the Mt Lewis and Windsor Tablelands and the area from Cairns to south of Tully, extending to the eastern Atherton Tablelands (Turton et al., 1998). Even in these areas rainfall varies from place to place. For example, Cairns has a total annual rainfall of 1,992 mm on an average 154 days (BOM Website), whereas Babinda receives 4,211 mm on an average 157 days (M. Marrinan, BOM, pers. comm.). This represents an increase in annual rainfall of 36 mm per kilometre. Similarly, annual rainfall increases 40 mm per kilometre between Atherton and Millaa Millaa (Turton et al., 1998). Many factors affect this but the major ones are closeness to mountains or to the Coral Sea, and the angle of the coastline relative to the prevailing winds (Turton et al., 1998). By contrast, Mareeba has fewer than eighty rain days and receives less than 1,000 mm annually. Mt Garnet, on the western edge of the plan area, receives just 772 mm per year (Johnson and Murray, 1997). To put this in context, this is still wetter than Melbourne - which has 574 mm a year - so even the driest place in the Wet Tropics is still relatively wet.

'It's water that makes the Wet Tropics wet' – Professor Richard Pearson, Rainforest CRC 10th Annual Conference, Cairns, 2003

Rainfall averages for selected locations in the Wet Tropics – Atherton, Cairns, Mareeba and Innisfail – are shown in Figure 1.

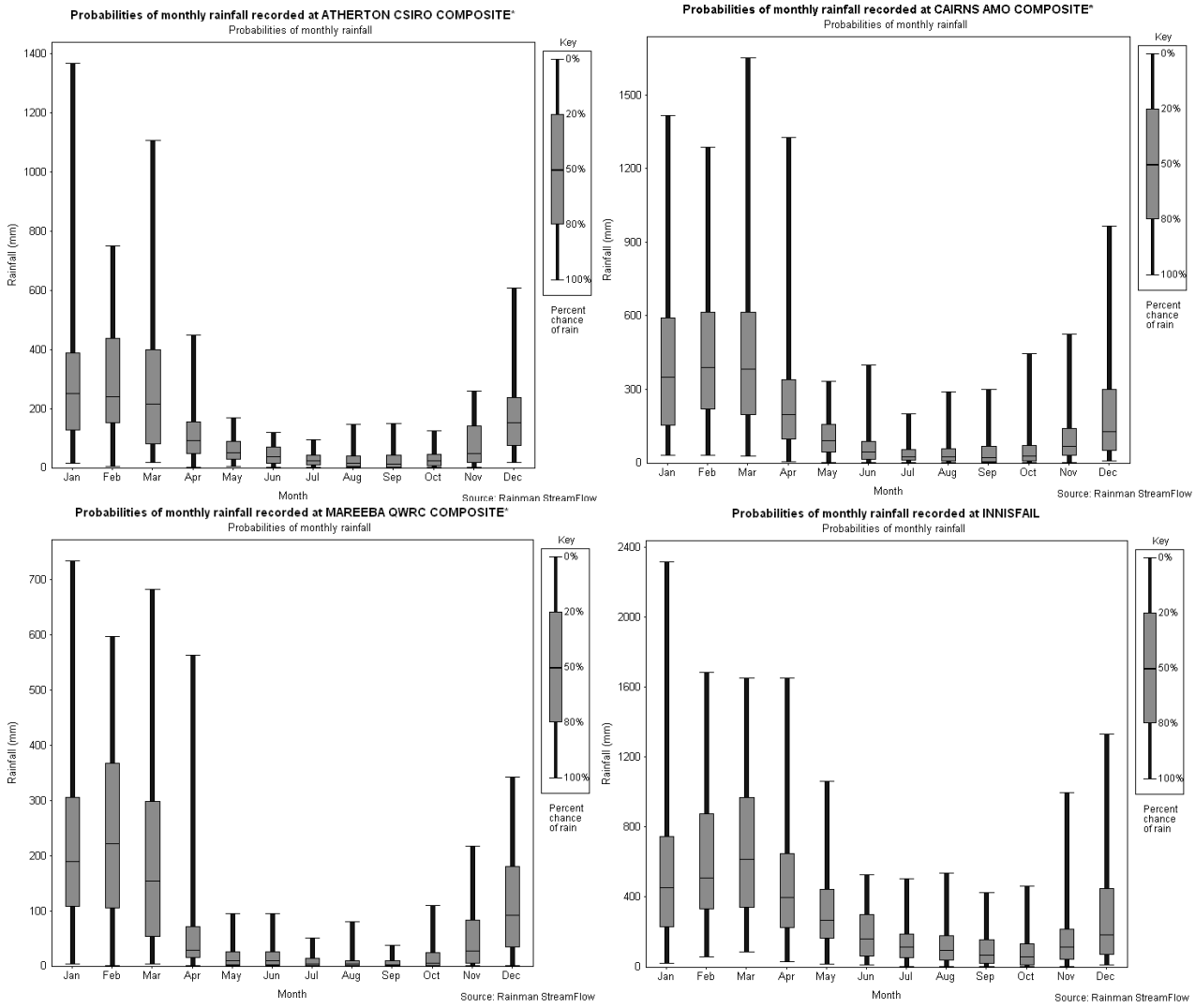


Figure 1: Monthly Rainfall Probabilities for Atherton, Cairns, Mareeba and Innisfail.

One of the major characteristics of rainfall in the Wet Tropics is that it varies greatly from year to year. Figure 2 shows how much the rainfall has varied in Cairns in the last ten years. Generally, the wettest years had almost twice as much rain as the driest years. An exception was 2002 however, when just 721 mm fell in Cairns. It was the driest year since records began in 1882 – only once before had total rainfall dropped below 1,000 mm in the city (929 mm in 1966) (Clewett et al. 1994).

The Wet Tropics have fairly uniform temperatures throughout the year. Typical daytime minimum and maximum temperature ranges on the coast are 22°C to 31°C in mid-Summer and 15°C to 26°C in mid-Winter. Average coastal humidity reaches 78% in Summer but often rises into the high nineties. The tablelands and uplands are cooler, with mean daily temperatures of between 17°C and 28°C in Summer, and 9°C and 22°C in Winter. Further west, temperatures climb again to between 21°C and 35°C in Summer, and 10°C and 29°C in Winter (BOM Website).

The prevailing winds are East to Southeasterly with strongest winds (cyclones excluded) usually occurring during April and August. During the Summer months, North to Northeasterly sea breezes dominate the winds along the coast.

Tropical cyclones

Tropical cyclones are common during the Summer months (November – April), with a frequency of four to six per year for the Coral Sea. On average, at least two cyclones cross the Queensland coast each year. The cyclone season is normally confined to between December and April but exceptions do occur. Figure 3 shows the average annual number of tropical cyclones around the Australian coast. In the Wet Tropics, the most active year to date from official records was 1977, when Cairns was influenced by four tropical cyclones (BOM Website). The recurrence interval for severe or general cyclone damage for the Wet Tropics region is three to forty years (Webb, 1958).

Climate change

Evidence for climate change is now considered by most to be irrefutable with evidence of impacts to numerous species and ecosystems already measurable. In 2001 the International Panel for Climate Change (IPCC) stated 'it is virtually certain that there has been a generally increasing trend in global surface temperature over the 20th century' (IPCC, 2001). Evidence suggests that Australia may be particularly vulnerable to the impacts of climate change especially areas such as the Wet Tropics due to the high biodiversity and complex ecosystems in often small and isolated areas. Computer modeled projections for the region predict a change in the annual maximum temperature of 0.3 – 5.2°C for the period 2030-2070, which would increase the current maximum average temperature of the region from 28.9°C to between 29.2 and 34.1°C and an increase in the occurrence of extreme temperatures (over 35°C) from the current average of three days per year to between three and 41 days per year by 2070. Predictions for changes to rainfall are as yet less specific (+/- 10%), however, an increase in evaporation will increase the demand on water. Other expected changes include more intense rainfall events and tropical cyclones, sea level rise and subsequent local flooding associated with cyclonic storm surges and a likely increase in the frequency of El Niño events.

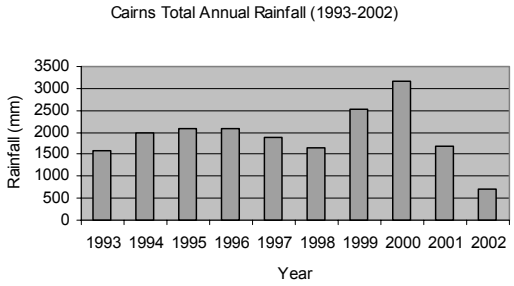


Figure 2: Cairns Total Annual Rainfall (1993-2002) (Source: J. Williams, BOM Website, pers. comm.)

Ecosystems of the Wet Tropics such as tropical rainforests are highly sensitive to climate change, especially changes to rainfall and temperature. A temperature increase of 1°C and rainfall decrease of 10% would reduce highland rainforest environments by almost 50% with irreversible impacts to flora and fauna and likely extinction events. The Great Barrier Reef too is highly sensitive with increased sea surface temperatures

leading to more frequent coral bleaching events. Other sectors that will be affected include agriculture, pests and weeds, vector-borne disease, coastal development, water availability, wetlands, forests and human infrastructure.

GEOMORPHOLOGY

The distribution of landforms, geological structure and surface drainage allow a classification of Queensland into major divisions with uniform landforms but contrasting geological structure and rock types, tectonic history and, to a lesser degree, past and contemporary climates (East, 1993). The Wet Tropics NRM Region straddles the Peninsula and Burdekin provinces of the Eastern Uplands division – an ancient orogen that forms a peripheral belt of high relief in the east and defines a generally narrow coastal plain.

WTMA

The NRM region is characterised by diverse and rugged terrain, including mountainous offshore islands.

The region is characterised by diverse and rugged terrain (Nix, 1991). The Great Escarpment (Ollier, 1982) is backed to the west by tablelands and ranges and on the east it descends abruptly to a narrow coastal plain with coastal ranges and mountainous offshore islands. Fringing reefs occur in the northern section of the region and are most extensively developed between Daintree and Bloomfield rivers. The major mountain masses exceed elevations of 1,000 m and all are granitic although some have flanking acid volcanic and metamorphic rocks (Nix, 1991). At 1,622 m, Mt Bartle Frere is the highest point in Queensland. Differential erosion between the relatively resistant granites and metamorphics has accentuated topographic relief and formed deeply incised valleys, precipitous mountainsides and steep, narrow spurs (Trott, 1996). Waterfalls are a feature of the region and Wallaman Falls, near Ingham, has the longest single drop (278 m) of any waterfall in Australia. The most extensive lowlands are in the south, associated with the floodplains of the Tully and Herbert Rivers (Goosem et al. 1999).

While this geomorphic diversity and, for Australia strong relief features, is a limitation to the area of arabale land, it is a major determinant of ecosystem diversity and of the scenic assets of the region.

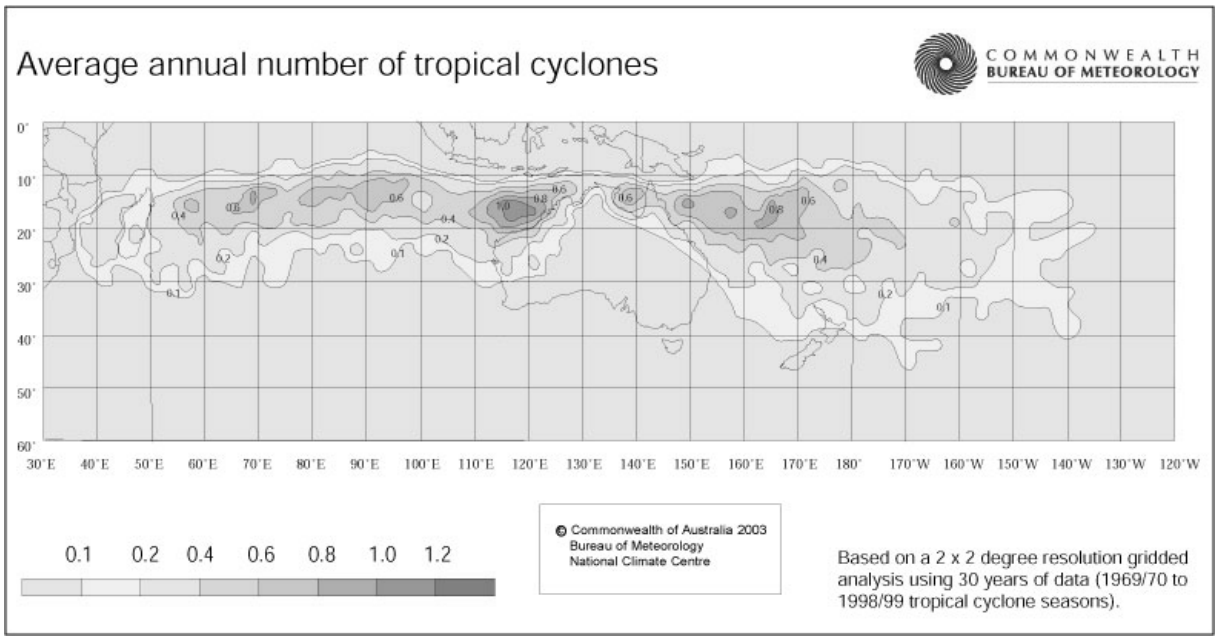


Figure 3: Average annual number of tropical cyclones (Source: BOM Website).

GEOLOGY

Beeston and Wade (1993) outlined the geological framework of the region. It mostly occurs within the Tasman Orogenic Zone – Palaeozoic to early Mesozoic orogenic zone and overlying basins. The upper Herbert catchment is located over a Proterozoic shield area. Consequently, surface geology is diverse in terms of both age and composition.

Much of the landscape is of very old origin with very recent igneous intrusion from volcanic activity. To the west, Proterozoic strata (2,000 million to 500 million years old) comprise sediments and volcanics that have been folded, faulted and metamorphosed to varying degrees and widely intruded by granite and basic igneous rocks. These rocks are intensively mineralised. Heading eastwards, deposition in the Palaeozoic and early Mesozoic eras, dating back 500 million to 200 million years, resulted in great thicknesses of sediments (including coral reefs) and volcanics, that were periodically folded and faulted, intruded by granite, and finally uplifted. Quaternary marine deposits, coastal dunes and alluvial plains and piedmont fans occur along the coast (Goosem et al. 1999).

SOILS

The lithology of the parent rock, geomorphic processes and present climate described above are important factors in determining the soil types and occurrences in the region. The following description (after Isbell et al. 1993) concerns the dominant soil orders of the region. It is based on the new Australian classification system that was formerly adopted by the Australian Soil Conservation Council in 1992 (Isbell, 1996). The soil groups closest to the superseded categories outlined by Stace et al. (1968) are listed in brackets.

Kandosols (red, yellow and grey earths, red and brown hardpan soils). Red, yellow or grey porous sandy to loamy soils that are termed Kandosols have 'massive' subsoils. Massive soil is coherent but, when disturbed, separates into fragments. They have physical properties favorable for plant growth but with low fertility and suffer erosion. This group is found in old, deeply weathered landscapes that now form undulating rises and plains in the upper Herbert catchment.

Dermosols (prairie soils, chernozems, some red and yellow podzoilc soils, xanthozems). Dermosols are a diverse group of soils with red, brown, yellow, grey or black subsoils that consist of natural aggregates. In some cases, the A horizons are thick, dark and friable. This group occurs mostly in the humid coastal area, forming on a wide range of rocks and terrain and is commonly quite fertile. They are the most widespread soil in the WTWHA.

Sodosols (solodic soils, solodized-solonetz, soloths, desert loams). Sodosols feature a sandy or loamy A horizon abruptly overlying a dense, dispersive clay B horizon which owes its tough, impermeable nature to the accumulation of sodium. Many are saline at shallow depths. These properties, together with low fertility, make the soils generally unsuitable for cropping. Though particularly susceptible to erosion and dry-land salinity, sodosols are important for grazing and hardwood timber. This group occurs in the Mareeba and Ingham districts and is commonly associated with either sedimentary or quartz-rich igneous rocks.

Ferrosols (krasnozems, euchrozems). Ferrosols are a group of well-drained, friable clay loam to clay soils high in iron with red or brown subsoils. When disturbed, the subsoils form into natural aggregates known as peds. These are fertile soils with exceptional physical properties that make them prized for agriculture, particularly sugarcane, dairying and horticulture. They exist in the higher rainfall coastal areas and are associated mainly with basalt. These are the 'red soils' of the Atherton Tableland.

Hydrosols (humic gleys, gleyed podzolic soils, solonchaks). Hydrosols are soils saturated with water for long periods (months) due to either tidal influence, high fluctuating water tables or saturation above an impermeable layer. Typically they have

grey (or greenish grey) colours and/or strongly contrasting yellow or red mottles. Other properties vary considerably. They are found mainly in coastal and subcoastal areas south of Tully. They are infertile, but improved drainage and fertilizer can make them highly productive.

Rudosols and Tenosols (lithosols, alluvial soils, siliceous sands, earthy sands). These soils show either virtually no changes with depth (Rudosols) or only slight variations in colour or appearance with depth and some have a thin white layer overlying their parent rock. They can be very shallow and stony with much rock outcrop. They occur on may parent materials, with quartz-rich sandstones and siliceous volcanic rock being the most common. They occur in the upper Herbert catchment and are used only for grazing.

Podosols (podzols). Podozols have formed in quartz sand and have a grey A horizon and a coherent B horizon that consists of an accumulation of organic, aluminium and iron compounds. The upper subsoil may form an irregular dark brown pan called 'coffee rock'. These soils characterise the more humid coastal regions, where wind-blown sand-dunes and beach ridges have been stabilised by vegetation. They carry diverse plant communities from rainforest to heathlands and are used for forestry and sandmining.

Ferrosols are fertile soils with exceptional physical properties that make them prized for agriculture, particularly sugarcane, dairying and horticulture.

Chromosols (red-brown earths, non-calcic brown soils). This order has sandy or loamy A horizons and shows clear, often abrupt, changes to yellow, brown or red-brown clay B horizons of generally neutral to alkaline pH. A thin, white subhorizon is present in some cases. Chromosols form on a range of parent materials and terrains. They are used to produce grain on flatter terrain in more favourable rainfall areas, for sown pastures on moderate slopes and native pastures in steeper or drier regions.

Organosols (*non-tidal organic soils*). Soils that are not regularly inundated by saline tidal waters and have more than 0.4 m of organic materials within the upper 0.8 m. or have organic materials extending from the surface to a minimum depth of 0.1 m. These soils either directly overlie rock or other hard layers, or overlie fragmental material such as gravel, cobbles or stones in which the interstices are filled or partially filled with organic material.

Vertosols (black earths, grey, brown and red clays). Vertosols are grey, brown or black clay soils that crack open to the surface when dry and commonly develop a hummocky relief called Gilgai. Of moderate to high fertility, often with a naturally friable, loose surface, they are capable of storing large amounts of water, which is then available to plants. These soils underpin grain cropping and irrigation. They also contribute significantly to the grazing industry and are commonly associated with basalts that flank the Great Divide. Landscapes containing Vertosols are usually subdued and range from flat, alluvial plains to rolling low hills.

Calcarosols (grey, brown and red calcareous red earths). Calcarasols are lime-rich soils with sandy or loamy textures that may gradually become more clayey with depth. The A horizon only may be non-calcareous but it must be alkaline. Calcarasols occur on limestones and calcium-rich sedimentary rocks and windborne deposits. They are used for grazing of the sparse native vegetation.

The area of Australian Soil Classification soil orders in the surveyed part of the plan area is presented in Table 1. Their distribution is shown on Map 4. This mapping is derived from land resource assessments that have been undertaken at a range of scales.

Land resource assessments

The most detailed assessments have been undertaken in the Mossman-Julatten (Wilson, 1991), Babinda-Cairns (Murtha et al. 1994), Mareeba-Dimbulah Irrigation Area (Enderlin et al. 1997), Atherton Tablelands (Malcolm et al. 1999), Ravenshoe-Mt

Garnet (Heiner and Grundy, 1994), Cardwell-Tully (Cannon et al. 1992), and the Wet Tropical Coast (Wilson and Baker, 1990). Less detailed surveys cover Cape York (Biggs and Philip, 1994), Einasleigh-Atherton Dry Tropics (Grundy and Bryde, 1989), Upper Herbert (Enderlin and Neenan, 2000), Mitchell-Normanby Land Systems (Galloway et al. 1970) and Atlas of Australian Soils (Isbell et al. 1968). The coverage of land resource assessment in the Wet Tropics NRM Region is shown in Figure 4.

Table 1: Area of Australian Soil Classification soil orders in the surveyed area (1,154,500 ha) within the Wet Tropics NRM Region (Source: Sustainable Use Condition Report).

Soil Order		Area (ha)	% of surveyed area
Calcarosol	grey, brown and red calcareous red earths	16,900	1
Chromosol	red-brown earths, non-calcic brown soils	48,200	4
Dermosol	prairie soils, chernozems, some red and yellow podzoilc soils, xanthozems	192,200	17
Ferrosol	krasnozems, euchrozems	147,100	13
Hydrosol	humic gleys, gleyed podzolic soils, solonchaks	103,300	9
Kandosol	red, yellow and grey earths, red and brown hardpan soils	269,500	23
Organosol	non-tidal organic soils.	6,400	1
Podosol	podzols	72,800	6
Rudosol	lithosols, alluvial soils, siliceous sands, earthy sands	86,500	7
Sodosol	solodic soils, solodized-solonetz, soloths, desert loams	151,800	13
Tenosol	lithosols, alluvial soils, siliceous sands, earthy sands	20,600	2
Vertisol	black earths, grey, brown and red clays	39,200	3

VEGETATION

There is an enormous degree of variation in rainfall, geology, drainage and altitude in the Wet Tropics and these, combined with the complex evolutionary history of the region, have resulted in a similarly complex spectrum of plant communities and forest types. The rainforests of the region, which dominate the narrow, coastal, high rainfall belt, have been classified into sixteen major structural types and thirty broad community types correlated with climatic zones and soil parent material (Tracey and Webb, 1975; Tracey, 1982). These rainforest types are fringed and dissected by a range of sclerophyll forest and woodland types, mangroves and swamp communities. Grasslands, tall woodlands and open forests of *Eucalyptus* species, and extensive seasonal and permanent lakes and wetlands occupy the drier, western part of the plan region. The vegetation of the Wet Tropics NRM Region, based on the Tracey and Webb (1975) survey and work by the Queensland Herbarium and Tropical Savannas CRC (Fox et al. 2001), is shown on Map 5.

WATER RESOURCES

The Wet Tropics NRM Region drains to the Coral Sea from six major coastal catchments, along with Trinity Inlet. Catchment boundaries mark the outer limits of the region from the Bloomfield River in

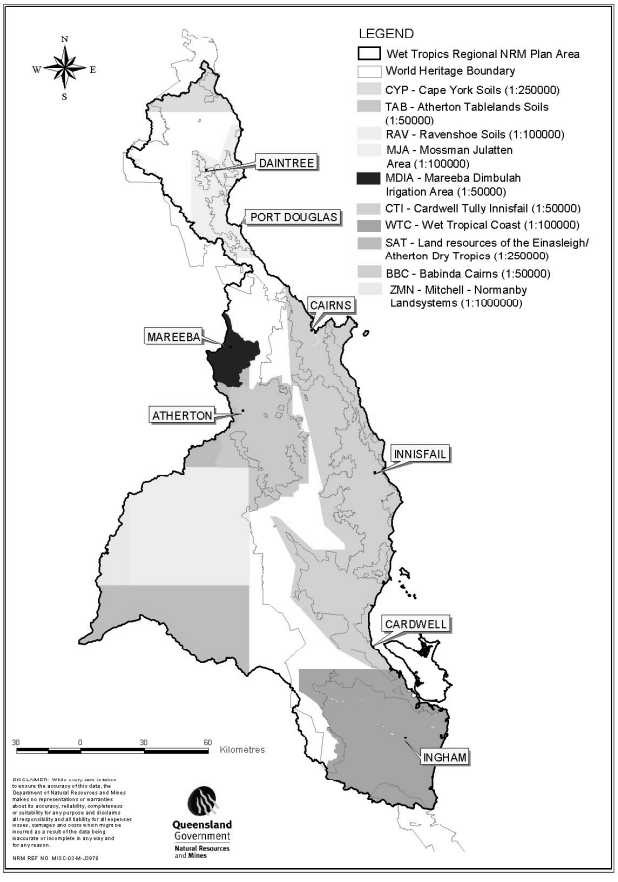


Figure 4: Coverage of land resource assessment in the Wet Tropics NRM region (Source: NR&M, Mareeba).

the north to Crystal Creek in the south. The six major catchments (progressing south) are the Daintree/Mossman (including the Bloomfield), Barron, Russell/Mulgrave, Johnstone, Tully/Murray, and Herbert River catchments.

The unique climatic and geomorphological conditions in the Wet Tropics result in fast flowing streams with high discharge rates.

The climatic and geomorphological conditions outlined above are unique in Australia and result in fast flowing streams with high discharge rates (DEH and DNR, 1999). For example, in the Herbert River total mean annual discharge is approximately 3.7 million megalitres and in the Johnstone and South Johnstone it is 3.23 million megalitres (DPI – Resource Management, 1995a and 1995b). Streamflow velocity can also be high, especially in southern catchments of the region. For example, in March 1967 a flow rate of 111,920 cubic metres per second was measured in the Herbert River at Ingham (DPI – Resource Management, 1995a). By comparison, the largest ever recorded instantaneous discharge in the Burdekin River at the Dam site was 36,000m^3/s. Although rainfall is highly seasonal, streamflow in the coastal catchments is more reliable than most other parts of Queensland and is close to perennial (DEH and DNR, 1999). The Department of Natural Resources & Mines has been asked to identify river systems that are regularly stressed during low flow periods, and which would in turn benefit from a Water Resource Plan for the Wet Tropics.

Sand dune, alluvium, fractured basalt and other fractured rock aquifers exist within the region (DPI – Resource Management, 1995a and 1995b). Long term pumping rates for most areas are considered low and over the entire region groundwater development has been limited (DPI – Resource Management, 1995a and 1995b; DEH and DNR, 1999). However, some local areas such as the Atherton Basalts are considered important locally for water supply (DEH and DNR, 1999).

More detailed information on water resources, including water health, i.e. the quality of water for a desired use, is provided in the Sustainable Use Condition Report (Volume 2B of this series).

2.3. THE WET TROPICS REGION – AN ABORIGINAL CULTURAL LANDSCAPE

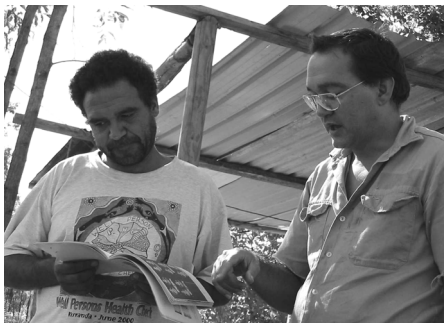
Aboriginal people have occupied and used their land and sea country in the Wet Tropics NRM Region for thousands of years (Wet Tropics Management Authority (WTMA), 2003). The ecosystems of the region have evolved over this time through active Aboriginal interaction with the land and sea and the management of its resources (WTMA, 2003). To the Aboriginal Traditional Owners, the region is a series of 'living' and dynamic cultural landscapes (Review Steering Committee, 1998). This means that the landscape and its natural features and resources are central to Aboriginal peoples' spirituality, culture, social organisation and economic use, including food, medicines and tools (Review Steering Committee, 1998; WTMA, 2003). The term 'country' is used to describe the cultural landscapes of the Aboriginal Traditional Owners of the region. Therefore the natural values and assets of the region are of cultural and spiritual significance to Aboriginal Traditional Owners – for them, nature and culture are one entity, not two separate issues (Bama Wabu, 1996).

'…country means place of origin, literally, culturally and spiritually. Country refers to more than just geographical areas; it is shorthand for all the values, places, resources, stories and cultural obligations associated with the geographical area. For coastal Aboriginal people …country includes both land and sea areas, which are regarded as inseparable from each other.' (Smyth, 1994:2)

There are at least 23 Traditional Aboriginal Owner groups within the Wet Tropics NRM region who express a strong and continuing sense of belonging to, and responsibility

for, their traditional estates. They are culturally diverse and include among others: *Banjin, Bar Barrum, Djabugay, Djiru, Dyirrabal, Girramay, Gulnay, Gunggandji, Kuku Yalanji,* Western *Yalanji, Mamu, Manbarra, Muluridji, Ngadjon Jii, Nwaigi, Waragamay, Warangnu,* Tableland *Yidindji, Gimuy Yidinji, Goldsborough Valley Yidinji, Mandingalbay Yidinji,* Lower Coastal *Yidinji* and *Yirrigandji.*

It is important to note that although many of these groups identify as Rainforest Aboriginal people, the traditional estates of some Traditional Owner groups in the western NRM Region is not rainforest vegetation but open woodlands. These groups are not another stakeholder group, but the Traditional Owners of the region who are the proper custodians for their traditional estates, which includes the land and sea, their resources, and the knowledge and practices associated with these (Webb, 1995). They have obligations for the management of these traditional estates as defined by that of Traditional Owner groups' customs and traditions (Review Steering Committee, 1998).



BARRY HUNTER JNR.

Will Duff (left) and Daryn Storch working on the *Djabugay* Flora and Fauna Survey.

The special relationship, the traditional knowledge of the environment, the rights and interests and the land and sea management regimes that the Aboriginal Traditional Owners have had, and continue to have, with the Wet Tropics NRM Region are recognised as a key issue in the Wet Tropics NRM Plan. An Indigenous (*Bama*) Plan[1] is being developed for the Wet Tropics NRM Region. This Plan will inform the final Wet Tropics NRM Plan.

It should be noted that there are also Torres Strait Islander peoples and historical Aboriginal peoples living within the Wet Tropics NRM Region. Many maintain connections with their traditional estates, and also have developed strong links with their new environment.

Aboriginal peoples' assets of the region

The Aboriginal cultural heritage within the Wet Tropics NRM Region is an extremely important asset for Traditional Owners and the broader regional community. As the Commonwealth of Australia (1987:19) points out, *'the wet tropics of North-east Australia preserves the only recognised extant rainforest Aboriginal culture and is therefore a major component of the cultural record of an Aboriginal society which has a long continuous history … for at least 40,000 years.'*

The biophysical assets of the Wet Tropics NRM Region, which are described within this report, also have important cultural values. The natural and cultural values of the region are inseparable for Aboriginal people. Some cultural assets might include: cultural and spiritual knowledge, ceremony (song and dance), sites of significance including sacred/burial sites, cultural artefacts, bush tucker (hunting and gathering practices), bush medicine, traditional ecological knowledge, law and language.

The huge biological diversity found in the North Queensland rainforests is reflected in the detailed vocabulary of the languages of the region, but these languages are at least as severely endangered as the biological species of the region (Commonwealth of Australia, 2001:131). Again, these values will be explored fully in the Indigenous (*Bama*) Plan.

2.4. POPULATION, THE ECONOMY AND RESOURCE USE

Most human activities one way or another depend on the natural asset of the region, whether it be the environmental values that attract tourists and support the massive tourist industry in the region; or whether it is the soils and climate resources that support tropical agriculture and forests resources.

[1] *Bama* is the term used by a large proportion (but not all) of the Aboriginal people in the Wet Tropics NRM region when referring to an Aboriginal person.

Each year nearly two million domestic visitors and one million international visitors come to the region directly supporting tourism businesses, and indirectly supporting a substantial part of the regional economy. Tourism is by far the major source of revenue and total visitor expenditure levels exceed $2 billion annually (OESR, 2002). It makes up 35-40 percent of jobs and income (S. White, Cairns Chamber of Commerce, quoted in *The Australian* 5/12/03).

Farmers produce approximately $750 million worth of crop and livestock products annually. Supporting agriculture engages many more people in transport, processing and marketing activities. While the sugar industry has struggled in recent years, the horticulture industry has grown rapidly producing high valued products for local and international markets (National Land and Water Resources Audit, 2002).

At present approximately 216,000 people live in the region and depend directly or indirectly on these natural resource based industries. That number is projected to increase to over 300,000 in the next twenty years. Natural resource management, the sustainable use of the Wet Tropics land and biological resources, therefore is central to the long term prosperity of the economy and the people who depend on it – that is almost everyone in the region[2].

HUMAN POPULATION

Historical background

Rainforest Aboriginal people have a significant and long-standing cultural, spiritual and economic relationship with the region (Review Steering Committee, 1998). The ongoing survival of rainforest Aboriginal people was based on an intimate knowledge of the environment. The traditional land management practices, which have shaped the ecosystems for thousands of years, were altered dramatically with the removal of Aboriginal people from their lands with the arrival of Europeans (Fourmile, 1995). European colonisation had a devastating affect on Aboriginal people in the region. For example, many Aboriginal people starved because their land and its resources were taken from them (Horsfall, 2002). However, Aboriginal people and their culture have survived and they continue to assert their rights to their country and their cultural heritage.

The European history of the region was summarised by Trott (1996). He reported that the first European to explore the Wet Tropics was Edmund Kennedy in 1848. After further exploratory forays, notably by George Elphinstone Dalyrymple in 1873, many people arrived to work the goldfields or in the timber industry. By 1875, timber cutters had commenced logging in the region's coastal valleys and had extended their operations to the western margins of the Atherton Tableland by 1881. Tin mining began to have an impact on the region in the 1880s and cattle grazing was introduced to supply fresh meat for miners and the growing settlements on the coast. At the same time, rainforest was progressively cleared from the lowlands to make way for sugar cane plantations that spread along the entire northern coast to beyond Cooktown. A dairy industry was also established on the Atherton Tablelands in the 1880s. Under the government land scheme of the day, selectors were required to clear their land for cropping or grazing within a specified

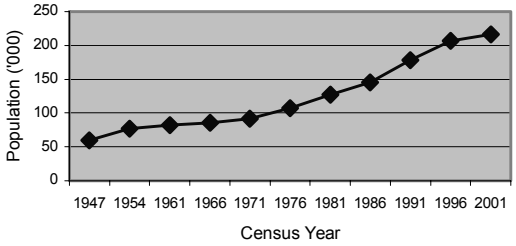


Figure 5: Wet Tropics Region population (1947-2001) (Source: WTMA, 2002, from Australian Bureau of Statistics Censuses of Population and Housing, 1947-2001).

[2] Catchment boundaries define the Wet Tropics NRM region, while Local Government boundaries define statistical regions. The NRM region is located mostly in the Far North Statistical Division but a small portion is also in the Northern Division. The region includes all of seven Local Government Areas (Atherton, Cairns, Cardwell, Douglas, Eacham, Johnstone, and Hinchinbrook), significant parts of Herberton and Mareeba shires and tiny parts of Cook and Dalrymple Shires. Also, two Aboriginal Community Councils, *Wujal Wujal* and *Yarrabah*, are in the region. These imperfectly matching boundaries create difficulties for statistical analysis and in this report we are explicit in defining 'regions'.

period. In 1931, the conservator of forests, Edward Swain, criticised the extensive land clearing of the region as shortsighted. After several decades there was a move to secure the forests for selective timber harvesting by protecting them from clearing for agriculture. The economy of the region has remained almost entirely dependent on primary production, but tourism has grown steadily since the 1950s to become the major driver (Trott, 1996).

Regional population

On 31 December 2001, the estimated resident population of the Wet Tropics NRM Region was 216, 685 persons, representing 6.0% of the state's population (Table 2). The average annual population growth rate for the region between December 1996 and December 2001 was 0.9%, compared with 1.7% for the state.

Most LGAs in the Wet Tropics NRM Region experienced population growth between 1996 and 2001. The highest annual average population growth rate was recorded in Cardwell Shire (3.4%), followed by Douglas Shire (2.0%) and Cairns City (1.2%). Negative population growth occurred in both the Johnstone and Hinchinbrook Shires (-0.4% and -1.0% respectively) over the same period. The highest annual average change for the period December 2000 to December 2001 occurred again in Cardwell Shire (2.4%), followed by Douglas Shire (2.0%) and Atherton Shire (1.6%).

About 91% of the region's population (196,629 persons) resides in the Cairns statistical subregion. This area contains seven of the nine LGAs listed in Table 2, excluding the Herberton and Hinchinbrook Shires. Census data indicate that most of the Cairns subregion's population growth has occurred since the early 1970s (Figure 5). Between 1947 and 1971, the population increased by 32,980 persons, while between 1971 and 2001 the population more than doubled, increasing by 123,374 persons. At the time of the 2001 Census, there were 20,483 persons in the Wet Tropics NRM Region who stated that they were of Aboriginal or Torres Strait Islander origin (Table 3). These persons comprised 8.6% of the total population (compared with 3.1% in Queensland). Of these Indigenous persons, 14,338 stated they were of Aboriginal origin, 3,761 stated they were of Torres Strait Islander origin, and 2,384 stated they were of both Aboriginal and Torres Strait Islander origin. Table 3 shows a high proportion of Indigenous people in the Hinchinbrook LGA. However, this is inflated by the inclusion of Palm Island residents in the census data[3]. The next highest LGA in terms of its Indigenous population was Herberton (12.9%), followed by Mareeba (11.6%).

Trends

By 2021, the population of the Wet Tropics NRM Region is projected to increase to 311,101 persons (Table 4). The annual average growth rate between 2001 and 2021 in the region is projected to be 1.6%. This compares with an annual average growth rate of 1.6% for the state. The region's share of Queensland's population is projected to be 6.3%.

Cairns City will remain the most populous LGA, with a projected population of 187,565 persons in 2021. Its share of the region's population is expected to increase from 55.6% in 2001 to 60.2% in 2021. The highest annual average growth within the region between 2001 and 2021 is projected to occur in Douglas Shire (2.3%), followed jointly by Cairns City (2.0%) and Cardwell Shire (2.0%), Herberton Shire (1.4%), and Atherton Shire (1.3%).

Pressures

The relationship between human population and its impact on the environment is a complex function of the highly variable nature of the environment and the way that individuals and groups of individuals interact with the environment (i.e. their

[3] The Palm Island Group is included in the Burdekin-Dry Tropics NRM Region. The Queensland Regional Bodies Information System database shows that, in 2001, 2,395 people were residents of Palm Island.

'ecological footprint'). These factors include resource consumption (especially land at the local level), waste production, recreational activities and other direct interactions (e.g. spreading of weeds), management or regulatory regimes for land use and the remedial strategies in place.

Table 2: Population trends for the Wet Tropics NRM Region and Queensland (1996-2001) (Source: OESR (2003a; 2003b; 2003c; 2003d; 2003e; 2003f; 2003g; 2003h; 2003i; 2003j), from Australian Bureau of Statistics, Population by Age and Sex, Queensland, 3235.3).

Local Government Area	Area (km^2)	Estimated resident population		Annual average change (%)
		1996	*2001*	*1996-2001*
Atherton	623	10,131	10,611	0.9
Cairns	1,850	113,507	120,433	1.2
Cardwell	3,062	9,114	10,744	3.4
Douglas	2,456	9,698	10,688	2.0
Eacham	1,127	6,293	6,353	0.2
Johnstone	1,639	19,780	19,383	-0.4
Mareeba (part)[1]	852	18,217	18,417[1]	0.2
Herberton	9,604	5,253	5,326	0.3
Hinchinbrook[2]	2,882	15,495	14,700[2]	-1.0
Wet Tropics	**24,095**	**207,448**	**216,685**	**0.9**
Queensland	1,734,190	3,338,690	3,635,121	1.7

[1]Includes Mareeba Shire – only 76% of the Shire's population resides within the Wet Tropics plan area (QRBIS database).
[2]Includes Palm Island, which is part of the Burdekin-Dry Tropics NRM region.

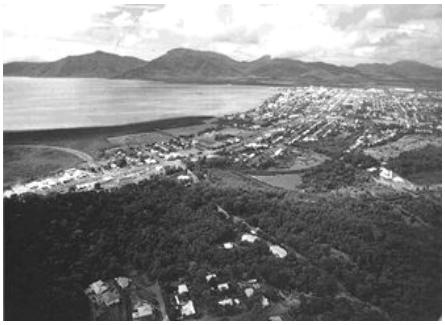
Table 3: Indigenous and Non-Indigenous population by LGA, Wet Tropics NRM Region and Queensland, 2001 (TSI=Torres Strait Islander; ATSI=Aboriginal and Torres Strait Islander) (Source: OESR (2003a; 2003b; 2003c; 2003d; 2003e; 2003f; 2003g; 2003h; 2003i; 2003j), from Australian Bureau of Statistics, 2001 Census of Population and Housing, Basic Community Profile). Other points worth noting about the regional population are that 71.6% of persons included in the 2001 Census were born in Australia, compared with 76.2% for Queensland as a whole. A total of 33,884 persons were born overseas, of which 14,344 persons were born in north-west Europe. More than half the population of Hinchinbrook Shire is of Italian descent (Hinchinbrook Shire Council, n.d.).

Local Government Area	Aboriginal		TSI		ATSI		Total Indigenous		Non-Indigenous	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Atherton	431	5.0	41	0.4	75	0.7	547	5.2	10,074	94.8
Cairns	6,630	5.0	2,923	2.2	1,509	1.1	11,062	8.3	122,137	91.7
Cardwell	474	4.1	149	1.3	93	0.8	716	6.3	10,727	93.7
Douglas	769	4.3	77	0.4	130	0.7	976	5.5	16,911	94.5
Eacham	191	3.1	12	0.2	13	0.2	216	3.5	6,034	96.5
Johnstone	1,151	5.8	241	1.2	252	1.3	1,644	8.2	18,310	91.8
Mareeba	1,844	10.2	159	0.9	96	0.5	2,099	11.6	15,997	88.4
Herberton	551	10.8	71	1.4	39	0.8	661	12.9	4,449	87.1
Hinchinbrook	2,297	15.7	88	0.6	177	1.2	2,562	17.5	12,049	82.5
Wet Tropics	**14,338**	**6.0**	**3,761**	**1.6**	**2,384**	**1.0**	**20,483**	**8.6**	**216,688**	**91.4**
Queensland	87,322	2.4	16,415	0.4	9,035	0.2	112,772	3.1	3,655,139	96.9

Table 4: Population projections, medium series, for the Wet Tropics NRM Region and Queensland, 2001-2021 (Source: OESR (2003a; 2003b; 2003c; 2003d; 2003e; 2003f; 2003g; 2003h; 2003i; 2003j), from Department of Local Government and Planning, Population Trends and Prospects, 2001 edition).

Local Government Area	2001	2006	2011	2016	2021	Annual Average Growth Rate 2001-2021 (%)
Atherton	10,808	11,583	12,394	13,215	14,048	1.3
Cairns	125,090	140,346	155,872	171,591	187,565	2.0
Cardwell	10,307	11,570	12,844	14,104	15,355	2.0
Douglas	11,137	12,607	14,206	15,866	17,528	2.3
Eacham	6,468	6,615	6,792	7,005	7,246	0.6
Johnstone	20,617	21,558	22,458	23,312	24,126	0.8
Mareeba	19,057	19,954	20,759	21,473	22,102	0.7
Herberton	5,703	6,157	6,610	7,056	7,493	1.4
Hinchinbrook	15,629	15,655	15,668	15,656	15,638	0.0
Wet Tropics	**224,816**	**246,045**	**267,603**	**289,278**	**311,101**	**1.6**
Queensland	3,628,081	3,962,034	4,297,745	4,632,195	4,964,404	1.6

Population growth is accompanied by increased demands for energy supplies and distribution corridors, telecommunications facilities, the upgrading and duplication of transport corridors, as well as increased demands for high quality water supplies for domestic, agricultural and industrial uses. Population growth and increased trade also inevitably lead to increases in the number and distribution of exotic invasive plants, animals and disease organisms. Increases in both the resident and tourist populations also place greater pressure on the environment for tourism and recreation purposes.



CAIRNS CITY COUNCIL WEBSITE

Aerial view of Cairns City and Trinity Inlet. The population of Cairns has increased rapidly in recent years, and will remain the most populous LGA, with a projected population of 187,565 persons by 2021.

Urban population growth in the Wet Tropics is placing increasing pressure upon the region's good quality agricultural land, as well as many of its remaining natural areas. Land consumption for residential and other urban purposes varies depending on the form of urban growth, but if the Queensland average conversion rate (0.30 ha/dwelling) is applied to the projected population growth in the Wet Tropics, a further 8700 hectares is likely to be converted to urban uses over the next twenty years. Specific impacts of concern include loss of land and viability of agriculture in the Cairns regions, urban encroachment associated with tourism development along the Wet Tropics coast north of the Daintree, Cairns northern beaches, Mission Beach and Cardwell.

These land types hold significant economic, environmental and social values for the region. In many cases, the relatively low housing densities being achieved exacerbate the impacts of urban expansion. The popularity of rural residential development has resulted in available land resources being used far quicker, thereby placing increased pressure to expand urban areas, with consequent impacts on land with high economic or environmental value (DCILGPS, 2000a; EPA, 1999). Unless managed effectively, increased growth in the region may result in a substantial reduction in environmental quality and access to employment and services, as well as a general decline in the region's overall standard of living. These issues are addressed in the FNQ 2010 Regional Growth Management Plan.

LAND RESOURCE USE

The major land uses of the Wet Tropics NRM Region are shown on Map 6 (see also Map 7 for principal economic activity areas). Much of the accessible land in the region is privately owned, while the more rugged parts of the region are predominately leasehold land, State forest, or National Park (Goosem et al. 1999). Most of the remaining forest in these areas is contained within the Wet Tropics World Heritage Area.

Agriculture is the major land use in the Wet Tropics NRM Region. In 2001, nearly 130,000 ha of the region were under some form of cropping, while about 47,000 ha were under horticulture (Table 5). Improved pasture for grazing accounted for about 65,000 ha of the region. In coastal areas the main crops are sugar cane and bananas. Extensive grazing is the major land use in the western part of the region, although mining and cropping are also locally significant (Goosem et al. 1999; Morgan, 1999). Cattle grazing is also a minor land use on the coastal lowlands, and continues to occur in sections of the Wet Tropics World Heritage Area (Goosem et al. 1999).

Agriculture is the major land use in the Wet Tropics NRM Region – in coastal areas, the main crops are sugar cane and bananas.

Although much of the region was once heavily dependent upon forestry, this industry has declined in recent times and activity is currently concentrated in broad hectare softwood plantations on the Atherton Tablelands and in the Cardwell area. However, it is worth noting that rainforest vegetation covers about 95,000 ha of freehold land (Annandale, 2002).

Table 5: Major land uses in the Wet Tropics NRM region catchments (percent of catchments) (Source: Queensland Land Use Mapping Program, 2003, 1:50,000 scale, National Heritage Trust, Queensland DNR).

	Daintree	Mossman	Barron	Russell-Mulgrave	Johnstone	Tully	Murray	Herbert
Total Area Ha	*216,198*	*48,863*	*225,954*	*204,278*	*240,513*	*173,136*	*117,840*	*1,021,530*
National Parks, and Other Conserved Areas	60	77	29	73	55	71	64	27
Sugar	2	11	3	14	15	13	13	8
Grazing	4	3	33	5	21	6	7	58
Cropping (not Sugar)	0	0	8	1	4	3	2	0
Forestry	32	0	18	0	0	2	6	4
Total	98	91	92	93	95	95	92	97

Trends

On the coastal lowlands, the major crop is sugar cane, which expanded substantially through the 1990s, reaching a peak in 1999. Since then major economic pressures (low export prices) on the industry have resulted in a reduced area of cane – a trend that may well continue if economic conditions do not change. At the same time there has been a significant increase in the area devoted to horticultural activities, especially bananas in the coastal districts. In addition there has been increasing diversity of, and a trend toward, the expansion and creation of new industries such as tropical fruits, livestock production, private forestry and aquaculture (Johnstone Shire Council, 2000).

Agricultural land uses on the Atherton Tableland are rapidly changing. Tableland sugar cane areas also appear to be declining due to poor profitability, tobacco has virtually disappeared and crops such as potatoes, bananas, maize and peanuts are on the increase. Mango and avocado production is increasing, and both currently have high economic value. Some crops, like tobacco and navy beans, are declining in importance, but the production of many others, such as macadamias, longans, lychees, custard apples, cut flowers and rare fruits, is rapidly increasing (DPI, 2000).

Pressures

As discussed previously, the expansion of intensive agriculture is placing increasing pressure on the region's consumptive water use, water quality, and the survival of its remaining natural areas, particularly on the coastal lowlands. These pressures also impact upon the Aboriginal cultural values and assets of the region.

ECONOMY

The major drivers of the regional economy are tourism, agriculture and grazing, and to a lesser extent, mineral production. The most recently available data describing these drivers are for the 1998/99 financial year. In some instances, however, the data presented is only current to 1996.

TOURISM AND RECREATION

The Wet Tropics NRM Region is an outstanding visitor destination and tourism plays a key role in presenting the outstanding natural and cultural values of the region to millions of visitors each year. The majority of visitors have traditionally been from domestic markets, but international markets have provided much of the impetus for growth since the late 1980s (see Table 6). This growth is attributed to the development of the Cairns International Airport, the increase in the diversity of tours, attractions and general product available in the region, and the key environmental strengths of the Great Barrier Reef and Wet Tropics World Heritage Areas (DCILGPS, 2000a).

QUICKSILVER

Based on 1996 figures, commercial tourism and recreational fishing and boating in the Great Barrier Reef World Heritage Area are estimated to generate nearly $770 million per year.

In 1999, the Cairns subregion (excluding Mareeba Shire) had 9,573 (18.4%) of Queensland's hotel, motel, resort, guesthouse and serviced apartment rooms. Of the total number of rooms, 47.2% (4,521 rooms) were located in Cairns City with a further 20.0% (1,917 rooms) located in Douglas Shire. Takings from tourist accommodation alone were $234 million, accounting for 21.9% of Queensland's takings from accommodation. Cairns City contributed 45.6% ($106.6 million) of the takings in the region, while Douglas Shire accounted for 25.8% ($60.5 million) (W. Cummings, Cummings Economics, pers. comm.).

Tourism in the WTWHA (over 90% of which falls within the plan area) is estimated to generate over $750 million per year.

It is important to note that nature-based activities underpin tourism in the Wet Tropics. Based on 1996 figures, commercial tourism and recreational fishing and boating in the Great Barrier Reef World Heritage Area are estimated to generate nearly $770 million per year (Driml, 1999). Tourism in the WTWHA (over 90% of which falls within the plan area) is estimated to generate over $750 million per year (Driml, 1997).

It is also important to note that local residents (i.e. those residing in the Wet Tropics bioregion, *sensu* Sattler and Williams, 1999) view the WTWHA as an integral and cherished part of their surrounding natural and cultural landscape and natural environment (Bentrupperbaumer and Reser, 2003). Recent research by the Rainforest CRC (Bentrupperbaumer and Reser, 2002) found that significantly more local residents visit the WTWHA than overseas and domestic Australian visitors (Bentrupperbaumer and Reser, 2002). In a survey of ten sites, 40% of all visitors were found to be local

residents and 35.5% were repeat visitors (had been to the sites before) (Bentrupperbaumer and Reser, 2002).

Table 6: The visitor expenditure levels by source of visitor to the Tropical North Queensland region in the year 1998/99. It shows that domestic tourism remains the major source of revenue and that total visitor expenditure levels exceed $2 billion annually (Source: OESR, 2002).

Visitors to the region	Domestic day visits	Domestic overnight	International	Total	Share of total
	$m	*$m*	*$m*	*$m*	*%*
Residents visiting within region	119	97	-	217	10.5
Visitors from other Qld regions	13	263	-	277	13.4
Visitors from interstate	3	591	-	594	28.8
International visitors	-	-	835	835	40.5
Sub-total: visitors to the region	135	952	835	1,922	93.1
Before/after expenditure of residents travelling interstate, overseas and to other Qld regions	-	52	89	141	6.9
Total	136	1,004	924	2,064	100
Share (%)	6.6	48.6	44.8	100	

Trends

The Wet Tropics region has experienced substantial increases in both domestic (Figure 6) and international visitors over the past two decades (Figure 7). Between 1985 and 1995 the annual number of visitors to the region increased from 840,000 to around two million (DCILGPS, 2000a). A range of visitor accommodation is available in the region, and is mostly concentrated in the Cairns, Port Douglas and to a lesser extent, the Daintree and Mission Beach areas.

The development of accurate long-term projections of visitor numbers to the region is extremely difficult due to a lack of reliable data and the range of domestic and international influences affecting tourism (DCILGPS, 2000a). Visitor trends and projections (Table 7) forecast in the Far North Queensland Regional Plan predict a linear rate of increase, resulting in almost twice the number of total visitors to the region by 2016. International visitors are a major contributing factor to this trend, and are projected to increase from 837,000 in 1999 to 1,850,000 in 2016.

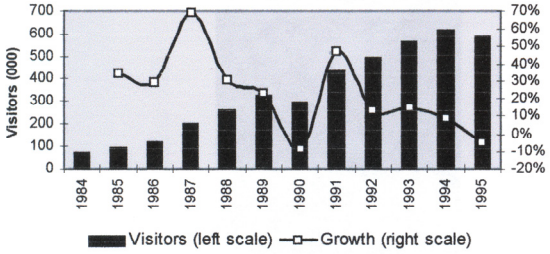


Figure 6: Domestic visitors to Far North Queensland (Source: FNQ Regional Plan, Supporting Technical Document – Tourism).

Pressures

While tourism and recreation provide significant socioeconomic benefits for the region, they are also placing an increasing pressure on the region's natural environment and Aboriginal cultural values. The tourism industry is predominately based on natural and cultural attractions, and the major concern is the high concentration of tourism activities in specific parts of the region (DCILGPS, 2000a). These areas are primarily located along the coast between Cairns and Cape Tribulation, and those areas of the Great Barrier

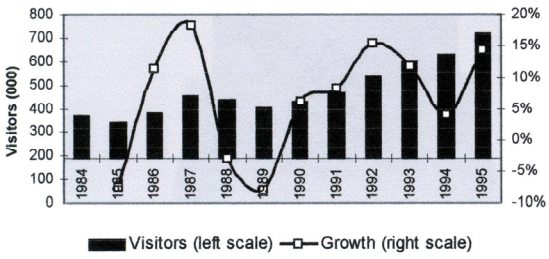


Figure 7: International visitors to Far North Queensland (Source: FNQ Regional Plan, Supporting Technical Document – Tourism).

Reef directly accessible from Cairns, Port Douglas and Mission Beach.

The Great Barrier Reef Marine Park attracted 1.6 million visitors in 2002, and there were about 730 permitted commercial tourism operators and 1500 vessels and aircraft permitted to operate in the area. Over 85% of visitors go to the offshore Cairns/Port Douglas and Whitsunday areas, which make up less than 10% of the Great Barrier Reef Marine Park. This concentration of visitation is placing significant pressure on the survival of coral reef environments, and other habitats such as sea grass, from anchor damage, poor diving practices, waste disposal, reef walking, and collecting.

The WTWHA receives around 2.8 million visitors annually. Visitor trends and projections forecast an increase in total visitors to about 4.5 million visitors. In 1998, there were over 210 commercial operators with permits to operate within the Wet Tropics region. Studies of nature based tourism opportunities in the WTWHA identify over 180 sites that are regularly used by visitors to the region, 94 of which have associated infrastructure (cited in WTMA, 2000). A recent study of ten visitor sites in the area found that they were visited by just under one million people in nearly 300,000 vehicles (Bentrupperbaumer and Reser, 2002; WTMA, 2003).

Table 7: Wet Tropics visitor trends and projections 1993-2016 (Source: FNQ Regional Plan, Supporting Technical Document – Tourism).

Visitor Details	Trends			Projections			
	1993	***1996***	***1999***	***2001***	***2006***	***2011***	***2016***
Domestic							
Increase	123	184	317	127	280	270	250
Number ('000)	1,456	1,640	1,773	1,900	2,180	2,450	2,700
Average per day	19,147	20,219	21,859	23,425	26,877	30,205	33,288
International							
Increase	-	101	296	103	310	300	300
Number ('000)	541	642	837	940	1,250	1,550	1,850
Average per day	10,375	11,611	1,405	16,740	22,260	27,630	32,945
Total visitors ('000)	1,997	2,292	2,610	2,840	3,430	4,000	4,550
Average per day	29,523	31,830	36,764	40,164	49,137	57,808	66,233

Increases in both the resident and tourist population is placing increasing pressure on the WTWHA, particularly in relation to road access, walking tracks, further developed visitor sites, camping grounds, picnic areas, lookouts and other visitor facilities (WTMA, 2000). Of the ten sites studied by Bentrupperbaumer and Reser (2002), Mossman Gorge received the highest number of vehicles (107,769) and visitors (366,415) over the survey period (September 2001/02). Goldsborough Valley, on the other hand, received the lowest number of vehicles (6,371) and visitors (20,069) out of all ten sites. The majority of visitors to Mossman Gorge were domestic Australian visitors while the majority of visitors at Goldsborough Valley were local residents (Bentrupperbaumer and Reser, 2002). Other popular sites with locals were Lake Barrine, Big Crystal, The Crater, Davies Creek and Murray Falls. Other than Mossman Gorge, the most popular site with domestic Australian visitors was Barron Gorge while for overseas visitors these were Marrdja and Henrietta Creek (Bentrupperbaumer and Reser, 2002).

AGRICULTURE AND GRAZING

The total gross value of agricultural production in the Wet Tropics NRM Region for the 1998/99 financial year was $754.2 million including crops and livestock products, representing 11.8% of the Queensland total (Table 8). Crops comprised 83.9% of the regional total, with livestock disposals (sales) and products (especially dairy products) accounting for the remainder. The total value of crops in the region for the 1998/99 financial year represented 17.9% of the value of all crops produced in Queensland (OESR, 2003j). The region produced 3% of the value of Queensland's livestock disposals, and 10.1% of the value of its livestock products. Within the Cairns subregion, sugar cane production for the year ended March 1998 was valued at $232.8 million, accounting for 41% of the subregion's total agricultural output, and 19.6% of Queensland's total sugar output.

Fertilizer and pesticide application inevitably accompany agriculture and grazing. In 2001, the application of nitrogen in intensive agricultural areas averaged 2.3 kg/ha, while the application of phosphorous averaged 0.6 kg/ha (Table 10). This equated to a total nitrogen application in the region of about 4970 tonnes, and a total phosphorous application of about 1405 tonnes (1 tonne = 1,000 kg). The highest total nitrogen and phosphorous application occurred in the Johnstone catchment (311.1 tonnes and 82.4 tonnes respectively).

The major pesticides used in the Wet Tropics NRM Region are Atrazine, Diuron, 2-4D, Chlorpyrifos and MEMC (Table 11). In 2001, the most heavily used pesticide in the region was Atrazine (138,624 kg), followed by 2-4D (76,476 kg) and Diuron (49,184 kg).

HERBERT RIVER CATCHMENT GROUP

Cattle and cane… The total gross value of agricultural production in the Wet Tropics NRM Region for the 1998/99 financial year was $754.2 million including crops and livestock products.

Table 8: Gross value of agricultural production, Wet Tropics NRM Region and Queensland, 1998/99 (Source: OESR (2003a; 2003b; 2003c; 2003d; 2003e; 2003f; 2003g; 2003h; 2003i; 2003j), from Australian Bureau of Statistics, Agriculture (7113.0), unpublished data).

Local Government Area	Gross Value ($million)			
	Crops	***Livestock disposals***	***Livestock products***	***Total Agricultural Production***
Atherton	31.9	8.7	7.0	47.6
Cairns	69.4	0.6	0.0	70.0
Cardwell	144.4	10.7	0.3	155.4
Douglas	16.4	2.2	0.0	18.6
Eacham	6.2	3.7	40.9	50.8
Johnstone	149.9	3.0	0.9	153.8
Mareeba	64.9	22.9	0.0	87.8
Herberton	8.5	6.5	8.1	23.1
Hinchinbrook	141.0	6.1	0.0	147.1
Wet Tropics	**632.6**	**64.4**	**57.2**	**754.2**
Queensland	3,542.8	2,274.2	567.3	6,384.3

Table 9: The area of land assigned to sugar cane in 2001 and the change over the period 1991-2001. The total area increased by 51,817 ha (28.4%). Major expansions occurred in the Tully and Herbert River districts and the Tableland industry emerged over the period (encouraged by the decline of the tobacco industry). It is also noteworthy that the area devoted to cane in the Mulgrave district declined by almost two thousand hectares, due largely to the loss of agricultural land to urban uses in the Cairns area (Source: Canegrowers, 2002: Profiles of Mill Areas).

Mill Area	Cane production area (ha)		Area harvested (ha)		Change in harvested area 1991-2001 (%)
	2001	*Change 1991-2001*	*2001*	*Change 1991-2001*	
Mossman	15,336	5,378	12,401	3,613	35.1
Tableland	8,811	8,811	5,957	5,957	100.0
Mulgrave	16,000	-1,944	13,715	-1,025	-12.2
South Johnstone	20,824	7,198	15,136	2,940	34.6
Babinda & Mourilyan	25,677	-2,193	21,740	-1,095	-8.5
Tully	30,001	14,325	23,774	9,304	47.7
Herbert - Victoria and Macknade	65,706	20,242	56,877	15,567	30.8
Total	182,355	51,817	149,600	35,261	28.4

Table 10: Total nitrogen and phosphorous from fertilizer by catchment for the Wet Tropics NRM Region, 2001 (Source: NLWRA, 2001).

	Catchment								
	Daintree	*Mossman*	*Barron*	*Russell Mulgrave*	*Johnstone*	*Tully*	*Murray*	*Herbert*	*Wet Tropics*
Catchment Area (km^2)	1,907	535	2,136	1,998	2,319	1,650	1,212	9,854	21,611
Agricultural land proportion (%)	2.92	10.45	11.24	20.55	28.35	5.27	4.11	6.25	11.14
Nitrogen (kg/ha/y)	0.30	2.97	1.42	2.56	4.73	2.5	1.75	1.78	2.3
Phosphorous (kg/ha/y)	0.10	0.87	0.43	0.65	1.53	0.67	0.53	0.43	0.65
Total Nitrogen (t)	56.8	158.4	304.2	511.1	1097.4	411.8	212.1	1754.0	4970.53
Total Phosphorous (t)	18.7	46.3	91.4	130.8	353.7	111.2	63.4	425.7	1405.4

Trends

The total area under sugar cane in the Wet Tropics NRM Region increased from 100,375 ha in 1983 to 112,469 ha in 1994 (Figure 8). Since then, there has been a further increase to 149,600 ha in 2001 (Canegrowers 2002). The major sugar cane growing areas in the region are Hinchinbrook Shire and Johnstone Shire, which together account for 75% of the total area under sugar cane in the region (based on 1994 figures).

Table 11: Pesticide application by catchment for the Wet Tropics NRM Region, 2001 (Source: GBRMPA, 2001).

Pesticide Application (kg Active Ingredient/Yr)	Catchment								
	Daintree	*Mossman*	*Barron*	*Russell Mulgrave*	*Johnstone*	*Tully*	*Murray*	*Herbert*	*Wet Tropics*
Atrazine	3,368	5,241	5,756	34,068	25,284	22,364	8,762	33,601	138,624
Diuron	2,378	3,278	835	4,702	17,353	2,768	1,252	16,618	49,184
2-4D	1,804	2,737	2,637	13,937	14,938	9,187	3,168	28,068	76,476
Chlorpyrifos	1,319	1,978	1,858	9,021	6313	2,941	1,166	3,084	27,680
MEMC	20	31	37	202	252	115	50	397	1,104

The total area under all horticultural crops increased from 10,243 ha in 1992 to 14,876 ha in 1997 (Figure 8). This represents a total increase in area of 44%. In 1997, Mareeba, Cardwell and Johnstone Shires together accounted for 79% of the total area under horticultural crops in the region. From 1990 to 1998, the area cultivated for bananas expanded by 126%, with around 60% of this increase occurring in the Johnstone River catchment, and 40% in the Tully-Murray River catchments (GBRMPA, 2001).

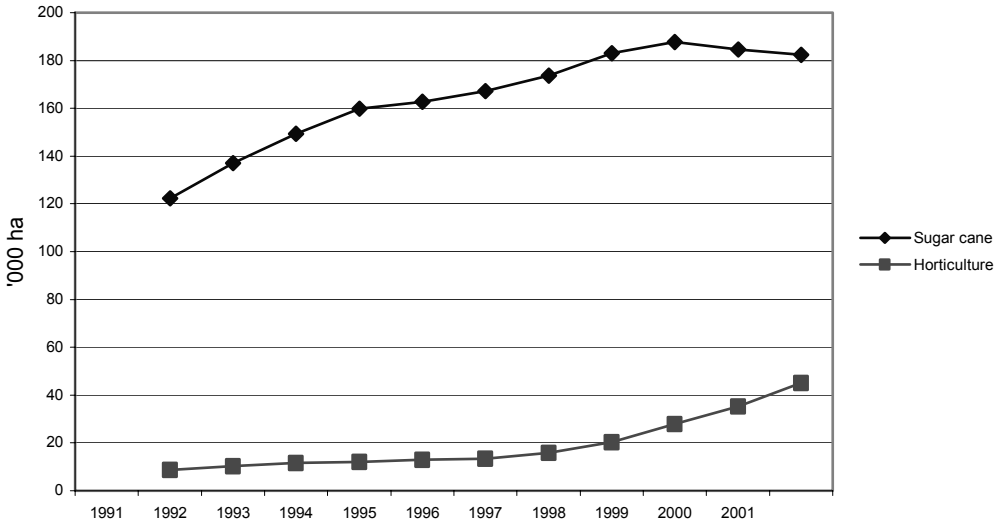


Figure 8: Area under sugar cane and horticultural crops, Wet Tropics NRM Region (Source: BRS, 2001; Canegrowers, 2003).

The increase in cultivated area for sugar cane and bananas has been accompanied by an increase in fertilizer application. Between 1990 and 1999, the combined usage of nitrogenous-fertilisers for both sugar cane and banana production is estimated to have increased by 55% in the Johnstone River catchment, and by 118% in the Tully-Murray River catchments (GBRMPA, 2001).

The number of meat cattle across all LGAs in the Wet Tropics NRM Region rose from 308,032 in 1983 to 338,308 in 1997 (Figure 9). About 45% of the region's meat cattle were located in Mareeba Shire. However, it should be noted that cattle production within the plan region is concentrated in the Upper Herbert and that many of the Mareeba properties occur outside this region. The number of milk cattle in the region

rose slightly from 26,701 in 1983 to 28,255 in 1997 (Figure 9). About 71% of the region's milk cattle were located in Eacham Shire.

Pressures

Agricultural expansion within the Wet Tropics NRM Region is placing increasing pressure on the region's natural environment, particularly in terms of its biodiversity and ecosystem processes. Changing agricultural and land use practices are responsible for the majority of pressure on existing water resource consumption, and demand for new or expanded water impoundments or increased subterranean water pumping.

Agricultural land use and related practices are also placing increasing pressure on the survival of the region's estuarine and inshore reef systems, mostly in terms of sediment and pollutant-related water quality decline. The further expansion of intensive agriculture has the potential to increase both sediment loads and nutrient concentrations of water entering the Great Barrier Reef lagoon (GBRMPA, 2001; Brodie et al. 2003).

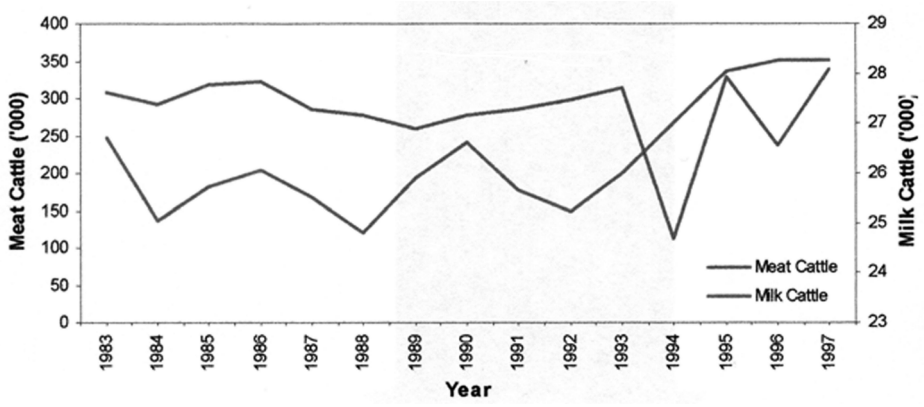


Figure 9: Number of meat and milk cattle, Wet Tropics NRM Region,1983-1997 (Source: BRS, 2001).

Many of the region's remaining coastal lowland rainforest ecosystems are under pressure from clearing for both agricultural and urban expansion (see Biodiversity Conservation Condition Report) and the introduction of pasture plants. Not everyone agrees as to which ecosystems and wildlife species are worthy of protection. A recent high profile land use conflict involved many of the region's lychee growers, who argued that the native spectacled flying fox, *Pteropus conspicillatus*, should be considered an agricultural pest species. The opposing view is that the spectacled flying fox, which is found in and around the rainforests of the Wet Tropics, is an important native species with a specialist ecological role in rainforest seed dispersal and pollination. Anecdotal evidence suggests that total number has declined dramatically in the Wet Tropics from 800,000 during the 1980s to around 195,000 in 2002 (Sullivan, 2002). The species was recently listed as 'vulnerable' under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

Vegetation clearing is a continuing threat to the regions environment and resources. For the region as a whole, 1837 ha was cleared 1999-2001, about half of which occurred in the Herbert catchment, mainly for grazing. The balance is patch clearing (mainly for agriculture and urban development), clearing for service-corridors and habitat drowning caused by impoundments (see Biodiversity Conservation Condition Report). The recently completed Regional Vegetation Management Plan under the *Vegetation Management Act* defines the location, type and status of regional ecosystems and identifies areas that should be retained or managed in a particular way. It also provides codes for assessing clearing applications. Currently there is a moratorium on vegetation clearing in the Wet Tropics while this plan is being approved and gazetted.

FORESTRY

Extensive clearing around the turn of the 20th century resulted in large areas of the region's accessible and heavily forested areas being converted for forestry and agricultural purposes. It is estimated that up to sixty million cubic metres of rainforest and eucalypt timber was burnt in the late 1800s and early 1990s (DCILGPS, 2000b). However, by the mid-1980s, multiple use management of forests in the Wet Tropics NRM Region was well established (Gould, 2000).

Errol Wiles on one of his forestry plantations near Babinda - farm forestry on cleared land is one of the four main forestry activities within the NRM Region.

The economic value of logging in the Wet Tropics in 1986 was around $26 million, which is equivalent to $34 million in 1994 dollars (Driml, 2000). However, since the listing of nearly two million hectares of the region as part of the WTWHA in 1988, tourism and recreation have emerged as the new economic focus of the region. Gross expenditure on tourism is about ten times the gross value of logging and timber production in the year logging ceased (Driml, 2000).

Forestry activities within the Wet Tropics NRM Region currently fall into four main categories: farm forestry on cleared land; native forests on private land; native forests on Crown lands; and large-scale plantations (state and private).

Trends

Farm forestry has the potential to become a true primary industry but is not viewed by many landholders as a viable enterprise due to past taxation impediments, failure of similar previous government schemes due to inadequate long-term resourcing, concerns over timber resource security due to conservation and habitat values of plantings, and the medium to long-term time frame required before harvesting generates a return on the initial investment (DCILGPS, 2000b). Native forests on private land have increased in importance since the cessation of rainforest logging following World Heritage listing, but the extent and nature of the private resource is poorly understood and its scattered distribution can complicate effective marketing on behalf of the land holder (DCILGPS, 2000b).

Native forests on Crown land outside the WTWHA are assessed and managed for multiple uses, such as water catchments, wood production, grazing, ecotourism, recreation and minor forest products such as honey and firewood. Plantation forests in the region consist mostly of native hoop pine, *Araucaria cunninghamii*, and exotic caribbean pine, *Pinus caribea*, and are managed for timber production.

Pressures

With the listing of the WTWHA, the pressure placed on the region's natural environment from commercial forestry operations has been significantly reduced. In contrast, the non-timber values of the region's native forests are placing increasing pressure on timber supplies, resulting in an increased demand for large-scale plantations of both softwoods and hardwoods.

FISHERIES AND AQUACULTURE

Cairns supports the largest fishing fleet in Australia with over 800 vessels fishing in regional waters for prawns, barramundi, reef fish, crabs, lobster and mackerel. This is supported by a burgeoning aquaculture industry, particularly in the area of prawn, barramundi and red claw (Cairns Chamber of Commerce Website). The commercial fishing industry is the region's third largest industry, employing about 1,600 people and injecting approximately $200 million each year into the local economy (Cleland, 2003). It is not known how much recreational fishing contributes to the regional economy, although Driml (1994) estimated the financial value of recreational fishing and boating to the Great Barrier Reef World Heritage Area at $122 million.

The limited fisheries resources in the Wet Tropics NRM Region are highly accessible, and face pressure from a combination of commercial and recreational/tourist fishing activities. As recreational fishing increases with population growth, fishing pressure will become especially intense near large population centres such as Cairns (DCILGPS, 2000b). More information on the condition of fisheries and aquaculture in the Wet Tropics NRM Region, industry trends and associated pressures on the natural environment are discussed in greater detail in the Sustainable Use Condition Report.

ECOFISH TNQ LTD

Cairns supports the largest fishing fleet in Australia with over eight hundred vessels fishing in regional waters.

MINERAL AND EXTRACTIVE PRODUCTION

The Wet Tropics includes historic tin and gold mining areas, although many of these areas are now within the WTWHA where applications for new exploration and mining tenures are not accepted. Tin and gold base metal mineralisation is known to exist in the Herberton area, and various exploration and mining tenures are current (DCILGPS, 2000b). Although no longer operational, many old tin mining sites have a significant ongoing impact on catchment water quality in the Wet Tropics. The Herbert Sednet Report recognises them as a major contributor of sediment. This may also be the case in other catchments (C. Coppo pers. comm.). Other mineral deposits are known to exist in the region, but are currently not commercially viable.

Quarry and extractive products of sand, gravel and quarried rock are of significant importance to the region's industries, particularly the construction industry (DCILGPS, 2000b). Waterways, floodplains and estuaries are the primary source for sand and gravel. Extraction operations have potential environmental, visual and social impacts; land use conflicts, for example, can arise from extraction operations, and associated transport movement (DCILGPS, 2000b). Such activities are now not permitted in the Barron and Mulgrave Rivers. Aboriginal Traditional Owners are also concerned about the impacts of mining on sites of significance on their country. However, compared with other land uses (e.g. agriculture) in the Wet Tropics NRM Region, mineral and extractive production do not appear to place significant pressure on the region's natural resources.

2.5. SOCIAL CONDITIONS

At the 2001 census, retail trade was the largest employer in the Wet Tropics NRM Region with 15,089 (15.5%) of the region's employed labour force (Table 12). Other major employment industries include accommodation, cafes and restaurants (9,096 persons or 9.3%), agriculture, forestry and fishing (9,095 or 9.3%) and health and community services (8,323 persons or 8.5%) (OESR, 2003j).

Unfortunately, tourism is not listed separately as an employer and it is difficult to determine how many in the workforce are employed directly or indirectly in this industry – although we know from revenue figures that this must be very substantial.

The Socio-Economic Indices for Areas (SEIFA), produced by the Australian Bureau of Statistics, summarise census information using a mix of social and economic variables. These indices are useful for describing the population profile and structure of communities. Socio-economic indices for nine LGAs that are wholly or partly within the Wet Tropics NRM Region were recently described in Crimp et al. (2003), and are based on the 1996 census[4,5]. The index of relative socio-economic disadvantage is a measure of an area's disadvantage relative to other areas.

'To allow for easy recognition of high and low scores, the raw index scores in the SEIFA are standardised. Each index has a mean of 1,000 and a standard deviation of

[4] Not including Cook and Dalrymple Shires, only tiny parts of which occur within the plan area.
[5] SEIFA Indices for the 2001 census are due for release on 30 September 2003.

100 across all Collection Districts in Australia. In practice, this means that around 95% of index scores are between 800 and 1,200. The higher an area's index value, the less disadvantaged that area is compared with other areas. High scores occur when the area has few families of low income and few people with little training and in unskilled occupations.' (Crimp et al. 2003).

Table 12: Employment by Industry, Wet Tropics NRM Region and Queensland, 2001(a)* (Source: OESR, 2003j, from Australian Bureau of Statistics, 2001 Census of Population and Housing, Basic Community Profile – Second Release).

Industry	Region		Queensland	
	Number	*Percent*	*Number*	*Percent*
Agriculture, forestry and fishing	9,095	9.3	76,532	4.9
Mining	519	0.5	19,286	1.2
Manufacturing	7,580	7.8	167,380	10.7
Electricity, gas and water supply	711	0.7	12,359	0.8
Construction	6,161	6.3	111,209	7.1
Wholesale trade	3,993	4.1	79,718	5.1
Retail trade	15,089	15.5	239,615	15.3
Accommodation, cafes and restaurants	9,096	9.3	88,381	5.6
Transport and storage	6,410	6.6	77,587	4.9
Communication services	959	1.0	23,016	1.5
Finance and insurance	1,837	1.9	44,562	2.8
Property and business services	7,421	7.6	153,864	9.8
Government administration and defence	5,237	5.4	75,048	4.8
Education	6,669	6.8	118,896	7.6
Health and community services	8,323	8.5	151,029	9.6
Cultural and recreational services	2,431	2.5	37,341	2.4
Person and other services	3,498	3.6	57,662	3.7
Non-classifiable economic units	437	0.4	7,452	0.5
Not stated	1,900	2.0	27,927	1.8
Total	97,336	100.0	1,568,864	100.0

*(a) Based on place of enumeration data.

The index compares average LGA values with the national performance of all Areas. In this index, no distinction is made between rural and urban areas. Factors that contribute to high scores on this index include:

- Family incomes;
- Dwelling ownership and facilities;
- Education levels (and people undergoing further education); and
- Levels of employment in the higher skilled occupations.

The results show that Douglas and Cairns are in the nation's top 50% of LGAs (i.e. above average), whereas all others are below average. The most disadvantaged area within the region is Herberton, which is in the lowest 10% of the Areas in Australia; Hinchinbrook is in the lowest 25%; the remaining shires are in the lower 50%. These results show the economic and social benefits brought to the region of the tourism

industry and related urban activities in the case of Cairns and Port Douglas districts. On the other hand, communities on the Tablelands and in the more agricultural Areas have higher populations of indigenous persons than the national average and have experienced a significant downturn in primary industries such as agriculture, mining and timber. All these factors contribute to a depressed economy and some depressed towns in the Wet Tropics.

Table 13: Index of Relative Socio-Economic Disadvantage for the Wet Tropics NRM Region by LGA (Source: Crimp et al. 2003, from ABS-SEIFA, 1996. See also National Economics 2002: *State of the Regions Report*. Australian Local Government Association, Canberra.)

	LGA value	**Values for Collection Districts within each LGA**			**Reference values for LGAs for Australia**				
		Minimum	***Median***	***Maximum***	***10%***	***25%***	***50%***	***75%***	***90%***
Area total	986	586	993	1150	924	951	981	1011	1051
Herberton (S)	896	780	897	979					
Hinchinbrook (S)	933	628	986	1150					
Mareeba (S)	954	753	973	1067					
Johnstone (S)	959	830	971	1052					
Cardwell (S)	967	850	959	1055					
Atherton (S)	979	902	969	1058					
Eacham (S)	980	859	990	1042					
Cairns (C)	1006	685	1014	1142					
Douglas (S)	1012	586	1013	1106					

The bars for each LGA show the range of values for the smaller Collection Districts (of approximately 200 households) within the Area. These illustrate a very important point – there are some very disadvantaged districts within Cairns and Douglas that are amongst the lowest in the region (and Australia). Conversely, there are some advantaged districts even within the poorer Areas such as Hinchinbrook.

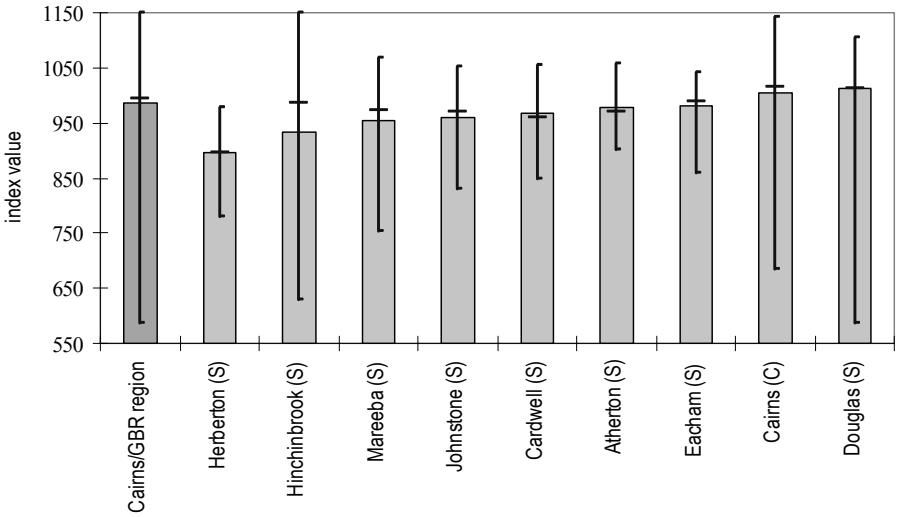


Figure 10: Index of Relative Socio-Economic Disadvantage for Local Government Areas in the Wet Tropics Region (Source: Crimp et al. 2003 from ABS-SEIFA, 1996). Note: Columns indicate the LGA index value; bars indicate minimum, median and maximum values for collection districts within each LGA).

Trends

Stable employment patterns have been experienced in the 'traditional' natural resource sectors (Agriculture, Forestry, Fishing and Hunting, and Mining), while all tourism related sectors (e.g. Retail Trade and Accommodation, Cafes and Restaurants, and Cultural and Recreational Services) have seen significant increases in the number of persons employed (Crimp et al. 2003). Tourism creates direct employment through the consumption of a wide range of goods and services.

The inflow of population into the region in recent decades has lead to increased social and cultural change that has included diversification, but also marginalisation and, in some cases, disintegration (DCILGPS, 2000c). Other regional social trends, identified as part of the FNQ 2010 planning process include the trend toward more low paid, casual or part time jobs with limited career opportunities, the inequitable distribution of the costs and benefits of growth, and increasing competition and conflict between residents for social infrastructure including recreation and natural resources (DCILGPS, 2000c).

Pressures

Population growth within the region is placing increased pressure on traditional lifestyles as well as the provision of social infrastructure, which has been unable to keep up with the demand and competition for resources between newly developing suburbs without services and established suburbs with limited or no services (DCILGPS, 2000c). Increasing house prices, rents and costs of living are placing increased pressure on the ability of older residents and those on low or fixed incomes to maintain their current standards of living.

3. NATURAL AND CULTURAL RESOURCE MANAGEMENT IN THE WET TROPICS

3.1. OVERVIEW

The natural and cultural values of the region make it perceived as a highly desirable place to live, visit and invest. However, human activity inevitably results in pressures and demands on the natural and cultural environment. This presents challenges to those involved in planning and management to ensure that threats are minimised while maximising the social, economic and other benefits to the local and wider community.

There are a broad range of existing policies and programs relating to NRM in the Wet Tropics. These are further detailed below. Two important documents are the Wet Tropics Regional Strategy for Natural Resource Management (NRM Board, 2000), which is the base document for the new Regional NRM plan, and the Far North Queensland Regional Plan (FNQ RPAC, 2000). Both identified issues of regional importance with respect to NRM in the Wet Tropics.

NRM BOARD'S REGIONAL STRATEGY

During development of the NRM Board's Regional Strategy in 2000, a working group consisting of representatives from the community and local and state agencies defined what they considered to be the top ten regional issues. These are shown below:

Top 10 Issues from the Wet Tropics NRM Board's Regional Strategy 2000
1. Vegetation loss, degradation and fragmentation, particularly in the coastal lowlands.
2. Loss and decline of native species and biodiversity.
3. Insufficient representation of specific natural community types in the region's protected area network.
4. Riparian and in-stream degradation through encroaching adjacent land uses, clearing, flooding and sedimentation and natural erosion processes.
5. Inadequate management and allocation of surface and ground waters.
6. Land management practices at the individual property level which do not accommodate the protection of natural values.
7. Failure to implement best practices in all primary industry production methodologies.
8. Pest animal and plant impacts on natural ecosystems and primary production.
9. 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.
10. Inadequate standards enforced to ensure best practice in waste management.

This list is by no means exhaustive as shown in the FNQ Regional Plan (see below). It is also important to note that there was no consultation or input from Indigenous people in this process. Key issues for Indigenous people of the region will be identified as part of the Indigenous (*Bama*) Cultural and Natural Resource Management planning process.

FNQ REGIONAL PLAN

FNQ Regional Plan (FNQ RPAC, 2000) identified 132 major regional issues under eleven strategy areas for the 'environment' and 165 major regional issues under sixteen strategy areas for 'natural resources'. The strategy areas are listed in Table 14.

Table 14: Natural Resources and Environmental Issues in FNQ 2010 Regional Plan (Source: FNQ 2010 Regional Plan).

Natural Resources	Environment
• Sustainable Natural Resource Management	• Regional Environmental Management Concepts
• Community Involvement in Natural Resource Management	• Conservation of Biological Diversity
• Participation of Indigenous Peoples	• Areas of Outstanding Biodiversity Value
• Watercourse and Riparian Management	• Coastal Management
• Environmental Flows	• Scenic Landscapes and Seascapes
• Wetlands and Estuary Management	• Nature-based Recreation
• Maintenance and Protection of Fish Habitats	• Community Involvement in Environmental Management
• Floodplain Management	• Conservation Management on Private Land
• Management of Potential Acid Sulfate Soils	• Coordination of Government Processes
• Urban Stormwater Drainage	• State of Environment (SoE) Reporting
• Protection and Maintenance of Good Quality Agricultural Land	• Regional Environmental Precincts and Integrated Rehabilitation Systems (REPAIRS)
• Agricultural Industry and Farm Management Issues	
• Management of Conflict Between Agricultural and Urban Land Uses	
• Pest Management	
• Management and Coordination	
• Mining and Extractive Industries	

A review of the issues identified in both the original Wet Tropics Regional Strategy and the FNQ Regional Plan reveals that some involve sustainability problems attributable to current use of the region's resources (either within the planning area or from outside). Others are of an administrative nature related to the provision of (or lack of) government management services. A further class of issues involves conflicts or competition for resources. These issues (or threats to values) will be considered in the development of the new NRM plan, as will others identified during the course of relevant processes (e.g. Reef Water Quality, see 'The Reef Science Panel' below, and development of Indigenous *(Bama*) Cultural and Natural Resource Management Plan). 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.

ASSESSMENT OF THREATENING PROCESSES

While all of the threats to values identified above are important, they vary in their degrees of significance across the Wet Tropics region. Therefore the relative impact of these threatening processes on the core assets of the region needs to be rigorously examined. This helps to prioritise and focus management decisions on those threats that are strategically important at the regional level. In order to examine the threatening processes and their priority for the region, a Risk Assessment Process will be undertaken as part of the NRM planning process.

Declining water quality due to sedimentation and other forms of diffuse pollution is one of the key issues confronting the NRM Region.

THE REEF SCIENCE PANEL REPORT

'The Panel has found that major land use practices in the Reef catchment have led to accelerated soil erosion, as well as increased fertiliser and pesticide application, with consequent increases in sediment, nutrients and pesticides in waterways flowing to the Reef. While these factors are known to have harmful effects on the health of tropical marine ecosystems, the spatial extent of impacts and the resilience of the Reef's systems to sediments, nutrients and pesticides is not as well understood.

Scientific measurements, calculations and predictive modelling of water quality conducted over the past 15 years consistently indicates that there has been at least a four-fold increase in sediment and nutrient delivery to rivers discharging to the Reef.

Current estimates of average annual sediment runoff in rivers draining to the Reef range between 10 and 15 million tonnes per year, while estimates of pre-1850 inputs fall between 1 and 5 million tonnes per year. Sediment increase factors of 4, 15 and 4 for rangelands, cropping lands and urban areas respectively, may often be conservative. Current estimates suggest that annual nitrogen (N) exports from catchments bordering the Reef have increased at least twofold (22,000 to 43,000 tonnes per year) since 1850. Annual phosphorus (P) exports have increased at least threefold (2,400 to 7,000 tonnes per year) since 1850.

Soil P levels in most sugar cane production lands and in soils used for vegetable production are nowadays well above those deemed as critical to achieve maximum yields indicating that improved fertiliser efficiencies are possible.

Inputs of fertilisers (chiefly N & P) and other chemicals for agricultural production in cropping systems of the Reef catchment have steadily risen.

Nitrogen budgets for cropping lands consistently indicate that a significant proportion (ca. 30-50%) of the N input is lost to the surroundings through gaseous transformations, surface runoff and leaching to groundwater. Between 80 and 90% of the P lost to waterways and the sea is attached to suspended sediments derived from eroded soil.

Because of the large area of land use involved, most of the sediments, N and P that moves from catchments to the Reef are sourced from extensive grazing lands in the drier catchments (Burdekin and Fitzroy Rivers). However, there is evidence from a number of catchments (Haughton, Johnstone, Herbert and Tully Rivers) that nitrate-N concentrations in river waters increase as water passes through intensive sugarcane growing areas. For example, in the Johnstone Catchment, sugarcane occupies around 12% of the catchment yet contributes close to 50% of the nitrate exported. In contrast, rain forest, which occupies >50% of the catchment, contributes little more than 10% of the nitrate load. Sugar cane farming also contributes a disproportionate percentage of the total P transported from the catchment to the sea (>30%).' (Baker, 2003).

3.2. LAND TENURE

The State Government defines the rights of people to access, occupy, use and 'own' land. In the Wet Tropics NRM region about half the land (48%) is held in National Park, Forest Reserve and other 'protected area' tenures in which the rights are generally limited to visitation only (Table 15, see also Map 8). The proportion of land in Freehold and Leasehold tenure for agricultural purposes varies widely between catchments in the region being highest in the Herbert River catchment (71%) and in the Barron and Johnstone River catchments, which have slightly more than 50% of their land in these tenures. On the other hand, the Daintree catchment has only 16% and the Mulgrave and Tully 29% in FH and LH tenures appropriate for agricultural, grazing and urban purposes.

In recognition of its outstanding conservation values, much of the protected area is also in the Wet Tropics World Heritage Area, a joint State/Commonwealth responsibility. [6] It is further important to note that much of the land containing these forests is potentially claimable under the native title legislation, and if Traditional Owners are successful in their claims, will be jointly managed for conservation and cultural heritage purposes.

Table 15: Area of different land tenures by catchment in the NRM Region (ha and percentage)[1]. Excludes Hinchinbrook Island, which is 39,145 ha and 100% NP (Hinchinbrook Island Resort has been developed on a special lease that covers 8.2 ha in the Cape Richards area and runs until 2053). Code: FH Freehold; LH Leasehold; NP National Park; FR Forest Reserve; SF State Forest; TR Timber Reserve; RE Reserve (Land Act); USL Unallocated State Land; CA Commonwealth Acquisition.

		Barron	Daintree	Herbert	Johnstone	Mossman	Mulgrave-Russell	Murray	Tully	NRM Region
FH	Area (ha)	95,463	25,476	225,407	117,296	12,370	74,691	32,962	46,816	630,481
	%	42.2	11.8	22.1	48.8	25.3	36.6	28.0	27.0	29.4
LH	Area (ha)	17,172	9,324	453,769	2,151	566	1,057	577	559	485,175
	%	7.6	4.3	44.4	0.9	1.2	0.5	0.5	0.3	21.6
NP	Area (ha)	4,784	70,436	145,135	31,399	6,546	63,564	33,790	6,834	401,633
	%	2.1	32.6	14.2	13.1	13.4	31.1	28.7	3.9	17.9
FR	Area (ha)	43,160	9,636	65,669	58,707	10,033	33,237	25,237	100,673	346,474
	%	19.1	4.5	6.4	24.4	20.5	16.3	21.5	58.1	15.4
SF	Area (ha)	39,539	-	39,215	-	9	482	9,982	2,805	92,032
	%	17.5	-	3.8	-	-	0.2	8.5	1.6	4.1
TR	Area (ha)	-	67,749	-	-	-	-	-	-	67,749
	%	-	31.3	-	-	-	-	-	-	3.0
RE	Area (ha)	5,053	2,439	7,819	1,892	1,265	3,043	920	1,615	24,046
	%	2.2	1.1	0.8	0.8	2.6	1.5	0.8	0.9	1.1
USL	Area (ha)	1,796	28,807	19,928	7,120	13,653	14,081	2,512	1,693	89,590
	%	0.8	13.3	2.0	3.0	27.9	6.9	2.1	1.0	4.0
CA	Area (ha)	-	-	-	4,515	-	-	-	1,686	6,201
	%	-	-	-	1.9	-	-	-	1.0	0.3
Total		225,954	216,198	1,021,530	240,513	48,863	204,278	117,840	173,136	2,248,312

[1]From DNR report based on Map 8. There are some tenures in the report that are not included on the map (or table above) due to scale limits.

Care must be exercised to ensure that the potential rights and interests of Indigenous people are considered, and that no steps are taken which could jeopardise those rights. Protocols exist to ensure that Indigenous people participate in decision-making concerning the use of forests that are situated on land that is potentially claimable through the Indigenous Negotiation Forum.

Virtually all the land used for intensive farming in the region is held in freehold title that provides owners maximum security of exclusive possession and to sell their land. The rights to subdivide land and many other rights to use the land are restricted by environmental and planning laws in the public interest and landowners must obtain approval for those activities. Just knowing what those rights are can be very complex

[6] A media release issued in late 2003 confirmed the Queensland Government's decision to give higher protection to nearly half a million hectares of tropical forest in the Wet Tropics World Heritage Area. Premier Beattie was quoted as saying that almost all of the 480,889 hectares of state forests and timber reserves in the Wet Tropics of north Queensland would become national park.

for landholders and those rights can vary from locality to locality depending on the local government polices and the particular circumstances of the land.

Most of the drier parts of the region, used for cattle grazing are leased to landholders by the state. The lease specifies conditions on use and development and rights to resources such as timber and water on the land (eg on leasehold land, the state retains ownership of timber). Currently, the state is reviewing the leasehold system.

The coastal waters of the plan area largely contained within either State Marine Park and/or the Great Barrier Reef Marine Park. Much of the protected area is also in the Great Barrier Reef World Heritage Area, another joint State/Commonwealth responsibility.

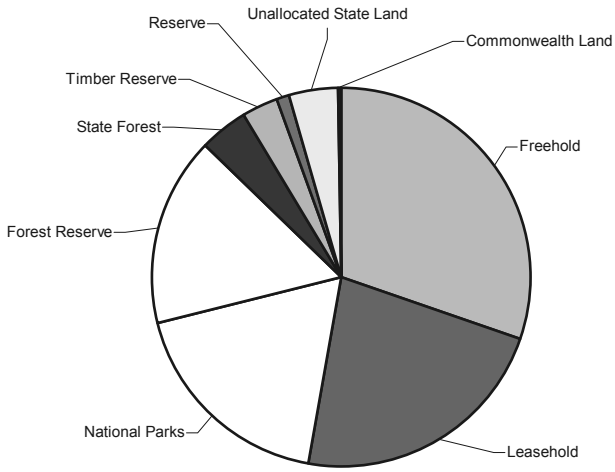


Figure 11: Area of different land tenures by catchment in the NRM Region, relative to Table 15.

LAND TENURE- A TRADITIONAL OWNER PERSPECTIVE

The western land tenure system has served to alienate Aboriginal Traditional Owners from their country in the Wet Tropics NRM region, and their ability to exercise their traditional responsibilities and customs. However, Aboriginal people do have significant rights within the region through various pieces of legislation including native title legislation and some groups have acquired land through the Indigenous Land Corporation. At least 80% and potentially up to 98% of the WTWHA is potentially claimable by a number of Rainforest Aboriginal groups under the *Native Title Act (1993)* (Cwlth) (Yarrow, 1996). To date there are a number of native title claims that are at varying stages of negotiation in the Wet Tropics NRM region by Aboriginal Traditional Owners. Some groups such as Ku Ku Yalanji are undertaking Indigenous Land use Agreements (under the *Native Title Act*) to gain greater control and access of their traditional country. Outside of this essentially western approach to native title offered by the *Native Title Act*, rainforest Aboriginal people assert their prior ownership of the WTWHA under common law (as per the *Mabo* High Court decision). Even though the fact that the full implications of native title rights and interests remain somewhat unclear the issue of native title has served as a major catalyst for a significant change in government attitude towards dealing with Rainforest Aboriginal people. Significant efforts must be made by government and non-government agencies in undertaking NRM projects to ensure that the potential native title rights and interests of Indigenous people are considered, and that no steps are taken which could jeopardize these rights.

In 1984, Queensland established a system of community level land trusts, to own and administer former reserves under a special form of title called a Deed of Grant in Trust (DOGIT). Each DOGIT area has an Incorporated Aboriginal Community Council (established under the *Queensland Community Services Act 1984*) and representatives are elected every three years. The Councils are able to make by-laws, appoint community police and are responsible for maintaining housing, infrastructure, the Community Development Employment Program (similar to 'work for the dole'), licenses and hunting and camping. There are two DOGIT communities located within the Wet Tropics NRM region, namely *Yarrabah* and *Wujul Wujul*.

3.3. POLICY AND LEGISLATIVE FRAMEWORK

As shown by Figure 12, all levels of government, as well as industry and the community, have a major role in environmental management in the Wet Tropics. As well as the original Wet Tropics Regional Strategy and the FNQ Regional Plan, there have been over one hundred plans and strategies prepared for coasts, catchments, endangered species, LGAs, world heritage areas, national parks and so on. Some are statutory but most are not enforceable by law. Their main function is to guide development and investment in the region. Table 16 outlines ten of the most important

planning processes for sustainable natural resource use in the Wet Tropics. The key characteristics of selected processes are included at Appendix 1.

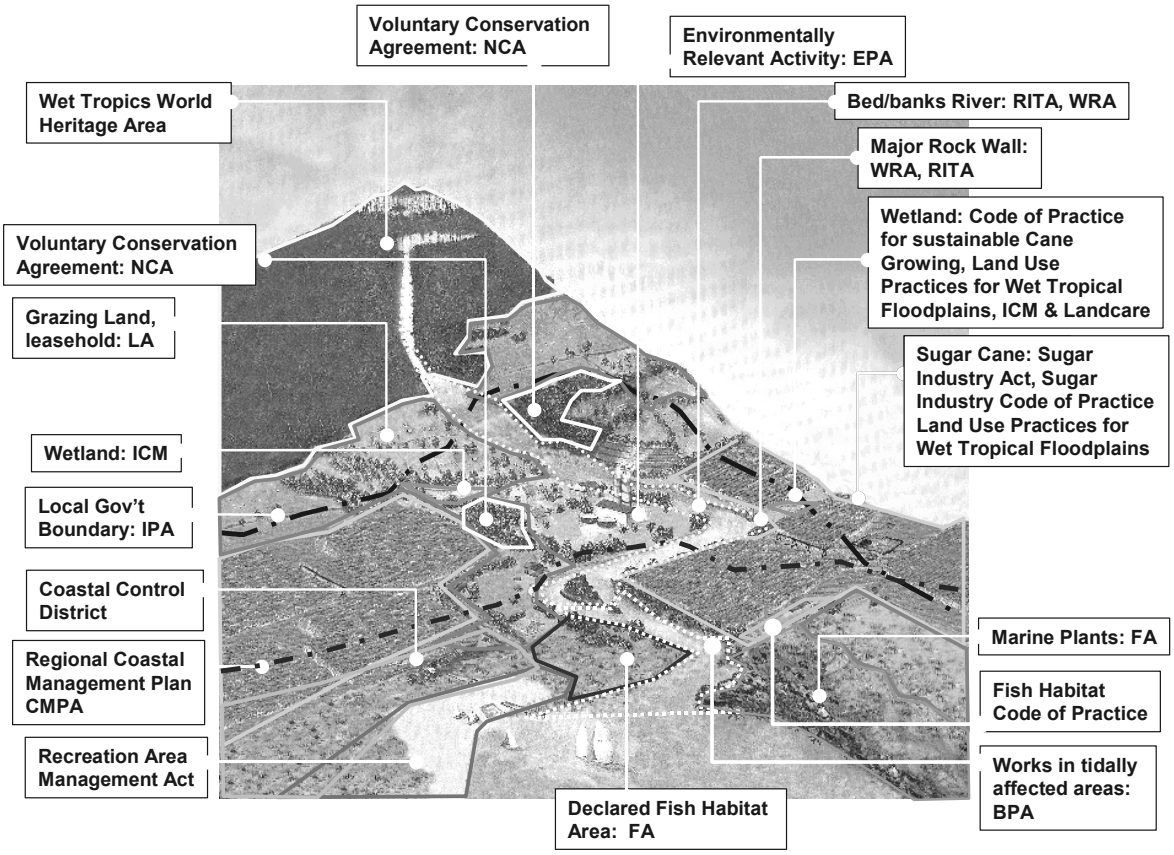


Figure 12: Institutional Arrangements for Environmental Management in a Wet Tropics Catchment (Source: Vella et al. 2000)

Other major planning processes not listed above include the Interim Negotiating Forum (negotiations between rainforest Aboriginal people and government for a regional agreement for the WTWHA), various Indigenous Land Use Agreements (ILUAs), pest plant and animal management plans, species recovery plans and licensing regimes for environmentally relevant activities under the Queensland *Environmental Protection Act* (for a more comprehensive list of relevant strategies and plans, see Appendix 2). Another important process is the preparation of IPA compliant planning schemes by Local Governments in the region (see below).

Planning for the Wet Tropics – workshops conducted for the Catchment to Reef project.

Table 16: Major Planning Processes for Sustainable Natural Resource Use in the Wet Tropics

Plan Type	Scope
Wet Tropics Regional Strategy for NRM	Prepared by the NRM Board (West Tropics) and strategy accredited by the Queensland LCMC is a framework for ICM and Landcare activities in the region.
FNQ Regional Plan	A framework for growth management by local and state agencies.
Reef WQ Protection Plan	A Commonwealth-State umbrella plan "Stabilising and reversing the decline in water quality entering the Great Barrier Reef as soon as possible".
ICM Plans	All major rivers in the region have community-based ICM groups that have undertaken assessment, strategy development and on ground works.
River and River Reach Management Plans	Prepared by River Improvement Trusts (RITs) - statutory partnerships between local government and local resource management groups.
Best Management Practices (BMPs)	BMPs have been produced by/for the aquaculture, forestry, horticulture and sugar industries.
Regional Vegetation Management Plans (RVMPs)	Prepared by the Regional Vegetation Committee under the *Vegetation Management Act 1999*. Draft Einasleigh and Wet Tropics RVMP completed in 2003, yet to be gazetted.
Water Resource Plans (WRPs)	WRPs are prepared under the *Water Resources Act* . Currently only for the Barron R. Wet Tropics WRP scheduled to commence circa 05/06.
Wet Tropics Management Plan	A management plan for the Wet Tropics World Heritage Area prepared under the *World Heritage Properties Conservation Act.*
Regional Coastal Management Plans (RCMPs)	Operate in conjunction with the State Coastal Plan and include region-specific policies. RCMPs prepared for Cardwell-Hinchinbrook and the Wet Tropical Coast have both been completed.

FNQ NRM LIMITED (WET TROPICS NATURAL RESOURCE MANAGEMENT BOARD)

The establishment of a new regional community-based management Board in September 2003 presents a new approach for natural resource management in the Wet Tropics. The Wet Tropics Natural Resources Board (FNQ NRM Ltd) will have significant responsibilities and funding, and the new regional arrangements represent a major change in the way governments and their individual agencies do business with respect to natural resource management. The new Board effectively replaces the old Natural Resource Management Board (Wet Tropics) Inc and North Queensland Afforestation Association (NQAA).

The new Board members were selected by an independent local panel on behalf of the Commonwealth and State Governments for their knowledge, linkages and experience across a range of backgrounds including catchment groups, coastal management, natural science, marketing, financial management and Traditional ecological knowledge (Indigenous). One of the first priorities of this group is the development of the new Regional NRM Plan and Strategic Investment Strategies.

ICM GROUPS

The Integrated Catchment Management (ICM) program aims to encompass the whole catchment and develop strategies and policies that link the activities of Landcare and other groups and individuals. The Queensland Government initiated the program in 1991 and, although ICM has funded some grass-roots projects and catchment coordinating committees (CCC), its primary functions have been to provide the strategic direction and guide the actions of the community to implement priority on-ground projects.

There are six catchment groups in the Wet Tropics NRM Region, namely:

- Cardwell Shire CCC;
- Douglas Shire CCC;
- Herbert River Catchment Group;
- Johnstone River Catchment Management Association;
- Mulgrave Landcare and Catchment Group; and
- Barron River Integrated Catchment Management Association.

LOCAL GOVERNMENT PLANNING SCHEMES AND RESPONSIBILITY FOR NRM

Local Government planning schemes prepared under the Queensland *Integrated Planning Act (IPA)* have considerable and increasing responsibility for managing natural resources. This arises because local governments have been delegated responsibility to manage development permit processes taking into account state and regional matters. Local planning schemes need to be consistent with state policies including:

- State Planning Policy 1/92: Development and Conservation of Agricultural Land;
- State Planning Policy 2/02: Planning and Managing Development Involving Acid Sulfate Soils;
- State Coastal Management Plan – and the Wet Tropical Coast and Cardwell-Hinchinbrook Regional Coastal Management Plans; and
- *Vegetation Management Act 1999* and Regional Vegetation Management Plans.

Table 17 shows the status of local government planning schemes in the region at the time of writing. Only the Atherton Shire Planning Scheme is gazetted. All others were at various stages in the preparation, consultation and referral process aiming for gazettal by June 2004. This means that incorporation of the priorities for this plan can only be included in subsequent revisions of these local schemes.

Table 17: Status of local government planning schemes in the Wet Tropics region, January 2004 (Source: http://www.dlgp.qld.gov.au/applications/planMakingProgress/list/).

Council	CurrentStage	Next Stage
Atherton	IPA Scheme in Force.	IPA Scheme in force.
Cairns	Planning Scheme on Display.	Proposed planning scheme on public exhibition until 30 January 2004.
Cardwell	First State Interest Check with Council.	Council to amend scheme in accordance with Ministerial Conditions prior to public notification.
Douglas	First State Interest Check with Council.	DLGP currently reviewing Council's response to Whole of Government comments provided from first State Interest Check.
Eacham	First State Interest Check with Council.	Anticipated response from Council to Department February 2004.
Herberton	First State Interest Check with Council.	DLGP to return comments on amendments by 1 February 2004.
Johnstone	Planning Scheme on Display.	Planning scheme on public exhibition from 3/11/03 to 4/02/04.
Mareeba	Planning Scheme on Display.	Notification of scheme commenced on 1 September 2003. Submissions closed 26 November 2003.

Local planning and development assessment of land where Acid Sulfate Soils (ASS) may exist, needs to reflect the State Planning Policy through mapping and assigning risk levels for development types on land identified in the mapping, and requiring soil tests to be undertaken, or refusing development on that land if it is likely to expose ASS. A similar process applies to the State Planning Policy for Good Quality Agricultural Land, where land suitability is mapped, and non-agricultural uses steered away from the agricultural lands wherever possible.

The main strength of local plans is to protect existing environments (e.g. riparian zones, wetlands, steep slopes) through development control of permitting material change of use (or rezoning), and operational works. Planning schemes can further prevent impacts of development on sensitive land (e.g. wetlands, World Heritage Areas, waterways) by triggering assessment of proposed new uses on or adjacent to these sensitive areas.

This Plan and associated NRM research, data collection and mapping can assist planning schemes with their optional development control, by identifying matters worth protecting/managing through appropriate use of land.

Gaps in outcomes and actions – there is substantial planning powers in these systems. It is yet to be determined whether the Plans are consistent and in total comprehensive. Regional coverage of the FNQ plan is critical for establishing regional priorities. It is highly unlikely that:

- Priority assessment is at consistent detail across the region;
- Condition targets are defined and agreed;
- Actions to achieve targets may have been identified but are not always assessed for site specific conditions; and
- Actions to achieve targets have been assessed in terms of cost-effectiveness or social impact.

There may be adequate statutory powers to manage natural resources, but it cannot be taken for granted that these will implemented consistently across the region in an integrated way.

RIVER IMPROVEMENT TRUSTS

A River Improvement Trust (RIT) is a Statutory Authority under the provisions of the *River Improvement Trust Act 1940*. They are linked to local government and are responsible for the preparation of Strategic Management Plans to prioritise the actions required to assist in the protection and improvement of rivers. This can include works to repair and/or prevention of damage to rivers beds and banks, in addition to the protection and mitigation of flooding. These Plans are for broad community benefit (http://www.nrm.qld.gov.au/planning/plans/river_improvement_trusts.html).

Of the seventeen River Trusts established in Queensland, five are in the Wet Tropics NRM Region, and are listed below. An asterisk (*) beside the Trust's name indicates if it has a Plan in place:

- Cairns River Improvement Trust*;
- Cardwell Shire River Improvement Trust*;
- Douglas Shire River Improvement Trust*;
- Herbert River Improvement Trust*; and
- Johnstone Shire River Improvement Trust.

INDIGENOUS ORGANISATIONS AND GROUPS

There are various Indigenous organisations that deal with natural and/or cultural resource management issues (including native title) within the region including

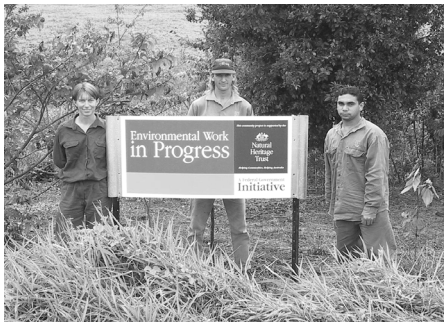
(amongst others): Girringun Aboriginal Corporation, North Queensland Land Council, Cape York Land Council, Djabugay Ranger Agency, Yarrabah Council, Wujul Wujul Council, Aboriginal Coordinating Council, Bamanga Bubu Ngadimunku, Ko Ko Muluridji Tribal Corporation, Ma:Mu Aboriginal Corporation, Balkanu, Budjubulla, North Queensland Clump Mountain Project Cooperative Society Ltd, Gumbilbara, and Ngadjon Mitch Jimmar Aboriginal Corporation.

Additionally, Aboriginal Community Liaison Officers, working through the Wet Tropics Management Authority support Traditional Owner groups to undertake cultural and natural resource management projects.

OTHER COMMUNITY GROUPS

Other community groups and networks play a vital role in monitoring, organising and linking individuals in community NRM activities. This includes groups formed through government-sponsored programs such as Bushcare, Coastcare and Landcare, plus organisations such as Conservation Volunteers Australia (CVA), Greening Australia, TREAT (Trees for the Evelyn and Atherton Tablelands), C4 (Community for Coastal and Cassowary Conservation), Low Isles Protection Society (LIPS), Tree Kangaroo and Mammal Group (TKMG) and the Wildlife Preservation Society of Queensland (WPSQ, branches in Cairns and Tully), as well as community conservation networks such as the Marine and Coastal Community Network and the Threatened Species Network.

Peak conservation and industry organisations are also active in stimulating public debate on NRM issues and are involved in public policy formulation, direct action campaigns and public media and education campaigns. Some local governments also support community efforts through their conservation and environmental programs and employ local government conservation, vegetation, wildlife and extension officers. Local Marine Advisory Committees (Port Douglas, Cairns, Mission Beach and Hinchinbrook) have also been established by GBRMPA as a conduit for information.



EACHAM SHIRE COMMUNITY REVEGETATION UNIT

TREAT

Wet Tropics community groups and networks play a vital role in regional NRM. Left: Eacham Shire Community Revegetation Unit. Right: Trees for the Evelyn and Atherton Tableland (TREAT) Group.

4. POLICY ENVIRONMENT FOR THE NEW PLAN

4.1. NATURAL HERITAGE TRUST

In 2000 the Commonwealth Government announced a new approach to regional natural resources management in the country. Six regions in the state, including the adjacent Burdekin region, are included in the National Action Plan for Salinity and Water Quality (NAP), which commenced two years ago. The Wet Tropics is a Natural Heritage Trust (NHT) region. Although this plan is not narrowly defined to meet only the requirements of the NHT, those requirements heavily influence the framework for the plan. In the draft Bi-Lateral Agreement for the NHT, the Trust defines that framework as a fundamental shift towards more strategic investment based on that used for the NAP, including bilateral and regional partnership agreements, investment against accredited regional plans, and the provision of foundation and priority funding.

The Agreement defines the three overarching objectives:

1 *Biodiversity Conservation* - the conservation of Australia's biodiversity through the protection and restoration of terrestrial, freshwater, estuarine and marine ecosystems and habitat for native plants and animals;
2 *Sustainable Use of Natural Resources* - the sustainable use and management of Australia's land, water and marine resources to maintain and improve the productivity and profitability of resource based industries; and
3 *Community Capacity Building and Institutional Change* - support for individuals, landholders, industry and communities with skills, knowledge, information and institutional frameworks to promote biodiversity conservation and sustainable resource use and management.

Activity Areas of the National Heritage Trust (NHT)

1. Protecting and restoring the habitat of threatened species, threatened ecological communities and migratory birds;
2. Reversing the long-term decline in the extent and quality of Australia's native vegetation;
3. Protecting and restoring significant freshwater, marine and estuarine ecosystems;
4. Preventing or controlling the introduction and spread of feral animals, aquatic pests, weeds and other biological threats to biodiversity;
5. Establishing and effectively managing a comprehensive, adequate and representative system of protected areas:
6. Improving the condition of natural resources that underpins the sustainability and productivity of resource based industries;
7. Securing access to natural resources for sustainable productive use;
8. Encouraging the development of sustainable and profitable management systems for application by land-holders and other natural resource managers and users;
9. Providing land-holders, community groups and other natural resource managers with understanding and skills to contribute to biodiversity conservation and sustainable natural resource management; and
10. Establishing institutional and organisational frameworks that promote conservation and ecologically sustainable use and management of natural resources.

Source: NHT Extension Framework Agreement, 2001.

The NAP/NHT programs add some distinctive features to regional planning including:

- A clear acknowledgement that many NRM issues are most effectively managed within a region; and
- A high degree of community-based regional self-determination on outcomes, priorities and choice of on-ground actions.

Characteristics of Regional NRM Bodies and Plans

Regional NRM Bodies:

- Must have 'a suitable level of authority' to develop and implement NRM plans (Intergovernmental Agreement).
- Must (at least) be incorporated as they are accountable for funds and for meeting targets.
- Must have majority community membership and must include local government (but not necessarily State or Commonwealth government). Membership must 'balance production and conservation interests'. The Regional NRM bodies are required to seek 'effective participation by all relevant stakeholders, including indigenous interests'.
- Must have the abilities and arrangements to work effectively and accountably (see range of detailed criteria in the IGA).

Regional NRM Plans:

- Are to be accredited jointly by Commonwealth and State, following agreed criteria.
- Must cover all NRM issues (but NAP funds will only be provided for actions that address salinity and water quality objectives; NHT funds likewise will be provided for specific priority areas or themes).
- Must have targets that are in line with national targets (although only 'matters for targets', not actual targets, are being set at the national level, for salinity, water quality and biodiversity – see 'framework' paper); national and state priorities are also to be set under NHT.
- Must be based on 'good' science (data and models)
- Must demonstrate consistency with existing plans, targets
- Must include and document economic and social assessment of impacts and tradeoffs
- Must include caps on water extraction.

Source: CEOs Committee, 2003

4.2. PREPARING NEW REGIONAL NRM PLANS

There has been a steady flow of guidelines and instructions for regional bodies as to how to actually prepare a plan that meets the new program, the most important of which are the Joint State and Commonwealth Steering Committee, 2003: *Guidelines for Developing a Regional Natural Resource Management Plan and Regional Investment Strategy in Queensland* and the *National Framework For Natural Resource Management Standards and Targets.* Many important guidelines have not been released or are only in draft form at this stage (see box below). Guidelines have been prepared to provide regional bodies with more detailed information about what is required in a plan to meet the criteria (National Accreditation Guidelines, 2002).

Table 18 summarises the key elements of the new regional NRM plans. More detailed guidance on each of these elements can be found in the National Accreditation Guidelines (2002) and the Revised Interim National Framework for Natural Resource Management Standards and Targets (AFFA, 2001; also Guidelines for Developing a Regional NRM Plan in Queensland – DNR, 2002, 2003). It is proposed that funding to implement an accredited regional plan will be determined on the basis of a Regional Investment Strategy to be developed by the regional body. The Guidelines note:

'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.'

The key new feature required in the new generation plan is the setting of targets as noted in Table 18. Regional bodies will set targets as a core element of integrated regional NRM plans. Governments will require all regions to undertake an initial assessment of all matters identified in the minimum set of required targets, as part of their integrated NRM planning process. Furthermore, State and Commonwealth resource and environmental agencies have set generic resource condition targets that all regions will need to consider.

Central to the setting of resource condition targets at the regional scale will be an understanding of the social and economic consequences that may arise in the delivery of actions towards the targets. It is important that an analysis is undertaken, based on an appropriate level of social, economic as well as environmental data.

Table 18: Key Elements of an Integrated Natural Resource Management Plan (Adapted from Draft Guidelines, NR&M, 2002).

1	**Executive Summary**	A précis of the key components and findings
2	**Background to the Plan**	Details of the Regional Group; summary of the planning process
3	**Linkages /Integration with other Relevant Planning Processes**	The regional NRM plan will need to rely on many of the existing or developing plans for implementation, particularly where it needs to work through existing statutory mechanisms. Agreed arrangements with existing planning bodies should be specified in the plan.
4	**Regional Overview**	Analysis of regional information on natural resource condition and trends, related cultural, social and economic issues and an outline of past and current natural resource activities to provide a qualitative and quantitative description of the natural resource management issues facing the region; their cause, extent and severity; and the impacts of these issues to use as a basis for setting objectives and targets.
5	**Vision, Objectives/Goals, Principles**	What regional situation is desired at a future point in time (the vision); Objectives/goals to resolve particular NRM issues; and overarching principles on which the objectives/goals are based.
6	**Targets**	Targets may be: Aspirational - the vision of the community for the desired condition of their natural resources in the longer term (50 years). Achievable resource condition targets desired resource condition in the medium term (10 to 20 years) - targets may relate to absolute improvement in resource condition or decreases in the rate of degradation. Governments have specified a minimum set of 'parameters for targets' for resource condition required in all regions. Management action targets define targets for the short term (1-5 years) needed to meet the resource condition targets, or to enable resource condition targets to be established.
7	**Priority Actions for Regional Investment**	Prioritised actions to address the range of natural resource management issues and meet the resource condition targets outlined in the plan.
8	**Monitoring and Evaluation**	A detailed monitoring and evaluation process to identify who is accountable for commitments, financial management, and performance monitoring and reporting arrangements.
9	**Reporting and Communication**	A reporting structure for communication of the effectiveness of priority actions being implemented and the outcomes of the activities undertaken
10	**Reviewing the Plan**	Requirements for ongoing review to reflect new information and ensure continuous development and improvement of the plan over time.
11	**Regional Investment Strategy**	A business plan to attract external investment in priority actions that are identified in the regional NRM plan. It outlines the funding required to implement an accredited plan and identifies the returns, if any, for the investment of the respective contributors

Draft Queensland Guidelines for involving Aboriginal and Torres Strait Islander peoples in the establishment of NRM Bodies, and development of the Regional NRM Plan and Investment Strategy.

The major factors of the guidelines include:

- Aboriginal and Torres Strait Islander peoples are the traditional custodians of all lands and seas in Queensland. These customary rights are recognised through a number of international covenants.
- Aboriginal and Torres Strait Islander peoples have extensive interests in natural resource management. These interests include traditional custodians of land and seas; culture, including cultural heritage; social interests; economic interests; and environmental interests.
- While areas and objects of cultural heritage are better known, other aspects of culture such as Aboriginal language, dance, art and lore relate directly to the land and/or the seas and any of these aspects may be important for people in relation to natural resource management and enhance NRM projects within the region.

Source: NR&M, March 2003

4.3. EVALUATION OF THE CURRENT SITUATION IN THE WET TROPICS

Strategy development includes:

- Consolidating actions across sectors and interests (to ensure that they are compatible and to seek synergies);
- Determining the cost-effectiveness of resource management practices that may assist meeting the targets; and
- Creating investment plans for the short and medium term that will guide the NHT and other programs.

The actions required are those needed to:

- coordinate existing actions and arrangements;
- capture community involvement in risk assessment, determining priority actions/tradeoffs to bring about necessary change; and
- put in place additional actions that, together with the above, achieve the condition target.

This now needs to be shared with land managers, to build ownership and commitment to change practices where they are found to be harmful.

For the Wet Tropics, few of the existing plans discussed above are based on or even mention targets or specifically quantifiable objectives. Exceptions include the Johnstone River Catchment strategy that includes management action targets, and the Great Barrier Reef Water Quality Action Plan. Plans do however refer to targets or standards defined broadly such as ANZECC water quality standards, biodiversity conservation standards, etc. or defer to those used by environmental agencies without actually specifying them. The two most significant existing plans on which this plan is based, the FNQ 2010 Regional Plan and the NRM Board's Regional Strategy, cover most of the topics addressed in this plan, and in both cases the plans have a strong foundation on objectives (which can be interpreted as Aspirational targets in many cases) and their implementation components do set out many actions (if only quite generally) that might be used for management action targets in this plan. At the Science Panel meeting (November 2002), those plans were analysed for their input into the target setting and action of this plan.

There is substantial work to be done for the new plan to be based on specific resource condition targets. In the first 'edition' plan it is unlikely that all the required information will be available for all the condition targets. However aspirational and management actions targets can be compiled, some of which will relate to improving capacity to set realistic and achievable condition targets. 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 location-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. 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?

We know enough to take 'no-regrets' actions and to rank management practices and localities based on the existing inventories and experience of local landholders, Landcare, catchment groups and local science and agency people. The existing databases and Condition Reports prepared in this planning process 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; and
- Refinement and promotion of best management practices for agriculture, aquaculture, grazing, and infrastructure corridors for landscape management, fertiliser and vegetation management.

Table 20 shows the broad scope of actions that may be taken to influence sustainable resource use. This plan is to provide a strategic investment framework for the region, and as such aims to assist implementation of the goals of many policies, programs and statutory instruments. It should integrate with the actions of these plans and guide investments across these implementation options. It is not envisaged that the Plan would have any statutory powers, rather assist in the implementation of existing plans with a statutory basis at the local government, state and national level.

Table 19: Overview of Preliminary Matters for Targets in the Wet Tropics.

Theme	Scope
Biodiversity	
Terrestrial ecosystems	Extent, diversity, distribution and condition of terrestrial ecosystems (including terrestrial vegetation, fauna, micro-organisms, and soils).
Inland aquatic ecosystems	Extent, diversity, condition and ecological values of inland aquatic ecosystems including rivers and other wetlands.
Estuarine, coastal and marine ecosystems	Extent, diversity and condition of estuarine, coastal and marine habitats.
Significant species and ecosystems	Extent and condition of significant native species and ecological communities.
Environmental Weeds, Pests and Diseases	
Weeds	Distribution and trends in pest plants and aquatic weeds.
Pests	Distribution and trends in pest animals.
Pathogens and diseases	Distribution and trends in introduced pathogens & diseases.
Global Carbon	
Global carbon	Stocks and flows of carbon in soil and plants.

Indigenous Cultural and Natural Resources	
Cultural heritage	Protection and management of Indigenous cultural values.
Cultural knowledge and practices	Maintenance and transmission of cultural knowledge and practices.
	Extent of transmission of knowledge and identity from one generation to the next.
	Extent of control of cultural knowledge and protection of intellectual property.
Cultural sites	Identification, protection and management by Traditional Owners.
Indigenous languages	Extent and maintenance of Indigenous language.
Land Resources	
Physical and chemical quality of soils and landscapes	The condition of soils and landscapes including chemical processes (acidification, acid sulfate soils, salinity and fertility) and soil erosion.
Native Pastures	The condition of native pasture resources used for grazing.
Forests	The condition of the ecological resources used for production forestry including farm forestry.
Water Resources, Waterways and Fisheries	
Water quality	The physical and chemical quality of water including sediments, nutrients and pesticides.
Water quantity	Water use, environmental flows, flooding and drainage.
Waterways and wetlands	The condition of river channels, riparian zones and wetlands.
Freshwater and marine fisheries	The size and condition of fish populations and fish habitats.

Table 20: Categories of Management Action in the Wet Tropics NRM Plan.

Resource assessment and monitoring	• Monitoring pasture condition carrying capacity (e.g. GRASS Check); • Water quality.
Statutory resource allocation and management	• Connect to RVMPs; • Local government planning schemes; • WRPs determine water allocations, trading and operating rules.
Management practices (BMPs)	• Targeting grazing pressures in priority areas such as identified by SEDNET; • Better management of water and fertiliser; • Default targets of improving resource condition. Adopt BMPs for sectors.
On ground works	• Protective measures; • Restoration works; • Areas to be managed for pests.
Capacity building research and development	• Developing and monitoring capacity.
Institutional change	• ICM and industry group support; • Local government; • Agency coordination.

4.4 PRIORITY ACTIONS FOR REGIONAL INVESTMENT

The overall guiding principle for determining priorities for action, at least as far as NHT funding is concerned is the return on investment in terms of natural resources management outcomes where these are identified with respect to regional condition targets. The specific Commonwealth principles and criteria to guide such investment decisions and for setting priorities are:

- The value of the asset for which the resource condition targets have been established is high in environmental, social and/or economic terms;
- The nature, magnitude and trend of the threat to the asset for which resource condition targets have been established;
- The scale of the outcomes arising from the investment; and
- The rate of change in the underlying resource condition anticipated form the investment.

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; and
- the cost of implementing improved land use practices relative to the observed present land use in landscape elements.

The problem of defining priorities and optimal actions is further exacerbated by the multi-criteria character of many resource outcomes.

4.5 IMPLEMENTING THE STRATEGY

REGIONAL PROCESSES

Many organisations are involved in the implementation of NRM initiatives in the Wet Tropics region. The Wet Tropics Management Authority and the Great Barrier Reef Marine Park Authority have statutory responsibility for the region's World Heritage areas, the state agencies Department of Natural Resources and Mines, Environment Protection Agency and Department of Primary Industries have natural resource management responsibilities and local authorities, through their development and land use planning functions, also have a significant role in the management of natural resources. In addition to these government organisations, the Wet Tropics regional community has a well-established record of participation in Landcare, ICM, land rehabilitation, industry groups (such as Canegrowers and Agforce), Indigenous groups and conservation organisations.

MT GARNET LANDCARE GROUP

The Mt Garnet Landcare Group.

The new NRM plan needs to build on existing planning and information frameworks and conform to new Commonwealth and State requirements for accreditation. In so doing, it will also give regional direction to future funding and prioritise investment from a range of sources, especially the proposed NHT.

It should be remembered that sufficient resources will rarely be available to implement all actions identified or to support all organisations seeking funding. As a result, the new plan must incorporate prioritised actions to address the range of NRM issues and meet the targets outlined in the plan. Wherever possible, these actions should focus on

the causes rather than the symptoms of problems. However, this does not preclude immediate action as appropriate, on preventative, enhancing or restorative activities. It is not yet clear how these actions will be undertaken. They could take the form of commissioned works, small grants to local groups, auctioning for outcomes, etc.

It is clear that, as pragmatically as possible, all relevant stakeholders should be committed to targets and actions proposed in the regional plan. For some specific stakeholders that are critical to the implementation of particular actions, the roles, responsibilities, specific commitments and cost-sharing arrangements will be included in the new plan. Other implementing groups will receive funds to undertake actions that generally address short-term management action targets but contribute to achieving the longer-term resource condition targets of the new plan. A critical part of the investment strategy will be leveraging local investment in new initiatives.

A Regional Technical Assessment Panel, based upon the existing group for NHT, will be used to assess the technical feasibility of specific project proposals once the plan is accredited. The regional body will make the ultimate decision on which projects are funded.

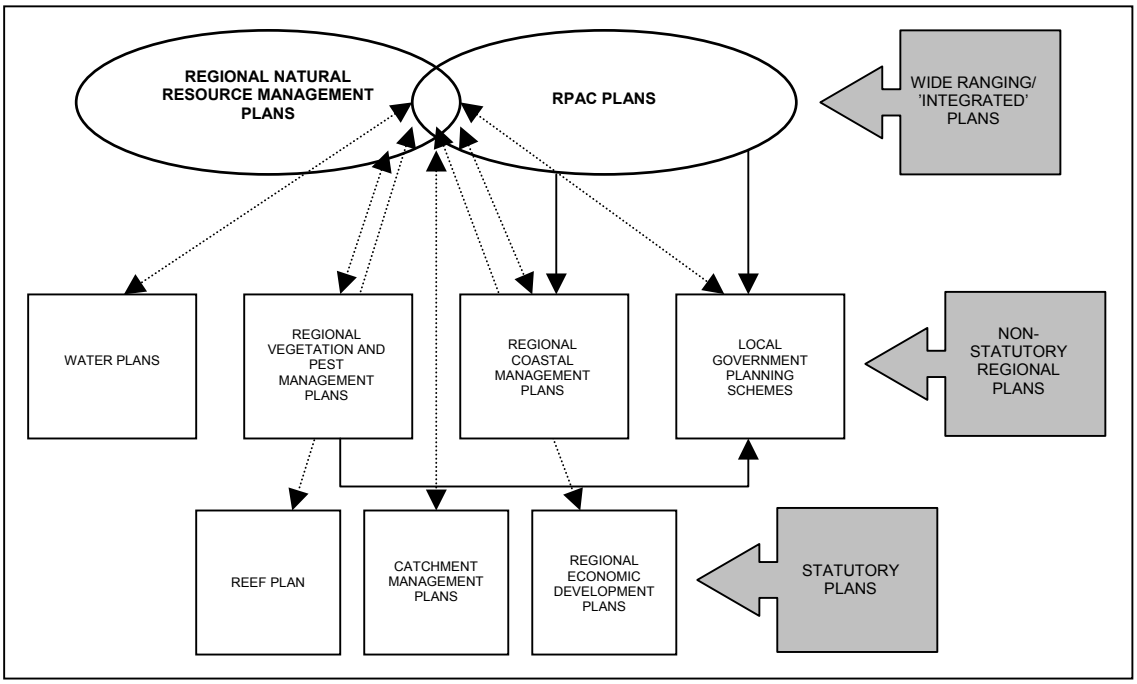


Figure 13: A model for the interrelationship of regional plans (Source: CEOs Committee, 2003).

RELATIONSHIP TO OTHER REGIONAL PLANS

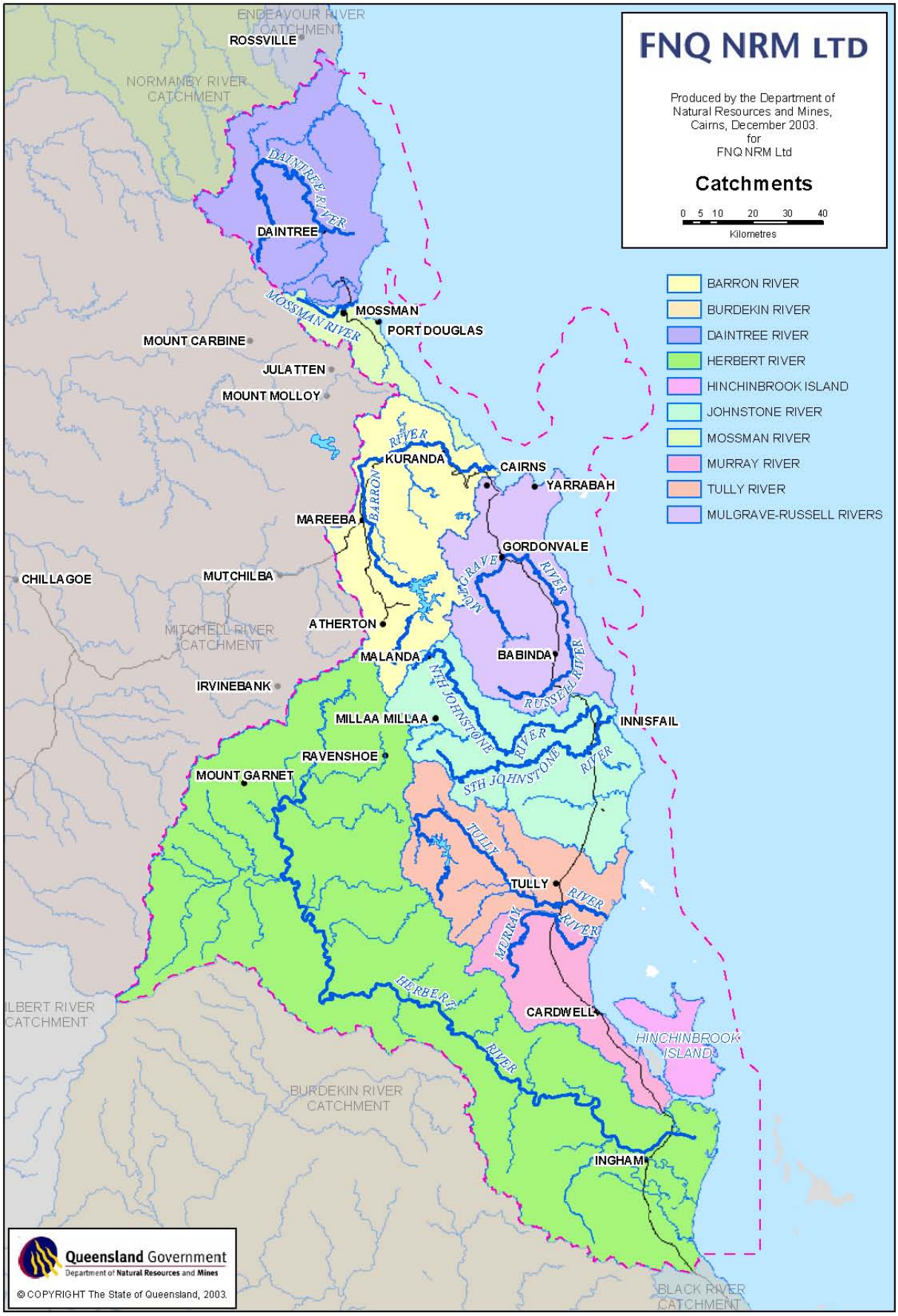
The intent of the NHT program is for regional NRM plans to cover all NRM issues. The Plan must 'demonstrate consistency with other planning processes, agreed national and state outcomes and catchment strategies and targets that have been collectively agreed by relevant jurisdictions in other forums such as the Reef Protection task force. They will therefore need to incorporate or complement relevant objectives, targets and strategies from plans endorsed under statute or agreed between Governments (e.g. the Reef Protection Plan)' (Queensland Government).

Figure 13 shows a conceptual model for the major regional planning activities from the CEOs Committee for Land and Resources, 2003 (Queensland Government). The key characteristics of this model are:

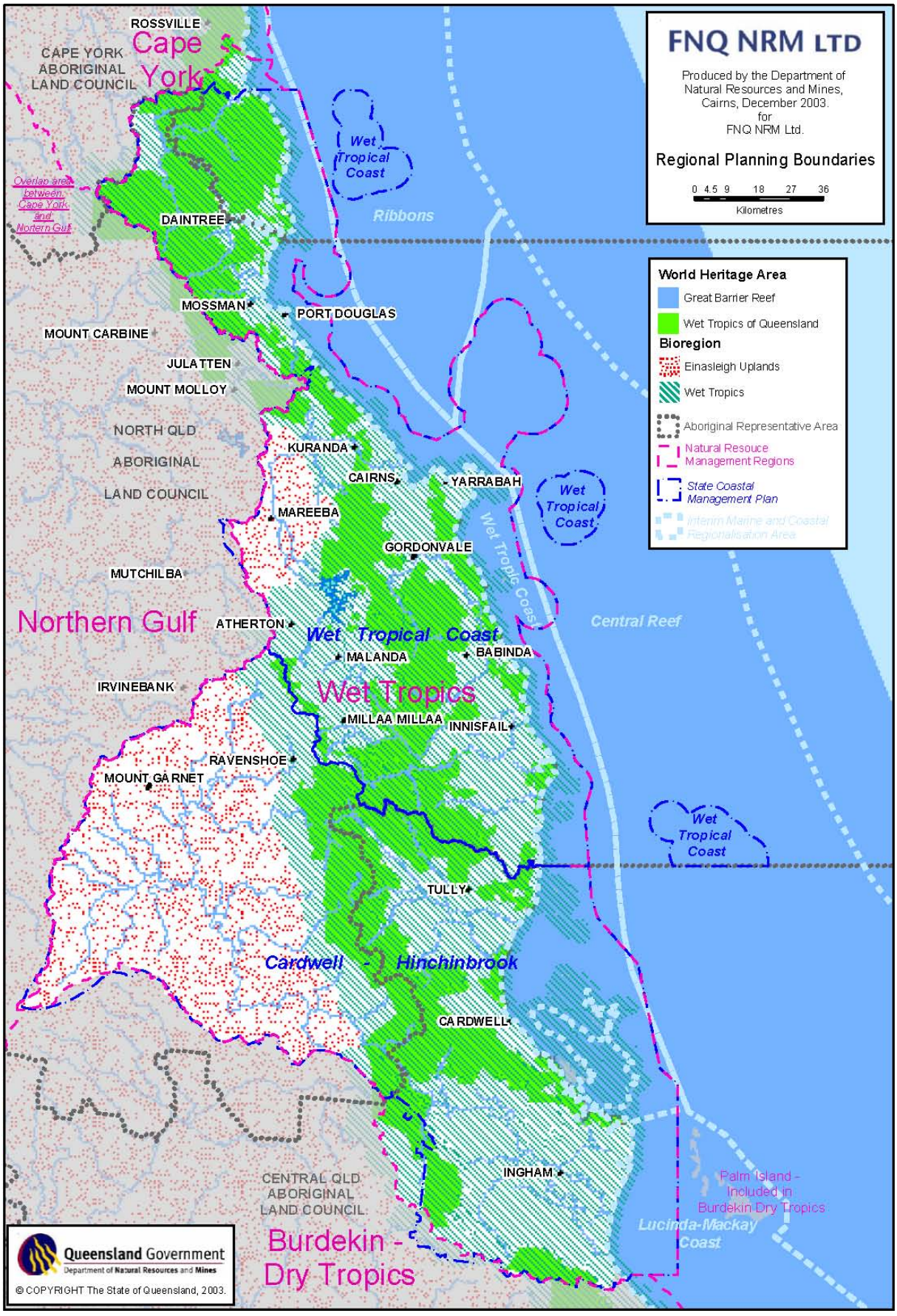
- The regional NRM plans, alongside RPAC plans (e.g. FNQ 2010) provide an opportunity for integrating or coordinating NRM planning. In this way, they can operate in a similar way to RPAC plans, which provide an integrating or

coordinating role for development issues. They will also need to operate alongside RPAC plans (where these exist) – the two plans will influence each other and share some objectives and possibly strategies;

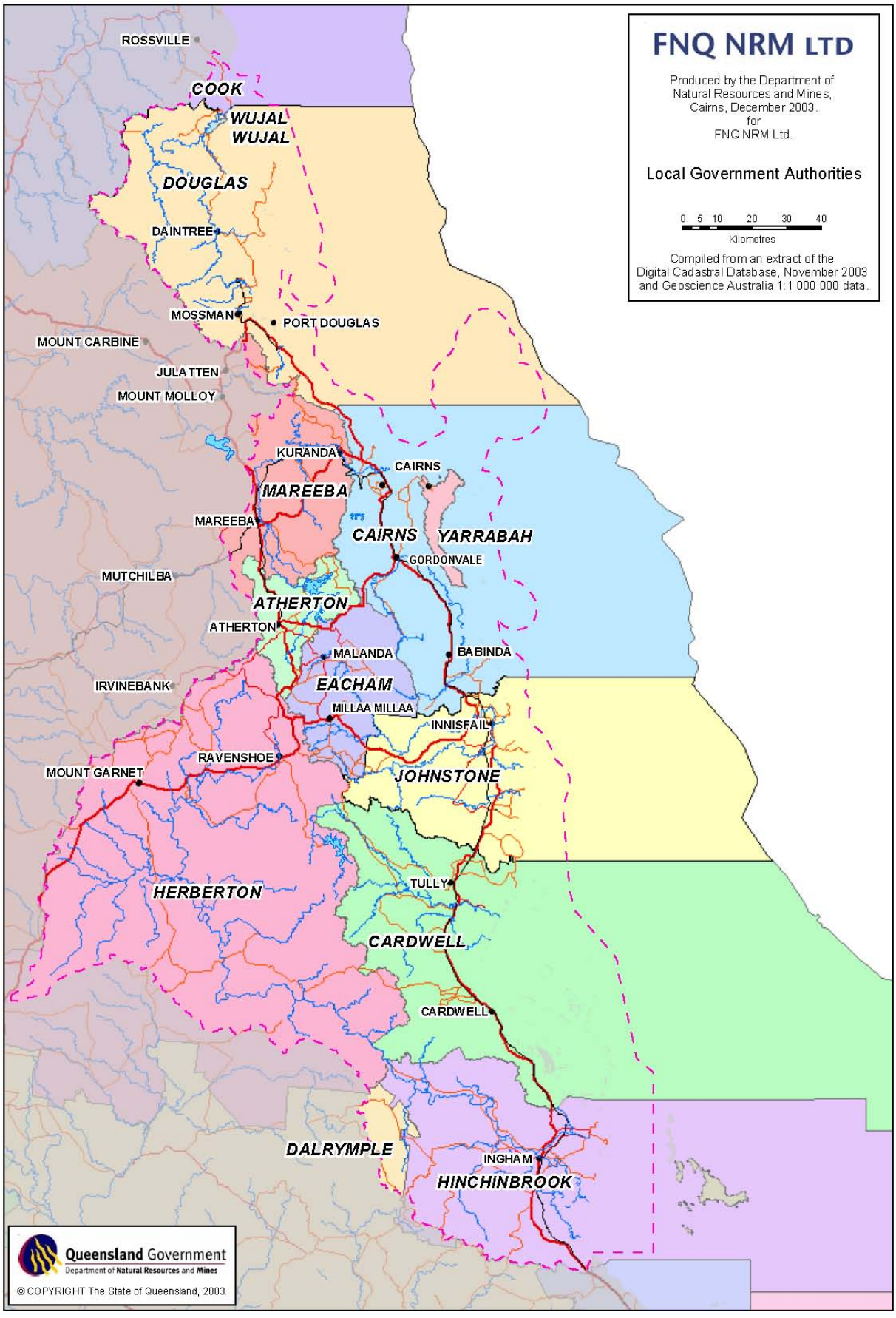
- The Regional NRM plans will need to coexist with a range of statutory regional and local plans, in particular, Local Government planning schemes, Regional Coastal Management Plans, Regional Vegetation Management Plans and Water Resource Plans. As the Regional NRM body will have no statutory powers, it must work through existing statutory mechanisms. The Regional NRM plans need to rely (in part) on the statutory plans and instruments (including Local Government planning schemes, Regional Coastal Management Plans, Regional Vegetation Management Plans, Water Resource Plans, Resource Operations Plans, Water Use Plans, Regional Pest Management Plans) as **implementation mechanisms**. Caps on water extraction, one of the requirements under the IGA, will need to come from the processes under the *Water Act*. State Government agencies may need to provide advice about appropriate delivery mechanisms and manage expectations about the extent to which outcomes can be achieved through statutory mechanisms; and
- **Existing regional NRM strategies** need to merge into, or be superseded by, any regional NRM plans developed under the NAP/NHT, that is, no two such strategies should coexist in one region.



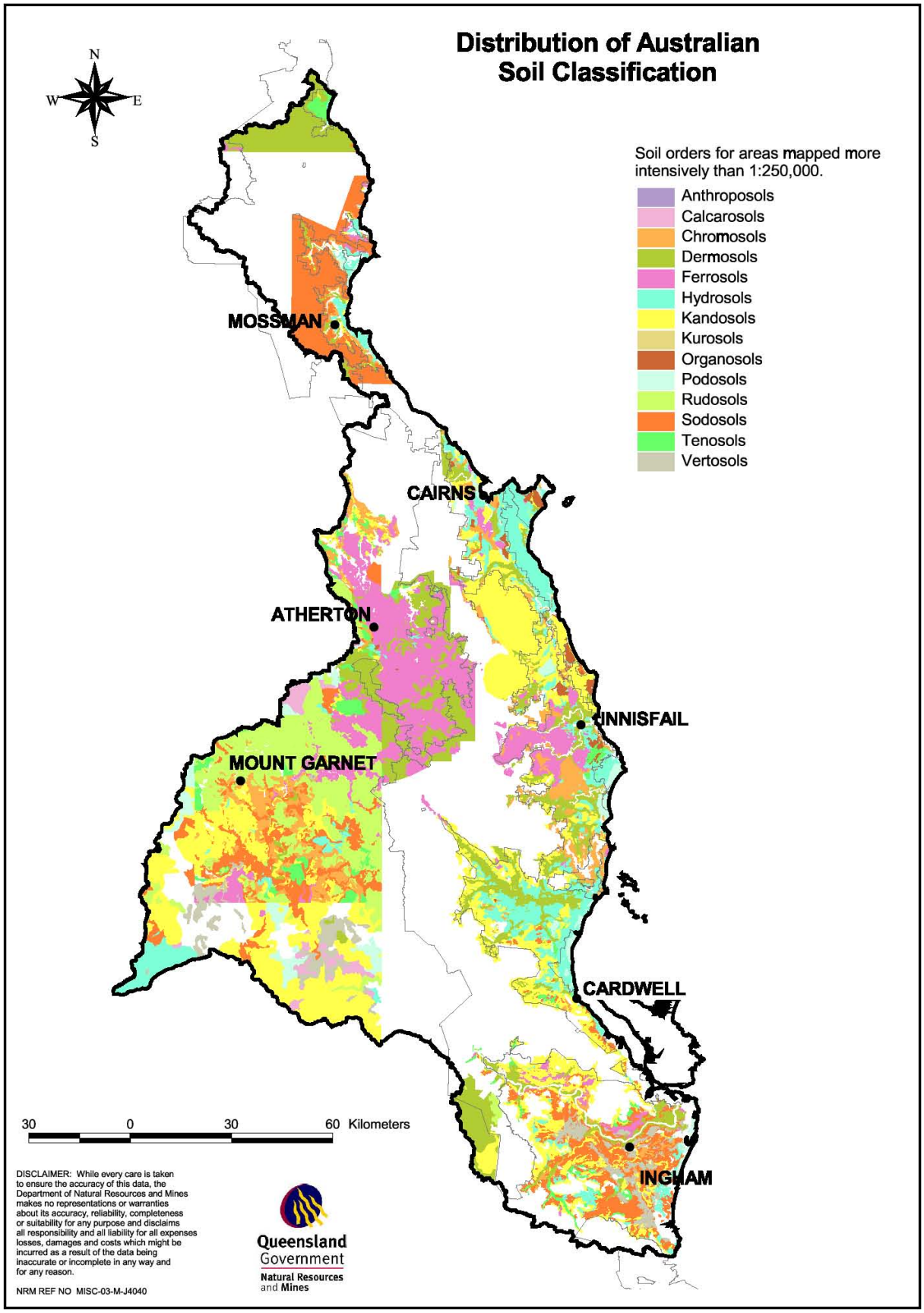
Map 1: Catchment areas within the Wet Tropics NRM Region (Source: NR&M, Cairns).



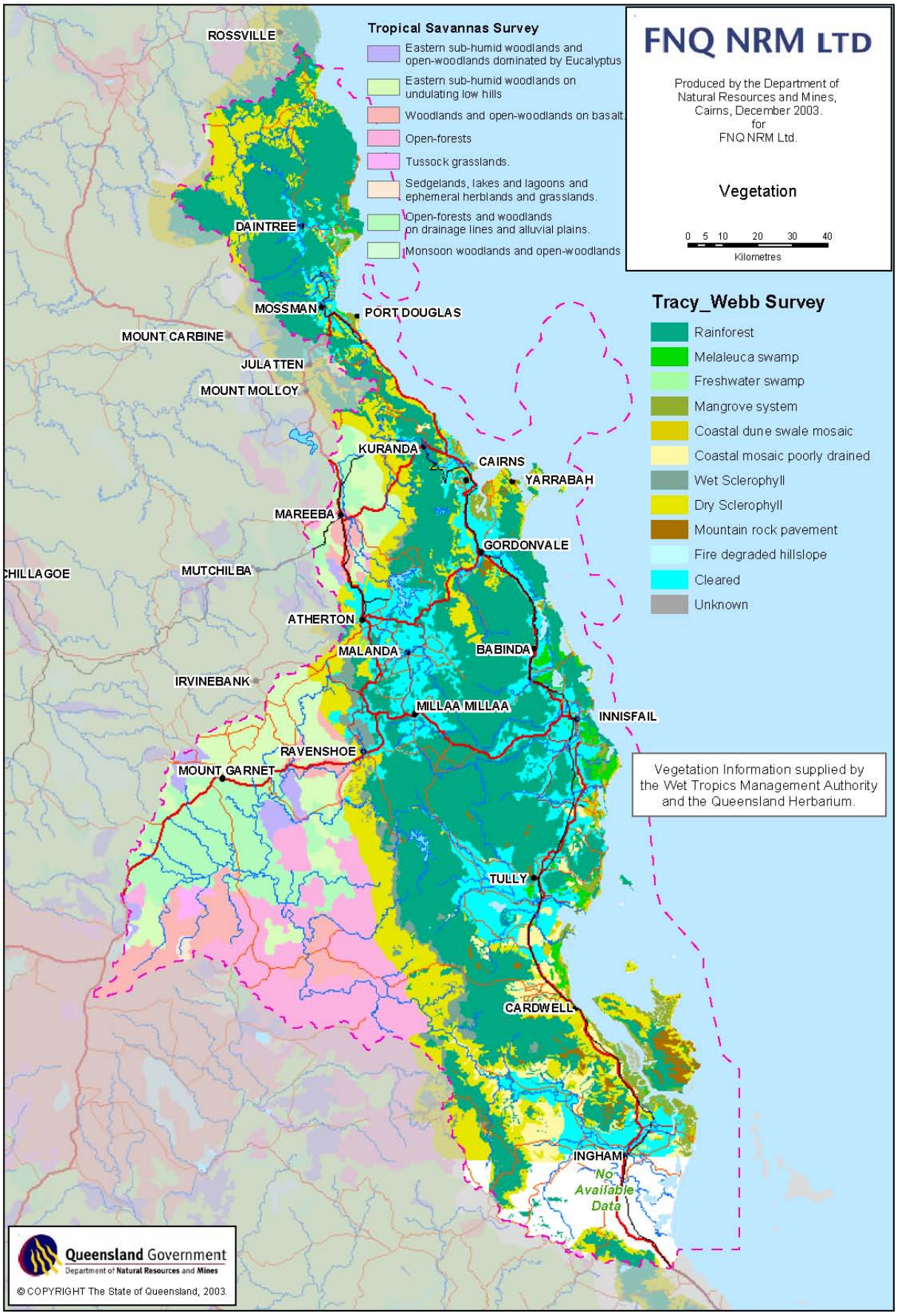
Map 2: Regional Planning Boundaries of the Wet Tropics NRM Region (Produced by: NR&M, Cairns).



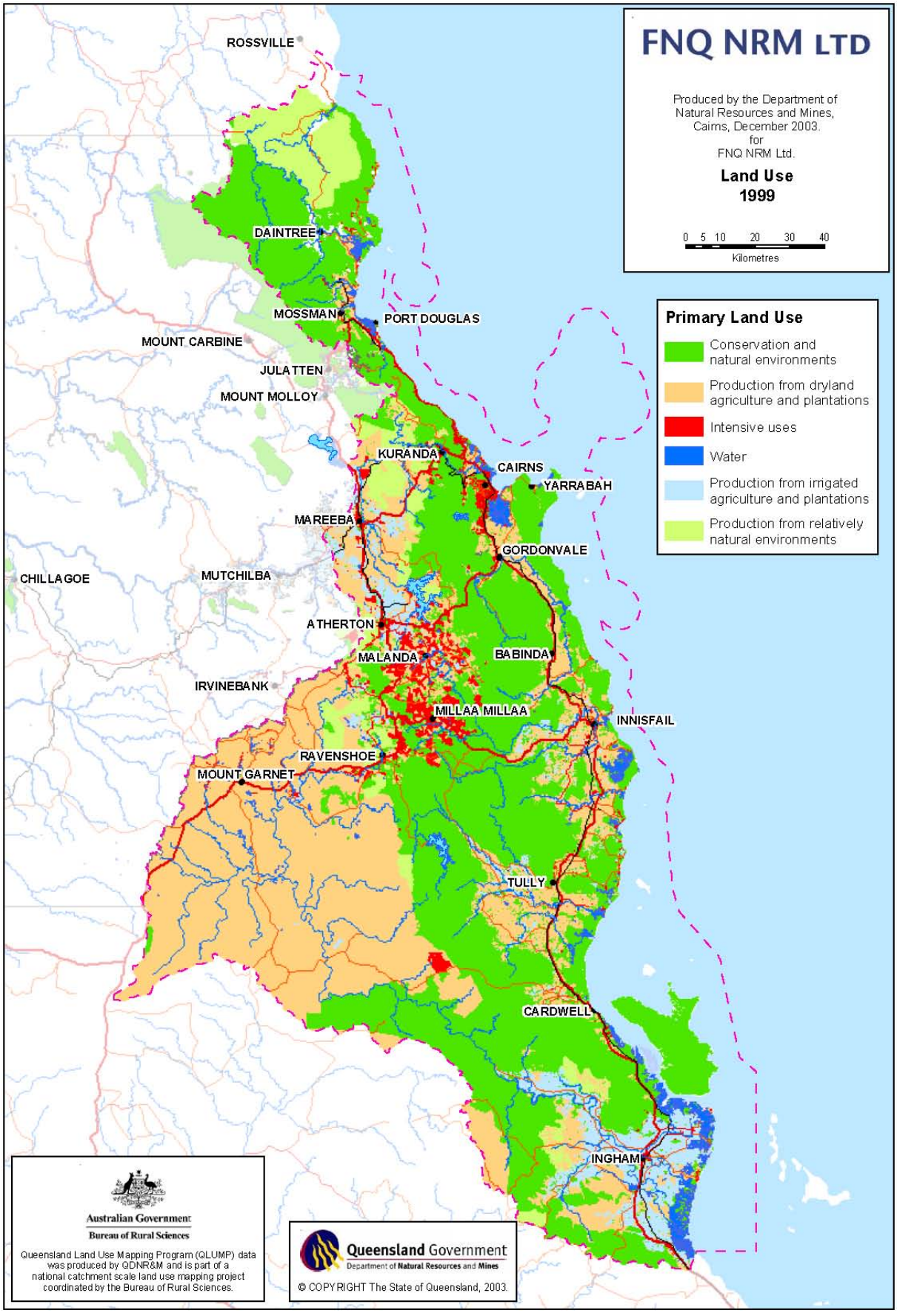
Map 3: Local Government Areas within the Wet Tropics NRM Region (Source: NR&M, Cairns).



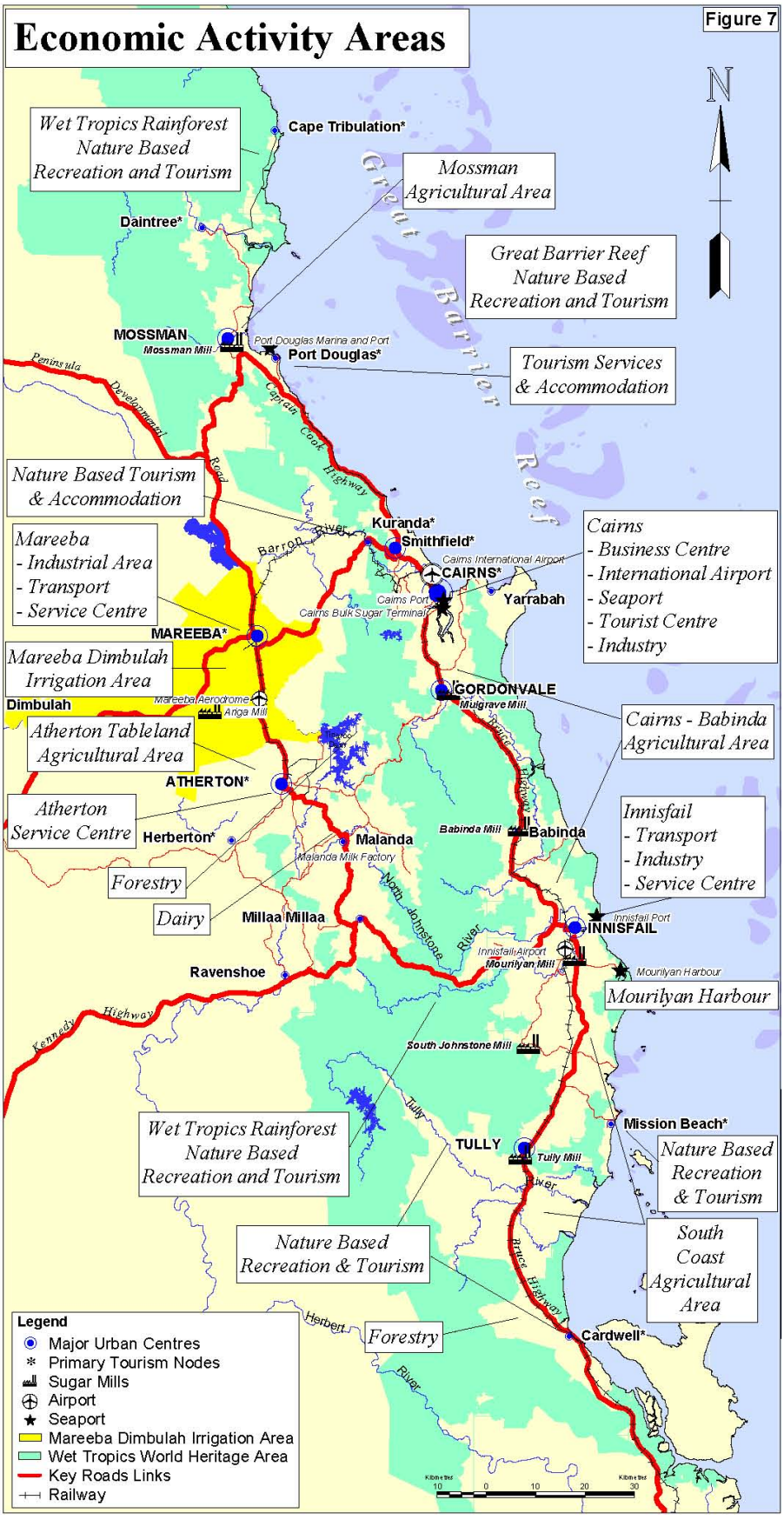
Map 4: Soils of the Wet Tropics NRM Region (Source: NR&M, Mareeba).



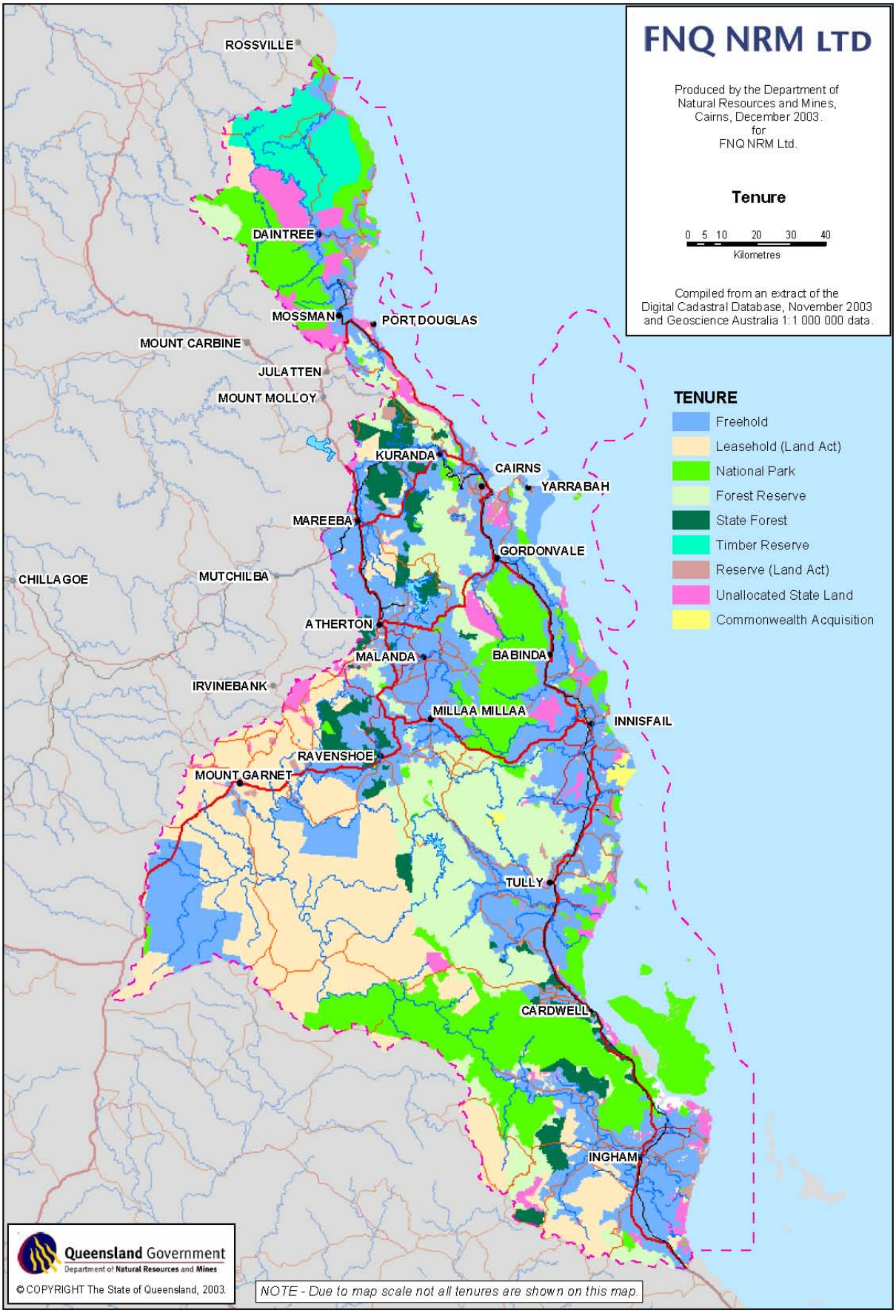
Map 5: Vegetation study of the Wet Tropics NRM Region (Source: NR&M, Cairns).



Map 6: Primary land use in the Wet Tropics NRM Region (Source: NR&M, Cairns).



Map 7: Principal economic activity areas of the FNQ 2010 Region (Source: DLGP).



Map 8: Land tenure in the Wet Tropics NRM Region (Source: NR&M, Cairns).

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APPENDICES

APPENDIX 1: REGIONAL PLANNING CHARACTERISTICS SUMMARISED

CEOs Committee for Land and Resources, 2003: The future design and operation of regional NRM planning (Source: Brisbane DNR).

	NRM Strategies	RPAC Plans	Regional Vegetation Plans	Water Resource Plans	Regional Coastal Management Plans
Scope (in terms of NRM issues):	all NRM issues	most include NRM issues that are considered a priority within the region	vegetation management (also land degradation)	water allocation (includes groundwater)	NRM issues within the coastal zone, which includes land from top of coastal catchments to coastal waters
Scope (in terms of agencies involved):	DNR	whole of Government	DNR and EPA	DNR	whole of Government
Scope (in terms of community involved):	Plan development	Plan development	Plan development	Plan development	Plan development
Coverage:	whole State, 13 regions	39% of State; 8 RPACs	whole State, 20	selected catchments	will be whole Queensland coast, 11 regions (can include catchments)
Boundaries align with:	catchments	LGAs (but not fixed in legislation)	bioregions (some subdivided)	catchments	North/south boundaries = LGAs;
Landward boundaries – coastal zone					
Contain quantitative targets?	×	some	✓ e.g. clearing levels/limits	✓ e.g. water allocations	×
Statutory basis for plans?	×	×	✓ (State codes under *IPA*)	✓ (subordinate legislation)	✓ Statutory instrument under *Coastal Act*, also has effect of State Planning Policy for *Integrated Planning Act*
Statutory basis for consultative groups:	×	✓ RPACs	✓ Regional Vegetation Management Committee	× Community Reference Panels	✓ Regional Consultative Groups
Statutory links:	×	×	×	✓ under *Water Act*, water resource plans must take into account strategies/plans for coastal zone (includes regional coastal plans)	✓ under State *Coastal Plan*, regional coastal plans must have regard to NRM strategies, RPAC plans and vegetation management plans

	NRM Strategies	RPAC Plans	Regional Vegetation Plans	Water Resource Plans	Regional Coastal Management Plans
✓ under IPA, regional coastal plans are relevant for local gov planning schemes and development assessment					
Australian Government involvement?	×	✓	×	×	✓ to date = GBRMPA (where adjacent to GBRMP)
× for other regions					
Endorsement by:	LCMC	Minister → Cabinet	Minister	Governor In Council	Cabinet → Governor In Council
Status:	3 endorsed	6 completed			
(1 under review); 2 well-advanced	all in preparation (due mid 2002 through to end 2003)	4 completed; 5 drafted; 4 in preparation	4 in preparation (aim for 2003)		

APPENDIX 2: SUMMARY OF NRM PROGRAMS, POLICIES AND PLANS AND RELATED STUDIES IN THE WET TROPICS REGION

Relevant regional strategies, policies and plans	Relevant NHT Theme		
	Biodiversity	Sustainable Use	Capacity Building
A Regional Action Plan for the Conservation of Rare and/or threatened Wet Tropics Biota	✓		
A Regional Monitoring Program for the Wet Tropics of Queensland World Heritage Area	✓	✓	✓
Aboriginal and Torres Strait Islander Commission Regional Plan			✓
Action Plan for Australian Bats	✓		
Action Plan for Australian Birds 2000	✓		
Action Plan for Australian Cetaceans	✓		
Action Plan for Australian Freshwater Fishes	✓		
Action Plan for Australian Frogs	✓		
Action Plan for Australian Marsupials and Monotremes 1996	✓		
Action Plan for Australian Reptiles	✓		
Action Plan for Australian Rodents	✓		
Action Plan for the Conservation of Migratory Shorebirds in the East Asian-Australasian Flyway 2001-2005	✓		
Atherton Shire Council Planning Scheme	✓	✓	✓
Atherton Shire Pest Management Plan	✓	✓	
ATSIC Cairns and District Regional Council - Strategic Plan 2001 and Beyond 2001.	✓	✓	✓
Australian National Strategy for Conservation of Australian Species and Communities Threatened with Extinction	✓		
Australian Water Quality Guidelines for Fresh and Marine Waters		✓	
Barron Delta Flood Mitigation and River Development Study (Stage 1)		✓	
Barron River Catchment Management Strategy	✓	✓	✓
Barron River Catchment Rehabilitation Plan	✓		
Barron Draft Water Resource Plan		✓	

Relevant regional strategies, policies and plans	Relevant NHT Theme		
	Biodiversity	Sustainable Use	Capacity Building
Beach Protection Plans (in progress)		✓	
Building a sustainable future for the Mitchell River Watershed (proposed management strategy)		✓	
Burdekin Water Resource Plan (in prep.)		✓	
Cairns Drain Management Plan		✓	
Cairns Plan – Planning Scheme for the City of Cairns	✓	✓	✓
Cairns Regional Tourism Strategy		✓	
Cairns to Port Douglas Marine Park Plan of Management (draft)	✓	✓	✓
CANEGROWERS Code of Practice		✓	
CANEGROWERS Environment Policy		✓	
Cardwell – Hinchinbrook Regional Coastal Management Plan (in prep)	✓	✓	✓
Cardwell Shire Council Planning Scheme	✓	✓	✓
Cardwell Shire Pest Management Plan	✓	✓	
Central Queensland Land Council 3 Year Strategic Plan (Native Title)			✓
City of Thuringowa Planning Scheme	✓	✓	✓
Cleaner Production Handbook for Local Government		✓	
Code of Forest Practices		✓	
Community Rainforest Reforestation Program Draft Strategy 1996-2000	✓		✓
Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes	✓		
Cook Shire Pest Management Plan	✓	✓	
Crystal Creek Environmental Management Plan	✓	✓	
Dairy Industry Best Practices for Dairy Effluent		✓	
Danbulla State Forest Management Plan	✓	✓	
Djabugay Ranger Agency – Community Planning Workshops 2001	✓	✓	✓
Djabugay – Strategic Directions Plan	✓		✓

Relevant regional strategies, policies and plans	Relevant NHT Theme		
	Biodiversity	Sustainable Use	Capacity Building
Douglas Catchments Rehabilitation Strategy (draft)	✓	✓	
Douglas Shire Catchment Management Strategy	✓	✓	✓
Douglas Shire Pest Management Plan	✓	✓	
Douglas Shire Planning Scheme	✓	✓	✓
Douglas Shire River Improvement Trust Scoping Study		✓	
Draft Recovery Plan for Marine Turtles in Australia	✓		
Eacham Shire Council Town Planning Scheme	✓	✓	✓
Einasleigh Uplands (North) Regional Vegetation Management Plan	✓	✓	
Einasleigh Uplands (South) Regional Vegetation Management Plan	✓	✓	
Endangered Forest Flora and Fauna Management System (Qld) [in prep]	✓		
Environment Protection Policies (Noise, Air, Waste, Water)		✓	
Estuarine Crocodile Management Plan	✓	✓	
Fisheries stocking plans		✓	
Floodplain Guidelines for Sustainable Agricultural Development of Queensland's Wet Tropical Coast		✓	
FNQ 2010 (draft) Integrated Regional Strategies	✓	✓	✓
FNQ Solid Waste Strategy		✓	
Great Barrier Reef Marine Park Management Plans	✓	✓	✓
Guidelines for the Protection, Management and Use of Aboriginal & Torres Strait Islander Cultural Heritage Places			✓
Guidelines for Wetland Protection [TEC, Sydney]	✓	✓	
Herbert River Catchment Management Strategy		✓	✓
Herbert River Catchment Rehabilitation Strategy	✓		✓
Herbert River Flood Management Plan		✓	
Herbert SIIP Environmental Management Plan		✓	
Herberton Shire Council Planning Scheme	✓	✓	✓

Relevant regional strategies, policies and plans	Relevant NHT Theme		
	Biodiversity	Sustainable Use	Capacity Building
Herberton Shire Pest Management Plan	✓	✓	
Hinchinbrook Rural Drainage Plan		✓	
Hinchinbrook Shire Council Planning Scheme	✓	✓	✓
Hinchinbrook Shire Pest Management Plan	✓	✓	
Implementation Plan for Cairns Campus Hillslopes Reserve		✓	
Integrated Management of the Johnstone River: habitat management plan	✓		
Interim Negotiating Forum (Wet Tropics Regional Agreement)			✓
Johnstone River Catchment Management Strategy	✓	✓	✓
Johnstone River Catchment Management Strategy: recommendations to canegrowers		✓	
Johnstone River Catchment Management Strategy: recommendations to horticultural industries		✓	
Johnstone River Catchment Management Strategy: recommendations to beef & dairy industries		✓	
Johnstone River Catchment Revegetation Strategy	✓		
Johnstone River Flood Study			
Johnstone Shire Council Planning Scheme	✓	✓	✓
Johnstone Shire Pest Management Plan	✓	✓	
Johnstone Shire Plan Review Habitat Management Working Paper	✓		
Keeping It Great – a 25 year strategic plan for the Great Barrier Reef World Heritage Area	✓	✓	✓
Kuku Yalanji Indigenous Land Use Agreement			✓
Liverpool Creek River Management Plan (JSRIT)		✓	
Local Greening Plans: a guide for vegetation and biodiversity management	✓		
Lowland Habitat Management and Recommendations: Tully-Murray Catchments	✓		
Mahogany glider Recovery Plan 2000-2004	✓		
Mareeba Shire Pest Management Plan	✓	✓	
Marlin Coast Landscape Master Plan	✓	✓	✓

Relevant regional strategies, policies and plans	Relevant NHT Theme		
	Biodiversity	Sustainable Use	Capacity Building
Mareeba Dimbulah Irrigation Area Land Management Strategy		✓	
Mitchell Water Resource Plan (in prep.)		✓	
Mossman Gorge Community – Based Planning Project *Bama Bubu Nganjin Djuma Ngajal*	✓	✓	✓
National Forest Policy Statement	✓	✓	
National Strategy for the Conservation of Australia's Biodiversity	✓		
National Strategy for the Conservation of Australian Species and Communities Threatened with Extinction	✓		
National Water Quality Guidelines		✓	
National Water Quality Management Strategy	✓	✓	✓
Native Title Representative Bodies 3 year Strategic Plan (Cape York, North Queensland & Central Queensland Land Councils)		✓	✓
Nature Conservation (Wildlife) Regulations	✓	✓	
North Johnstone River Management Plan (in prep)	✓	✓	
North Queensland Land Council 3 Year Strategic Plan (Native Title)			✓
Queensland Water Quality Guidelines Draft		✓	
Queensland: A Decade of Land Care Plan	✓	✓	✓
Recovery Plan for cave-dwelling bats 2001-2005	✓		
Recovery Plan for the magnificent broodfrog 2000-2004	✓		
Recovery Plan for the northern bettong 2000-2004	✓		
Recovery Plan for the southern cassowary 2001-2005	✓		
Recovery Plan for the stream-dwelling rainforest frogs of the wet tropics biogeographic region of north-east Queensland 2000-2004	✓		
Reef Fishery Management Plan (QFMA)		✓	
Reef Water Quality Protection Plan	✓	✓	✓
Regional Pest Management Plan (proposed)	✓	✓	
Russell-Mulgrave Catchment Management Strategy	✓	✓	✓

Relevant regional strategies, policies and plans	Relevant NHT Theme		
	Biodiversity	Sustainable Use	Capacity Building
Russell Mulgrave River Overview Study Report Stages 1-3 and Strategic Management Plan for Reach 4, Russell River		✓	
Sediment Control Guidelines – Cairns City Council		✓	
South Johnstone River Management Plan	✓	✓	✓
State Coastal Management Plan (statutory plan)	✓	✓	✓
State Planning Policies (e.g. protection of good quality agricultural land, acid sulfate soils)	✓	✓	
State Water Conservation Strategy			
Strategic Cassowary Management Plan, Mission Beach District North Queensland	✓		
Strategic Management Plan Russell River Reach 4		✓	
Strategic Plan of the Russell and Mulgrave Rivers	✓	✓	✓
Stream Management Plan, Herbert River and District		✓	
Sugar Coast Environment Rescue Package (SCERP) [Mahogany Glider]	✓		
Sugar Industry Infrastructure Packages [and associated reports]		✓	
Threat Abatement Plans [in progress for Fox, Feral Cats, Dieback from *Phytophthora cinnamomi*, Rabbits]	✓	✓	
Trinity Inlet Management Plan [and associated reports]	✓	✓	✓
Tropical East Coast Fishery Management Plan (QFMA)		✓	
Tully and Murray Rivers Management Strategy	✓	✓	✓
Tully-Murray Catchment Management Strategy	✓	✓	✓
Tully-Murray Catchment Rehabilitation Plan	✓		
Tully-Murray Water Management Scheme (SIIP)		✓	
Wetlands Policy of the Commonwealth Government of Australia	✓		
Wet Tropical Coast Regional Coastal Management Plan (in prep)	✓	✓	✓
Wet Tropics Conservation Strategy	✓		
Wet Tropics Plan (statutory plan) and Protection Through Partnerships (policies for implementing the Wet Tropics Plan)	✓	✓	✓

Relevant regional strategies, policies and plans	Relevant NHT Theme		
	Biodiversity	Sustainable Use	Capacity Building
Wet Tropics Regional Vegetation Management Plan	✓	✓	
Wet Tropics Walking Strategy		✓	
Wild Rivers Conservation Management Guidelines [AHC]	✓		
Yarrabah Community Council Plan	✓	✓	✓