



# Implementation Plan for Climate Change Adaptation Research: Marine Biodiversity and Resources

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## **1. Purpose of Implementation Plan**

This Implementation Plan sets out a national program for research investment to address the priorities identified in the *National Climate Change Adaptation Research Plan: Marine Biodiversity and Resources* (the adaptation research plan).

The focus is on (1) delivering research and the adoption of research outputs to address the objectives of the research plan, (2) facilitating collaborative arrangements, (3) maximising resources for priority research, and (4) optimising the timing of research investments.

Additional opportunities for research investment are likely to arise in this area over the next few years. Hence, the Implementation Plan is not a static document - it will be updated periodically to ensure that new opportunities are developed and harnessed.

## **2. Basis for Research Collaboration**

The NCCARF appointed a team of experts chaired by Dr Bruce Mapstone to develop the adaptation research plan – in consultation with key researchers and stakeholders, including a period of public review.

Climate change affects marine systems physically, chemically, and biologically, with far reaching consequences for marine biodiversity, resource management, and the users of the resource. The

adaptation research plan identifies the research required over the next 5-7 years to inform policy development and help managers of coastal ecosystems and the marine environment – and associated industries and communities – prepare for the consequences of climate change. It provides a framework to guide decisions on research funding, and it sets directions for Australia's marine research community. The priorities for research are set out in Attachment 1.

In March 2009, the Oceans Policy Science Advisory Group released a report entitled *A Marine Nation: National Framework for Marine Research and Innovation*. While climate change is not a central focus, the report draws attention to the impacts of climate change on Australia's marine resources, and notes that a better understanding of climate change pressures on marine biological, physical and social systems will enable the impacts of climate change to be factored into adaptive management strategies. The adaptation research plan is a key mechanism to give effect to this.

### **3. Potential Sources of Research Delivery**

Australia has a long history of research into marine ecology, biodiversity, natural resource management, fisheries, and aquaculture. By contrast, there has been comparatively little research targeting specifically the effect of climate change on Australia's marine environment. Research to date has focused on selected geographic locations (especially the Great Barrier Reef and the North West Shelf) and has addressed relatively narrow questions such as coral reef bleaching, fisheries recruitment, and effects of ocean acidification. Agencies with an existing focus on marine research provide a strong research platform to address the priorities in the adaptation research plan within a collaborative approach to ecosystem based management.

This section describes the main research organisations that might be involved in implementing the adaptation research plan. In many cases, these research organisations have access to resources that might be used to assist with funding the research.

#### **3.1 Commonwealth Scientific and Industrial Research Organisation (CSIRO)**

Two key initiatives in CSIRO are directly relevant to delivery of the research priorities in the adaptation research plan - the *Climate Adaptation Flagship* and the *Wealth from Oceans Flagship*. These flagships support research within CSIRO that are applicable to the research plan, delivering both targeted information and underpinning knowledge that contribute to a better understanding of marine biodiversity and resources.

CSIRO considers partnerships in research investment on a case-by-case basis depending on the mutual alignment of interests. Examples include long-term partnerships in CRCs and other research ventures where the prospects of end-user engagement and research effectiveness are likely to be increased by partnering. CSIRO is not a funding agency *per se* but does co-invest from time to time when there are distinct opportunities to align its research interests with those of partner organisations.

CSIRO is leading the development of a *National Marine Climate Change Report Card* that includes recommendations for enhancing climate change adaptation. This follows an earlier report on *Climate Change Impacts for Australian Marine Life*. Collectively, these efforts show the need for more applied research on marine biodiversity and fisheries resources. CSIRO is planning to use in-kind investments to contribute to projects that deliver the priorities in the adaptation research plan.

### **3.2 Centre for Australian Weather and Climate Research (CAWCR)**

The Centre for Australian Weather and Climate Research is a partnership between Australia's leading atmospheric and oceanographic research agencies - the Bureau of Meteorology and CSIRO. The centre was established in 2007 to ensure that Australia remains a world leader in climate, weather and oceans research so that it can meet the severe weather and climatic challenges that continue to confront the nation. The centre has five research programs:

1. Atmosphere and land observation and assessment
2. Ocean observation, assessment and prediction
3. Coupled earth system modelling
4. Weather and environmental prediction
5. Seasonal prediction, climate variability and climate change.

These research activities will improve observational databases, improve understanding of observed climate variability, and deliver climate predictions (seasonal to decadal) for use in risk assessments. Improved accuracy and resolution of the prediction of future climate are particularly relevant to management of marine biodiversity and resources.

CAWCR could provide contextual climate change information to underpin research projects that address priorities in the adaptation research plan, in particular outputs from the physical models used to make future climate projections.

### **3.3 Geoscience Australia**

Geoscience Australia (GA) is a prescribed agency within the Department of Resources, Energy and Tourism. It conducts geoscience research to inform government policy, including development of fundamental data and information products that are needed for climate change adaptation and the assessment of community safety issues such as natural hazard risk.

GA's Risk & Impact Analysis Group develops risk assessment models, tools and databases to assess the risk to a range of natural and human-caused hazards. Climate-related hazards of interest include tropical cyclone, storm surge, flood, landslide and coastal erosion. An example of climate change adaptation research is the assessment of physical and socio-economic vulnerability of coastal systems and communities to the consequences of sea-level rise and potential changes in storm frequencies and magnitudes.

GA's research and policy advice is done in large part through the agency's appropriated budget, and through collaborative or co-funded projects with the Australian, state and local governments, CRCs, universities, and industry partnerships. GA seeks partnerships to develop, maintain, and value-add to geoscience information to inform government policy and the public in the national interest. GA is not a funding agency, but does co-invest in areas of interest to the Resources, Energy and Tourism portfolio, including marine resources where geoscience information is required.

### **3.4 Australian Institute of Marine Science (AIMS)**

AIMS is Australia's major tropical research institute, with an operating budget of around \$80 million p.a., 220 staff and 80 post graduate students. Funding is from both government (70%) and industry (30%) sources. Its headquarters are in Townsville with research facilities also in Darwin and Perth.

The institute maintains and operates fixed ocean and air-sea interface monitoring equipment and research craft – deployed to monitor the marine ecosystems of the Great Barrier Reef (for more than 20 years) and the North West Shelf of WA (>15 years). Climate change is now a major research focus with projects addressing the impacts of climate change on reef micro-biology, coral reef bleaching and ocean acidification. The institute is establishing a \$55 million Australian Tropical Oceans Simulator (ATOS) that will allow controlled experiments to reflect climate change impacts and ecosystem perturbations under range of short and long term environmental conditions.

The Australian Coral Core Archive is also maintained by AIMS as a record of environmental change that can be re-interpreted as knowledge expands and new theories arise. As a major player in the marine biodiversity and resources area, AIMS is keen to explore additional collaborative work with partners to address the research priorities in the adaptation research plan.

### **3.5 Australian Ocean Data Centre Joint Facility**

The Australian Ocean Data Centre Joint Facility (AODCJF) provides a whole-of-government approach to ocean data management. It aims to develop a national multi-agency data management system to manage the ocean data resources of partner agencies through a distributed network. It is a joint venture between six Australian Government marine data agencies - Australian Institute of Marine Science (AIMS), Australian Antarctic Division (AAD), Bureau of Meteorology (BOM), CSIRO Marine and Atmospheric Research (CMAR), Geoscience Australia (GA) and Department of Defence (RAN Directorate of Oceanography and Meteorology).

The facility provides an accessible source of information for any new research initiative addressing the priorities in the adaptation research plan. Information stemming from new research will be able to be placed within the facility. It is unlikely that the facility, itself, would undertake new research addressing the priorities.

### **3.6 Integrated Marine Observing System (IMOS)**

IMOS is a project funded by the National Collaborative Research Infrastructure Strategy (2005-11) to support a distributed set of equipment and data-information services contributing to marine climate research in Australia.

The observing system provides data in the open oceans around Australia out to a few thousand kilometres as well as the coastal oceans (Fig. 1). IMOS coordinates the deployment of a wide range of equipment and assembles the data through 11 facilities distributed around the country. The data are made available to researchers through the electronic Marine Information Infrastructure (eMII) located at the University of Tasmania with support of CSIRO Division of Marine and Atmospheric Research. IMOS also contributes to Australia's role in international programs of ocean observing.

IMOS provides a valuable resource to underpin the building of the research effort across Australia to address the priorities in the adaptation research plan.



Figure 1. Schematic representation of the Integrated Marine Observing System

### 3.7 Cooperative Research Centres (CRCs)

Cooperative Research Centres (CRCs) bring together researchers from universities, CSIRO, other Australian and state government research organisations, private industry, and/or public sector agencies in long-term collaborative research arrangements. CRCs are funded to support research, development, and education activities to achieve real outcomes of national economic and social importance.

#### 3.7.1 CRC for Antarctic Climate and Ecosystems (ACE CRC)

ACE CRC leads Australia's effort to understand the roles of Antarctica and the southern ocean in the global climate system and climate change. It is a joint venture between Australian Antarctic Division, CSIRO Marine and Atmospheric Research, the Commonwealth Bureau of Meteorology, and the University of Tasmania as its core partners. There is an extensive range of contributing support partners from Australia and overseas.

The Australian Government recently announced an extension of the ACE CRC to 2014, with a new research plan that covers four key areas:

- Antarctica's ice sheets and the surrounding sea ice
- Changes in the southern ocean's temperature and currents
- Role of the southern ocean in storing carbon
- Impacts of changes on southern ocean ecosystems.

The ACE CRC is well positioned to play a strong role in building and delivering the national research agenda addressing the priorities in the adaptation research plan.

#### 3.7.2 Other Cooperative Research Centres

The research activities of a number of other CRCs are relevant, but not central, to climate change and marine biodiversity and resources. Examples are the CRC for Spatial Information, and the Sustainable Tourism CRC.

Opportunities with these CRCs are still to be explored in relation to collaboration to fund national level research into climate change and marine biodiversity and resources. It seems that there is limited opportunity for program level collaboration with these CRCs. However, NCCARF will in future explore opportunities for collaboration with these CRCs.

### **3.8 Universities**

Universities employ researchers with wide ranging capabilities for research across disciplines relevant to marine biodiversity and resources - from highly theoretical approaches which challenge the ways we frame problems through to practical problem solving.

There is also the opportunity for large groups of researchers across universities to tackle complex multi-faceted problems. Universities generally welcome partnership arrangements such as those with CRCs, other research groups (including those overseas) and agencies, but need to consider carefully costs and benefits on a case-by-case basis.

The NCCARF Adaptation Research Network for Marine Biodiversity and Resources, hosted by the University of Tasmania, has a membership of over 300 researchers from universities, government research institutions, and industry. Collectively, the members have access to a wide range of field and laboratory research facilities, and have knowledge of the pathways to public and private sector research investment funds. Direct cash investment is unlikely to be secured through these sources, but in-kind research time is possible.

### **3.9 Regional or Strategic Partnerships**

Currently there are a number of regional partnerships between universities, state, and national agencies with research interests in the climate change dimensions of marine biodiversity, conservation management (parks, reserves, and species), fisheries and aquaculture.

These are illustrated by the Tasmanian Aquaculture and Fisheries Institute, the Western Australian Marine Science Institute, the Arafura Timor Research Facility, the Australian Maritime Hydrodynamics Research Centre, the Sydney Institute of Marine Science, the Victorian Marine Science Consortium, and the ARC Centre of Excellence for Coral Reef Studies (based at James Cook University).

The geographic spread of these partner groups provides a rich resource to address national-scale research questions in marine biodiversity and resources. Many already have cross-institutional arrangements, and many of the researchers in these partner groups are active members of the NCCARF Climate Change Adaptation Research Network for Marine Biodiversity and Resources.

These partnerships are also highly successful at leveraging research investment – working across state and local governments, and stakeholder communities. A number of these partnerships have expressed keen desire to connect into the national research agenda and work with NCCARF in the delivery of the adaptation research plan.

A National Climate Change Implementation Framework for Fisheries and Aquaculture has been proposed. This is being developed in conjunction with the Australian Fisheries Management Forum (comprising the Australian, state, and territory governments), the fisheries and aquaculture sectors, Department of Climate Change, and NCCARF. It is proposed that this framework will bring these groups together to understand, prepare, and respond to the challenges and opportunities resulting from climate change, including in relation to research, development, and

extension. When fully developed, the program is expected to comprise three regional programs (South-East, Western, and Tropical), and an overarching national program. This framework will recognise the *National Climate Change Adaptation Research Plan: Marine Biodiversity and Resources*, and the *National Climate Change Action Plan for Fisheries and Aquaculture* as principal documents to identify and guide priorities.

The South-East component of the Coordination Program mentioned above has already commenced. It is known as the *South-Eastern Australia Program: Adaptation of fishing and aquaculture sectors and fisheries management to climate change* (SEAP), and is being led by a consortium between Department of Primary Industries Victoria, Fisheries Research and Development Corporation, Australian Fisheries Management Authority, Primary Industries and Resources South Australia, Department of Industry and Investment New South Wales, Department of Primary Industries, Parks, Water and Environment Tasmania, and CSIRO. This consortium has a mixture of pooled and in-kind investment.

#### **4. Potential Sources of Research Funding**

This section deals with potential sources of research funding to address climate change adaptation in marine biodiversity and resources, including current investment activities and opportunities for collaboration.

NCCARF has approached key potential research funding organisations to scope the availability of funding for research in this area. This includes examining the alignment of the priorities identified in the adaptation research plan with each organisation's funding priorities, the organisation's (current or future) programs for funding open calls for research, opportunities for collaborating in funding research in this area, and possible mechanisms for co-funding.

NCCARF has consolidated the responses received from potential partners and drawn relevant conclusions relating to the composition of a national investment research portfolio. This information is summarised below.

##### **4.1 Australian Government**

###### ***4.1.1 Department of Climate Change - Adaptation Research Grants Program***

The Department of Climate Change (DCC) intends to allocate up to \$4 million as seed funding for research in climate change adaptation for marine biodiversity and resources through its Adaptation Research Grants Program.

A key requirement of the program is that this seed-funding is used to lever additional funds to support a nationally coordinated effort – bringing together available resources from the Australian Government, state, territory, and local governments, research organisations, community organisations, and industry.

The grants funding will be available from early 2009/10, and all projects funded through this program will need to be completed by June 2012. Ideally, there will be a mix of both long and short term projects.

There are a number of options for maximising the effectiveness of the DCC seed-funding. The DCC, in partnership with NCCARF, has options relating to initiating one or more open research calls, commissioning research projects, or forming strategic alliances with one or more funding partners.

#### **4.1.2 Department of Agriculture, Fisheries and Forestry (DAFF)**

DAFF is the Australian Government Department with primary carriage of all policy and regulatory matters relating to the Australian fishing industry. Currently it is drafting the *National Climate Change Action Plan for Fisheries and Aquaculture* on behalf of the Australian Fisheries Management Forum (comprising state, territory and Commonwealth governments). This strategic plan doesn't include funding options.

#### **Australia's Farming Future (AFF)**

The AFF is an Australian Government initiative delivered through DAFF with relevance to both the NCCARF adaptation research plan and the *National Climate Change Action Plan for Fisheries and Aquaculture*. The first round of funding for adaptation research through the AFF Program was announced by Minister Burke in June 2009, and included an allocation of \$800,000 for a project addressing adaptation options for the commercial fishing sector centred in SE Australian waters. This is being delivered by the SEAP (see section 3.9). Outcomes of the project are likely to provide a base for adaptation options more broadly around Australia.

The research project funded under the SEAP umbrella includes strong contributions from state governments and industry. It includes a communication component recognising the importance of linking research with end-users. A similar strategy might be considered in other projects addressing the priorities in the adaptation research plan.

#### **4.1.3 Department of the Environment, Water, Heritage and the Arts (DEWHA)**

DEWHA is the Australian Government Department with prime responsibility for developing and implementing national policy, programs, and legislation to protect and conserve Australia's environment and heritage. There are two key programs relevant to implementing the priorities in the adaptation research plan.

#### **Commonwealth Environment Research Facilities (CERFs)**

Funding for the CERFs commenced in July 2006 with phase 1 scheduled for completion in June 2010. CERFs have a public good and multi-disciplinary focus. Social and economic issues are of increasing importance, and climate change adaptation is beginning to emerge more prominently in forward planning.

Currently there are a number of CERF projects undertaking activities relevant to the priorities in the Research Plan including:

- *CERF for Prediction and Management of Australia's Marine Biodiversity*
- *CERF for Landscape Logic: Linking Land and Water to Resource Condition*
- *CERF for Tropical Rivers and Coastal Knowledge (TRaCK)*
- *Marine and Tropical Sciences Research Facility (MTSRF)*
- *Australian Marine Mammal Centre*
- *Volunteer monitoring of the state of Australian rocky reef communities*
- *Ecosystem model analysis* - to address fisheries management issues in south eastern Australia and the implications of climate change.

Of particular relevance is MTSRF which is a consortium of over 38 end user organisations working with 300 scientists from 15 research providers. CERF has provided a solid base for new research investments towards marine biodiversity and resources to build on. DEWHA is currently scoping the possible next phase of the CERF program, for implementation post June 2010.

## **Great Barrier Reef Marine Park Authority (GBRMPA)**

The primary focus of GBRMPA is policy and implementation of the management of the reef's resources. It also provides some financial support for research that informs policy and planning. Research is undertaken in collaboration with a range of industry bodies (e.g. tourism and fisheries organisations) and research institutes (e.g. James Cook University). Opportunities exist for GBRMPA to play a strong role in the emerging collaborative research agenda with partners in tropical Australia and overseas.

GBRMPA is currently delivering a 5-year \$9 million *Climate Change Action Plan* that has been funded through the Council of Australian Governments (COAG). Funds from the plan have already been committed and research to date is already making a significant contribution to knowledge on the impacts of climate change on coral reef systems. Adaptation to climate change has been identified as a primary research need, especially for establishing management responses to bio-physical and socio-economic issues.

GBRMPA recently released a *Tourism and Climate Change Action Strategy 2009-2012* that includes monitoring, reporting, and research objectives. It identifies climate change as a major threat to tourism in and around the Great Barrier Reef.

### **4.1.4 Caring for our Country**

Caring for our Country is an initiative jointly managed by DAFF and DEWHA. It commenced in 2008 and integrates delivery of the Australian Government's previous natural resource management programs, including the Natural Heritage Trust, the National Landcare Program, the Environmental Stewardship Program and the Working on Country Indigenous land and sea ranger program. It also delivers a range of other natural resource management funding elements including Community Coastcare, and World Heritage programs. The initiative, however, does not currently cover marine biodiversity issues.

This initiative offers grants for environmental and sustainable resource management projects with grants assessed against 5-year defined outcomes and targets within annual business plans.

Funding provided for the SeaNet Program in 2008-09 was provided through the Caring for our Country (landcare component) and was delivered through Oceanwatch Australia. It supports a network of extension officers to provide capacity building and education within the industry and to translate research results into beneficial outcomes. The future of funding for this program under Caring for our Country is currently under consideration. For the aquaculture industry, the focus of Caring for our Country is on practices that improve the quality of water for operational aspects of the businesses.

### **4.1.5 Australian Research Council (ARC)**

The Australian Research Council grants program is often the first consideration for many researchers and research institutions that seek additional support. Grants offered by the ARC under its National Competitive Grants Program (NCGP) include the well-known *Discovery Projects* and *Linkage Projects* grants. Through the NCGP, the ARC aims to support research and research training of national benefit. *Responding to climate change and variability* is identified as a priority goal under the national research priority of *An environmentally sustainable Australia*.

One hundred post-doctoral positions are to be offered for early career scientists over a four year period under a new *Super Science Fellowships* grants scheme with funding starting in June 2010.

Approximately 30 of these will be in the area of marine and climate research, representing a substantial investment. The fellowships can be hosted through universities and other research institutions such as Australian Institute of Marine Science and CSIRO. These fellowships will obviously have a substantial flow-on effect to national programs and research capacity in climate change and marine systems.

Another recent ARC scheme, *ARC Future Fellowships*, promotes research in areas of critical national importance by giving outstanding researchers incentives to conduct their research in Australia. The aim of *ARC Future Fellowships* is to attract and retain the best and brightest mid-career researchers and significantly boost Australia's research and innovation capacity in areas of national importance. Preference will be given to those researchers who can demonstrate a capacity to build collaboration across industry and/or research institutions and/or with other disciplines.

Over a five-year period (2009-2013), *ARC Future Fellowships* will offer four-year fellowships to 1,000 outstanding Australian and international researchers in the middle of their career. In addition, each researcher's Administering Organisation will receive funding of up to \$50,000 per year to support related infrastructure, equipment, travel and relocation costs. The first 200 *Future Fellowships* were announced in September this year.

Opportunities for funding marine and climate research also exist at ARC within the *Centres of Excellence* scheme. In 2005, the ARC funded the *Centre of Excellence for Coral Reef Studies* (\$40 million over 5 years) to undertake leading-edge research on the sustainable use and management of coral reefs. The centre is a partnership between with James Cook University, the Australian Institute of Marine Science, The Australian National University, the Great Barrier Reef Marine Park Authority, and the University of Queensland. While there is alignment with some of the goals of the centre and priorities in the adaptation research plan, the centre is in the last year of its current funding making it impractical to establish new collaborative links at present.

#### **4.1.6 Department of Defence**

The Department of Defence manages naval port bases and training facilities, and operates fleet units all around the Australian coastline as well as in the exclusive economic zone. Environmental stewardship is an integral part of land and maritime naval operational activity that takes place in areas of ecological sensitivity such as Cockburn Sound and Ningaloo Reef in the Northwest Cape (WA), Sydney Harbour, Jervis Bay and Twofold Bay (NSW), and the Great Barrier Reef and Shoalwater Bay (Qld). No opportunities are evident at present for collaborative research with the Department of Defence to address climate change adaptation and marine system ecology. The NCCARF will continue to explore options.

#### **4.1.7 Other Australian Government Departments**

Some other Australian Government Departments, or Divisions within Departments, appear to have either a direct or indirect interest in climate change adaptation for marine biodiversity and resources. The main ones are the Department of Education, Employment and Workplace Relations, Department of Innovation, Industry, Science and Research, Department of Resources Energy and Tourism, Australian Maritime Safety Authority, and the Environmental Research Institute of the Supervising Scientist. Opportunities for collaborative funding with these bodies will be explored further by NCCARF in the context of future partnerships in research investment.

## **4.2 Fisheries Research and Development Corporation (FRDC)**

The FRDC was formed as a statutory corporation in 1991 under the provisions of the Primary Industries and Energy Research and Development Act (1989), and is responsible to the Minister of Agriculture, Fisheries and Forestry. The FRDC is a co-funded partnership between the Australian Government and the Australian fisheries and aquaculture industry. It takes an environmental, economic and social approach to management of Australia's marine resources, investing in research, development, and extension.

The FRDC facilitates government and industry investment, and establishes and addresses RD&E priorities by collaborating with stakeholders and key partners. It also invests in the adoption of research outputs and evaluates the benefit of investments.

The Board of the Fisheries Research and Development Corporation has approved an investment of a minimum of \$2.7 million available to fund research that is consistent with FRDC's statutory requirements and addresses the priorities in the *National Climate Change Action Plan for Fisheries and Aquaculture*, and the *National Climate Change Adaptation Research Plan: Marine Biodiversity and Resources*.

The FRDC is currently considering the extent to which its investment in this area may increase over the next few years.

## **4.3 State and Territory Government Organisations**

All state governments and the Northern Territory government have departmental administrative arrangements and research capacity in the area of marine biodiversity and resources, covering marine conservation and fisheries resources management.

NCCARF has held discussions with representatives of some state and territory government agencies to explore collaborative arrangements. These discussions have not yet identified opportunities for partnerships at the program level to lever funding towards a national investment portfolio for research in climate change and emergency management. NCCARF will continue to explore possible opportunities with state, territory, and local governments. State-based research organisations are able to respond to research calls with the possibility of attracting some state-based support on a project-by-project basis.

## **4.4 Private Sector**

A wide range of peak bodies for industry sectors, non government organisations and advisory bodies are increasingly becoming more aware of the implications of the need to adapt to extreme weather and changing climatic conditions.

Peak bodies represent the interests of producers of both specific fisheries resources such as finfish, shellfish and salmonid aquaculture, and broader sectoral interests. These bodies include the Commonwealth Fisheries Association, Recfish Australia, and the National Aquaculture Council. They also cover the interests of maritime operators (e.g. the Australian Association of Port and Marine Authorities) and offshore oil and gas producers (e.g. Australian Petroleum Production and Exploration Association).

Conservation interests are represented by bodies such as OceanWatch Australia and World Wildlife Fund. Advisory bodies in the field include Oceans Policy Science Advisory Group, and the Fisheries Research Advisory Bodies.

Collectively, these and similar bodies demonstrate that there is a diverse range of potential players who could influence the emerging research agenda and point out pathways for innovative funding arrangements. The NCCARF will continue to explore these for future funding opportunities.

#### **4.5 International**

There are a range of international organisations that could interface with research in Australia to address the research priorities in the adaptation research plan. While no immediate opportunities for program-to-program collaboration have been identified with these organisations, opportunities remain for scientific exchange and collaboration on a project-to-project basis. Some examples are listed below:

- World Bank - previously funded coral research and is now moving into climate change,
- Nippon Foundation - looking to develop initiatives on climate change with a focus on the Pacific Islands,
- United Nation Environment Program (UNEP) - revamping its marine program,
- Asia Development Bank - Australia has membership,
- National Ocean and Atmosphere Administration (NOAA) - has a new coral policy and is looking at climate change,
- AusAid - focuses on in-country climate change adaptation research capacity building,
- International Climate Change Adaptation Initiative for the Pacific and SE Asia,
- Australian Centre for International Agricultural Research, and
- Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security - multi-national initiative.

In September 2009, the US Administration released the Interim Report of the Interagency Ocean Policy Task Force, describing a comprehensive and eco-system based approach to the management of marine resources. This includes strengthening the abilities of coastal communities and marine environments to adapt to climate change. The report calls for substantial funding investment and describes the need for research to inform decision making. The NCCARF will explore collaborative opportunities through existing and possibly new climate change initiatives between Australia and the US, as the US program develops.

### **5. Strategy for National Coordination**

NCCARF has undertaken a range of activities to formulate this Implementation Plan, including interviews with prospective research partners and a workshop with key players (3 July 2009). Analysis shows that funding to address the research priorities in the adaptation research plan will grow substantially over the next few years. In particular, the Super Science Fellowships to be established by the Australian Research Council for early career scientists to address the effect of climate change on Australia's marine systems will obviously have a substantial flow-on effect to national programs and research capacity.

#### **5.1 Immediate investment**

Two main opportunities for program-level funding to instigate new research initiatives have emerged immediately from this review. First, the Department of Climate Change intends to allocate up to \$4 million from the Department's \$30 million Adaptation Research Grants Program with the intent of ensuring that all priority areas in the adaptation research plan are covered. All projects funded through this program will need to be completed by June 1012.

Secondly, the Board of the Fisheries Research and Development Corporation have approved an allocation of a minimum of \$2.7 million to fund research that addresses climate change that is

directed to, or consistent with, FRDC's statutory requirements. Two million of this will be directed towards adaptation in marine systems. The remainder would support mitigation and freshwater RD&E for the fisheries and aquaculture industries.

At the same time, there appear to be considerable opportunities for research providers (e.g. state organisations, CSIRO, universities) to partner with new research initiatives on a project-by-project basis. The NCCARF Climate Change Adaptation Research Network for Marine Biodiversity and Resources is well placed to assist with building research consortia and securing additional resources for any new initiatives.

It is proposed that DCC and the FRDC initiate immediately a single collaborative open research call to address the high priorities identified across all research areas in the *National Climate Change Adaptation Research Plan: Marine Biodiversity and Resources*. This approach has the important advantage that there would be a single process through which research organisations would respond to the call.

With respect to the roles of the organisations, it is proposed that:

1. NCCARF and FRDC would co-manage the Call for Proposals,
2. NCCARF would be responsible for the appointment of the expert Science Review Panel, and would be the point of interaction with that Panel,
3. FRDC would administer the call on behalf of DCC and NCCARF.

The Call would involve a two-stage process of short Expressions of Interest, evaluated by the Science Review Panel, leading to invitations for full proposals, also to be evaluated by the Science Review Panel. At the stage of invitations for full proposals, there would be the opportunity to broker consortia for the submission of full proposals. This would be overseen by FRDC for the topics of (1) Aquaculture and (2) Commercial and recreational fishing; and by NCCARF for (3) Conservation Management, (4) Tourism and recreational uses, and (5) Cross-cutting issues.

The intent is for contracts to be in place for research to commence in early 2010. Allocation of funding to the different priority areas in the adaptation research plan will take into account the relative funding interests of each partner, the opportunities for additional resources to be directed to each priority area in the near future, and Australian Government research investments already made through the DAFF AFF program. Funding will be made on the basis of the merit of proposals, and will take into account that projects may address more than one priority area in the adaptation research plan.

It is also proposed that some funding be reserved to seed additional projects or commissioned work (possibly to commence 2010/11) to fill gaps in the developing research program.

## **5.2 Building future programs**

The NCCARF Adaptation Research Network for Marine Biodiversity and Resources will continue to undertake an analysis of stakeholders with a view to developing and enhancing opportunities for research investment and collaboration. It is also enhancing international links of individual members of the network through its international visiting professor program.

It is anticipated that a research call instigated immediately may encourage other funding organisations to identify and allocate funds towards the high priorities in the adaptation research plan. NCCARF together with the DCC and other partners will continue to explore options to build the national research base to address the high priorities. One mechanism to do this may be to convene a workshop of other potential funding organisations to be held in early 2010 to review the outcomes of the initial research call, and to scope the way forward.

## **6. Impediments and Risks**

Australia has a small research community – especially considering the challenges that will be involved in building and delivering a national research program to address the priorities in the adaptation research plan. It is recognised that building research capacity will not be easy or straight-forward.

As such, it is expected that implementing the research agenda will take time. A key focus will need to be on increasing the size of the research funding directed to this research agenda – across a wide variety of organisations and stakeholder groups - while at the same time utilizing the resources available immediately for carefully targeted and effective research. The Adaptation Research Network for Marine Biodiversity and Resources will play a prime role in building the research agenda and reducing risks in program implementation.

## **7. Monitoring**

NCCARF will work with the Adaptation Research Network for Marine Biodiversity and Resources to track research being conducted across Australia that implements the adaptation research plan. NCCARF will monitor the progress of research commissioned through the proposed new research call in order to identify emerging gaps and research needs. It will also maintain continuing dialogue with key stakeholders and the research community. NCCARF will produce an annual report on the progress of investments being made, with the first to appear in 2010/11. The Implementation Plan will be updated periodically.

NCCARF, through a dedicated research program, will also synthesise research outcomes in the area of climate change and marine biodiversity and resources as these evolve.

Success in developing and implementing research directed towards priorities in the adaptation research plan will be measured in terms of the extent to which the research budget is built nationally, the degree of collaboration and coordination to maximise the efficiency of resource use, and the extent to which the research delivers to the needs of research funders, to decision makers, and to stakeholders nationally.

## Attachment 1

### Priorities for research in the *National Climate Change Adaptation Research Plan: Marine Biodiversity and Resources*

#### 1. Aquaculture

- 1.1 Which farmed species in which locations are most likely to be impacted by climate change?
- 1.2 What options are there for businesses to adapt to climate change effects either by minimising adverse impacts or taking advantage of opportunities? What are the barriers to implementing such changes and how might they be overcome?

#### 2. Commercial and recreational fishing

- 2.1 Which fishery stocks, in which locations, are most likely to change as a result of climate change? What will those changes be (e.g. in distribution, productivity) and when are they likely to appear under alternative climate change scenarios?
- 2.2 What options or opportunities are there for commercial fishers in identified impacted fisheries to adapt to climate change effects through changing target species, capture methods and management regime, industry diversification, relocation or divestment?

#### 3. Conservation management

- 3.1 Which ecosystems and species of conservation priority most require adaptation management and supporting research, based on their status, value, vulnerability to climate change and the feasibility of adaptive responses?
- 3.2 How should conservation managers and planners adapt their practices to ameliorate climate change risks and enhance adaptation options? What intervention strategies will increase system resilience and improve the time within which biological systems can adjust to a future climate?

#### 4. Tourism and recreational uses

- 4.1 What are the predicted regional impacts of climate change for marine tourism assets – for instance, what tourism sites will be most vulnerable to change and to what degree?
- 4.2 What is the adaptive capacity of the marine tourism industry and how can it be enhanced to cope with climate change impacts?

#### 5. Cross-cutting issues

- 5.1 What are the key interactions across sectors, cumulative impacts and cross-jurisdictional issues that will affect the development of adaptation strategies in each sector, and how can these cross- and multi-sectoral issues be best addressed?