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ASSESSMENT OF THE DIRECT AND INDIRECT RISKS FROM HUMAN INDUCED CLIMATE CHANGE TO KEY ECOSYSTEMS IN NORTHERN AUSTRALIA

Synopsis

A report prepared by Hyder Consulting for WWF-Australia

August 2007

This synopsis summarises information in the report *Assessment of the Direct and Indirect Risks from Human Induced Climate Change to Key Ecosystems in Northern Australia*. The report, currently being finalised, assesses climate change risks to key ecosystems of Northern Australia, and provides recommendations regarding mitigating those threats and building resilience to climate change.

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Excerpt from the Foreword

This is an important summary report… The focus in this report on northern Australia is appropriate in an era where climate change is now accepted as a reality, but is leading some to advocate greater exploitation of the Australian tropical environment. This attention on northern Australia is both an opportunity and a threat. Any move to further "develop" the north must be balanced by careful consideration of the natural balance of nature and how this may be disturbed by human actions…

Several key new results largely based in observations, suggest that the real world is moving along the upper end of the range of uncertainty in the IPCC projections that are the basis of this report. The so-called "sceptics" have called for action to be based on facts rather than theory. Well, what is really happening is at the high end of the theoretical range of uncertainty – things are in fact worse than what the IPCC thought most likely…[for example] carbon dioxide emissions are increasing at a rate as great as the most rapid considered by [the] IPCC…this means that readers of this report should look seriously at the worst possibilities suggested by the authors, as more extreme outcomes now look more likely. This is especially so in relation to sea-level rise, which threatens coastal wetlands and coral reefs with rates of rise that will be far more difficult to adapt to…

Dr Barrie Pittock, PSM

Books on climate change by Dr Pittock

Pittock, B., 2003. *Climate Change: An Australian Guide to the Science and Potential Impacts* (editor). Published by the Australian Greenhouse Office, Australian Government, Canberra, 2003.

Pittock, B., 2005. *Climate Change: Turning Up the Heat*. CSIRO Publishing, Canberra, 328pp.

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- Dr Stephen E Williams, Reader / QLD Smart State Senior Research Fellow Director - Centre for Tropical Biodiversity and Climate Change Research School of Marine and Tropical Biology James Cook University, Townsville.

Individuals from the following organisations have also provided suggestions and feedback for the report: CSIRO Sustainable Ecosystems, NT Department of Natural Resources Environment and the Arts, TRACK research consortium, The Wilderness Society and eriss Darwin.

1. Key Findings

The key findings from the report are shown below.

- **All ecosystems in Northern Australia are at risk from climate change**
  All of Northern Australia's globally significant ecosystems are threatened by climate change. Current climate change projection scenarios indicate that these ecosystems could face major degradation while dependent industries and communities could undergo significant dislocation and uncertainty. It is evident that adaptation may not be sufficient to compensate for the potential impacts posed by changing climate. A low-carbon future will be necessary to reduce risks associated with these impacts. Deep cuts to global greenhouse gas emissions are required to avoid the worst consequences of climate change predicted in this report.

  With an estimated 95% of the north's tropical savannas remaining uncleared, avoiding greenhouse gas emissions from land clearing and reducing wildfires are major opportunities to reduce global warming. Avoiding major land clearing of forests, woodlands and grasslands in Northern Australia presents one of the cheapest climate change mitigation options available to Australia.

- **Northern Australia's at-risk ecosystems must be conserved and sustainably managed to build resilience to climate change**
  Building the resilience of Northern Australia's ecosystems is essential as the ability of these ecosystems to adapt is constrained. Ecosystems with relatively intact native vegetation and river systems have greater resilience than landscapes where most vegetation has been modified, rivers dammed and over-utilised.

  The existing relatively intact condition of Northern Australia's savannas and river systems provides Australia with arguably its best opportunity to build ecological resilience to climate change across such a vast area in a cost effective and timely manner.

  A major program is needed to build resilience to climate change across the key ecosystems of Northern Australia to maximise their ability to adapt to climate change. This should involve a range of measures to maintain healthy ecosystems, and repair damaged ones. A climate change adaptation program for Northern Australia should include policies and actions to:

  - Support Traditional Owners and pastoralists who conserve ecosystems, such as through providing stewardship payments for delivering ecosystem services such as fire management;
  - Reduce landscape scale threats such as fire, weeds and invasive animals;
  - More strongly regulate pastoralism and supporting sustainable cattle grazing to reduce stock pressures on sensitive habitats and species;
  - Avoid land clearing to give wildlife the room to move across intact landscapes;
  - Establish protected areas, including Indigenous Protected Areas and covenants on pastoral lands, as buffers to climate change;
  - Keep waterways healthy by preventing dams on free-flowing rivers to allow fish and other aquatic life to move up and down rivers, and in to estuaries.

- **Ill-considered responses to climate change may pose threats to some ecosystems in Northern Australia which are potentially greater than impacts associated with climate change itself**
  Ill-conceived responses to climate change also pose significant risks to some ecosystems in Northern Australia as governments and industries rush to secure new water, land and

energy resources in the north. Largely driven by pressures and interests in southern Australia, these short term climate change responses could be significantly more damaging to some areas than direct effects of climate change in the long term. For example, growing water scarcity in the Murray-Darling Basin under worsening climate change may be used to justify major farm developments in Northern Australia, which may require major land clearing and new dams. The need for liquefied natural gas as a lower carbon alternative to coal risks driving pressure for developing LNG plants and pipelines on high conservation value islands and coastal areas in the Kimberley and Northern Territory.

2. Project Scope and objectives

This report was commissioned by WWF-Australia to assist it in better understanding direct and indirect risks posed by human induced climate change to key ecosystems in Northern Australia. The study area is defined as the areas of Queensland, Western Australia and the Northern Territory, north of the Tropic of Capricorn.

3. Location of key ecosystems assessed for climate change risk in Northern Australia

Six key ecosystems are assessed in the report as being at risk from climate change. These are:

1. Coastal low-lying wetlands
2. Coral reefs
3. Tropical rainforest
4. Tropical savannas
5. Tropical rivers
6. Small islands

The locations of these ecosystems are shown in Figure 1.

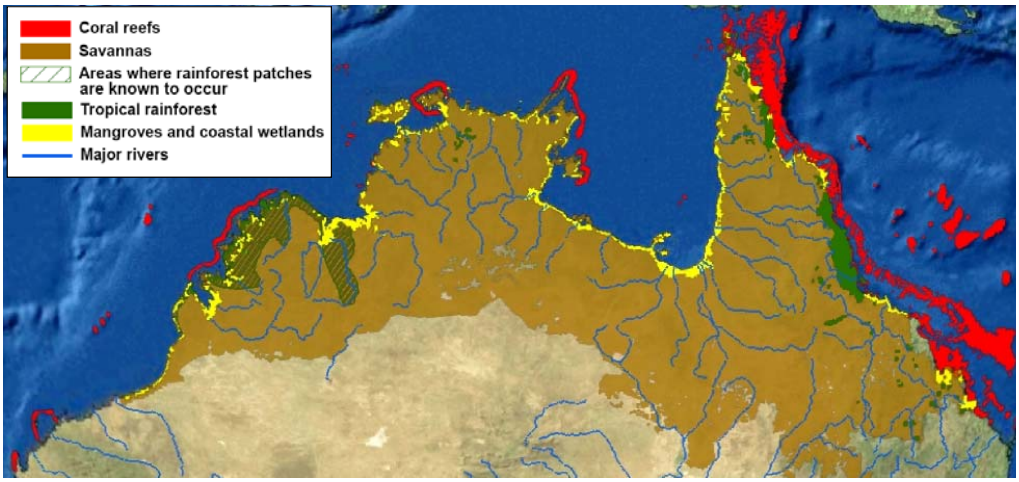

Figure 1. Location of Northern Australia and key ecosystems at medium or high risk from climate change.

4. Assessment of climate change risks to key ecosystems in Northern Australia

The key climate change impacts, such as rising sea levels or increased temperatures, and overall risks to the six key ecosystem types are shown in Table 1. Each of the six key ecosystems are assessed as being at medium to high levels of risk from climate change. Whilst climate change threats to well-known ecosystems such as the Great Barrier Reef or Kakadu's wetlands have been documented in the past, this assessment shows that in fact all major ecosystem types are at risk.

Table 1. Assessment of direct climate change risks to key ecosystems of Northern Australia.

Ecosystem	Key climate change impact	Risk
Coastal low-lying wetlands	More intense and frequent cyclones	Medium
	Sea level rise	Medium/High
Coral reefs	Increase in ocean surface temperature	High
	Increase in ocean acidity	High
	Sea level rise	Medium
	More intense and frequent cyclones	Medium
Tropical rainforest	Sea level rise	Medium
	More intense and frequent cyclones	Medium
	Increase in temperature and rainfall variability	High
	Altered fire regimes, such as potentially more intense fire events	Medium
Tropical savannas	Increase in atmospheric CO_2	Medium
	Altered fire regimes, such as potentially more intense fire events	Medium/High
	Increase in rainfall variability, drought frequency and duration	Medium
Tropical rivers	More extreme rainfall events	Medium
	Sea level rise	Medium
	Increase in temperature	Low
	More frequent and longer drought	Medium
Small islands	More intense and frequent cyclones	Medium
	Sea level rise	High

Coastal low-lying wetlands are particularly at risk from rising sea levels which will change them from freshwater wetlands to saline wetlands.

Coral reefs across the north, and not just the Great Barrier Reef, are at high risk from increasing ocean temperatures and more acidic seawater.

Rising temperatures and changes to fire patterns, such as changes to the timing of fires, or increased intensity, threaten tropical savannas and rainforests from Cairns to Broome.

Globally significant tropical rivers are threatened by longer droughts and more extreme rainfall events.

Rising sea levels threaten small islands in the Torres Strait.

5. Projections of Climate Change in Northern Australia

Increased temperature, decreased rainfall (except in the far north) and declines in moisture balance are expected throughout Queensland, the Northern Territory and Western Australia (see Table 2). Changes in fire regimes are also highly likely in the future. Fuel loads are expected to increase under increased plant growth associated with higher CO_2 levels.

Table 2. Summary of Temperature, Rainfall and Moisture balance predictions for Queensland, Northern Territory and northern Western Australia for 2030 and 2070. Note data apply broadly across Northern Australia. Climate predictions vary at local scales.

State/ Territory	Season	Average Predicted Changes					
		Temperature Change (^{O}C)		Rainfall change (%)		Moisture Balance decline (mm)	
		2030	2070	2030	2070	2030	2070
QLD	Annual	**0.2 - 3.0**	**0.8 - 6.0**	**-15 - +15**	**-35 - +35**	**N/A**	**N/A**
NT	Wet	**0.2 - 2.2**	**0.8 - 7.2**	**-16 - +8**	**-40 – +20**	**30 - 130**	**90 – 400**
	Dry			**-20 - +8**	**-20 - +60**	**20 - 100**	**70 – 320**
Northern WA	Annual	**0.4-1.8**	**N/A**	**-15 - +7.5**	**N/A**	**N/A**	**N/A**

6. Indirect risks of climate change to Northern Australia

To date Northern Australia has been largely spared from the destructive impacts associated with land clearing, intensive agriculture and dam building that have had significant impacts on the ecosystems of Southern Australia. However, as part of a societal response to climate change it is possible that resources in the north may be targeted for development. Indirect impacts from climate change on Northern Australia could include

- Expansion of broadacre farming and associated land clearing;
- Increasing cattle numbers and water use on pastoral properties;
- Large scale irrigation and increased water extraction from rivers and aquifers;
- Building new dams and weirs;
- Building pipelines to transport water to southern cities and farms;
- Developing new liquified natural gas plants and pipelines; and,
- Exploring and mining for uranium.

Societal responses to climate change may in fact be more damaging to some ecosystems in the short term than the direct impacts from climate change. Pressures to develop water, land and energy resources in the north are growing, largely in response to perceived or real needs arising in southern Australia.

For example, plans to develop Northern Australia as a ‘food bowl for Asia’, as water scarcity threatens Murray-Darling Basin farms, presents a major threat to tropical rivers and savannas. Similarly, proposals to provide more water for cities on water restrictions by piping water from the Burdekin River south to Brisbane, or from the Fitzroy River south to Perth, represent major threats to the health of these major tropical rivers and their estuaries.

In terms of pressure to secure additional energy resources, growing world demand for liquefied natural gas, a lower carbon fuel than coal, risks damaging fragile marine and coastal ecosystems off the Kimberley and Northern Territory coasts. Similarly, development of a major biofuels industry could drive major land clearing and water extraction.