Executive summary

1 Methods and techniques

This vulnerability assessment was undertaken using a cause and effect framework (see fig 1). The approach used recognised that climate change and sea level rise needed to be examined in the context of the natural variability of the processes affecting the coastal wetlands of the Alligator Rivers Region (ARR). Two sets of forcing factors have been identified, natural and human. These affect natural, cultural, social and economic systems and result in a range of governmental responses.

The vulnerability assessment was based on an assessment of past and current geomorphic changes in the coastal zone and predictions of likely further change. An ecological assessment was then superimposed. Information specific to the region was supplemented from studies carried out in adjacent catchments. The assessment provided views of change at a biophysical regional scale for Van Diemen Gulf, a series of regional catchments encompassing Kakadu National Park, and for the catchment of Magela Creek within the park as an example of a locality scale assessment.

2 Delineation of affected zones

All wetlands areas in the region below 4 m in elevation are assessed as being vulnerable to climate induced changes. The wetlands of the region have a well recognised conservation value and have been mapped. They were not separated into different types (eg mangroves, saltflats and freshwater floodplains), but were treated as interconnected habitats. The major rivers and creeks were identified from maps and remote imagery. Lowland monsoonal forests adjacent to the wetlands were also considered as vulnerable. The vulnerability of these habitats to climate change was not assessed in isolation of other impacts and/or threats that were changing, or could change, the ecological character of the wetlands.

3 Sources of information

The assessment was based largely on information held by the Environmental Research Institute of the Supervising Scientist (***eriss***). Other agencies conducting research and management within the Alligator Rivers Region, which includes Kakadu National Park, were able to supplement the ***eriss*** information. The descriptive information on the region is contained in databases, including GIS, publications and photographic records (aerial photography and satellite images).

Information on the environment of the region has been collected, stored and published by Commonwealth agencies, principally ***eriss*** and Parks Australia. (Parks Australia was formerly called the Australian National Parks and Wildlife Service, or ANPWS, and later the Australian Nature Conservation Agency, or ANCA). For the particular study site of Magela Creek, information was also available from mining companies. Additional information was made available from the Bureau of Meteorology, National Tidal Facility, Environmental Resource Information Network (ERIN) and AUSLIG. A large amount of information was available, but unless in published documents (not usually containing raw data) it was either not previously collated, or was difficult to access, even when in GIS format.

The development of a meta-database will resolve some of these difficulties. However, unless there is a major cooperative effort, the issue of sectoral custodianship and storage of data will not be resolved. An extension of the ***eriss*** meta-database to cover the inter- and intra-governmental data sets from the region could contribute to solving this information management problem.

4 Further information

For the long-term application of vulnerability assessment, more precise information on areas likely to be impacted is required. Delineation at a more detailed scale would be useful, but only if complemented with more accurate meteorological and hydrological information, including tidal records and water movements in the adjacent seas. Ecological information is mainly confined to studies limited in space and time which generally do not address the processes that impose fragility or resilience in the face of impacts. The absence of a time series of reference data hinders the vulnerability assessment. The ecological character of the region is partially described, but data upon which changes to this character can be identified are, at the best, cursory. The ecological character of the wetlands has undergone major change and is changing further, but the extent of change has not been widely determined.

There is a strong case for a national environmental reference station concentrating on time series broad scale biophysical monitoring of coastal change in the wet-dry tropics. With the information already collected and compiled by ***eriss***, a reference monitoring station could be established immediately in Van Diemen Gulf and the ARR.

5 Coordination mechanisms

The assessment was undertaken by a multi-disciplinary team established by ***eriss***. It was coordinated through a steering committee involving major environmental research groups and management agencies along with representatives of Aboriginal peoples. An inter-sectoral coordination mechanism was essential. Although ***eriss*** is not responsible for land management decisions (its prime function is environmental research, including the collection of environmental data), it was well placed to undertake an independent coordinating role for the Alligator Rivers Region study, in a broader biophysical regional context.

6 Consultations

The ***eriss*** team consulted widely across the region. A technical session and a public meeting were held in Darwin. Local community interests, particularly landholders adjacent to the park and representatives of Aboriginal peoples were involved. Given the nature of the land tenure in the park, the prime governmental agency involved was Parks Australia. Aboriginal people's views were presented by the Northern Land Council (NLC) and Parks Australia. Personal consultations were essential as there are few encompassing records of information available and with relatively large turnover of staff the collective loss of corporate knowledge is a hindrance to such studies. The ***eriss*** meta-database and other planned information systems can play a role in resolving the information management problem and enhancing the basis for recording material collected through the consultation and associated processes.

7 Application of Integrated Coastal Zone Management (ICZM)

The wetlands of the ARR (including Kakadu National Park) cannot be managed in isolation from those in the adjacent areas (pastoral leases under NT regulation and Aboriginal lands represented by local associations and the NLC). Environmental information from across the larger region is required in order to implement ICZM—the coastal zone and the catchments of the rivers that feed the wetlands do not follow the sectoral divides of the administrative structures. ICZM must also take into account other changes that are occurring or are expected to influence the wetlands and their catchments. The wetlands are already undergoing major ecological change and can be expected to change even further due to natural factors, recovery from the past impact of buffalo and weed infestations.

Long-term monitoring of key biophysical parameters in the wetlands and their catchments and adjacent seas are required in order to provide an adequate spatial and temporal database that itself must be contained within an effective information management system.

eriss is a component of the federal environment portfolio and could assume a lead role in designing and operating such a coastal monitoring program in an ICZM context. An intra-departmental effort will enhance the government's capacity to make decisions on coastal vulnerability and changing conservation values based on sound data.

8 Responses

The issues of hazard and risk, governance, strategic planning, acquisition and custodianship of information and further research and monitoring must be addressed. These will provide the basis of determining human perceptions and values that are seemingly critical in our management of conservation resources. Management needs to respond by assessing the significance of natural, cultural and socio-economic changes and placing these into a coastal zone and catchment context. Involvement of the entire community is essential. Management decisions need to be based on and verified by effective monitoring.

The processes of change have been at least partly explained in this study and they can be interpreted and accommodated. There appears to be no need for large scale intervention strategies, although vigilance is strongly recommended. There is a need to raise public awareness of the changes and the implications of the change process.

9 Policy implications

The wetlands within the region are part of a broader biophysical region and must be treated in this manner. Thus, responses to change, including sea level rise, must be addressed by policies at the catchment and coastal zone level and not in isolation of adjacent jurisdictions or communities. Local associations, and all spheres of government, should be encouraged to participate actively in the planning, implementation and appraisal of management activities. Management policies that can respond to change are required and should pro-actively address the major or prime change scenario.

Such ecological change has social implications for local and distant communities. International treaties that are generally implemented along sectoral lines need linking and integration into the management processes. The capabilities of all agencies and associations with a vested interest in the ARR need to be carefully assessed and utilised in developing policies for coastal management in the wet-dry tropics. As such, a focus on the Van Diemen Gulf and ARR provides a solid basis for developing policies that are applicable across similar biophysical regions in northern Australia.

10 The future

About half of Kakadu National Park is owned by the Aboriginal people, and all of the park is managed jointly by Aboriginal traditional owners and Parks Australia, through the Kakadu Board of Management. Thus, the Commonwealth Government plays a significant role in managing the Alligator Rivers Region. Hence, the prime responsibility for developing effective spatial and temporal monitoring, enhancing management at a biophysical regional level, ensuring effective information storage and exchange and responding to the needs of the local communities rests with the Commonwealth Government and local Aboriginal communities. At a regional level the challenge to all spheres of government will be to develop strategies to achieve a coherent multi-sectoral policy across wetlands that straddle a coastline under different jurisdictions.

Climate change must be addressed within the overall context of environmental change—information and management processes hold the key. ***eriss*** already conducts environmental research throughout the region and can provide a focal point for further inter- and intra-governmental environmental initiatives, such as establishing a natural environmental reference station for the long-term monitoring of environmental change.

eriss has extensive experience in designing research programs. The research unit is currently addressing complex wetland management issues. This research is not only based on, but is also leading current international thinking on wetland conservation. Given the likely major changes to the highly valued wetlands of Kakadu and surrounds, there is an opportunity to further develop this expertise and enhance our national conservation and coastal management capacity. Part of the capacity will entail integrating vulnerability assessment into the management processes for the coastal wetlands. ***eriss*** has the skills and expertise to assist other agencies with an interest in wetlands and the coastal zone to develop a biophysical monitoring program to overcome the serious gaps in information identified in this document.