

A resource for the best-laid plans

*He had bought a large map representing the sea,
Without the least vestige of land;
And the crew were much pleased when they
found it to be
A map they could all understand.*

– Lewis Carroll, *The Hunting of the Snark*

This happy verse has been adopted by a CSIRO team developing powerful computer packages to help regional planners manage the future development of Australia's coastal lands and waters.

They are creating maps of Australia's coast and coastal waters that detail geography, population, geology, vegetation, land use, drainage, climate and soils on the land; and the bathymetry, seismology, salinity, temperature, wave patterns, and seagrasses in the oceans. And that's only for starters!

Their ultimate aim is to see all maps – or spatial information systems as the more complex databases are now known – of Australia's coastal zone brought together into an integrated database. Following Carroll's philosophy, they then want to make this giant atlas available in a form that all the crews charting the future course of our coastal development can easily understand.

People have been mapping Australia as long as they've been here. The Aborigines made maps of the land through their Dreamtime, putting the information that governed their management of the environment into a story form that they could pass on to future generations.

Chinese, and later European mariners, charted the coastal regions of Australia to aid exploration, and in search of trade and possible settlement. But as the information age has exploded in the last few decades, the maps have grown in scope and complexity to levels undreamt of in previous eras.

Making this information accessible and useful is what the CSIRO's CAMRIS project is all about. CAMRIS (Coastal and Marine Resources Information System) is primarily a demonstration project. It aims to show that the various coastal and marine maps of Australia – be they topographic, geographic, oceanographic or treasure maps of Australia's mineral resources – can be made into an integrated database which planners can manipulate with analytical computer tools. This will enable the impacts of proposed policies to be assessed before they are implemented.

One of the driving forces behind CAMRIS is Dr Neil Hamilton of CSIRO's Division of Wildlife and Ecology. He says that the conservation versus development issue is probably more sharply focused in the coastal zone than elsewhere in Australia.

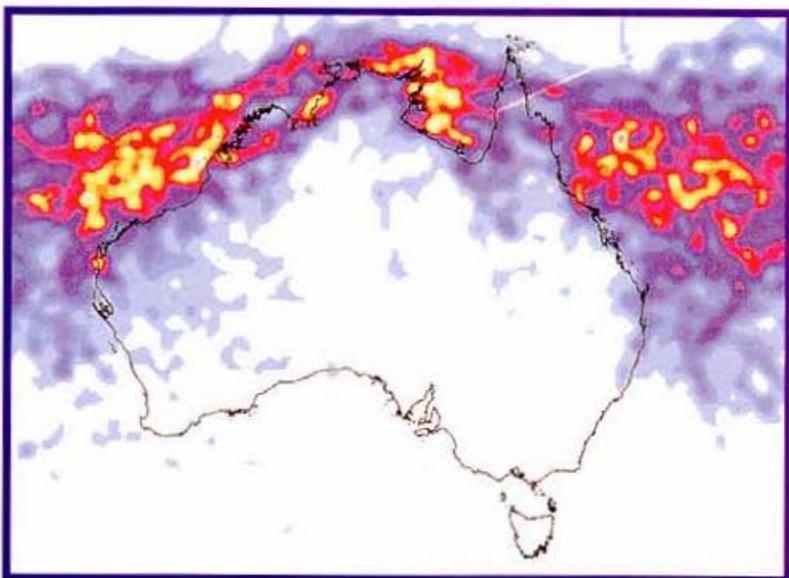
'The Australian love affair with the sun, the sand and the sea, the growing population and the even faster

growing domestic and international tourism industries, all place pressure on the coastal zone,' Hamilton says. 'We foresee the heavily-settled coastal arc from Cairns to Adelaide continuing to be the major setting for resource and environment conflict, competition and controversy.'

The scale of the resource and environmental management challenge is staggering. Australia is the world's largest island, has the longest ice-free coastline (about 30 000 kilometres) and the second largest 200 nautical mile zone (approx 8.9 million km²). Australia has the largest seagrass beds in the world and the largest number of seagrass species. It has major provinces of mangroves and coral ecosystems, including, of course, the world's largest coral reef, the Great Barrier Reef.

The different coastal regions vary enormously from the tropical north to the rugged south, facing the cold southern ocean. This coastal zone supports more than half of the nation's biodiversity, with the offshore fauna being the world's most biologically diverse. Surveys have revealed more than 3600 species of fish and tens of thousands of aquatic molluscs, many unique to the region.

Hamilton says that scientific understanding of this vast and varied natural resource is patchy at best. For example, current knowledge of distributions of most resources, particularly biological resources, can be



Information and maps generated by CAMRIS have been used to interpret extreme weather conditions. This image depicting cyclone hazard across northern Australia is based on six-hourly data provided by the Australian Bureau of Meteorology.

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fitted onto small scale maps. This provides planners with little more than an overview.

'Because it will be a long and expensive national endeavour to upgrade this knowledge, one objective of CAMRIS is to see just how much use can be made now of the limited technical knowledge to hand to help improve management of the coastal zones. This will also highlight where the most urgent future mapping and survey tasks lie,' Hamilton says.

The CSIRO scientists working on CAMRIS have worked closely with other organisations responsible for the collection, publication and use of maps of the coastal lands and water. Such collaborative effort has become the foundation for setting up a 'national coastal atlas'. These organisations include the Environmental Resource Information Network in the Department of Environment, the Bureau of Meteorology, the Australian Oceanographic Data Centre and the Australian Geological Survey Organisation.

The scientists have also collaborated with less likely partners such as the Surfriider Foundation, which in 1993 published its State of Our Surf report (see story on page 24). This was Australia's first survey of Australia's most popular beaches, showing everything from sewage outfalls to syringe concentrations. CAMRIS enables the results of the survey to be brought together with other databases, ranging from wave patterns to population distribution, and will eventually be linked to pollution studies.

To select projects that will demonstrate CAMRIS, the scientists began with a list of 20 significant maritime management issues identified by the Government's Ecologically Sustainable Development Working Groups on Coastal Issues. From these, four were selected for initial examination:

- selection of coastal and marine areas for protection;
- identification of possible 'hot spots' of marine pollution caused by land-based activities;
- planning for coastal population growth; and
- assessment of the impact of possible climate change in the coastal zone.

The four projects have identified maps and analytical software that are relevant to these issues. They have also collected additional data needed to form plausible models. This activity has already delivered usable results.

Techniques have been developed for dividing coastal and marine areas into conservation management units. Algorithms for selecting marine protected areas (MPAs) are being tested now, to help develop a comprehensive set of marine reserves around the country, similar to the national parks on land.

The pollution 'hot spots' study has been used by the New South Wales Environment Protection Authority to assist in its State of the Environment reporting process. The information will form the core of new studies into the effects of human activities on the environment. Demographic change statistics for the past 20 years, socioeconomic data, and models of human-environment interaction are also being used in this work.

CAMRIS has already been applied to the maps of Australia's coastal soils by Dr Greg Bowman, one of the scientists working in the Coastal Zone Program, to assist in identifying

acid sulfate soil problems. Acid sulfate soils, when disturbed for building or other earthworks, release sulfuric acid into drainage basins that can cause serious harm to plant and animal life in estuaries, mangroves and wetlands. (See story opposite.)

The project has also developed a system that will give users access to a comprehensive database of literature references on coastal issues, which can be searched by either keyword or by physical location. This database, containing up to 12 000 references, will be released in mid-1995 and is being keenly awaited by local councils.

Hamilton sees the potential use of CAMRIS in analysing whole systems, rather than single-issue problems. Population growth, for instance, can't be seen in isolation from impacts on biodiversity, recreation needs, community amenities, fishing stocks and so on. By integrating available databases, helping co-ordinate future data collection and providing powerful analytical computer tools, CAMRIS may be able to flag, if not predict, areas and activities – on a continental scale – that could cause problems in the future.

Hamilton stresses, however, that neither the demonstration projects nor even the comprehensive national information system, actually make policy recommendations. That, he says, is still the realm of the political process.

'CAMRIS, or a more developed version of it, will be an aid to policy makers and to community groups in understanding the impacts of different policy options. It can remove some of the conflict between proponents of conservation and proponents of development by giving them an agreed basis for discussion, but it cannot reconcile the sometimes conflicting values of different groups in the community.'

'These are aids to decision making,' he says, 'not alternatives to them.'

Great Barrier Reef Marine Park Authority

