



NCCARF

National
Climate Change Adaptation
Research Facility

Adaptation Research Network
MARINE BIODIVERSITY AND RESOURCES

marine adaptation bulletin

volume two, issue one | autumn 2010



IN THIS ISSUE

Featured Theme: Integration	2
Marine Adaptation Network in 2009	2
First National Marine Climate Change Adaptation Summer School	3
Tackling Coastal Climate Change in Northern Australia	4
International Year of Biodiversity	5
International Perspective: Pacific Island Countries	6
The Australian Tropical Oceans Simulator (ATOS)	7
Marine NARP funding call	8

Convenor's Spot



Welcome to the first issue of the Marine Adaptation Bulletin (MAB) for 2010. MAB takes on a new look in 2010 - we hope you like it.

challenges that confront Australia's northern coastal communities under climate change. Dr Tony Weir provides insight into Pacific island developing countries under climate change. Dr Peter Doherty reports on the Australian Tropical Oceans Simulator (ATOS) hosted at the Australian Institute of Marine Science (AIMS). This issue also features the Network Integration Theme and reflects on some of the highlighted Marine Network activities undertaken in 2009.

The National Climate Change Adaptation Research Plan (NARP) for Marine Biodiversity and Resources was released on 26 March 2010 by Senator the Hon Penny Wong. Expressions of Interest in undertaking funded research in response to the NARP priority questions are due on 7 May 2010. Together with representatives from the Fisheries Research and Development Corporation (FRDC), the Network gave a series of information sessions in major cities around the country regarding the NARP release and the funding call. Details are provided on page 8 of this Bulletin.

Neil Holbrook.

2010 is the International Year of Biodiversity – as declared by the United Nations. The preservation of marine biodiversity in the face of a changing climate will be critical to maintaining the health of Planet Earth. Given the significance of the International Year, against an ongoing background of climate change affecting the marine environment, the Adaptation Research Network for Marine Biodiversity and Resources would like to take this opportunity to urge marine managers and policy-makers to avoid delays in considering and working to develop climate change adaptation strategies in planning processes, to help protect marine biodiversity.

In this issue, Prof Karen Edyvane discusses the strong relationship between Indigenous Australians and the marine environment across Northern Australia, including the

At a glance

The Adaptation Research Network for Marine Biodiversity and Resources will foster an inclusive, collaborative and interdisciplinary research environment that generates outputs relevant for policy-makers and managers to develop appropriate climate change adaptation responses.

FUNDING

\$1.6m direct funding

\$1.9m cash and in-kind partner contributions

INVESTMENT

Australian Government Department of Climate Change through the National Climate Change Adaptation Research Facility (NCCARF) hosted by Griffith University

FRAMEWORK

Five interconnecting themes (integration, biodiversity & resources, communities, markets, policy)

HOST INSTITUTION

University of Tasmania

CONVENOR

Associate Professor Neil Holbrook

TIMEFRAME

2009-2012

How to contribute

If you would like to contribute an article to the Marine Adaptation Bulletin please write to arnmbr@arnmbr.org or call 03 6226 2134.

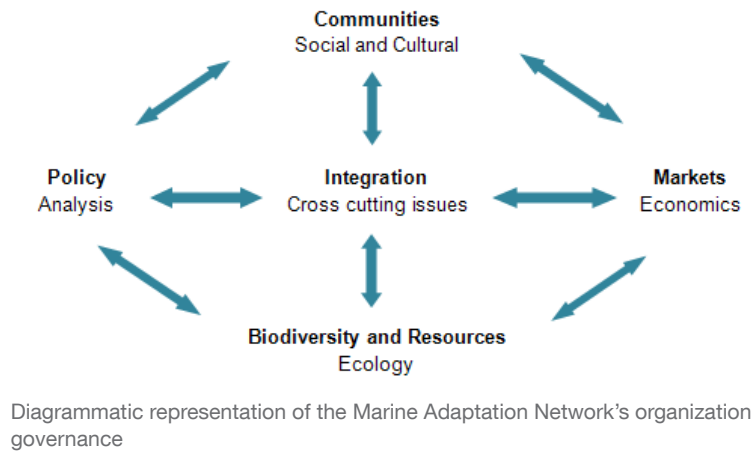
Featured Theme: Integration

Dr Julie Davidson and Assoc Prof Neil Holbrook

Australia's marine environment is likely to experience significant impacts as a result of climate changes. In turn this will mean major changes for the communities that rely on the ocean and coastal estuaries for their livelihoods. Commercial and recreational fisheries, aquaculture, and tourism are major contributors to the economies of many communities. How such industries are managed has important implications for how marine ecosystems are able to cope with and adapt to change, and therefore maintain their ability to provide goods and services to communities. The problem with climate change is that the climate system and its associated feedbacks are so complex that even small changes can initiate large and unpredictable effects. Under conditions of unpredictable change, socio-economic systems and ecosystems will need to be resilient. This means that they will not only need to be able to cope with and recover from shocks such as cyclones or sea temperature warming events, but they will also need to be able to adapt and even transform if necessary. Transformation could involve, for example, a fishing community (a

social-ecological system), switching its livelihood from a reliance on a particular fishery to a greater focus on tourism.

policy and decision-makers can develop appropriate climate change adaptation strategies to build adaptive capacity.



The concept of 'resilience' is being used more and more to inform the management of complex social-ecological systems. With the guidance of the Integration Theme, the Marine Adaptation Network is utilising this concept to integrate across its theme areas – biodiversity and resources, communities, markets and policy - and to foster interdisciplinarity among biophysical and social sciences. The organisational structure of the network with its five cross-cutting themes encourages interdisciplinary collaborative research, data-sharing, communication and education, and the synthesis and advancement of climate change adaptation knowledge so that

One example of collaborative, interdisciplinary activity informed by the resilience assessment paradigm involves a series of working papers led by individual theme groups with contributions from each of the other network identified themes. The main aims of these case-study based outputs and outcomes are to understand marine social-ecological system dynamics, to identify the potential for unexpected change and, in using these understandings, to generate strategies for enhanced resilience of the marine system. This approach will ensure the effective synthesis of both quantitative and qualitative data, and the integration of cross-cutting research activities, issues and feedbacks between the themes. Finally, resilience thinking also informs the network's other activities including national workshops, where the aim is to engage a diverse range of operators, practitioners, policy-makers and researchers in building adaptive capacity and identifying knowledge gaps.

Marine Adaptation Network in 2009



A primary aim of the Marine Adaptation Network during its establishment year in 2009 was to set up mechanisms for promoting and facilitating information exchange between Network members. This included the design and

Adaptation Bulletin - and three information sheets: (1) Species responses to climate change, (2) Ecosystem responses to climate change in the ocean, and (3) Climate Change impacts on Tasmania's marine life.

Among the other Network activities and achievements were the development of research protocols for social participatory research projects relevant to marine biodiversity and resources, which are now available on the Network website, and the planning and initial drafting of a series of integrated synthesis papers across the five network themes on marine social-ecological resilience. The papers, which will be completed in 2010, will examine the current condition and potential for change of several case studies within the marine social-ecological system. The network Policy theme is examining and mapping science-policy connections in response to climate

development of a comprehensive, functional and attractive website (including a password-protected discussion facility), publication of four network newsletters – the quarterly Marine

change across three marine sectors, focusing in 2009 first on the edible oyster industry where they have recently undertaken a series of interviews with researchers, stakeholders and policy makers regarding this industry. Principles and guidelines for assessing and reducing vulnerability to climate change have

also been developed and drafted through a full-day network-partner workshop held at the University of Tasmania on 28 October 2009. Below we report on the First National Marine Climate Change Adaptation Summer School, another important activity in the first year of the Marine Network lifetime.

First National Marine Climate Change Adaptation Summer School

As part of the network mission to build adaptive and research capacity, and to educate the future generation of marine climate change adaptation researchers, the Marine Adaptation Network designed, developed and held the First National Marine Climate Change Adaptation Summer School in Hobart on 4 December 2009. This intensive one-day Summer School focused on educating Honours, postgraduate students and Early Career Researchers about approaches to building resilience in the marine social-ecological system. The School included an afternoon workshop designed to build practical skills in vulnerability assessment with a view to developing adaptation strategies to climate change.

The Summer School was held in two sections: (1) a morning lectures session presented by seven leading researchers with expertise in climate change, variability and risk, marine biology, physical oceanography, policy, economics and social science, and (2) the afternoon mentored-workshop session



Students and some speakers at the First National Marine Climate Change Adaptation Summer School, 4 December 2009. Photograph by Christine Materia

The Summer School was ... “Very well organised with excellent presentations. The speakers made difficult topics accessible and interesting. The whole day was very valuable!”

where students were encouraged to explore the prospect of undertaking a vulnerability assessment on their own case study. The one day event was attended by 29 participants from around Australia, with every state represented.

All participants were enthusiastic about the summer school, and

were keen to continue to build connections with other participants. The Marine Adaptation Network is facilitating these connections through the Network Members’ page and a specifically designed “Summer School Alumni Forum” where the participants can continue to discuss climate change adaptation issues and their own issues surrounding their adaptation work or study.

Feedback from participants was extremely positive as evidenced by the overall results from completed evaluation sheets. Results from a series of 13 questions using the Likert scale showed that participants were overall very happy with the organisation, course structure and content, and presentation of lectures (all scores ranged between 4.12 and 4.92 out of a possible maximum positive response of 5). Many positive comments were received from students, e.g. “Very well organised with excellent presentations. The speakers made difficult topics accessible and interesting. The whole day was very valuable!”



Students participating in workshop section of Summer School, 4 December 2009. Photograph by Clare Brooker

Tackling Coastal Climate Change in Northern Australia

Prof Karen Edyvane, Northern Territory Government & Charles Darwin University

The waters and sparsely populated coastal regions of Northern Australia are globally significant and include: some of Australia's largest, pristine catchments, tidal estuaries and coastal wetlands; intact, free-flowing networks of tropical rivers; largest area of mangroves nationally (and among the highest diversity); and also, the largest remaining relatively intact tropical coastal savanna in the world. The intact coastal-marine biodiversity of Northern Australia is also of major cultural, social and economic significance for Aboriginal people, who inhabit much of the remote regions of Northern Australia. Aboriginal Territorians own ~85% of the coastline, including intertidal lands and waters to the low water mark, under inalienable Aboriginal freehold tenure granted under the Aboriginal Land Rights Act (NT) 1976. Aboriginal people still make significant use of subsistence resources in many marine and coastal areas and have binding cultural relationships with particular places, flora and fauna and natural phenomena in the sea. This fundamental cultural association with 'sea country' places underpins Aboriginal aspirations for greater involvement in management and pursuit of legal rights in the sea.

While the coasts of Northern Australia currently represent some of Australia's most remote and sparsely populated shores - it is also a region experiencing unprecedented economic development and coastal development pressures, particularly increases in mining and mineral extraction, offshore oil and gas exploration activities, shipping, and pressures to expand agricultural production, water harvesting and transfer schemes. Significantly, the impacts of these enormous coastal development

pressures will be compounded by global climate changes, such as altered rainfall regimes, rapid ocean warming, increased cyclonic activity (and storm surges), changing ocean chemistry and rising sea levels.



Migratory shorebirds (Great and Red Knots), Buffalo Creek, Northern Territory (Photo: Brian Thistleton). Northern Australia remains a major, and importantly an increasing, refuge for migratory and non-migratory shorebirds, seabirds and waterbird populations (with the NT recording c. 50% of the national total). These populations are under major threat from climate change impacts on coastal habitats.

Northern Australia's low profile coasts, shallow continental shelves and macro-tidal conditions make low-lying, intertidal coastal environments (i.e., mangrove, lagoons, floodplains and other wetlands) highly vulnerable to the impacts of climate change, especially increased saltwater intrusion, coastal inundation and storm surges (through the interactive effects of rise in sea levels and cyclonic intensity). Wetland ecosystems depend

4 million ha of predominantly freshwater wetlands are at risk from rising sea levels and storms surges

on a finely balanced interaction between freshwater and marine environments. The low relief of these areas means that even small rises in sea level could result in relatively large areas being affected by salt water intrusion, at the expense of present-day freshwater wetlands. In addition, extensive seasonally-inundated freshwater swamps and floodplains can often extend for approximately 100km

along rivers. Of the approximately 7.5 million ha of coastal low-lying wetlands of national importance in Northern Australia (between Rockhampton and Exmouth), an estimated 4 million ha of predominantly freshwater wetlands are at risk from rising sea levels and storm surges (Hyder Consulting 2007). In the World Heritage-listed wetlands of Kakadu National Park, the natural levees that act as a barrier between freshwater and saltwater systems are, in certain areas, only 20cm high. Similarly, much of the southern shores of the Gulf of Carpentaria are at elevations below 5 metres, and are particularly at risk from rising sea level and storm events, including tropical cyclone-induced, storm tide inundation.

Aboriginal people in remote coastal communities are likely to be particularly vulnerable to sea level rise and changes in climatic forcing of extreme events. These communities include several of the Torres Strait islands, the Australian territory of Cocos (Keeling) Islands, and also several Aboriginal coastal communities across Northern Australia. Potential significant impacts include affects on local food supply and cultural practices and activities (as traditional hunting grounds, sacred sites and cultural sites are submerged). The IPCC Fourth Assessment Report highlights the sharp regional differences in impacts and vulnerabilities to climate change – with those being in the weakest economic position often having the least adaptive capacity, and the most vulnerability to climate change.

Improved coastal and ocean observations, and understanding of climate variability and coastal climate change, is essential to support rapidly increasing (and sustainable) development in Northern Australia. However,

Australia's northern waters remain among the most poorly understood and observed regions in Australia. Improved regional oceanographic observations (particularly in Australia's tropics) are critical to underpin mitigation and adaptation strategies, and also extreme event prediction through improved coupled modelling systems. Understanding natural decadal variability and improving poorly modelled ocean processes will play a key role in model validation and resolving this uncertainty. For Australia's northern waters, critical ocean observational priorities include: (i) improved understanding of the major physical and biological oceanographic processes, circulation, dynamics and behaviour of the Arafura Sea region to enable linking of deep-ocean forecasting models (i.e., BlueLink) to finer-scale near-shore models; (ii) improved understanding and prediction of the Leeuwin Current (particularly the links between large-scale, offshore remotely driven variability and the inter-annual behaviour and response of the shelf/slope boundary current system); and (iii) improved understanding of the Arafura Sea – Gulf of Carpentaria region (boundary currents, inter-basin flows) in the generation of the Leeuwin Current and its seasonal cycle. Developing a coastal and ocean observational capability for Northern Australia will be essential in understanding and predicting climate variability and extreme event

projections – and also for understanding biological climate responses and feedbacks.

On 18 December 2009, the Northern Territory Government launched the \$34 million Northern Territory Climate Change Policy (see: <http://www.greeningnt.nt.gov.au/climate/docs/Climate_Change_Policy.pdf>) - a comprehensive action plan to combat climate change.

Northern Australia faces major challenges with limited scientific resources and capabilities

Under this policy, by 2011 the Northern Territory will develop a Territory Climate Change Adaptation Action Plan (Target 35). This will include undertaking risk assessments, and progressing a collaborative, North Australian Climate Science Initiative to support climate change adaptation planning and implementation across the Northern Territory and Northern Australia.

As one of the most remote and sparsely populated parts of Australia – Northern Australia faces major challenges with limited scientific resources and capabilities. As such, understanding the impacts of coastal and marine climate change and developing adaptation strategies will require national research efforts and effective cross-jurisdictional

collaboration and cooperation. This collaborative approach needs to recognise the rights and aspirations of Aboriginal coastal custodians and ensure their effective participation in developing adaptation strategies. Under the Caring for Sea Country Program (Northern Land Council) and the Australian Government's, 'Working on Country Program', there are now more than 30 Aboriginal community-based Land and Sea management agencies and ranger programs with 'sea country' management capacity in the Northern Territory. These ranger programs undertake a range of marine management activities, from marine surveillance to pest, debris, habitat and wildlife monitoring. Ongoing investment, training and partnerships in Aboriginal 'sea country' management through low-cost, 'in-situ' climate and ocean monitoring and observation programs in remote areas, provide a unique opportunity to support and develop coastal climate change monitoring and observation capability in some of the most remote regions of Australia – and help protect some of Australia's most significant coastal-marine ecosystems and cultural landscapes.

Hyder Consulting. (2007). Assessment of the Direct and Indirect Risks from Human Induced Climate Change to Key Ecosystems in Northern Australia. A report prepared for WWF-Australia, Sydney.

International Year of Biodiversity



'Biodiversity is Life. Biodiversity is our Life.' is the slogan of the 2010 International Year of Biodiversity. The purpose of this United Nations initiative is to increase worldwide awareness of biodiversity, to emphasise the significance of biodiversity and to engage more people in the conservation of a bio-diverse planet. The preservation of marine and coastal biodiversity is of critical concern, particularly in light of global warming trends and predictions. As reported by the Convention on

Biological Diversity (<<http://www.cbd.int/doc/bioday/2009/banners/cbd-ibd-banners-5-en.pdf>>) it is feared that up to 95% of Australia's Great Barrier Reef will be lost by 2050 due to the dramatic increases in sea surface temperatures and changes to water chemistry that have been observed and predicted for our future. This is a dark omen for marine wildlife, given that worldwide coral reefs contain 25% of all marine species. The International Day of Biological Diversity is celebrated on 22 May. For information on 2010 International events that celebrate and help to protect biodiversity, visit <<http://www.cbd.int/2010/welcome/>>. Australia will be hosting four events, one each in Sydney, Perth, Kangaroo Island and Kununurra, Western Australia. 2010, as the International Year of Biodiversity, provides a timely reminder of the significance of biological diversity.

International Perspective: Pacific Island Countries

Dr Tony Weir, Director of the Pacific Centre for Environment and Sustainable Development (PACE-SD) at the University of the South Pacific, and Cherie Morris write about Fiji's bid to help conservation of inshore marine resources.

The University of the South Pacific (USP) is the premier tertiary teaching and research institution in the South Pacific region. It is a regional institution, whose members are 12 Pacific Island countries – essentially all those east of Papua New Guinea which are not French Territories. Thus the USP region encompasses a vast spread of tropical ocean but very little land area. USP has a main campus in Fiji and a full campus and/or a staffed teaching centre in all the other member countries.

Given this environment, marine studies and marine science have been among USP's special areas of interest from its foundation over 40 years ago. In 2009 there were over 200 undergraduates and 10 postgraduates studying marine science at USP. Particular foci include fisheries – both coastal and pelagic (especially tuna) – and coral reefs. USP is a member of various consortia monitoring changes in reefs, especially due to human factors, El Niño and climate change. The good news is that reefs in the Pacific Islands, unlike many in the Caribbean, seem to have recovered quite well from the bleaching associated with the El Niño of 2000/01.

In the last decade, USP has been at the forefront of a new approach used in the Indo-Pacific region, particularly in Fiji, to help conserve inshore marine resources. Participatory methods have been used to help communities design simple action plans to meet their prioritised threats to marine biodiversity important to them. The key element of the work is that the communities are in control. Information is provided by co-managers to help make decisions, but the community members make all of the decisions, such as the location of protected areas. They are assisted to monitor changes and regularly analyse and discuss these results. Thus the goal of informed decision making on resource management is as important as

the actual resource improvement. This approach to marine conservation, which has become a growing trend throughout the Pacific, blends the application of modern scientific techniques with traditional conservation practices, in what has recently come to be called



© Leone Limalevu

“locally-managed marine areas” (LMMAs). It is envisaged that healthier reefs may contribute to higher resilience and resistance to climate change threats.

Small island developing countries (which includes all USP members) have been identified both by IPCC and by the Climate Change Convention as among the most vulnerable areas to climate change. Indeed for the low-lying atoll countries such as Kiribati and Tuvalu in particular, the associated sea level rise is a threat to their very survival. Even for those island countries which rise more than 4 metres above mean sea level, virtually all their settlements and infrastructure are along the coast. Adaptation to climate change is thus a high priority for all countries in the region.

As Coordinator of the South West Pacific Node of the Global Coral Reef Monitoring Network, USP has been involved in determining sea surface temperature trends at several monitoring sites around Fiji and the region. These trends are then used to detect abnormally high temperatures:

specifically those which reach the bleaching threshold, thus identifying bleaching hotspots.

Already USP has facilitated nine community adaptation projects in rural Fiji, focused on appropriate and sustainable technologies for communities which have problems either with water supply or with coastal erosion – problems expected to worsen under climate change. These projects have used a community-centred approach based on that of the LMMAs and have produced noticeably positive outcomes over three years, and are yielding good lessons for future projects. (See photo).

From 2010, USP will offer a postgraduate diploma in climate change, and offer a wider range of formal and informal courses in climate change. Many of these courses will be offered through USP Centres around the Pacific region. Graduates will also be able to undertake research in climate change for a Masters or PhD degree.

“This will help build the pool of people with skills needed to address this major challenge to the development and sustainability of the Pacific Islands,” said the Vice-Chancellor Professor Rajesh Chandra. “The University is most grateful to AusAID, who are providing A\$1.6million to USP as part of the Australian Government's International Climate Change Adaptation Initiative. These funds will not only be used for scholarships, but also to develop new courses and to hire some extra staff to support the courses and the associated research.”

USP can always use more people to help us to help the island peoples to deal with these vital issues. Offers of collaboration, by way of academic visits, technical facilities, or student exchange are welcome.

The Australian Tropical Oceans Simulator (ATOS)

Dr Peter Doherty, Research Director of the Australian Institute of Marine Science, reports on an exciting new facility being developed for experimental research.

The Australian Institute of Marine Science (AIMS) is Australia's tropical marine research agency (www.aims.gov.au) with a mission to deliver strategic science to support the sustainable development, conservation, and management of marine resources and marine environments. The Institute operates across all of northern Australia from bases in Townsville, Darwin, and Perth supported by two modern research vessels: R.V. Cape Ferguson and R.V. Solander.

The Australian Government 2009-10 budget increased Commonwealth spending on science and innovation by 25%, including the \$1.1 billion Super Science Initiative which delivered an additional \$388 million for marine and climate science (<http://minister.innovation.gov.au/carr/pages/supersciencemarineandclimate.aspx>). This package included welcome replacement of the Marine National Facility vessel, extension and enhancement of Australia's Integrated Marine Observing System, and \$55 million to enhance AIMS infrastructure to support tropical marine research.

The jewel in the crown of the Tropical Marine Research Facilities Project will be the construction of the Australian Tropical Oceans Simulator (ATOS) on the AIMS site at Cape Ferguson in North Queensland - adjacent to the middle of the Great Barrier Reef.

ATOS will be a large, state-of-the-art seawater facility capable of supporting a wide range of experimental research into our changing seas.

ATOS will be an integrated extension to the current seawater precinct at AIMS, which currently includes an aquaculture facility for the domestication of tropical crustaceans, a quarantine facility with an attached PC2 (Physical Contaminant Level 2) laboratory for work with hazardous microbes, and a range of holding tanks and aquaria for biological experiments.

The addition of ATOS to the precinct will require a tripling of current daily capacity to pump seawater from intakes located 500m off Turtle Beach, which is the seaward boundary of the Institute's 200 hectare site in a Queensland national park. The volume of water held onshore in covered storage reservoirs will be increased to several megalitres. Controlling the flow rates in

these ponds will allow for differential aging and sedimentation of the incoming supply.

ATOS will be based on a flexible design. Current planning is for a large footprint of climate-controlled space with a mixture of natural and artificial lighting as well as easy access to outdoor tank systems (covered and uncovered). The internal air conditioned space will include multiple rooms with independent atmosphere control suitable for highly-

replicated experiments as well as open areas allowing operations in larger mesocosms and flumes. Regardless of tank size, ATOS plumbing will allow researchers to have choice over vital water quality parameters including temperature, salinity, suspended solids, and

pH. Different water streams, based on these variables, will be delivered to each experimental room maintained with its own atmosphere.

The flexible design of the Australian Tropical Oceans Simulator is purposeful despite the increased engineering challenges. The multiple pressures already evident in coastal water quality (excess nutrients, multiple contaminants) plus the rapid pace of global change affecting the base state of our oceans (temperature, acidification) means that the need to understand the synergies among stressors is urgent. This will require

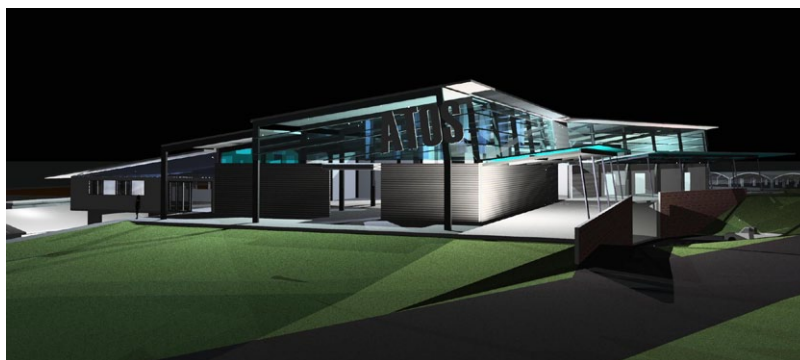
numerous multifactorial experiments performed with a diverse range of organisms.

Most importantly, the accelerating pressures on our coastal seas require a rapid and innovative response that is more likely to come from a broad intellectual community. The Australian Tropical Oceans Simulator will

be another example of infrastructure operated by AIMS that is designed to serve the national interest. The Institute is a highly collaborative organisation and invites expressions of interest from anyone with an interest in using this new facility, which is expected to be commissioned in 2012-13. Early responders will have an opportunity to contribute to final design of the Facility and/or to register for a periodic update on progress as this exciting project is brought on stream.

Enquiries: Peter Doherty, AIMS Research Director, p.doherty@aims.gov.au

The Australian Tropical Oceans Simulator will be another example of infrastructure operated by AIMS that is designed to serve the national interest.



Draft artist's impression of the ATOS building to be built at Cape Ferguson in North Queensland

Marine NARP funding call

The National Climate Change Adaptation Research Plan for Marine Biodiversity and Resources (aka the Marine NARP) was released on 26 March 2010 by Senator the Hon Penny Wong, Australian Government Minister for Climate Change, Energy Efficiency and Water.

The Research Plan identifies research priorities in five main areas. These are marine aquaculture, commercial and recreational fishing, conservation management, tourism and recreational uses, and cross-cutting issues.



Photo courtesy of Commonwealth of Australia (GBRMPA).

The Australian Government also announced \$5.5 million funding for priority research to help marine managers and stakeholders adapt to the likely impacts of climate change.

The Marine Adaptation Network initiated and, alongside the Fisheries Research and Development Corporation (FRDC), ran eight information sessions around Australia. The aim of these sessions was to inform researchers and stakeholders about the aims of the funding call, and to advise about the selection criteria and the application process for Expressions of Interest.

More than 100 researchers and stakeholders attended the information sessions around Australia. As climate change is a highly complex challenge and requires interdisciplinary and multidisciplinary research approaches, the focus of the information sessions was to encourage collaborative national bids between marine researchers and stakeholders, and building consortia.

To download a copy of the Marine NARP visit: <<http://www.nccarf.edu.au/national-adaptation-research-plan-marine-biodiversity-resources>>



NCCARF

National
Climate Change Adaptation
Research Facility

Adaptation Research Network
MARINE BIODIVERSITY AND RESOURCES

Contact us

Adaptation Research Network for
Marine Biodiversity & Resources
School of Geography and Environmental Studies
University of Tasmania, Private Bag 76
Hobart, TAS 7001 Australia
Phone: 03 6226 2134
Fax: 03 6226 7628
E-mail: arnmbr@arnmbr.org
Website: <http://www.nccarf.edu.au/marine/>

THEMES

Integration

Associate Professor Neil Holbrook
Neil.Holbrook@utas.edu.au

Biodiversity & Resources

Dr Alistair Hobday
Alistair.Hobday@csiro.au

Communities

Professor Tim Smith
Tim.Smith@usc.edu.au

Markets

Professor Quentin Grafton
Quentin.Grafton@anu.edu.au

Policy

Associate Professor Marcus Haward
Marcus.Haward@utas.edu.au

If you would like to submit an article to the MAB, please send correspondence to arnmbr@arnmbr.org

This issue of the Marine Adaptation Bulletin has been compiled by Clare Brooker.

MAB Editors: Neil Holbrook and Clare Brooker

Marine Adaptation Network Partners:



The Adaptation Research Network for Marine Biodiversity & Resources is an initiative of the Australian Government Department of Climate Change being conducted as part of the National Climate Change Adaptation Research Facility <http://www.nccarf.edu.au>