



Joint Environmental
Management Study

off the shelf

Issue 2

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Information systems working together

Anyone who has ever used a computer is aware that software systems and formats come in a wide range of options, and most of them will not talk to, or interchange with the others. In the world of science these format gaps can be even more significant. Scientists often program their own software for a specific project.

The North West Shelf Study depends upon accessing research information that already exists and combining it with a range of new data, from a number of participating organisations. One of the first questions to be answered was: How do we access all of this data, and roll it into one standard format that is universally available?

Easy access to information

A Geographic Information System (GIS) is being used by the North West Shelf Joint Environmental Management Study to include different information sources in an easily accessible library and analysis centre.

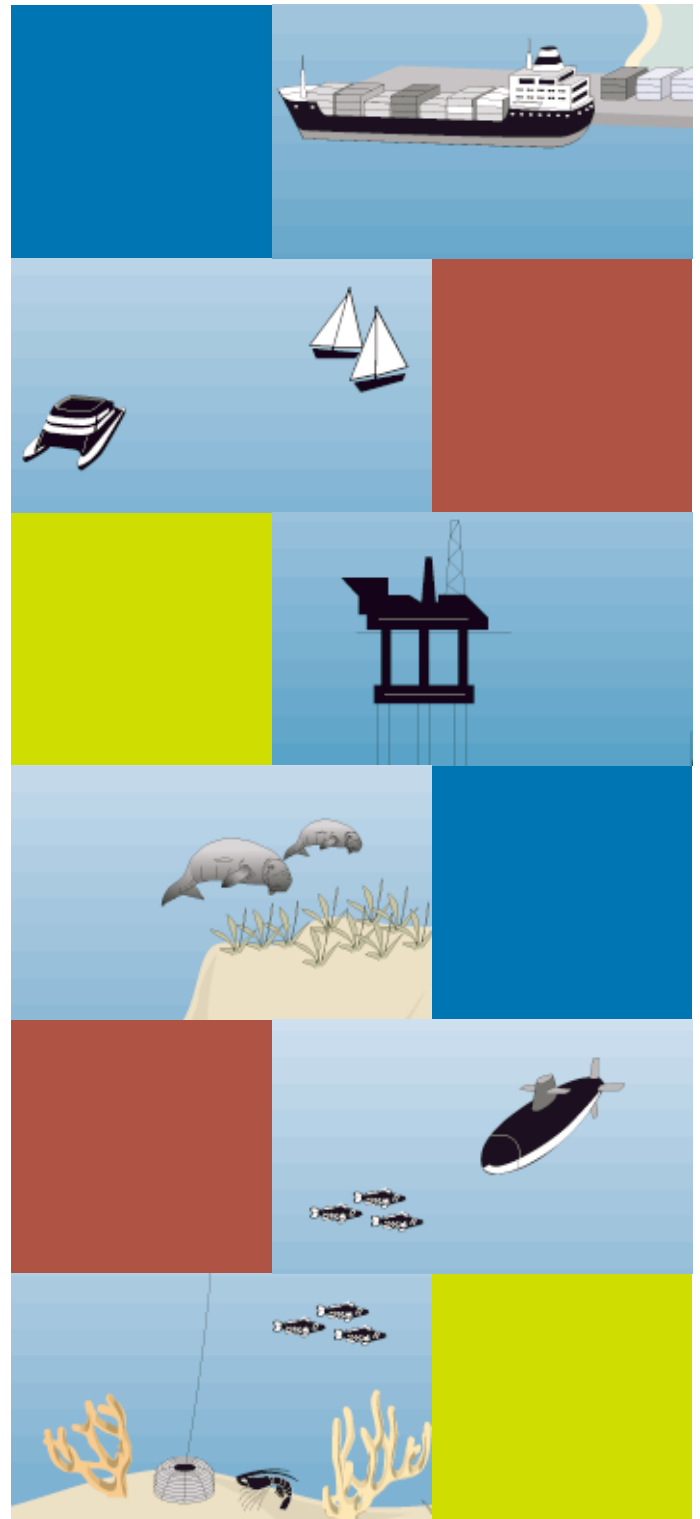
At the Department of Environmental Protection (DEP), GIS has been used as the basis of a Data Management System.

Mike Fuller, the JEMS Data Manager with the DEP, says the system allows easy access to information layers for display and analysis.

Data has been obtained from a wide range of different sources and agencies in a variety of formats.

Once obtained, the GIS allows the information to be transformed into a common format where it can be displayed and analysed.

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Once data is entered into the system, the GIS can be used for a wide range of tasks, including:

- Presentation and overlay of different types of information
- Integration of information for comparison and analysis
- Preparation of high quality maps and reports
- Spatial analysis and statistics

“GIS gives us the ability to view different types of environmental information at a range of spatial scales to better understand their relationships.

“Relationships may be as simple as the types of marine habitats in an area, where the fish are located, and the zones that define areas where people catch fish.

“Overlay of these layers can give an indication of the habitat types that have the most fishing activity.

“Building upon these simple types of spatial queries we can develop a better understanding of the environment and GIS provides the tools to perform the analyses” Mr Fuller said.

Examples of the different types of data that have been obtained include:

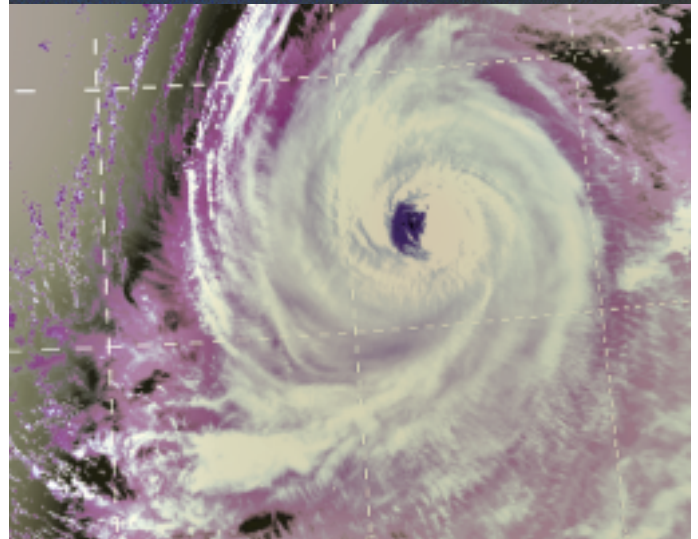
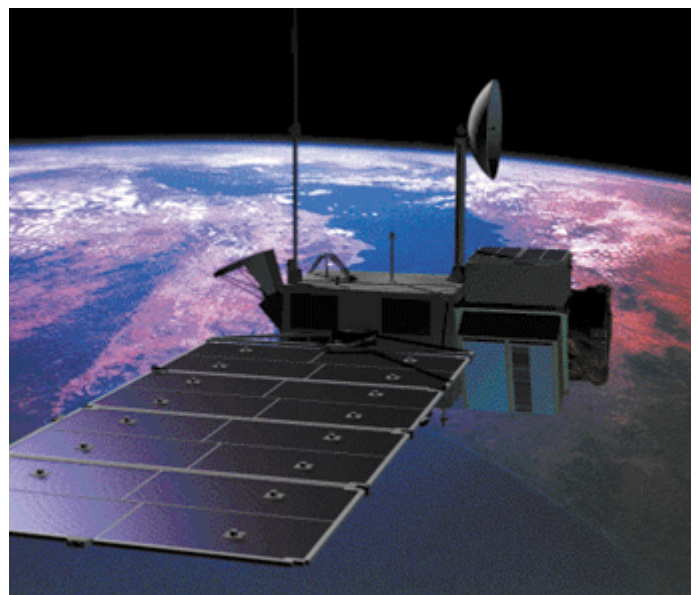
- Aerial Photography
- Satellite Imagery
- Marine and Terrestrial Habitats
- Bathymetry
- Flora and Fauna
- Bio-regional classifications
- Maritime Boundaries
- Land Tenure and Use
- Administrative and Conservation Boundaries

Information about the data obtained is also entered into a Metadata database (Data about Data) describing the type of data, source, ownership and licensing.

Metadata of datasets obtained has been made publicly available through the Western Australian Atlas (http://www.walis.wa.gov.au/data_gateway/index.htm) and the DEP - NWSJEMS web site (http://epagate.enviro.nws.gov.au/nws/metadata/MET_SearchMain.asp).

Mr Fuller said that once incorporated into the GIS Data Management System, the data can be manipulated and analysed, as well as exported and provided to different users and groups who require the data.

Users include other State Government agencies, NWSJEMS collaborators (Private and Public organisations) and key research and environmental modelling staff within the NWSJEMS.



Birds-eye view from a satellite locates a weather system.

Management Strategy Evaluation (MSE)

The North West Shelf of Western Australia is today the source of most of Australia's domestic and exported oil & gas products. Other major industries operating on the shelf include commercial fisheries, aquaculture (especially pearl farming), salt production, iron ore mining, 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.

These major industries operate in a region recognised for its rich marine biodiversity. From experiences 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 within an integrated and ecologically-based management framework.

The principal objective of NWSJEMS is to develop and demonstrate practical science-based methods to:

- Support integrated regional planning and management of the North West Shelf marine ecosystems under existing statutory arrangements.
- Consolidate and extend the information on, and understanding of, the NWS ecosystem and the cumulative impacts of multiple human uses.
- Comprehensive science-based support, for the multiple use management, must be able to scientifically compare the performance of different prospective management strategies.

MSE Framework

Management Strategy Evaluation (MSE) is an approach that provides a practical and useful framework for evaluating the effectiveness of prospective management strategies in the achieving defined objectives.

MSE assesses the consequences of a range of management strategies or options. It then presents the results in a way that

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This model is used to assess how the natural system might respond to a wide range of human uses and natural events.



Management Strategy Evaluation (MSE) from previous page

lays bare the tradeoffs in performance across a range of management objectives. It does not seek to prescribe an optimal strategy or decision. Instead, it seeks to provide the decision maker with the information on which to base a rational decision, in accordance with their own set of objectives, preferences, and attitudes to risk. The key ingredients of this approach include:

- Determine current knowledge about the NWS
- A clearly defined set of management objectives
- A set of performance criteria related to the objectives
- A set of management strategies or options to be considered a means of calculating the performance criteria for each strategy
- Evaluation of outcomes
- Communication of the results, highlighting the trade offs

These models are used, together, to determine how the natural system might respond to both natural events and human activity. The computer program used for MSE traces the impact of a particular management strategy on the actions of sector firms or agencies. Then it traces the impact of the affect that these actions have on the natural environment.

In so doing, the program keeps track of details on sector response to:

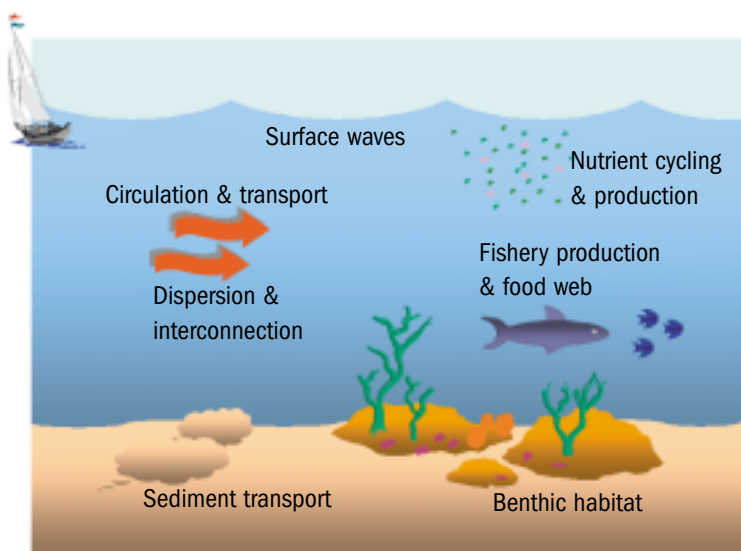
- Management actions
- Sector performance
- The way the natural system changes in response to sector-specific actions
- Important random events
- And any strategy-mandated adjustments by managers as a result of sector and/or system response

The community survey provided a strong indication that the first priority for the region was the preservation of the natural environment.

Computerised MSE Model

The core components of the computer-based MSE framework are:

- A model of the natural system
- A model of each of the important sectors of human activity
- A model of how decisions are made, including monitoring activities.



Conclusions

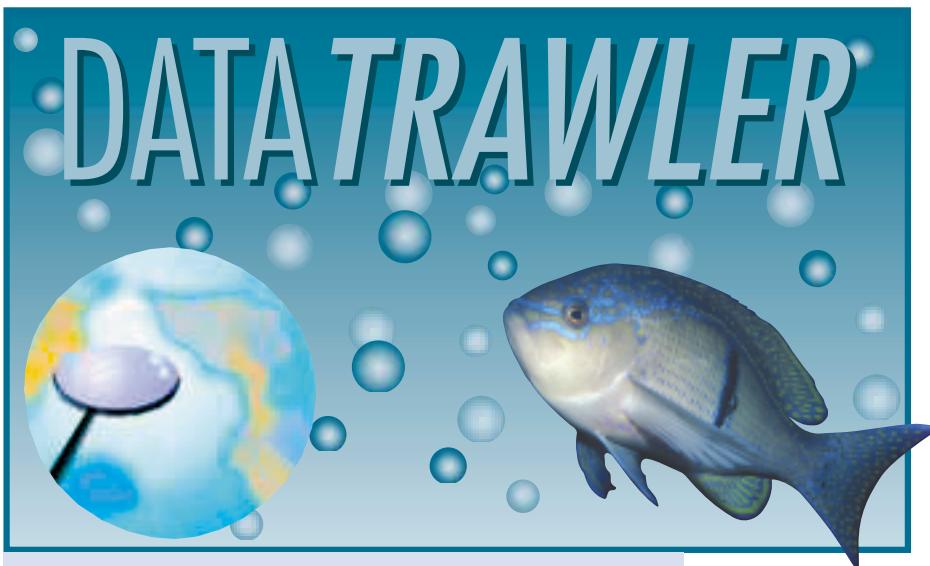
The community survey provided a strong indication that the first priority for the region was the preservation of the natural environment. This throws the responsibility for the acceptable development of the region to the region's managers.

In addition to the community's desires for the region, the long-term economic rationale demands that managers walk the fine line of sustainable development that will preserve resources for future generations of Australians.

The computerised MSE Model is a tool that can be used by managers to balance the many uses of the region with environmental responses, to evaluate the impact of management strategies.

Major components of the model of the natural systems on the North West Shelf.

Trawling for scientific marine data



Scientific data has suffered from high levels of data personalization. This occurs when individual scientists lock highly valuable data away in 'information islands' outside the reach of other researchers. This is usually not intentional, but difficulties often arise out of the use of differing computer software and formats, which make it difficult to share information.

The cooperative nature of the North West Shelf Study made it imperative that all data was available, not only to scientists, but to a wide range of people. The Marine Research Division of CSIRO, in partnership with the Western Australian Government's Department of Environmental Protection, has developed an internet application called Data Trawler to increase access to scientific data.

Data Trawler, and its associated warehouse, is aimed at eliminating data access problems by providing an easy-to-use interface that allows wide access to data.

Discover, investigate and download . . .

The Data Trawler can be found at following URL (<http://www.marine.csiro.au/warehouse/jsp/loginpage.jsp>). This is a discovery tool, built using Java 2 technology, to access the Study's data warehouse via the Internet. Data Trawler provides a capability to discover, investigate and download scientific data held in the data warehouse.

Based upon an extended version of the classic on-line store model, Data Trawler provides a search interface, a basket where discovered data can be placed between searches and a capability to download selected data. The warehouse stores a range of scientific data, including profile, time series and model data.

To access the warehouse data with Data Trawler, users are required to logon using an e-mail address and password. Data Trawler uses the supplied e-mail address as a destination for sending e-mails associated with data download requests.

For security purposes, when a user logs on, Data Trawler assigns a customized profile if the user has previously been registered, while an unregistered user is assigned a public profile. A registered user's profile includes a number of data access keys. A public profile includes only a single "public" access

key. Each piece of data in the warehouse is also assigned an access key.

When an unregistered user executes a search, Data Trawler returns only data assigned a public access key. When a registered user executes a search, Data Trawler returns data with access keys that match the keys defined in the user's profile. It is intended that the majority of data in the warehouse will eventually be placed in the public domain.



North West Shelf survey results

Pilbara residents have been surveyed to provide data about development options for the North West Shelf. This will be used to assist in the environmental management of the North West Shelf from Exmouth to Port Hedland.

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

“Consulting with all regional user groups, and the broader community, is important in building an understanding of research and to create links between organisations,” said Project Community Liaison Officer, Ms Tonia Swetman.

“Information from the community is critical to the study. We need the community to consider the development options for the North West Shelf and to evaluate these according to the values they place upon the environment and economic development,” she said.

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

The survey also seeks information relating to resource uses, perceived threats, community values, and preferred outcomes. Survey forms were distributed widely.

“This research of community opinion is meant to measure environmental, economic and cultural issues for the community, as a part of a significant study of the region’s marine environment.

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Roebourne resident wins trip for two to Tasmania



Laurel of Harvey World Travel draws the winner, overseen by Justice of the Peace, Fatima Rebola Gibson.

By completing a survey about the North West Shelf marine environment, Amy Smith has won a holiday package that includes two return airfares to Tasmania, one week’s accommodation and car hire in Hobart. Amy and her lucky friend will also visit CSIRO’s marine laboratory, during her trip.

Amy, who has lived in Roebourne for is very concerned about maintaining a healthy marine environment and completed the survey as

part of a class activity at Roebourne Education Centre.

The survey was part of the community consultation process for the North West Shelf Joint Environmental Management Study, which is being conducted by the Western Australian Government and the CSIRO.

The study area extends from the coast to the 200-metre depth contour and from Exmouth to Port Hedland, an area of 110, 000 square kilometers.

Dr Chris Fandry, Project Director from the Department of Environmental Protection, congratulated Amy.

“Over three hundred people completed the survey, which is a great response. I would like to thank the participants for their important contribution. Understanding the values of people living in the region is a vital part of the study. I am delighted to present Amy with her prize.”

The major aim of the study is to gather as much information about the region as possible. This data will be used to help predict the impacts of natural events and human activities on the North West Shelf.

The scientific information will be combined with environmental, economic and social objectives, to develop a computer modeling system. This system will enable the assessment of existing and proposed management strategies for the many uses of the North West Shelf.

Dr Fandry also expressed his gratitude to local travel agent “Harvey World Travel” based in Karratha, who have assisted with the prize.

“Members of the community have been very supportive of the study and it is great to have the support of local business. On behalf of the project I sincerely thank Leanne Rowlands and her team for their backing.”

Information from the community is critical to the study . . .

RESULTS

USES: What coastal recreational activities are important to residents?

activity	percentage of respondents
Walking along the shore	79%
Enjoying the view	73%
Fishing	70%
Looking for / watching marine life	68%
Swimming	67%
Boating	60%
Diving / snorkeling	55%
4 Wheel driving	48%
Viewing Aboriginal Rock Art	40%
Collecting seafood / shellfish	33%
Collecting shells	29%
Other	22%
Surfing	13%
Skiing	8%

VALUES

How important would you rate the following natural qualities of the North West Shelf marine environment?

The survey strongly indicated that water quality and the natural environment and ecosystems were the most important qualities of the region.

natural qualities	very important	fairly important	not important
Water quality	94.5	4.81	0.69
Variety of plants and animals (biodiversity)	88.7	10.27	1.03
Number of plants and animals	76.98	21.99	1.03
Health of plants	90.82	8.17	1.02
Health of animals	92.10	7.22	0.69
Aesthetic (or attractiveness) values	46.37	46.37	7.27
Healthy and natural environment (ecosystem integrity)	92.98	6.32	0.70

THREATS

What were the threats perceived by the respondents?

Threats arising from the following:

Natural events

- Cyclones
- Global warming

Human activities

- Coastal development associated with industrial and population growth

- Resource extraction such as fishing, oil and gas
- Impacts of coastal effluents
- Dredging
- Shipping

OUTCOMES

Preferred outcomes for the region.

- Protection of marine plants and animals
- Unpolluted waters
- Accessible beaches for swimming, diving, and boating

For the study area, rank the following goals in terms of importance to you.

The goals were ranked accordingly from most important to least important.

- 1 Maintenance of sustainable relationships among plants, animals and people.
- 2 Having processes in place to manage the region's environment.
- 3 Growth in Employment, income and standard of living.
- 4 Pleasant environment with features available for the public to use.

A high ranking was clearly placed on the elements of managing and maintaining the sustainability of the environment when compared to growth in employment and having a pleasant environment.

“The outcome of the survey indicated a desire to preserve the region's water quality and ecosystems, by maintaining the

balance between environment and development. The response indicated, however, that the environmental protection was the more important outcome. This highlights the importance of the Management Strategy Evaluation (MSE) program being developed by the study,” said Dr Keith Sainsbury. “Through the use of the MSE program, managers and regulators will have access to a tool to evaluate the effectiveness of a proposed management strategy.”

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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