



Joint Environmental
Management Study

off the shelf

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The objectives of the North West Shelf Joint Environmental Management Study

What is The North West Shelf Joint Environmental Management study? Who is conducting the study? What will the study accomplish? Why is it important? What progress has been made?

Western Australia's North West Shelf contributes \$6 billion a year to the national economy. It is the most economically significant land or sea region in Australia. A wide range of business and community interests want access to this area.

The \$6 million study is a cooperative effort on the part of industry, the Western Australian Government and the CSIRO. Its objective is to develop a management model to ensure that such areas are utilised in a fair and environmentally sustainable manner.

Who is conducting the study?

Western Australia's Department of Environmental Protection (DEP) and CSIRO jointly manage the study. The total project cost of \$6.1 million comes from a \$2.7 million contribution from WA and \$3.4 million from CSIRO.

Support for and participation in the study comes from a full range of organisations. These include WA government departments such as Minerals and Energy, Fisheries, Conservation and Land Management. Research participants include the Australian Institute of Marine Science and the Australian Geological Survey Organisation. Industry participants are Hammersley Iron, Chevron Australia, Woodside Energy, the Australian Petroleum Production Exploration Association and Apache Energy.

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The objectives of the North West Shelf Joint Environmental Management Study

What will the study accomplish?

That objective is to provide a working management model, which takes account of environmental needs for the region's coastal and marine systems," said Dr Chris Fandry, from Western Australia's Department of Environmental Protection.

"It is essential that a marine area, so rich in resources, be capably managed. We are currently seeing the results of bad management over much of Australia's landscape. Billions and billions of dollars are being committed to redressing the management mistakes made upon the land.

"Attempts have been made to manage the North West Shelf area, but these have not been consistent nor aided by the full range of research needed to make knowledgeable decisions. As a result, there has been an accumulated tangle of over 200 regulations, Federal, state and local, pertaining to development of the region.

"The study's management model takes into account the varying ecological dynamics of the region, the demands made upon the system by the various modes of usage and the community expectation regarding the protection of the system. Models are computer tools designed to test and report on a wide variety of possibilities, taking a broad spectrum of variables into consideration. The model is then able to quickly respond to varying patterns of usage, responding to each with projected impacts upon the system.

Community consultation is a vital part of the study, according to Dr. Fandry. "This is an important part of the study" he said.

"The management model is of no use unless it measures North West Shelf development against community attitudes

and expectations. We are carefully surveying those expectations so that managers and regulators, using the model, can be confident that their decisions will not be out of step with the community.

"Managers and regulators will be able to quickly determine the likely result of various projected combinations of development, factor in the community's response and set management plans accordingly."

Why is the study important?

The study is important because two-thirds of Australia's territory is under the oceans. It contains great riches and beautiful, unique ecosystems. We must learn how to manage this vast and bountiful area so that we may use it without making the same errors that were made in the management of our land resources.

The implications for Western Australia are significant. Application of the management model will allow the vast resources of the North West Shelf to be developed in a sustainable manner. This will provide management tools to help keep the economic benefits flowing from the region, without endangering the environment of the area. This is important to ensure that we do not abuse our resources, but maintain them in a healthy condition for the benefit of future generations.

Farther afield, the management model will find application in other regions, both in Australia and internationally. Feeding the model with the research data and community expectations, from other areas, will allow the management model to function, in a similar manner.

Tropical Mangroves are considered important as nursery areas for some commercial fish species as well as habitats for many other species of conservation value.



It is essential that a marine area, so rich in resources, be capably managed.

What progress has been made?

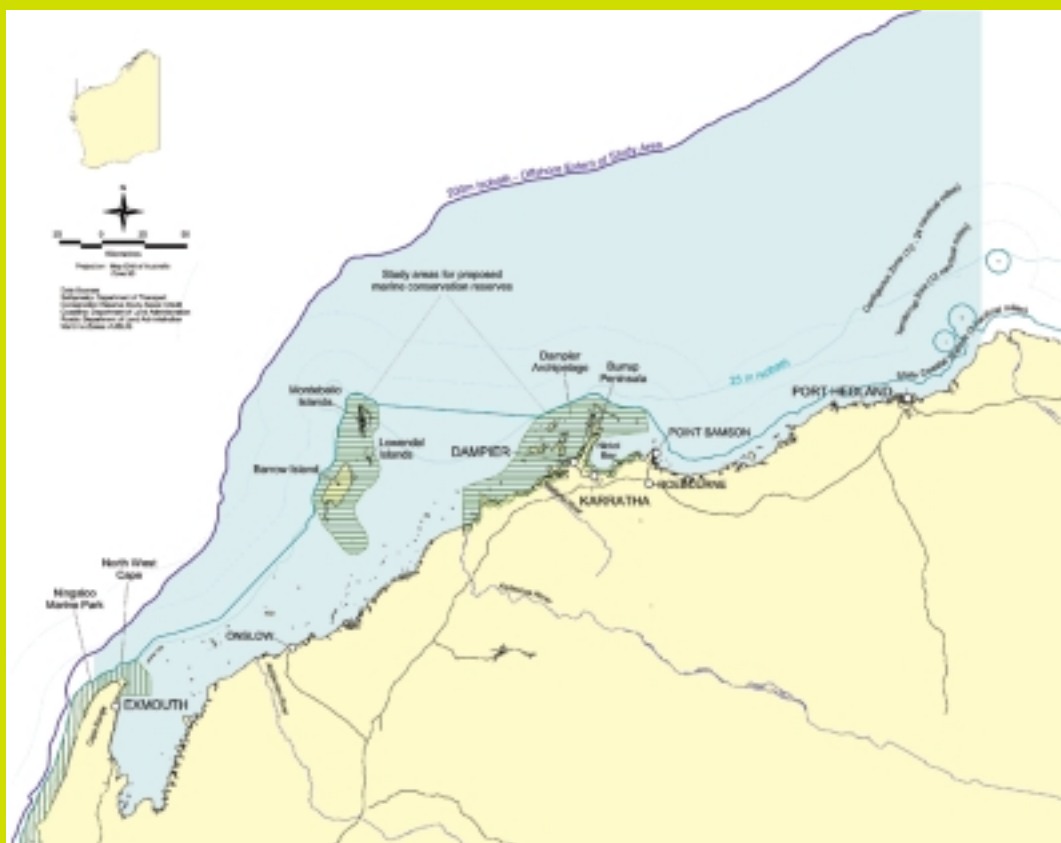
“We’ve just heard from the scientific workshop reporting on the progress of the first 12 months, and Australia’s first offshore environmental study is on track,” said Co-Director, Dr Chris Fandry.

“This is a significant research journey with some key milestones and achievements along the way. We are on track to achieving those milestones, and to reaching our ultimate objective.

Dr Fandry said much new ground was broken in the first 12 months of the project. Key aspects include –

- The development of a prototype computer-based system for evaluating management strategies applied to multiple-uses on the North West Shelf
- A computer model of the ecosystem which integrates the physical and ecological processes to enable the prediction of natural events, such as tropical cyclones, and human activities, such as fishing and petroleum exploration and production.
- A community consultation process to determine the broad local community’s values and preferred outcomes and options for the environmental management of the North West Shelf.
- A Geographic Information System that is a database for a vast amount of scientific data obtained from research organisations, government departments and industry. The system produces charts and maps for a wide range of applications.

The study area extends along the coast from North West Cape to Port Hedland, and out from the coast to the 200 metre depth, encompassing an area of 110,000 square kilometres.



Dr Chris Fandry

Community liaison manager appointed

The goal of the North West Shelf Study is to create a development model that can be used to successfully evaluate and manage the mix of development in the area. One of the parameters for the modelling process is social demand and expectation. What is the feeling of the community? How would the community achieve a balance between the rewards and dangers of marine development?

In order to accomplish this part of the research process is societal. The study has gone directly to the people looking for a valid response to the question: "What do you want for the North West Shelf?".

As a part of this process a community liaison manager was appointed to the North West Shelf Joint Environmental Management Study. Ms Tonia Swetman, of Cognito Consulting, is a former Assistant Director and Acting Chief Executive of the Pilbara Development Commission.

Ms Swetman has substantial experience in liaison between government, industry and community in the Pilbara region, said study Director, Dr Chris Fandry. "Tonia has contributed to several major planning initiatives of the Pilbara region and has developed and managed several projects which have directly and indirectly contributed to the Pilbara's growth and prosperity.

"The North West Shelf Study is a significant pioneering project with potential regional benefits and it is important to ensure all interested business, industry and community groups are kept informed throughout," Dr Fandry said. "Seeking community views is also vital to the study process."

The study area of 110,000 square kilometres extends from the coast to the 200 metre depth contour, and from North West Cape to Port Hedland.

"The major objective of the study is to gather as much information about the region as possible and to use it in combination with models of the marine ecosystem to help

predict the impacts of natural events and human activities on the North West Shelf. Ultimately, this will lead to a more integrated approach to planning and management of the North West Shelf with the goal of ecologically sustainable development.

Ms Swetman said the rapid growth of marine industries in and around the North West Shelf has led to complex management and regulatory structures.

"Consulting with all regional user groups and the broader community will be important to building an understanding of research and creating the links between organisations. A collaborative approach to integrated management is essential to balancing these uses, and avoiding conflict.

"Critical to the study is information from the community to consider development options of the North West Shelf environment and the values placed on the environment and economic development," she said.

Pilbara residents have been surveyed to assist in the environmental management of the North West Shelf coastal waters from Exmouth to Port Hedland.

The survey was part of the community consultation process initiated through the North West Shelf Management Strategy by the Department of Environment, Water and Catchment Protection and CSIRO.

Ms Swetman said the survey will provide –

- an indication of coastal recreational activities
- desired environmental outcomes from the study
- the value residents place on the natural qualities of the North West Shelf marine environment
- values of recreational, cultural, industrial and conservation development
- key environmental questions which should be considered in the study

Survey forms have been distributed and are currently being evaluated. Ms Swetman said all responses would be treated confidentially, and an analysis is expected to be available later this year.

"This is an effective approach to measuring environmental, economic and cultural issues for the community as part of a significant study of the region's marine environment.

"The outcomes will contribute to options and opportunities in the way this environment is managed for the future," Ms Swetman said.



Tonia Swetman has substantial experience in liaison between government, industry and community in the Pilbara region.

Modelling the environment

One of the first outcomes of the North West Shelf Joint Environmental Management study is a computer model which simulates the response of the region to seasonal cycles and natural events such as cyclones.

The North West Shelf experiences an average of three to four cyclones a year. This is the highest incidence of tropical cyclones along Australia's coast. This can cause massive destruction to coastal areas and seabed habitats. The effect of such natural phenomena on the natural variability of the North West Shelf's marine ecosystem is not well understood. This is because of the absence of long-term monitoring programs. This means scientists and managers cannot properly assess the potential impact of proposed industrial developments and other human activity.

This computer model will be available to regional management authorities, industry and community organisations. CSIRO's Dr Scott Condie, who developed the computer models, says the North West Shelf contributes substantially to Australia's economy and is recognised internationally for the wealth of its marine biodiversity.

Dr Condie says that for regional managers and resource users, it is important to know how the system links up over 110,000 square kilometres of this distinctive marine ecosystem, and provides responses to natural events or man made activities.

"For example, the extent of scouring that a cyclone causes on the seabed and the subsequent impact on the marine flora

can be modelled relative to the strength of the storm," Dr Condie said. "From this, ecologists can determine how those changes may influence marine life.

"The model can also predict the distribution of other biological processes such as coral spawning, and the transport of larvae by ocean currents to maintain downstream coral reefs. For the valuable pearl industry, the model can assist in identifying the wild oyster stocks whose spawning eventually provide the shell collected by farmers."

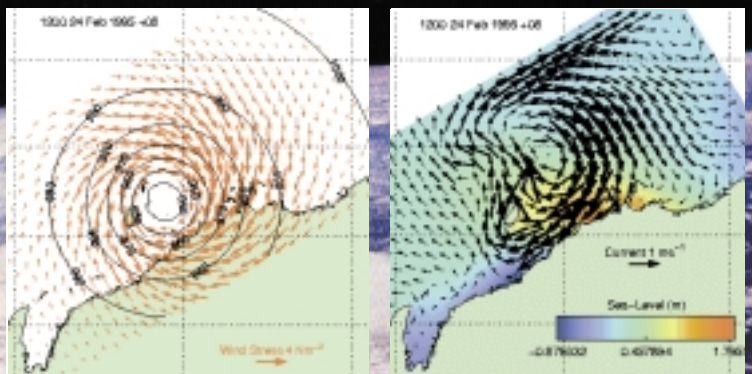
The computer models will be integral to the broader management model being developed for the North West Shelf. Dr Condie said the study will provide an understanding of the marine environment, and the tools to aid and streamline management decision-making.

Cyclones are just one of the natural influences on the marine environment. Others include large tidal currents, sub-surface waves that can affect coastline installations and pipelines, and large-scale variations in ocean temperature and salinity, influenced by the Indonesian throughflow and other regional currents.

"The effect of cyclones and other natural variability on the North West Shelf's marine ecosystem is not well understood because of a lack of long term monitoring.

"This model provides a valuable tool that allows managers to consider natural variability in association with the potential impacts of proposed industrial developments and other human activities," Dr Condie said.

Modelled winds and pressures during cyclone Bobby (left) and modelled sea level and current response (right) based on the 5 km resolution model.



Scott Condie

Testing the marine development model

Our Oceans are rich in terms of unique biodiversity, rich in the type of knowledge waiting for us in their depths, and rich in terms of the possibilities for economic development. It is important that we consider all three areas of wealth if we are to use our oceans wisely and sustainably. How can this be done?

Our Oceans are a commonly held resource that calls for careful stewardship and cooperative management. How can we regulate marine territories in a knowledgeable and responsible fashion?

Trying to regulate development on the resource rich North West Shelf has led to complex management and regulatory structures. How can we create a more practical and useful model to manage the multiple use of this type of marine region?

“We’re applying what we know from regional development and activity in the past, invoking a suite of management practices and then projecting them forward to test their future environmental impact,” says CSIRO’s Dr David McDonald.

“We want to take account of the uncertainties and risks, and then find the strategies that can cope with these risks to avoid expensive and possibly irreversible environmental mistakes. The study replicates this resource-rich region and simulates many of the natural environmental factors such as ocean currents, tides, the seafloor, corals and mangroves. This is one of the most challenging aspects of the research”, he said.

Australian research is at the cutting edge of this emerging field of integrated marine management, with similar work

being undertaken by groups in British Columbia and the Netherlands. Dr McDonald said that once developed, the environmental management prototype can be used in other regions such as Queensland’s south-east, the Great Australian Bight and the Great Barrier Reef.

The North West Shelf Joint Environmental Management Study has brought together other WA Government Departments, North West Shelf resource industries, the Australian Geological Survey Organisation, the Australian Institute of Marine Science, and community, recreational and conservation groups. Dr McDonald said a collaborative approach to integrated management is essential to balance the full range of uses of the marine and coastal environment, and to avoid conflict.

“A major objective of the study is to make use of as much information about the region as possible from existing and previous studies. This will be used in combination with models of the marine ecosystem to help predict impacts of natural events and human activities on the North West Shelf. Natural events may be related to El Nino, such as ocean warming causing coral bleaching, or tropical cyclones, while human activities may be fishing, oil and gas exploration and production, industrial production or tourism-related.

“The scientific information will be combined with environmental, economic and social objectives to develop a computer modelling system to provide a more integrated approach to planning and management of the North West Shelf with the goal of ecologically sustainable development,” David said.



David McDonald



The study will provide new knowledge and understanding of marine conditions and processes on the North West Shelf.

Pouring science on troubled waters

Before we can create models to guide us in the sustainable development of the North West Shelf we must have a full understanding of the threats we are facing. One of the areas that must be studied is the number, the type and the source of any contaminants that threaten the area.

Then we must discover how these contaminants affect the marine life in the region, and how these contaminants may be controlled.

The results of a study into the likely affect on the marine life of contaminants in the waters of the North West Shelf will be known later this year. Researchers from the company Des Lord and Associates have begun a review of the toxicological impact of contaminants, discharged on the shelf, from all sources including industrial, municipal and natural such as ground water and oil seeps.

Study Director, Dr Chris Fandry, who compiled an inventory of discharges, and the volumes and sources, said up to 20 types of discharge occur in the region. These range from oil platform seepage to waste water treatment plants.

“In this review, we want to identify what is in the discharges and its toxicity on the marine environment,” said Dr Fandry. “The discharge of produced formation waters containing oil from offshore platforms is part of the petroleum extraction

process, but it is only one of a number of sources of oily waters entering the system.

“It has long been recognised that a considerable volume of oily water comes from natural sources on the seafloor. Understanding the influence of this contribution will be important to assessing the potential impact from industrial sources,” he said.

Instruments on satellites such as the Canadian Radarsat are now being used to detect oil spills and discharges, and formation water can be clearly seen in satellite images of the North West Shelf. A 1996 study undertaken for the Australian Petroleum Production and Exploration Association (APPEA) found that the highest source of oily waters in the global marine environment came from municipal and land-based industrial sources. Globally, natural sources account for eight per cent of oil in the marine environment, while only two per cent comes from offshore production. The source of the remaining 90% is comprised of Refineries (3%), Municipal/industrial (30%), Atmospheric Fallout (9%), Transport other than Shipping (13%), Tanker Accidents (13%) and Tanker Operations (22%).

“How these figures compare to the North West Shelf marine environment is not known” said Dr Fandry, “but the review will provide this important information.”



Monitoring contaminants entering the marine environment is important for effective management for example here water quality sampling for E.coli count (sewage).

Managing for today and tomorrow

The North West is ecologically complex and diverse. The seabed habitats of the North West Shelf support the highest biodiversity recorded anywhere in the world. They support a remarkable array of marine fauna, including tropical fish, turtles, hard and soft corals, sponges, and a great many crustaceans. The marine biodiversity is extensive and includes major coral reef systems, coastal mangrove areas, and a host of other distinctive marine species, including charismatic large fauna such as whale sharks, turtles, and dugongs.

Western Australia's North West Shelf is a \$6 billion contributor to the national economy and the most economically significant land or sea region in Australia. It produces the majority of Australia's domestic and exported oil and gas. Other major industries operating on the shelf include commercial fisheries, aquaculture (especially pearl farming), salt production, iron ore processing, shipping (associated with the transport of oil, gas, salt and iron ore) and a rapidly expanding tourism industry.

With the rapid growth of marine industries across a range of sectors, the potential for conflict between different uses of the marine environment is increasing. From experience elsewhere in the world environmental quality and the ecological



sustainability of industries, with their associated employment and wealth generation, may be compromised at some point unless development occurs in an integrated and ecologically based management framework.

The North West Shelf Joint Environmental Management Study will significantly increase our basic understanding of the marine ecosystem, produce a range of predictive tools, including ones to support management decision-making, as well as provide some information on potential impacts of the major activities. The study will also provide the scientific foundation for an integrated, ecosystem-based approach to environmental management and planning.

Study Collaborators

WA Department of Environmental Protection
and CSIRO Marine Research

Project Support

West Australian Government
Minerals and Energy, Fisheries, Conservation and
Land Management

Science

Australian Institute of Marine Science,
Australian Geological Survey Organisation



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<http://epagate.environ.wa.gov.au>

<http://www.marine.csiro.au/nwsjems/index.html>

Photography from: Centre Coral Reef Ecosystem Clay Bryce - WA Museum; Aquaculture Pearls and Commercial Fishing fish - WA Fisheries; Recreational Fishing Jirri Lockman - WA Fisheries; Petroleum Woodside Platform - Woodside Energy Ltd (Cotton, I.); Tourism CSIRO; Coastal Development Aerial shot - Hammersley Iron Pty Ltd.



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