



western australian
marine science institution

**MARINE SCIENCE CASE
BUSINESS CASE & CO-INVESTMENT STRATEGY
FOR THE KIMBERLEY-BROWSE REGION
Kimberley-Browse Marine Science Policy Summit
11 March, 2008
The University Club of Western Australia
Formal Dining Room, First Floor, Hackett Drive, Crawley**

Thank you for your interest in the Kimberley-Browse Marine Science Policy Summit. The Summit will address key strategic issues and big management questions for the Kimberley-Browse marine region and the science information required to address these issues. This will provide valuable input for the preparation of a Marine Science Case and companion Business Case report which will be prepared by consultants and submitted to WAMSI in mid August 2008.

The Summit is the initial gathering for the project and since there are financial and space limitations, not all with expertise and interest will be able to attend. However, these papers and the outcomes from the Summit will be posted on the WAMSI website and further contributions will be welcomed during the next phase of consultation.

These documents have been sent via the same email to assist participants as they prepare for the Summit. It contains:

- Draft Summit Agenda
- Marine Science Policy Summit Briefing Paper and
- A questionnaire. (This is a separate document for ease of use.)

These documents are also being sent to organizations that have expressed interest in the Summit, but who are unable to attend. Both Summit participants and other interested organizations are invited to complete the Questionnaire.

It would be appreciated if the response to the Questionnaire could be provided by 28 March 2008, by either:

- emailing the Questionnaire response to Dr Des Mills (desm3@inet.net.au)

or, if you wish to answer the Questionnaire by phone,

- emailing your phone number and a convenient time to be contacted.

If you are sending a representative to the Summit, please pass these papers on and advise the person's name and contact details to leith@parexcellence.com urgently

Thank you

Dr Des Mills

Dr Mike Wood

(Consultants to the project)



western australian
marine science institution

Kimberley-Browse Marine Science Policy Summit

11 March, 2008

The University Club of Western Australia

Formal Dining Room, First Floor

Hackett Drive, Crawley

AGENDA

0830 Registration / Tea & Coffee

FIRST SESSION

Setting the Scene

- 0900 Introduction (10 min) Dr Peter Rogers (WAMSI Chairman)
- 0910 Opening Address (10 min) TBA
- 0920 Keynote: *Marine Biogeography of the Kimberley Region* (15 min) Dr Barry Wilson
- 0940 Keynote: *Strategic Issues, Planning and Management Questions* (15 min) Mr Barry Carbon
- 1000 The Kimberley-Browse Marine Science & Business Case Project (10 min)
Key outcomes for the day Dr Mike Wood
- 1010 Government Strategic Objectives (10 min) Dr Des Mills
- 1020 *Morning Tea (20 min)*

SECOND SESSION

Strategic Objectives, Critical Issues and Management Questions for the Region

- 1040 Introduction to Group Discussions (15 min) Dr Mike Wood
- 1055 Group Discussions - Critical Issues and Key Management Questions for the Region (35 min)
- 1130 Presentation of Group Findings on Key Issues and Management Questions (40 min)
- 1210 Plenary Discussion - 10 min
- 1220 *Lunch (40 min)*
- 1300 **Strategic Marine Science in the Kimberley-Browse Region – What does it take?** (10 min)
Des Mills
- 1310 Plenary Discussion (10 min)



Marine Science and Information Requirements - their Relevance to Critical Issues and Management Questions

- 1320 Introduction to Group Discussions (5 min) Dr Des Mills
- 1325 Group Discussions – Marine Science and Information Requirements (35 min)
- 1400 Presentation of Group Findings on Marine Science and Information Requirements (40 min)
- 1440 Plenary Discussion (15 min)
- 1500 *Afternoon Tea (20 min)*

THIRD SESSION

Research Plans, Opportunities for Collaboration and Co-Investment

- 1520 Opportunities for Collaboration and Co-Investment (10 min) Mike Wood
- 1530 Discussion (20 min)

FOURTH SESSION

Iterative development and Review of Marine Science & Business Case

- 1550 Presentation: (10 min)
- 1600 Discussion: (20 min)

FIFTH SESSION

Recap on Outcomes, Next Steps and Close

- 1620 Recap on Outcomes of Day (10 min) -Key management questions, key science gaps; pathways to implementation Mr Barry Carbon:
- 1630 Participants' take-home priorities: Discussion (10 min)
- 1645 Formation of Reference Group Where to from here? – Next Steps? (10 min)
- 1700 Thanks, Close & Refreshments Dr Peter Rogers



western australian
marine science institution

**MARINE SCIENCE CASE
BUSINESS CASE & CO-INVESTMENT STRATEGY
FOR THE
KIMBERLEY-BROWSE REGION**

**MARINE SCIENCE POLICY SUMMIT
BRIEFING PAPER**

INTRODUCTION

The Western Australian Marine Science Institution (WAMSI) represents a significant new approach to ensure that issue-based marine research is undertaken within a strategic framework involving the best scientists and project teams from multiple agencies collaborating within a joint venture.

WAMSI represents the coming together of fifteen organisations with expertise in marine research from Commonwealth and State governments, Western Australian universities and the business sector. Each of the members brings to WAMSI a particular array of capacities including research personnel and funding. Other research bodies are likely to join WAMSI over time.

The WAMSI vision is to establish a world leading research capability to underpin the conservation and sustainable management of the marine environment and resources for the economic, social and environmental benefit of the State of Western Australia and the nation as a whole.

WAMSI Strategic Directions

WAMSI's forward planning process has determined that, from a regional, State and national perspective, there is a priority need for a major program of fundamental and issue-based marine research in the Kimberley-Browse region of Western Australia.

This unique region has outstanding natural and cultural values and has been recognised as worthy of assessment for national and international heritage site listing. The scenic beauty, recreational and wilderness experience offered by its coastal waters and islands is attracting an ever-increasing number of visitors and tourists to the Kimberley. The region contains renewable and non-renewable resources, such as natural gas, condensate and minerals, which are potentially of great economic value to the nation, and the demand to develop these resources is increasing.

If governments and users are to avoid repeating previous mistakes in other regions, then sound planning and management at both a regional and sub-regional scale will be required to ensure that natural and cultural values of the Kimberleys are not compromised and that the cumulative impacts of human activities are minimised. Sound planning, management and decision making requires good information



and understanding about the valued attributes and sustaining processes of the environment itself. It requires information on the types, patterns and trends of human-use, and science-based predictions of the cumulative effects of existing and proposed uses and activities, including resource exploration and development, coastal and offshore infrastructure, marine-based tourism, uses in drainage catchments, overfishing and other pressures. Superimposed on all of this, information and understanding of the effects of climate change on the region, its communities and ecosystems will be needed by decision makers.

However there is broad agreement that the marine environments and ecosystems of the Kimberley-Browse region are amongst the *least documented* and most *poorly understood* of any around Australia. For example, there is an urgent need for basic systematic biodiversity surveys across the region, to find out what habitats and communities are there, and to establish a benchmark for assessing the effects of local activities and climate change in the future. Improved knowledge and understanding of the marine environment, its values, processes and its interactions with human activities will be required to underpin sound planning and decision-making in this region.

WAMSI Kimberley Marine Science Consultancy

In mid December 2007 WAMSI contracted Dr Mike Wood and Dr Des Mills [consultants] to coordinate the preparation of a high-level strategic Marine Science Case for the Kimberley-Browse region.

The purpose of this WAMSI consultancy is to identify the key issues and big questions confronting planners, managers and decision-makers for the region, the science that is needed to address these questions, and the resources and capabilities required to undertake the necessary scientific work.

Stakeholders are invited to participate during the development of the Marine Science Case. The consultants will conduct a Marine Science Policy Summit in Perth and will hold Community and Stakeholder Consultation Meetings in Broome. Meetings with Federal Government and peak bodies in Canberra have taken place. WA State Government consultation is currently underway. Scientific workshops and further meetings with individual organisations will be arranged as needed.

Through the literature and in discussion with managers, scientists and stakeholders , the consultants will:

- review information on the natural values, pressures and threats in the region;
- assess the key issues and management questions which can be supported by science;
- review the existing , current and planned scientific research and human-usage data for the region, and
- identify and prioritise the key gaps in knowledge required to address key issues and management questions.



The Marine Science Case will be accompanied by a Business Case outlining the benefits of investment in the science, the resources needed to fill the science gaps, and identifying the potential sources of funds and in kind support.

The consultants will report to WAMSI by mid August 2008.

The aim of the project is to achieve broad agreement from stakeholders across a range of sectors on a set of strategic science priorities for the region, the benefits of the proposed science for planning and decision making and, where possible, investment commitments in order to carry out the science.

Once broad agreement on the priority science areas and funding commitments are obtained, WAMSI will work with stakeholders and research providers to coordinate the development of a detailed scientific programme with well-defined outcomes and the formation of research teams from multiple agencies to conduct the research. WAMSI will audit progress and achievement of agreed outcomes and will ensure that there is integration of the science into the form of decision-support tools that address the strategic issues and management questions for the region.

THE KIMBERLEY-BROWSE MARINE REGION

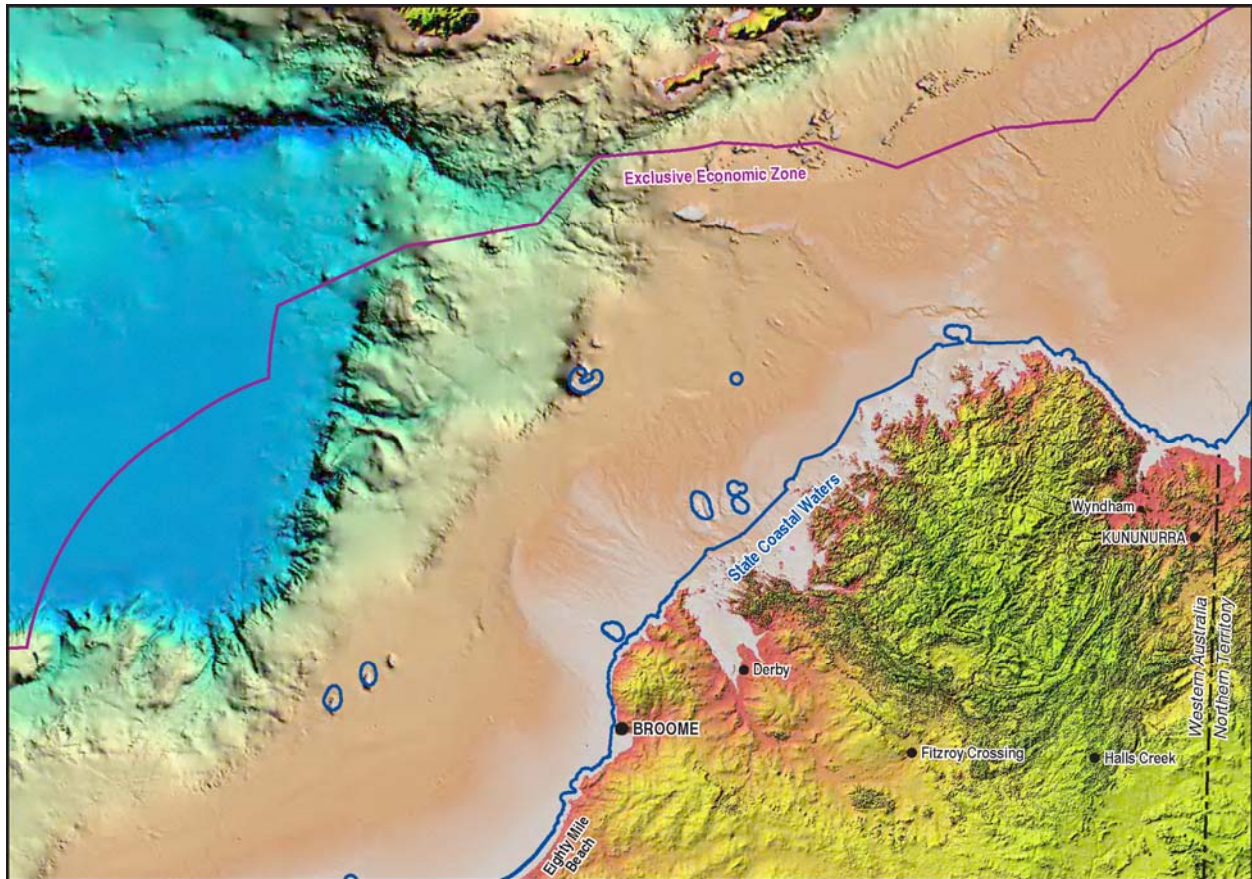
This consultancy focuses primarily on the marine and coastal environments off the northern part of Western Australia (see map on page 4), extending:

- alongshore from the Eighty Mile Beach, south of Broome, to the Western Australia/Northern Territory border, and
- offshore to encompass all of the Maritime Zones declared under the Commonwealth *Seas and Submerged Lands Act 1973*.

The Maritime Zones, measured from the Territorial Sea Baseline, include:

- State Coastal Waters from the Territorial Sea Baseline seaward to 3 nautical miles (nm);
- Territorial Seas, from the Territorial Sea Baseline seaward to 12 nm;
- Contiguous Zone, from 12 nm seaward to 24 nm;
- Exclusive Economic Zone (EEZ), extending seaward from 12 nm to 200 nm; and
- The Australian Fishing Zone (AFZ), extending seaward from 3 nm to 200 nm.

The Kimberley-Browse marine region includes seven marine mesoscale bioregions identified in the Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0). Five of these bioregions are coastal marine (Eighty Mile Beach, Canning, King Sound, Kimberley, Bonaparte, Cambridge-Bonaparte) and two are offshore (North West Shelf, Oceanic Shoals).



The Kimberley-Browse marine region showing the outer limit of State Coastal Waters (blue line) and of the Exclusive Economic Zone (pink line) (Courtesy: GeoScience Australia)

The region is influenced by the southeast Indian Ocean circulation, the Indo-Pacific Throughflow and experiences a tropical monsoon climate with two major seasons. Moist winds from the Indian Ocean and southern Asian waters prevail during the 'tropical summer season', giving way to a predominantly south easterly airflow from the continent's interior during the 'dry season'. Sporadic tropical cyclones and severe tropical storms with strong localised winds and heavy rainfall occur during summer. The region includes areas of abyssal plain, a deeply incised continental slope, a broad continental shelf with atolls and many islands, and a varied coastline with rocky shores, fringing coral reefs, sandy beaches, sand flats, seagrass meadows, mangrove communities and mud flats which are often found in the more sheltered embayments and estuaries. The shelf and coastal waters are subject to tides of up to 12.5 m with strong tidal currents and receive highly variable freshwater and sediment runoff from the mainland river catchments.



The region has diverse and productive marine and coastal habitats and biological communities which take advantage of a wide variety of geomorphic and environmental settings. It is thought to have retained a high degree of ecological integrity compared with other large tropical marine ecosystems of the world. While some species are also present in other parts of the Indo-Pacific tropical region, a large portion of the demersal and benthic fauna in particular are relatively unique to the region. The region provides nursery and feeding areas for marine mammals such as whales, dugongs and dolphins and nesting areas for turtles. It is internationally recognised as a very important staging area for migratory birds.

The region has a low population base with relatively few towns and settlements, but is growing rapidly. Aboriginal people comprise almost half of the current population. The indigenous cultural values and wilderness qualities are unique assets of the region.

The Kimberley-Browse marine region currently supports a range of industries including marine and coastal-based tourism, commercial fishing (particularly prawns), aquaculture (particularly pearling) and mining. The region's ports ship cattle and mineral products from the region and import commodities. There is enormous potential for growth in the size and scale of nature-based tourism and associated commercial enterprises as the iconic status and beauty of the Kimberley coastal and offshore environments becomes more widely known. Very large reserves of petroleum and gas have been discovered at offshore locations in the Browse and Bonaparte basins and other offshore fields. Known gas reserves in the Browse Basin alone exceed 31 trillion cubic feet.

Demand for tourism, aquaculture, fisheries, mineral, oil and gas developments will intensify over the coming decades. Hence there is an urgent need to develop effective planning, management and decision-making capabilities within a regional ecosystem-based context so as to ensure that these activities will not compromise the environmental assets and values of the region.

Current scientific knowledge of the region's ecosystems and the processes sustaining them is limited. Little is known about the susceptibility of its biological communities to stresses imparted by human activities within the region as well as from the effects of natural disturbance such as cyclonic events and the broader influences of climate change. WAMSI has therefore identified a critical need for a major investment in science to achieve an understanding of the entire region's marine environment, how it functions, and how it would respond to a range of conservation, sustainable use and development scenarios.



STRATEGIC OBJECTIVES, ISSUES AND OUTCOMES

STRATEGIC OBJECTIVES

The following high level strategic objectives for the Kimberley-Browse region are based on Australia's international, national and state commitments (e.g. the National Strategy for Ecologically Sustainable Development and the National Strategy for the Conservation of Australia's Biological Diversity) and may be stated as follows:

- understand and protect the natural values of the Kimberley-Browse marine environment and its sustaining processes;
- recognize and respect the cultural values and indigenous links to the land and water;
- manage sustainably living marine resources;
- manage human activities for both the present and future benefit of the region, state and nation, and so as not to compromise ecological and cultural values.

SPECIFIC OUTCOMES FROM GOVERNMENT COMMITMENTS

Within the context of broad strategic objectives, governments have committed to a number of more specific outcomes for Australia's marine jurisdictions. These outcomes include:

- Marine bioregional plans for conservation and use ;
- A system of comprehensive, adequate and representative Marine Protected Areas ;
- Ecologically sustainable fisheries and aquaculture ;
- Effective management to prevent or combat marine pest introductions;
- Effective systems of environmental impact assessment, environmental management and State of Environment reporting;
- Understanding climate change impacts on the region and appropriate response strategies.

In the case of the Kimberley-Browse region, many of these outcomes are, at best, in the early stages of their implementation and there is currently a scarcity of basic information on which to further their implementation.



STAKEHOLDER ISSUES AND MANAGEMENT QUESTIONS

There are at least six areas of strategic importance for the Kimberley-Browse region where science can support decision making. These areas include:

- Climate change
- Conservation
- Oil and gas
- Tourism
- Other existing uses (e.g. pearling, aquaculture, fisheries, mining)
- Environmental protection

Summit participants will be asked to:

- *name any other areas of strategic importance;*
- *identify the key questions of concern, surrounding these areas, that can be addressed by science;*
- *focus not only on current issues and management questions, but ones that could arise in the future.*

For example, what would be the issues and management questions surrounding:

- a dramatic increase in marine-based tourism (e.g. if passenger liners from international destinations were permitted to cruise regularly along the Kimberley coast and islands);
- a regional scale natural heritage conservation initiative; or
- ongoing development of the vast oil and gas reserves of the region.

Identifying those key issues and management questions of concern will help to inform the science needs and priorities.



EXISTING MARINE SCIENCE IN KIMBERLEY-BROWSE REGION

Oceanography and Geophysics

Research on the Indo-Pacific Throughflow and the SE Indian Ocean is developing the broadscale oceanographic context for the region. However ocean circulation within the region itself is still not well-defined and the extent and frequency of nutrient upwelling onto the continental shelf is poorly understood.

Drifter trajectories and model experiments have looked at the issue of connectivity within and between outer-shelf atolls, but cross-shelf and nearshore connectivity also need to be addressed to understand genetic dispersal processes. This is an important ocean management issue.

Tidal currents are found to dominate on the broad continental shelf and these have been shown to be important agents of sediment mobilisation and vertical mixing, particularly in shallower areas and in the wake of islands.

Regional and shelf-scale hydrodynamic models have been developed but there are relatively few locations where current meter data are available for use in assessing the performance of these models. Some of the models do not incorporate the tides and tidal currents. The models generally do not have fine enough grids to resolve the complex bathymetries found near islands or coastal embayments.

Most current meter and other metocean data are available in areas of interest to the oil and gas industry. Much of this data has been collected near the outer edge of the shelf under non cyclonic and cyclonic conditions for engineering design purposes. These data have been used to study the generation of internal waves which give rise to rapid currents and need to be considered in the design of offshore structures.

Geoscience Australia has conducted broadscale seabed characterisation over the shelf and slope. This information is useful for engineering design purposes and also has enormous potential to provide broadscale “surrogate” information on the likely distribution of habitats and their biological communities.

The nearshore hydrodynamics and sediment regimes of Cambridge Gulf and King Sound have received attention. The Cambridge Gulf investigation made an assessment of the effects of dam construction on estuarine and nearshore marine processes. In most other nearshore localities very little work has been done.

From a regional perspective there is still a paucity of metocean and fine resolution bathymetry data, and a need to improve the understanding and prediction of physical processes which are important drivers for the ecology of the region.



Biology and Ecology

Much of the biological and ecological research within the region has been focused upon the *offshore reefs and islands* of Ashmore, Cartier, Scott, Seringapatam and the Rowley Shoals. These are either declared marine protected areas or are close to known, exploitable reserves of petroleum and gas.

The WA Museum, WA Universities and others have conducted surveys and biodiversity assessments of the intertidal and nearshore subtidal biological communities at selected localities along the Kimberley coast.

Extensive seagrass habitats, structurally complex and diverse fringing coral reefs and filter feeding communities are known to occur in particular subtidal areas. However they have not been adequately mapped throughout the region. Their biodiversity, environmental requirements, ecological linkages and resilience to stress are all poorly understood.

Much remains to be done to arrive at a systematic understanding of the resources, environmental variability, sustaining processes, pressures and threatening processes at regional, shelf and local scales.

Human Use

An understanding of the type, distribution and intensity of human use in the region, and projections of future trends is an essential input to the assessment of the social values associated with the marine environment, the anthropogenic pressures exerted on marine ecosystems and allocating priorities for issue-based marine research.

The Kimberley Development Commission and the WA Department of Local Government and Regional Development publishes an annual Kimberley Economic Perspective report which provides a summary of the latest available information on population, labour force and employment, mining, agriculture, fishing, manufacturing, construction, commerce, tourism, indigenous economic development and infrastructure. This report collates information from the Australian Bureau of Statistics and a range of federal, state and local government agencies as well as from private sector organisations.

As part of its Marine Bioregional Planning programme, the Federal Government compiles human use data and atlases on fisheries and non-fisheries uses in Australia's marine jurisdiction. The current focus of this programme is on the North West, including the Kimberley-Browse marine region.



STRATEGIC MARINE SCIENCE NEEDS FOR THE REGION

The Kimberley coastal and offshore region, because of its size, remoteness, strong tidal currents and turbidity, is a very challenging environment in which to conduct marine research.

WAMSI provides an effective framework for developing and facilitating major strategic marine research programmes, since it brings Australia's major marine and climate research providers together with the research capacities of four WA universities, the private sector and a number of federal and state government agencies. Several of WAMSI's participants already have considerable experience of operating within the Kimberley region and the WAMSI Kimberley marine science focus is likely to further draw to the region the nation's major research facilities, including its primary marine research vessels, sophisticated equipment and cost-effective technologies for data acquisition, analysis and prediction. This also provides critical opportunities for the training of young marine scientists, itself a strategic issue. WAMSI coordinates the formation of multi-agency research teams to work on agreed science themes and monitors the integration of the science and the provision of outputs required to service the strategic needs of governments and ocean users. Data sharing and long term data management and access are critical issues for WAMSI.

Summit participants will be asked to propose priority science information needs which are required to address the critical issues and management questions identified in the earlier Summit session.

The rationale for proposed marine science needs for the region should be presented in terms of their relevance to planning, management and decision making. Given the relatively undeveloped state of marine science in the Kimberley-Browse, it is likely that critical information will be derived from both fundamental and issue-based research.

In this context, fundamental science develops:

- the primary physical and biogeochemical datasets that are required to characterise the region's environment, its key values and attributes (e.g. resource inventories), and
- the understanding of the region's environment, its ecosystem structure, sustaining processes and natural variability.

Applied or issue-based research cannot exist in a vacuum. It builds on the fundamental science information for the region and focuses on understanding and predicting:

- how ecosystems respond to human pressures;
- what are the cause-effect pathways between the pressure and the values of the environment that are threatened;
- what are the risks to human activities and infrastructure posed by the environment.



Both fundamental and applied research outputs for the region underpin the development of decision support tools for use in planning and management. These tools may include broad scale resource assessments, robust indicators of environmental change, predictive models, management strategy evaluation methods, and the like. Managers who commission issue-based research do not always anticipate significant emerging issues. Fundamental research and monitoring can provide early warning to managers of issues that were not anticipated.

In general terms, the more areas of decision making and the more sectors that depend on a particular science output, the greater the priority that would be placed on that science output. Priority for fundamental research should focus on values deemed to be highly significant but for which there is little understanding. For issue-based research, the priority should focus on significant values which are most likely to be threatened and for which the level of understanding of the threat-value interaction is low.

Environments and ecosystems function as the result of interacting processes across a wide range of time and space scales and any comprehensive program of environmental research would need to be interdisciplinary, integrated and operate across these scales. For example, the investigation of coastal ecology would occur within the context of shelf-scale studies, which in turn would require information about broadscale atmospheric and ocean forcings. Likewise, short term spatially intensive surveys (e.g. the depth of the photic zone) need to be interpreted within the context of longer term time-series data to understand variability over tidal cycles, seasons and years.

The need for planning, management and decision making in the Kimberley-Browse Region is not simply a “one off”, but will endure for decades to come. It follows that there is an ongoing need for targeted science and monitoring to service and continually improve that decision making. Successive management and decision making challenges will continually raise new questions with new science information requirements. The complex ecosystems of the region, their variability and response to emerging pressures cannot be reliably predicted at present, which highlights the need for good initial baseline monitoring programmes to document the present state of the region’s ecosystems, and ongoing monitoring to understand the trends in key environmental parameters. This information will directly inform decision making and provide the data needed to build more reliable, predictive ecological models and decision support systems.

Some further science management considerations relating to the development of a Strategic Marine Science Case are listed below:

- well-defined science themes encompassing groupings of science requirements;
- balancing fundamental research, issue-based science, monitoring and prediction
- integration of science outputs and development of decision support tools to inform strategic decisions for the region;



- long-term data management and ease of data exchange;
- alignment with national research priorities.

With regard to the strategic objectives and desired outcomes for the Kimberley-Browse region outlined above, the following preliminary science themes and their role in supporting planning and management in the region are provided as a basis for discussion.

1. Broad scale climate and oceanography – to develop enhanced understanding of the broad scale climate [change] and oceanography of the SE Indian Ocean and their role in driving physical and biogeochemical processes in the Kimberley-Browse region. This may lead to benefits in greater understanding of:

- regional climate variability and long term trends in critical atmospheric and oceanic parameters (e.g. cyclone frequency, rainfall, ocean temperature and acidity);
- the connectedness with other regions as a factor controlling / sustaining biodiversity;
- fisheries recruitment processes ;
- offshore nutrient sources and biological productivity;
- operating environment for offshore oil and gas production.

2. Continental slope, shelf and coastal processes – these studies should lead to an improved understanding of the region's marine ecosystem functions and services, providing a number of benefits in relation to understanding of:

- connectedness and its influence on the distribution of marine biodiversity and endemism within the region;
- extreme events (e.g. cyclones, internal waves, storm surge), their risks to offshore and coastal infrastructure and their effects on the environment;
- environmental requirements and sustaining processes for key habitats and communities;
- marine effects of river discharges and the influence of catchment modifications;
- fisheries recruitment processes and management of the fisheries;
- operating environment for offshore oil and gas production.



3. Living marine resource and human pressure inventories – this priority area acknowledges the importance of habitat and biodiversity studies and their exposure to human pressures, and will provide increased information about:

- broad scale benthic habitats and marine flora and fauna distributions;
- managing cumulative impacts in multiple use environments;
- site selection for aquaculture or industry development;
- fine scale mapping of areas of specific interest, and
- identification of marine protected areas

4. Baseline and long term monitoring to define natural variability of ecosystem function and change over time – these studies will be important in order to:

- assess long-term, regional trends in metocean properties, water quality, primary productivity and habitat condition;
- provide a long term, regional context for more localised, tactical monitoring.
- design cost-effective systems to monitor:
- natural variability in these indicators in reference areas representative of undisturbed ecosystems and bioregions;
- natural variability in other regions prior to the commencement of human activities;
- the occurrence of any departures from natural variability, leading to investigation of the anthropogenic or other causes of these departures;

5. Management-related Process Studies - – these studies should lead to an improved understanding of the processes linking natural and human-induced pressures with changes in the ecology of an area and will provide benefits in relation to identifying early warning indicators of ecological change. This will be of significant benefit for

- ecosystem-based fisheries management
- environmental impact prediction and management
- predicting the impacts of climate change on the biodiversity and biological systems of the region, and the adaptation of these ecosystems.



6. Planning tools for Ecologically Sustainable Development – improved decision-making will flow from the application of the strategic research to develop decision-support tools for managers and operators. These tools may include:

- rapid, broad scale resource assessments based on remote sensing technologies calibrated to the region;
- cost-effective systems for monitoring environmental change over periods ranging from days to decades;
- predictive ecological models incorporating natural variability and the cumulative effects of existing and projected human pressures , and
- management strategy evaluation tools to assist managers in identifying the relative strengths and weaknesses of alternative strategies in the context of multiple use and multiple management objectives.

THE BUSINESS CASE

The application of financial, human and organisational resources to address strategic issues in complex systems requires a high level of collaboration, coordination and management across governmental systems and with other stakeholders to achieve targeted outcomes.

Presently research and data acquisition in the Kimberley-Browse region is carried out by several federal and state agencies and the private sector. Some of the research is targeted to meet localised or specific statutory responsibilities of agencies and the requirements faced by the private sector in project design and meeting environmental approvals. Some of this research is commissioned and outsourced to research organisations such as AIMS under rules that ensure the scientific knowledge gained is widely accessible.

The Australian Government's Marine Bioregional Planning Process has focused attention on consolidating, synthesising and making more accessible existing data sets from multiple research agencies and this has revealed important information gaps. However there has not been a comprehensive programme of research that is focused on the strategic science needs of the region.

Meeting these needs and filling these gaps will have benefits for an understanding of the region and assist decisions that are directed towards achieving the social, economic and environmental values set out for the region.

In preparing the Business Case the consultants will consider different ways in which research may be organised, funded and applied.



Initial scoping for the Business Case will be undertaken by gathering data on the existing practices of the major stakeholders in the public and private sectors around co-investment and the successes and failures of such activity. Confirmation will be sought on the respective budget cycles and the processes used to list, evaluate and allocate funds for research.

Identified stakeholders will be asked by the consultants to estimate the costs of filling in the science gaps noted in the draft Marine Science Case. They will also be asked if their organisations had any current proposals to undertake research in the region that would complement or supply research needs identified in the Marine Science Case. Information will be sought on the likely sources of funding for priority research, the benefits for the different industry sectors and the government of this research and the estimated funds required over the medium and longer term. While some additional data might be available at the Summit, the consultants expect to gather more during the post-summit consultations.

ORGANISING RESEARCH

The organisation of marine science research to fill the gaps in strategic science tabled as a result of the summit and the project overall, will require work that is multi-disciplinary and coordinated across a great variety of stakeholders. WAMSI is well-placed to fill this role, given its existing structure, research, financial arrangements and the level of cooperation already displayed by members.

There needs to be a clear pathway for research from the identification and resourcing of priorities to the successful application of research. This pathway for implementation needs to be traversed in a political, economic and social environment that is in a state of flux as challenges such as climate change are faced. The time-frames for research and the political and economic cycles are not synchronised and it might be necessary to create new ways of organising and implementing research. This could be magnified because of anticipated shortages of scientists able to undertake the research.

FUNDING RESEARCH

At present, several different methods are used to fund research. These include the use of grants to universities, by commissioning research, using tenders, collaborating with other stakeholders and philanthropy.

The most effective means of funding research should be discussed, given that there is likely to be a need to accelerate research into the key areas discerned in the summit and the post-summit consultations.

APPLYING RESEARCH

Some stakeholders look for research whose application will make a difference perhaps by reducing the problems which they face and are required to act on for reasons related to regulatory approval or election undertakings.



western australian
marine science institution

The timely provision of data and its analysis, the use of new technology, addressing the research to contemporary problems or the adoption of an appropriate regulatory framework are some examples of issues in the application of research.

ESTIMATED NEEDS

Identification of key marine science needs should be accompanied by estimates of the long-term research requirements for a period of up to 30 years with closer horizons being set for immediate and short-term research.

Research into the Kimberley-Browse marine region needs special consideration for funding because of its remoteness. There is also a need to fund the development of scientists to reduce the shortage in supply of researchers with appropriate expertise and experience. WAMSI, because of the policy and science capabilities of its members, is able to address these challenges.

CONCLUSION

The Marine Science Policy Summit provides an opportunity for steps to be taken to set out initial priorities for the marine science case, given the recognition by governments of the social, economic and environmental values of the region and the need for sound planning and management based on reliable information. Participants will be involved in a unique meeting to further knowledge and its application in this exceptional and important region.