4.6 Air Quality

The Haughton River catchment is not a heavy industrial area so emissions are limited to the Invicta sugar mill at Giru, cane fires during the crushing season, and emissions from controlled burns and wildfires. Outdoor air quality is most affected during the crushing season (July to November), as this is the period when controlled burns and wildfires are likely to occur in addition to cane fires and mill emissions.

Table 4-1 is a summary of the air quality in the region.

Table 4-1 Condition of the Atmosphere in the Haughton River Catchment

Atmosphere			
Indicator	**Pressures**	**State (or condition)**	
		Documented	**Anecdotal**
Greenhouse effect	Annual greenhouse gas emissions – from cane fires and grass and bush fires, plant and equipment use, transport vehicles, livestock.	Not documented – not considered to be a significant issue.	Not mentioned – emissions expected to exceed sequestration.
Outdoor air quality	Emission of air pollutants – emissions in the Haughton are generally limited to Invicta Sugar Mill, cane fires and grass and bush fires.	Not documented - not considered to be a significant issue.	Not mentioned.

The greenhouse effect is likely to be exacerbated within the Haughton catchment due to the more significant activities producing greenhouse gas emissions compared to the carbon sinks.

4.7 Human Settlement

Pressures from human settlement do not have major impacts on the condition of the catchment in comparison to the pressures resulting from agricultural activities (**Table 4-1**). There are no plans for any significant expansion of concentrated human settlements in the Haughton River catchment.

There is a possibility of increased demand for rural residential type settlement as lifestyle and retirement blocks.

Table 4-1 Impact on Condition from Human Settlement

Human settlement			
Indicator	**Pressures**	**State (or condition)**	
		Documented	**Anecdotal**
Waste disposal	Household and industrial effluent, solid waste, groundwater quality.	Potential issues with groundwater quality in the vicinity of Giru as septic systems are used within the catchment.	No adverse impacts noted. Septic tanks at Cungulla.
Attitudes and actions	Capacity and willingness to change.	Not measured.	Some groups mentioned as reluctant to change.

5. Objectives and Targets

5.1 Draft Objectives With Reference To The Identified Issue Areas

The draft objectives in **Table 5-1** have been drawn from the regional strategy developed for the Burdekin Dry Tropics region by the Burdekin Dry Tropics Group prior to the commencement of work on this catchment plan. The objectives were developed after broad consultation with the community and organisational stakeholders and reflect the views of the regional community as far as possible. A list of the Visions and Objectives drawn from the regional and sub regional strategies is included in **Appendix N**, along with their references to a catchment approach to natural resource management.

Table 5-1 Issues and Objectives

Issues / Pressure	Primary objective
Information availability	A community that is aware of and committed to "whole-of-catchment" sustainable natural resource management
Coordination levels	A catchment community actively managing its future in an effective partnership with government and industry
Land use change and development	Allocation of land resources based on capability and suitability to foster sustainable natural resource use
Unsustainable land management practices	The catchment's soil resources protected and rehabilitated, through best practice measures
Unsustainable water management practices	Optimum water quality restored and maintained throughout the catchment
Vegetation clearing and degradation	A viable range of vegetation communities maintained across the catchment

There are many more issues and associated objectives within each issue area. Specific objectives can be defined with regard to specific issues when developing solutions and actions. In that respect we need to look at some achievable targets that can be used when framing objectives at that level of detail.

At the other end of the scale the broader goals may be achieved by implementing some of the underlying objectives. For example by implementing actions to achieve the primary objectives for land, water and vegetation management we are likely to ensure achievement of the broad goal of "A region/catchment with a protected range of healthy habitats that maintain viable native flora and fauna populations".

As with any systems approach the whole is generally greater than the sum of its parts however, due to resource constraints, we cannot work on the whole system at the one time. We need to work on the component parts to eventually attain the desired outcome for the whole system. Setting targets and measuring progress also has to be done in relation to component parts with the combined results then giving an indication of the overall health of the whole system. As a starting point we need to determine what we can effectively measure and the target figures we are aiming to achieve.

5.2 Catchment Targets For Salinity, Water Quality And Biodiversity

Targets for the three main areas of concern in the National Action Plan for Salinity and Water Quality can be expressed in relation to the environmental indicators suggested by the Australian and New Zealand Environment and Conservation Council (ANZECC) for reporting on the state of the environment. This will provide the link between the pressures on the catchment, the state of the catchment, and enable us to measure the success of the responses. A list of the ANZECC (2001) environmental indicators is provided in **Appendix O**.

The relevant environmental indicators from the ANZECC list are:

- Salinity
  - Area of rising water tables
  - Area affected by salinity
- Water Quality (ground)
  - Groundwater extraction versus availability
  - Exceedence of groundwater quality guidelines
- Water Quality (surface)
  - Exceedence of surface water quality guidelines
  - Surface water extraction versus availability
  - Freshwater algal blooms
  - Discharges from point sources
  - Extent of deep-rooted vegetation cover by catchment
  - Exceedence of marine and estuarine water quality guidelines
- Biodiversity
  - Native vegetation clearing
  - Aquatic habitat destruction
  - Fire regimes
  - Introduced species
  - Species outbreaks
  - Extinct, endangered and vulnerable species and ecological communities
  - Extent and condition of native vegetation
  - Extent and condition of aquatic habitats and wetlands
  - Populations of selected species
  - Terrestrial, marine and estuarine protected areas
  - Recovery plans
  - Area revegetated
  - Vegetated stream lengths
  - Estimated freshwater fish stocks
  - Estimated wild fish stocks
  - Total seafood catch
  - Disturbance of marine habitat

Some of the indicators are relatively easy to measure by collating and analysing existing information while some will require the collection of baseline data and subsequent analysis.

The ANZECC water quality guidelines have been generally accepted as the standard in Australia, although concerns have been raised in the past that they are not fully applicable to northern Australian conditions. Recently revised guidelines recognise this deficiency and attempt to make the guidelines more relevant. The revised ANZECC (2000) guidelines will be used as an initial guide to set the water quality targets for the Haughton River catchment. The need for locally relevant water quality targets to be developed has been highlighted by a recent ACTFR report, which identified Phosphorus levels above the ANZECC guideline limits. Is this a water quality issue or a function of overly conservative targets? More work needs to be undertaken to determine appropriate targets for local conditions. A summary of default targets for tropical Queensland is provided as **Appendix P**.

Many of the targets listed in **Table 5-1** need to be quantified, as they are expressed in 'aspirational' terms only. This does not imply that nothing should be done until we have more information but rather that we should work towards the 'goal' in the meantime. When the necessary information is available we can redefine the targets and work towards a more definite outcome.

Table 5-1 Draft Targets For Salinity, Water Quality And Biodiversity In The Haughton River Catchment

Element/indicator	Target
Salinity	
Area of rising watertables	The area of rising water tables remains stationary ie. no net increase in area
Area affected by salinity	The area affected by salinity remains stationary ie. no net increase in area
Water quality - groundwater	
Groundwater extraction versus availability	Extraction rate maintained at a level to ensure the watertable does not rise closer than 5 metre to the surface
Exceedences of groundwater quality guidelines	Default water quality targets for Drinking Water for tropical Queensland are not exceeded
Water quality - surface	
Exceedences of surface water quality guidelines	Upper levels of default water quality targets for Aquatic Ecosystem Protection for tropical Queensland are not exceeded during high flow and first flush events
Surface water extraction versus availability	Surface water extraction does not exceed the values determined by the Burdekin Water Resource Plan (to be completed)
Freshwater algal blooms	Algal blooms do not exceed levels determined to occur naturally
Discharges from point sources	Contaminant levels from point source discharges remain below the licensed limits
Extent of deep-rooted vegetation cover by catchment	Fifty percent of deep rooted vegetation is retained in the catchment
Exceedences of marine and estuarine water quality guidelines	Upper levels of default water quality targets for Aquatic Ecosystem Protection for tropical Queensland are not exceeded except during cyclonic conditions
Biodiversity	
Native vegetation clearing	Vegetation clearing maintained at a level below the rate of native vegetation regeneration and replacement
Aquatic habitat destruction	No increase in the extent of degraded aquatic habitat
Fire regimes	Fire regimes matched to the optimum for maintenance of biodiversity and agricultural production
Introduced pest species	No increase in the number or extent of introduced pest species
Pest species outbreaks	No outbreaks of pest species and in the event of an outbreak an effective control program is implemented
Extinct, endangered and vulnerable species and ecological communities	No extinctions and no increase in the number of endangered and vulnerable species and ecological communities
Extent and condition of native vegetation	Regional ecosystems at 30% or more of the estimated original extent & no deterioration in condition
Extent & condition of aquatic habitats & wetlands	All remaining wetlands and aquatic habitat maintained and condition improved
Populations of selected species	Selected indicator species maintained at sustainable levels
Terrestrial, marine and estuarine protected areas	Protected areas increased to encompass viable areas of vegetation communities not currently represented in protected areas
Recovery plans	N/A
Area revegetated	Two percent per annum of a the area identified as requiring revegetation
Vegetated stream lengths	Eighty percent of stream lengths vegetated by 2030
Estimated freshwater fish stocks	Stocks maintained at naturally occurring levels
Estimated wild fish stocks	Stocks maintained at naturally occurring levels
Total seafood catch	Catch maintained at a sustainable harvest level
Disturbance of marine habitat	No disturbance of marine habitat

The targets listed are primarily *aspirational targets*. Further work needs to be done to determine appropriate *resource condition targets* and *management action targets* specific to the Haughton River catchment.

6. Options Available to Address Issues and Reach Targets

6.1 Information Availability

There are a number of models, which are used to increase the availability of information for use in natural resource management including that of the Herbert Resource Information Centre (HRIC) based in Ingham.

Regardless of the model adopted to improve information availability the first stage in the process is to determine the likely participants and their needs. A structured needs analysis will provide guidance for the type of model best suited to the situation. For example, from the perspective of a community based natural resource management group there appears to be a need to have some form of central hub to facilitate ready access to natural resource information for strategic planning and decision-making purposes.

Once an appropriate model is decided upon the protocol for sharing information needs to be determined including the way the information is stored, referenced and accessed. Given the number of stakeholders likely to be involved, and the different levels of contribution and use, this stage can be problematic. The overall common goal needs to be kept in mind so that the process doesn't become "bogged down".

The custodians of the information are sometimes reluctant to be involved in formalised information sharing as first impressions imply a one-way flow of data ie. away from the custodians. Vestiges of corporate culture can also be an impediment to information sharing.

An economic evaluation was conducted on the HRIC after its initial period of operation with the results showing benefits for all participants well in excess of the costs. The evaluation did not take into account the intangible benefits which were likely to outweigh the direct benefits by a significant amount. The lesson from the exercise was that regardless of first impressions, perspectives and cultural differences the benefits of information sharing far outweighed the costs on economic, social and environmental grounds.

To maximise the use of resources while maintaining practical geographic boundaries the process is best arranged at a regional level with catchment and other groups included as information sharing stakeholders.

6.2 Coordination levels

Smaller-scale projects and programs are usually well coordinated at the local level due to the small number of people and organisations involved. When the situation becomes more complex and involves cooperative arrangements the coordination component often suffers.

Often the main reasons for poor coordination are poor communication and undefined implementation structures and processes. To develop any of the necessary structures and processes the people and organisations need to have some form of common objectives. To determine the common objectives a group of stakeholders needs to get together and that process in itself needs to be coordinated. The fact that coordination levels need to be improved is not surprising given the relatively recent advent of cooperative, multi-stakeholder community based natural resource groups. We are also encumbered with an adversarial rather than cooperative history where environmental issues are concerned.

It is at the catchment regional and sub regional levels that coordination needs to be improved. This can apply within organisations as well as between organisations, and can be as much a factor of corporate culture as situation complexity. Options for improving the level of coordination within organisations rest with the individual organisations.

Inter-organisational coordination can be addressed to some extent through clearly defined implementation arrangements in natural resource plans and strategies. The implementation arrangements should be grounded in sound consultation processes and include formal recognition of the responsibilities of stakeholders in delivering a program or project.

Coordination of activities can be further improved through the development of a communication plan to compliment implementation arrangements. This will help ensure the implementation of actions through the transmission of the appropriate signals, to the relevant people at the right time. It will also provide a feedback mechanism to assist with monitoring and review of the progress of all actions from the local project to regional strategy levels.

6.3 Land Use Change And Development

Land use change and development are loosely guided by regional growth strategies and generally driven by population growth and economic forces. A wide body of legislation regulates land use change and development however there are areas where natural resource planning initiatives could serve to guide some of the regulatory frameworks eg. development assessment levels and criteria for parts of local government planning schemes under the Integrated Planning Act.

The natural resource information gathered and analysed to develop a catchment plan may be usefully translated across to other planning and development assessment processes. An example would be the identification of viable property size for a given landscape type which could then be used as a measure of ecological sustainability when assessing proposed subdivisions.

The most practical way to ensure the adoption of natural resource initiatives in **planning schemes** is a regional and catchment approach involving the local governments. The appropriate measures could be determined at the catchment scale and incorporated in the planning schemes of the local governments in each catchment. For this to happen in practice, a regional local government natural resource management group needs to be formed or an existing local government forum expanded to encompass this role. While natural resource assessments would be carried out on a catchment basis the local government group would cover the wider region and interact with the range of natural resource groups from the catchment to regional level.

6.4 Unsustainable Land Management Practices

Unsustainable land management practices are often difficult to eradicate for a number of reasons including:

- Perceived property rights;
- The capacity for change of individuals and industries;
- Market forces and the pressures to produce;
- Lack of knowledge of appropriate practices; and
- Climatic impacts and physical constraints.

While unsustainable land management practices may be difficult to address the task is not insurmountable and may need to be preceded by attitudinal changes before solutions can be implemented. That is, the long term solution may require some short-term directional changes, which challenge the ideals and beliefs of some land managers.

Land use and management practices need to be based on land capability and sustainable production areas rather than pre-existing use and property size. In many cases the activity may be suited to the block but where a use is incompatible the fact needs to be recognised and options assessed to remedy the situation.

Where an activity is suited to an area but land management practices are unsustainable, the methods of management need to be assessed and modified to achieve the desired outcome ie. viable and sustainable production. A twofold approach to the adoption of best practice measures would involve the development of management guidelines relevant to the Haughton catchment for the major land use activities, with an accompanying extension component, and the development of Environmental Management Systems (EMS) for each agricultural activity, which incorporate best management practices.

The adoption of 'new' methods will only be successful if the social and economic factors are taken into consideration in conjunction with the environmental and production elements. Land management practice change is therefore more likely to work in distinct social and geographic areas where the participants feel a common bond with the other members of their group. While a program may be delivered through regional and catchment organisations the implementation groups are more likely to be based on sub catchment and industry lines. Prioritisation of action areas would be on a needs basis with criteria developed to ensure the best value was obtained from the available resource.

6.5 Unsustainable Water Management Practices

Unsustainable water management practices can be easily addressed at the catchment and regional level, primarily through the cooperative action of the regulatory agencies responsible for the development and maintenance of water infrastructure and the administration of water allocations. The key to the successful implementation of sustainable water management practices requires environmental accounting to be taken seriously in the overall cost benefit analysis of water supply schemes.

As with land management, attitudinal change may need to precede the implementation of solutions to water management issues. Options compatible with long-term sustainable use of water resources may require what are perceived to be radical changes to accepted practice. The biggest challenge to water managers may be the effort required to look at the situation from another perspective and view it with a degree of objectivity, which is outside their normal comfort zone. Facilitation of this process needs to be approached sensitively to reduce the potential for conflict that generally accompanies change, which is seen by some as threatening.

For any measures to be accepted and implemented they need to be backed up by sound science. Understanding the interaction/s between groundwater and surface water in the Haughton River catchment is vital to the development and adoption of any management measures for sustainable water use.

The economic implications of not acting also need to be understood as realistically the economic outcome is usually the most critical component in decision-making. While sustainable natural resource management and the economy are inextricably linked the difference in time scales between the two components can be mistaken for a separation of the interactions between the two. Short term economic gains are no compensation for long term degradation of natural resources and the cost of repairs to return that resource to a productive state, if in fact it can be repaired.

6.6 Vegetation clearing and degradation

Vegetation clearing is addressed to some extent through the Vegetation Management Act (VMA) however the condition of remnant vegetation is not. Degradation of vegetation, along with clearing, reduces habitat and biodiversity values and can lead to land and water degradation also.

Knowledge of the condition of vegetation in the catchment is a prerequisite for developing actions, which can be strategically applied. Revegetation can be an expensive exercise so the maximum value needs to be obtained from the available resources. This can't be achieved without a better understanding of the extent and condition of key habitat areas including riparian zones and vegetation linkages. Wetlands are another key habitat that needs to be assessed, as they are important for the maintenance of biodiversity in a region of unpredictable seasonal conditions.

Some areas have already been identified as critical to the maintenance of biodiversity values and these would form the basis for any protection and management actions. A long-term program of acquisition and management should be considered to conserve local and regional biodiversity values in the dry tropics region. The main component of such a program would probably consist of a range of voluntary management agreements along with strategic acquisition of key habitat areas and linkages. It would need to be implemented at a regional level with assessment criteria developed to ensure the protection of locally and regionally important habitat.

Other areas to focus attention on to address vegetation clearing and degradation include:

- Coordinated pest management planning on a catchment basis;
- Coordinated fire management on a sub catchment basis;
- Finalisation of the regional vegetation management plan;
- Vegetation management planning incorporated into property planning and/or environmental management systems; and
- Measures in local government planning schemes to fill any gaps in the VMA.

Appendix Q provides a list of projects, programs and research initiatives that are relevant to the Haughton catchment that may be used to achieve the various catchment strategies.

6.7 Potential Social And Economic Impacts

Social and economic impacts result when the natural resource base is degraded to an extent where production is affected in some form to the detriment of the catchment economy and surrounding areas. To understand the impacts of degraded natural resources the social and economic linkages need to be identified. As a starting point the productivity of the catchment needs to be determined. Table 6-1, Table 6-2 and Table 6-3 provide some basic statistical information used to calculate the value of agricultural production derived from the Haughton River catchment.

Table 6-1 Local Government Areas in Relation to the Haughton River Catchment

Local Government	Local Government Area Hectares	Catchment Hectares	% Of Catchment	% Of Local Government Area In Catchment
Burdekin Shire	504,200	49,000	22.5	9.72
Dalrymple Shire	6,836,200	79,000	36.3	1.16
Thuringowa City	186,600	26,000	12.0	13.93
Townsville City	187,100	63,381	29.2	33.88
Total	**7,714,100**	**217,381**	**100.0**	

Table 6-2 Production Figures for the Year Ending March 1999

Local Government. Area	Crops		Livestock disposals		Livestock products		Total	
	Sales $m	%	Sales $m	%	Sales $m	%	Sales $m	%
Burdekin Shire	$231.5	95.90	$9.1	19.87	$0.1	2.38	$240.7	82.60
Dalrymple Shire	$1	0.41	$33.6	73.36	$0		$34.6	11.87
Thuringowa City	$2.5	1.04	$2.2	4.80	$2.4	57.14	$7.1	2.44
Townsville City	$6.4	2.65	$0.9	1.97	$1.7	40.48	$9	3.09
Totals	**$241.4**		**$45.8**		**$4.2**		**$291.4**	

Notes: 1. Components may not add to totals due to rounding)
2. Source: ABS, Agriculture, Queensland (unpublished data) and ABS, Regional Population Growth, Australia (3218.0), regions based on Australian Standard Geographical Classification (ASGC) 2000

Table 6-3 Land Use Estimates for the Haughton River Catchment

Land Use (ha)	Burdekin Shire	Dalrymple Shire	Thuringowa City	Townsville City	Totals
Orchards	1,512.00			178	1,690
Small crops	192.7			1,049.70	1,242
Mixed farming	1,342.00				1,342
Cane	12,041.00				12,041
Animals	55.3			142.1	197.4
Cattle	23,401	70,000	20,000	27,921.90	141,323
National Park	7,856			16,561.60	24,418
Reserves	0.3			7.5	8
Public utilities	19			836.3	855
Extractive				497.7	498
Vacant land	1,303.00			6,330.00	7,633
Commercial	35			400	435
Residential	38				38
Rural residential	878			3,318.40	4,196.4
Industrial	6				6
Unidentified		(9,000)	(6,000)	5,900	5,900
Totals	**48,679.30**			**63,143**	**201,823**

Source: Digital cadastral data and land use provided by Burdekin Shire Council and Townsville City Council

As production figures are supplied by local government area or statistical region some assumptions have been made to estimate the value of agricultural production in the Haughton River catchment. See **Appendix R** for statistical division location and population figures.