Coastal Zone Monitoring and Evaluation: A Descriptive Analysis of Western Australian Practices

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COASTAL ZONE MONITORING AND EVALUATION.

A descriptive analysis of Western Australian practices.

by

Michael F. Williams

A Thesis Submitted in Partial Fulfilment of the Requirements for the Award of:

Bachelor of Science (Environmental Management) with Honours

at the Faculty of Science, Technology and Engineering, Edith Cowan University,

Joondalup.

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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.
ABSTRACT

Currently there is no information available which documents the monitoring and evaluation practices undertaken in the coastal zone of Western Australia by coastal zone managers. A review of current Australian-wide management practices in coastal management reveals that monitoring and evaluation are limited in their application. The adequacy of the links between coastal monitoring and evaluation, on which our understanding of the state of the coastal zone environment is based, is one of two central themes throughout this research. The other theme is that without an accurate, reliable and effectively managed monitoring and research information base, coastal management will be haphazard leading to duplication and waste of time, funding, and personnel.

A survey of Western Australian State and Local government coastal zone managers was undertaken to establish a profile of coastal monitoring and evaluation practices. The survey revealed that coastal zone management in Western Australia does not function as a cohesive unified process. This survey highlighted poor coastal zone awareness among coastal managers; funding and time as the main constraints to effective monitoring; inefficient management of monitoring and research information; and the lack a management framework which effectively integrates monitoring and evaluation activities as the major monitoring and evaluation initiatives that need to be developed if Integrated Coastal Zone Management is to provide for sustainable use of the coast.

A number of coastal management frameworks are outlined which have the potential to address these issues. These lead to a model for combining integrated coastal zone management with a life cycle approach to program and policy evaluation. Current Western Australian efforts to overcome information management problems are compared and recommendations presented. Conclusions and recommendations are made based upon political realism and practical achievability.
DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signature

[Signature]

Date: 11/11/1997
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GENERAL INTRODUCTION

Monitoring and evaluation have become fashionable. Commerce and industry often talks about monitoring its activities and efficiencies. These activities are carried out in relation to specific objectives with the aim of identifying areas for improvement in performance and profits. Does the same apply in coastal zone management? Is monitoring undertaken as a series of disconnected research projects with rather vague objectives and undertaken because we think we need to know what's there, i.e. undertaking a survey, or is monitoring purpose orientated? A review of the literature quickly reveals that many people are collecting and keeping considerable amounts of information; often for no good reason, using dubious methods, and producing vast amounts of un-analysed, and often difficult to analyse data (Roberts, 1992).

Does this situation apply to coastal zone management in Western Australia? To answer this question we need to ascertain the range of activities undertaken in the coastal zone of Western Australian. Coastal zone management is similar to commerce and industry management in that there is a need to improve delivery of quality products and services; maintaining and advancing corporate values while satisfying stakeholders. Coastal management aims to deliver sustainable use of the coast; maintain environmental, social and cultural values while meeting community expectations regarding access and use of the coast. In commerce and industry there are integrated frameworks in place which ensure the most appropriate information is collected to address management objectives and concerns. This information is systematically analysed, disseminated amongst all relevant parties, then stored in an integrated data management system. By utilising this information management programs and policies can be evaluated and adjustments made where necessary. In the long term this integrated approach to monitoring and evaluation contributes to the management goals outlined above.
In Western Australian coastal zone management, the main vehicle for the delivery of management policies is the coastal management plan (Donaldson et al., 1995). The product or result of these management plans should improve or maintain environmental values and satisfy stakeholders, but rarely has this been evaluated. While the larger aims and objectives of both coastal and corporate management are similar, coastal zone management has not developed comparable methods for undertaking integrated monitoring and evaluation in order to assess if the management programs are working or not.

RATIONALE FOR THIS RESEARCH

It was never the objective of this project to add to the numerous publications available which detail the scientific requirements for undertaking monitoring programs. From conception, this research project always sought to describe in qualitative terms the rationale, process, actions, and the implementation of monitoring and evaluation in the coastal zone of Western Australia. The idea for a descriptive research project was initiated in part by a number of key State government coastal managers wanting to know the relationship between current coastal management practices and the perceived and actual role which monitoring and evaluation played.

STRUCTURE OF THIS THESIS.

One of the aims of this research project was to produce and disseminate quality research worthy of publication with out excessive extraction and editing. Therefore, it was decided early in this study to break with the traditional honours thesis format of:

• Introduction;
• Methods;
• Results; and
• Discussion.
and produce three distinct yet unified and cohesive sections, which would be suitable for publication in refereed or edited journals.

A description of the content of each section, the relationships both conceptual and logical between sections and to the thesis as a whole, and current progress in seeking publication follows.

Section 1.

Monitoring and evaluation in the coastal zone of Western Australia. A survey of coastal managers.

This section is the equivalent of the methods and results sections and part of the literature review. This section provides the background to current coastal management practices and the management frameworks within which they operate internationally, nationally and within Western Australia. The position of monitoring and evaluation within these management frameworks is highlighted and different approaches contrasted. A critical analysis of relevant literature is presented. The rationale for the research is presented based upon limited current knowledge and previous research.

The time and resource constraints of an honours project limited the nature and scope of the project to Western Australia. Hence the major research component for this project is a state wide survey of key coastal zone managers throughout Western Australia (refer to Appendix A for a copy of this survey). The rationale, objectives and methodology of this survey are presented. The survey approach was considered the most appropriate method given the purpose of the project was to describe the various relationships between managers, monitoring and evaluation. Surveys describe and assess frequencies, and as such this approach precluded a strong experimental focus to the project (de Vaus, 1991). Nevertheless, the approach was effective in investigating monitoring and evaluation along Western Australian coasts.
Results of this survey are the focus of this section. A discussion based in part on the survey results and relevant literature follows and highlights four key findings of the project:

- there is a poor understanding of the coastal zone as a discrete management unit in Western Australia;
- a range of constraints to monitoring were identified by respondents;
- there are problems with the management of monitoring information; and
- many coastal zone managers fail to make the link between monitoring and evaluation.

SECTION 2.

Monitoring and evaluation: the key to effective coastal planning and management.

This section consists of the major discussion component of the thesis and extends the findings from Section 1. The need for an effective management framework which is capable of integrating monitoring and evaluation is discussed. Examples are given of a number of common frameworks currently being utilised in coastal zone areas throughout the world. These frameworks are contrasted against recommended “Good Practice” for coastal zone planning and management. Commonwealth and Western Australian coastal examples are used to investigate their usefulness.
SECTION 3.


This section expands upon the findings from Section 1 relating to the management of data and information generated by monitoring programs. The format is as a discussion paper. The shortfalls in current information management are highlighted and the need for a more effective system discussed. Two frameworks for data management currently in operation or under consideration in Western Australia are identified and discussed as possible solutions.
SECTION 1.

Monitoring & Evaluation in the Coastal Zone of Western Australia.

A Survey of Coastal Managers.
1.1 INTRODUCTION

The need for an integrated approach to coastal zone management has been recognised and accepted for over twenty years (Kenchington & Crawford, 1993; Ehler & Bower, 1995). The current model or paradigm for this integrated approach is known as Integrated Coastal Zone Management (ICZM). ICZM is a multi-faceted planning and management framework that aims to preserve and protect the productivity and biodiversity of coastal zone ecosystems while promoting rational development and sustainable utilisation of coastal zone resources (Post & Lundin, 1996).

The management process within an ICZM framework is typically, though not always, a four stage cyclic process. It begins with an inception and planning stage in which problems or needs are identified, the spatial and temporal aspects of the plan are established, and strategies and implementing structures are selected (Scura et al., 1992; Olsen, 1993; International Workshop on Integrated Coastal Management (IWICM) 1996; GESAMP 1996). The second stage is the formalisation stage. This is where projects and policies are formally adopted and funding is secured. An implementation stage occurs next. This involves the development, execution and enforcement of actions, policies and regulations. The last stage in this cyclic process is generally monitoring and evaluation. The positioning of the monitoring component in the ICZM process varies. IWICM (1996) includes monitoring in the implementation stage while Scura et al., (1992) places monitoring along side evaluation. In either model, the results from the monitoring and evaluation feed back into the process in a cycle of continuous adaptation and improvement.
The merits and benefits of ICZM have been extensively outlined in Seura et al., (1992); OECD (1993); Cicin-Sain (1993); Kenchington & Crawford (1993); Sorensen (1993); Atkins (1996); and Post & Lundin (1996) and are not revisited here. The primary focus of this research is not the benefits of Integrated Coastal Zone Management (ICZM) per se but a subset of that process, namely an integrated approach to coastal zone monitoring and evaluation.

There is a consensus among managers regarding the global principles and desired outcomes of coastal zone planning and management as articulated in Chapter 17 of Agenda 21. The actual products or results of current planning and management processes, however, often fall short of these desired outcomes (Commonwealth of Australia, 1995a & 1996). The failure to deliver these outcomes is, in part, due to a lack of monitoring and evaluation feeding back into the management loop thereby improving management effectiveness. Historically planning and management of coastal areas has focussed on policies and management plans. Inadequate attention has been given to monitoring the actual outcomes of these policies and plans and the effectiveness of management practices (Commonwealth of Australia, 1995a).

Monitoring in the coast according to Bayliss & Walker (1996) provides many benefits to managers:

- improved understanding of the coastal zone environment;
- contributes to improved decision making;
- assists in achieving the goals of management, which is protection of the environment, living resources, and human health and well being; and
- gathers information that is central to implementation and evaluation of management practices.
When monitoring and evaluation are combined, further benefits are achieved. Monitoring and evaluation, as feedback mechanisms, validate and reassess the efficacy of plans and policies during and after implementation. This leads to a refinement of plans and policies so they will be more effective and acceptable (Scura et al., 1992). Monitoring and evaluation are instruments for dealing with unanticipated socioeconomic and biophysical consequences that often occur as consequences of management actions (Scura et al., 1992). Therefore, the efficiency of management actions, the effectiveness of a program or policy in dealing with specific issues in the coastal zone, and the continuing relevance of aspects of a program or policy are reflected in the adequacy of our monitoring and evaluation programs (Commonwealth of Australia, 1996).

1.2 PREVIOUS STUDIES ON MONITORING AND EVALUATION AND THE RATIONALE FOR THIS STUDY.

The effectiveness of many coastal programs and policy initiatives must be viewed with a considerable degree of faith or scepticism as little has been done to evaluate their effectiveness. This can be attributed to a lack of management information due to inadequate monitoring (Jacoby, 1994). A survey of published studies which detail evaluations for coastal zone programs and policies found few examples. Papalia (1996) evaluated the performance of coastal watershed management in New South Wales, Australia. Colt (1994) defined and developed evaluation criteria as the first step in evaluating the implementation and management of an integrated estuarine management plan.
A recent example of an extensive evaluation program is the National Coastal Zone Management Effectiveness Study in the USA (Bernd-Cohn et al., 1997). This study had as its principal goal the determination, to the extent that data was available, of the on-the-ground outcomes of the policies, processes, and tools that State coastal management programs use to accomplish the objectives of the Coastal Zone Management Act. The study utilised two sets of indicators: (1) process indicators, which were the States' management programs, tools and techniques that the coastal management plan used to address coastal issues and (2) outcome indicators which are the specific on-the-ground effects that result from implementation of coastal programs. The evaluation centred on determining the effectiveness of State coastal management programs based on the outcome data that could be linked back to each State's process indicators. Often it was not possible to develop clear findings regarding the effectiveness of coastal programs due to the lack of sufficient outcome data. This was directly related to a general lack of organised outcome monitoring. This weakness was traced back to shortcomings in coastal zone management policy, such as the lack of outcome monitoring requirements and performance standards (Bernd-Cohn et al., 1997).

A study by Brown & Burke (1993), although not focused on monitoring and evaluation, provides some insights into the information needs of coastal zone management in Australia and therefore can contribute to the design of monitoring programs. In 1993 as part of the Resource Assessment Commission's (RAC) coastal zone inquiry, Brown & Burke (1993), undertook a nation wide survey of coastal zone managers. Their study investigated the environmental, social and economic information and research needs of coastal managers for integrated coastal zone management (ICZM). A set of 28 different information requirements were put to respondents, who were asked to identify their priorities from this list. There were 1099 responses of which 12.6% (n=138) came from Western Australia. The results from Brown & Burke (1993) are compared and contrasted against findings arising from this research project.
A review of Australian management practices in the coastal zone reveals that monitoring and evaluation are limited in their current application (Jacoby, 1994). Without monitoring and evaluation, policy formulation and management itself will be haphazard (Bayliss & Walker 1996). Currently there is no information available which documents the actual monitoring and evaluation practices undertaken in managing the coastal zone and its resources in Western Australia, a state which manages about one third of the nation's coastline. In addition there is also a complete lack of information on the perceptions and attitudes of Western Australia coastal zone managers regarding monitoring and evaluation of coastal management. Managers' perceptions of the role of monitoring and evaluation and also current practices are critical to improving coastal monitoring and ultimately coastal management.

This study was undertaken to investigate the status of coastal monitoring and evaluation within Western Australia and the institutional arrangements (incorporating socioeconomic, political and natural systems), policies and management instruments relating to monitoring and evaluation programs in the Western Australia coast to help in strengthening the role of monitoring and evaluation in Western Australia.
1.3. THE ROLE OF MONITORING & EVALUATION ON THE COAST.

1.3.1 MONITORING

Monitoring according to Hellawell (1991) has become an omnibus term for a disparate range of activities. Cairns (1990) notes that monitoring has been an all encompassing term to include study, surveillance, or monitoring to detect if pre-established quality control conditions are being maintained. Consequently, a vast range of definitions of monitoring exists with relevance to ICZM:

i Intermittent (regular or irregular) surveillance (an extended program of spatial and temporal surveys) carried out in order to ascertain the extent of compliance with a predetermined standard or the degree of deviation from an expected norm (Hellawell, 1991).

ii Regular assessment of a management program and of the resources being managed, checking that desired outcomes are achieved, and adjusting the plan where necessary (Government of Western Australia, 1992).

iii Routine counting, testing or measuring of environmental factors or biota to determine their status or condition (Zann, 1995).

iv A range of activities needed to provide management information about environmental conditions or contaminants (National Research Council, 1990).
Within the last five years there has been an increasing realisation that for the purposes of management, the coastal environment encompasses more than just the biophysical. The relationship between socioeconomic, political and natural systems as they relate to coastal zone management has generated considerable interest (OECD, 1993; Fagan et al., 1992). For example, in their consideration of environmental change in coastal zones as the result of climate-related threats, Turner et al., (1996) noted that the assessment of socioeconomic parameters is as important as the assessment of biophysical factors when developing management strategies. Waterman (1995) notes that monitoring encompasses the political, biophysical, socioeconomic and cultural effects of changes to the environment brought about by people and their activities. Yet most definitions of monitoring focus on the biophysical environment. However, effective coastal management and planning requires due consideration and integration of social, economic and political factors. This study investigates the extent to which these factors are considered as part of monitoring and evaluation activities in Western Australia.

1.3.2 EVALUATION

Evaluation is the systematic application of a range of scientific and social research procedures for assessing the conceptualisation, design, implementation, and value of coastal zone policies and programs (Adapted from Rossi & Freeman, 1993). Evaluations must focus on the effectiveness and appropriateness of programs and the policies which frame them, and should ideally have three main objectives:

- to provide a better information base to help managers in improving policy and program performance;
- to help decision making and planning; and
- to contribute to improved accountability (Barrett, 1992; Sedgwick, 1993; and Amies, 1994).
Performance indicators and evaluation have increasingly become part of program management over the last few years. Those who undertake evaluations of programs are immediately faced with the fact that few programs are devised with a clear rationale and measurable performance indicators. Stewart (1991) states that this is because many management programs are political constructs which have been justified with reference to extremely vague objectives. Indicators are primarily used in the identification of key issues for the evaluation to focus on. Good performance information and indicators give any evaluation a flying start. It also means, that any information gathering can be highly focused and limited in scope, thus saving time, money and staff (Jarvie, 1993).

Evaluations are beneficial in justifying or improving performance indicators. Performance indicators can understate or overstate the success of management programs and policies if not chosen with care. Evaluations can indicate where changes should be made in the method of collection of monitoring information. Evaluations provide the impetus to improve monitoring information, not just the information used for performance indicators (Jarvie, 1993). Traditionally there has been a dichotomy between evaluation and monitoring. Monitoring was seen as regular, highly quantitative, simple and limited in focus, while evaluation was seen as a separate process, involving more complex data, and requiring a greater degree of judgment in its interpretation. However, clearly each is of considerable importance for the other (Jarvie, 1993).
1.4. COASTAL MANAGEMENT IN WESTERN AUSTRALIA

1.4.1 INTRODUCTION.

Western Australia is extremely large (2,525,500km²), covering about a third of the land area of Australia and includes 12,500 km of coastline. Western Australia’s population is currently 1.75 million, with 1.28 million (73%) living in its coastal capital city Perth. Perth extends over a 90km stretch of coastline and extends 40km inland. Western Australia’s population is expected to rise to 2.7 million by 2029, much of it in the coastal zone. Population increases have a flow on effect concerning increased consumption and waste management. This increase will put increased pressure on coastal and wetland areas; mineral resources; ports; and national parks (Government of Western Australia, 1995; Dept. of Environmental Protection, 1997a). For further background information on Western Australia’s coastal management refer to: Donaldson et al., (1995); and Kay et al., (1997).

Research into Western Australia’s coastal management and planning (history and practice) can be found in a variety of sources (O’Brien, 1988; Gepp, 1991; Hulajko, 1993; and Bignell, 1993). However, none of these studies examined the question of monitoring and evaluation of coastal programs and policies.

Kay et al. (1995) and Carman-Brown (1994) note that the perceived success of coastal management plans was reviewed internally by the Western Australia Government in 1989 and by Gepp (1991). Although the plans themselves were well received by the local communities and government, there were serious problems in their final implementation. Lack of resources and funds were cited as the main reasons for this (Kay et al., 1995; Carman-Brown, 1994).
1.4.2 DONALDSON REVIEW (1994/95)

According to Donaldson et al. (1995) the need for the review of coastal management in Western Australia was prompted in part by inefficiencies and overlaps in the State's current coastal management approach; a poor information base on which coastal and marine management decisions are made; and fragmentation and downgrading of resource management functions which result in a reduction in resources and funding for coastal zone management.

The Terms of Reference for the review involved the identification of goals and objectives for coastal management and recommending improvements to the general administration and coordination of coastal management. Regarding those Terms of Reference, the key monitoring and evaluation recommendations arising from this review are:

- **recommendation three**
  - the provision of an efficient and accountable mechanism for coastal zone planning and management; and

- **recommendation four**
  - acquisition, maintenance and dissemination of technical information, data and expertise;
  - establishment, monitoring and maintenance of standards for coastal zone management;
  - determination and monitoring of performance indicators for coastal zone management (Donaldson et al., 1995).

Clearly the Western Australian government recognised the need to strengthen the role of monitoring and evaluation if effective coastal management is to be achieved.
1.4.3 CONSTRAINTS TO EFFECTIVE COASTAL MONITORING AND EVALUATION IDENTIFIED BY THE DONALDSON REVIEW

The Review Committee noted that effectiveness of coastal management plans is revealed by the state of the environment in which the plan operates. The review team also noted a complete lack of criteria to measure the performance, effectiveness and efficiency of the State's coastal zone management program (Donaldson et al., 1995). In fact criteria to evaluate the performance of the coastal management system in Western Australia has never been developed. This lack of performance measurement for coastal management programs is not confined to Western Australia. The Review Committee was, in fact, unable to find examples where performance measurement for coastal management programs was utilised anywhere else in Australia or for that matter the world (Donaldson et al., 1995). The lack of an effective mechanism to undertake a coordinated monitoring and evaluation program was also recognised by the Review Committee as a major constraint. An issue of general concern by many who made submissions to The Review was the low level of funding for focused and coordinated research, particularly in relation to the identification and monitoring of coastal and marine resources (Donaldson et al., 1995).
1.5. SURVEY / METHODS

1.5.1 OBJECTIVES

A state wide survey was undertaken, by the author, of people who are either directly involved in Western Australia's coastal zone planning and management or whose employment has an impact on the coastal zone. The survey was designed to describe:

- their perception of the role monitoring and evaluation currently play in coastal zone management;

- the degree of importance coastal managers place on monitoring and evaluation;

- the degree and type of monitoring and evaluation undertaken;

- constraints to monitoring;

- the information management processes utilised, including the use of Integrated Data Management Systems and Quality assurance programs for monitoring data; and

- the information and research requirements of West Australian coastal zone managers compared to the national requirements of CZM as outlined in Brown & Burke (1993).
1.5.2 SURVEY DESIGN AND STRUCTURE

A 12-page survey was initially constructed and pilot tested. The final survey was developed based on the results of the pilot study.

The survey was broad in its applicability to respondents and did not target a particular section of the coastal management community. This was due to the wide range of employment sectors, spheres of government and locations for respondents. The survey comprised a mixture of open and closed format questions, often with both formats in the one question. All closed format questions were precoded for ease of data input. The key information was obtained primarily through the forced choice closed format while any expression was allowed for in the open "comments" section. The choice of this format and structure was based on the efficiency of responses and the length of the questionnaire (44 questions over 12 pages). The wording of the questions assumed a reasonable knowledge of the organisation's operations, and of coastal zone management.

The Questionnaire Consisted of Nine Main Categories:

- Profile of coastal zone managers (number of respondents n=88);
  - Employer; location; and nature of employment.

- Planning activities of coastal zone managers (n=70);
  - Involvement in the formation of plans and strategies.

- Monitoring activities in the coastal zone (n=64);
  - Is monitoring undertaken?; Why monitor, what concerns are addressed, what information is obtained and how relevant is it, and how much time is committed to monitoring?
• Management of monitoring information (n=64);
  - The use of Integrated Data Management Systems and Quality Assurance programs for monitoring data.

• Constraints to undertaking monitoring (n=88);

• Evaluation (n=88);

• Management approaches utilised by coastal zone managers (n=88);

• Coastal manager's beliefs regarding monitoring (n=88); and

• Brown and Burke's Information use question (n=88).

Some questions required respondents to select from a five-point Likert scale. Possible responses ranged from “Highly Relevant to Not Relevant”. Responses from Likert scale were recoded into a linear scale ranging from 0 (Not Relevant) to 100 (Highly Relevant). This scale allowed for all responses (especially “not relevant” responses) for each information type and resulted in a ranking for total relevance out of 100 (e.g. refer to Tables 5 & 10).
1.5.3 DEFINITIONS

To avoid confusion regarding definitions of monitoring and evaluation, respondents were provided with the following definitions:

1.5.3.1 Monitoring:

"The systematic and regular measuring of a system's response to management actions as well as providing a measurement of human activities or pressures on the system. It achieves this by providing information on changes to a particular variable in time and space. Monitoring addresses the issue of detecting human induced change against the background of natural dynamic change. Monitoring also provides the information to evaluate the effectiveness of management actions and programs, in the biophysical, socioeconomic, political and cultural realms."

1.5.3.2 Evaluation:

"The establishment of measurable indicators that are linked to all management objectives. Continually monitoring these indicators and adapting management strategies where necessary is pivotal for ensuring that management is moving towards and accomplishing its intended objectives."

1.5.4 THE RELATIONSHIP BETWEEN THIS RESEARCH AND BROWN & BURKE (1993)

The research aims of Brown & Burke (1993) and the aims of this research overlap in some regards. Both research programs sought answers to questions regarding the types of information coastal managers valued and also the channels of information exchange between coastal managers. However the method of survey administration, the numbers and locations of respondents and also the general aims and objectives of the two surveys differed.
Therefore the results of this survey while very applicable to coastal managers in Western Australia they are not necessarily transferable to other coastal locations. The advantage of undertaking a comparison between two sets of results is that it places the information requirements of Western Australia coastal managers in context with those of their national counterparts and highlights' regional priorities in Western Australia.

1.5.5 SURVEY DISTRIBUTION

Selection of respondents was based on past submissions to the Western Australian Coastal Review (Donaldson et al., 1995) as well as involvement in coastal management plans, studies and strategies, or because coastal zone management and planning formed part of their organisations' operational activities. Internal phone and address lists were obtained from larger State Government departments involved in coastal zone management. A list of all Local Governments was obtained from the West Australian Department of Local Government. Pre-survey phone calls were used to target the most appropriate persons within each office or department to respond to the survey.

A total of 130 individual surveys were posted out in June 1997. The survey detailed the project's aims and research objectives, a brief description of the activities respondents would be asked to undertake and an estimate of the time required to answer (30 minutes). A letter of informed consent was attached for respondents to sign and return with the survey. A self-addressed reply-paid envelope was provided to facilitate respondents replying. An assurance of complete personal anonymity and confidentiality was given.
A response period of eight weeks (June and July 1997) was set for the study. A series of follow-up telephone calls and faxes were used to improve the response rate four and six weeks after the surveys were distributed. A total of 88 responses were received out of a mailing of 130 (72.13%). Eight respondents were confirmed as ineligible or unreachable. This response rate compares extremely favourably against the response rates of other coastal zone surveys, such as Alder (1996) 30% (n=290); Coffen-Smout (1996 & 1997) 11% (n=1,457); and Knecht et al. (1996) 38% (n=1215).

1.5.6 SURVEY ANALYSIS

Data collected from the questionnaire was collated and analysed using SPSS for Windows. Analyses included differences and similarities between regional and metropolitan results for State and Local government.

Descriptive statistics were used for the analysis. These were used to organise, summarise and describe the results. For example:

- percentages;
- frequencies;
- rankings; and
- Likert scales.

It must be noted that questionnaire surveys assess frequencies and relationships; they are rarely experimental (de Vaus, 1991).
1.6. RESULTS

1.6.1 PROFILE OF COASTAL ZONE MANAGERS.

Table 1. Profile of respondents to coastal survey (n=88).

<table>
<thead>
<tr>
<th>EMPLOYER</th>
<th>State Agency</th>
<th>Local Govt</th>
<th>Other: (Industry, academics, and consultants)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>56%</td>
<td>34%</td>
<td>10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>Perth Metro Area</th>
<th>Country Towns</th>
<th>Main Regional Centres</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>23%</td>
<td>50%</td>
<td>27%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EMPLOYMENT</th>
<th>Environmental</th>
<th>Planning</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35%</td>
<td>22%</td>
<td>9%</td>
</tr>
<tr>
<td>Administration</td>
<td>8%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Construction/Industry</td>
<td>3.5%</td>
<td>3.5%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Education/Research</td>
<td>3.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation/Tourism</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The majority of respondents (90%) were from either State or Local government. Responses from industry were very disappointing. This meant that the survey and the project as a whole focused on monitoring and evaluation from a government perspective.

Environmental Management and Planning were the two major fields of employment selected by respondents (Table 1). Those in the ‘Environment’ sector were employed mainly by the State government and were distributed throughout the study area. Whereas those in ‘Planning’ were predominantly located in country towns and employed by Local government. The “Management” sector was mainly State government employees located in regional centres.
1.6.2 PLANNING ACTIVITIES OF COASTAL ZONE MANAGERS.

Over 80% of respondents were involved in the preparation of various management plans and strategies. There are approximately fourteen different types of plans and strategies which respondents nominated as being relevant. However, due to some very low response rates only the first seven have been included (Table 2). State managers are primarily involved in coastal management plans, rural strategies and foreshore management plans, whereas Local government managers are primarily involved in foreshore management plans, structure plans, and urban development plans.

Table 2. Respondents involvement in the preparation of plans and strategies.

<table>
<thead>
<tr>
<th>Plan Type</th>
<th>% Response for all respondents (n=70)</th>
<th>Ranking for State respondents (n=40)</th>
<th>Ranking for Local govt respondents (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal management plans</td>
<td>50%</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Rural strategies</td>
<td>46%</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Foreshore management plans</td>
<td>46%</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Structure plans</td>
<td>43%</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Urban development plans</td>
<td>37%</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Coastal strategies</td>
<td>36%</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Resource plans</td>
<td>34%</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Social plans</td>
<td>13%</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>
1.6.3 MONITORING ACTIVITIES OF RESPONDENTS

Respondents were asked if their organisation undertook monitoring in the coastal zone. Seventy-three percent (n=64) of respondents stated that they undertook some form of coastal zone monitoring. "No" responses were filtered out from further questions until later in the survey since they were not qualified to answer the remaining monitoring questions. The majority of monitoring is undertaken by State government (60%) followed by local government (31%). Several other agencies/groups such as industry, academics and consultants also undertake monitoring activities (9%).

Most monitoring is conducted in country towns (47%) and regional centres (30%) where the relative intensity of pressures is greater and the coastline is much longer compared to the much smaller Perth Metropolitan coastline.

1.6.3.1 Why is monitoring undertaken in the coastal zone?

The majority of respondents agreed that the primary objective of monitoring is to provide timely and relevant information for use in decision making (Table 12). The nature of that "timely and relevant" information and the types of decision making undertaken as a result of monitoring was investigated in depth. The five main reasons for undertaking monitoring in the coastal zone (Table 3a) must be interpreted in relation to the nature of the organisations' operational objectives (Table 3b), public concern issues (Table 4), and the relevant information types (Table 5).
Results from Tables 3a, 3b, 4 and 5 were synthesised to produce a composite picture of the rationale behind monitoring activities undertaken in Western Australia:

- **Maintaining and Developing Cultural & Ecological Values;**
  - based upon respondents operational requirements and the design of monitoring programs
- **Compliance with approval or permit conditions; and**
  - development activities and the EIA process
- **Formation of management plans.**
  - to protect and conserve cultural & ecological values
  - monitor to review effectiveness of plan

Monitoring as a function of undertaking an organisation's operational requirements was ranked highest by respondents overall (Table 3a). Monitoring to meet operational requirements, however, is a much higher priority for Local government managers (68%) than for State government managers (36%) who considered monitoring to comply with approval conditions a higher priority (44%).

Respondents were asked to list their operational objectives and requirements. These objectives were synthesised into two main categories based upon whether the objectives were a natural (i.e. ecological) attribute or a societal use of the environment that is conducive to public benefit, welfare or health (Table 3b) (Department of Environmental Protection, 1996).
Table 3a. The five main reasons for undertaking monitoring (based on the number of responses).

<table>
<thead>
<tr>
<th>Reason</th>
<th>All respondents (n=64)</th>
<th>State govt (n=39)</th>
<th>Local govt (n=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For your own operational requirements</td>
<td>44%</td>
<td>36%</td>
<td>68%</td>
</tr>
<tr>
<td>Compliance with conditions</td>
<td>36%</td>
<td>44%</td>
<td>16%</td>
</tr>
<tr>
<td>Formation of Management Plans</td>
<td>28%</td>
<td>36%</td>
<td>16%</td>
</tr>
<tr>
<td>Work in areas of high conservation value</td>
<td>22%</td>
<td>28%</td>
<td>16%</td>
</tr>
<tr>
<td>Effects monitoring</td>
<td>13%</td>
<td>15%</td>
<td></td>
</tr>
</tbody>
</table>

Table 3b Operational objectives and requirements of respondents synthesised into either cultural or ecological values.

<table>
<thead>
<tr>
<th>Maintaining and developing cultural values</th>
<th>Maintaining ecological values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmentally sensitive development and management leading to an enhanced natural and built environment</td>
<td>Water quality and health of coastal waters and estuaries</td>
</tr>
<tr>
<td>Efficient use, protection and enhancement of resources for present and future generations</td>
<td></td>
</tr>
<tr>
<td>Commercially viable and sustainable fisheries' resource</td>
<td></td>
</tr>
<tr>
<td>Sustainable rural development</td>
<td></td>
</tr>
<tr>
<td>Develop and enhance the recreational values of the natural environment</td>
<td></td>
</tr>
<tr>
<td>Safe use and sustainable development of the coastal zone</td>
<td></td>
</tr>
<tr>
<td>Provide for the needs and concerns of the community</td>
<td></td>
</tr>
</tbody>
</table>
Public concern and monitoring in the coastal zone of Western Australia.

Monitoring to address the maintenance of cultural and ecological values was reinforced by responses to questions of addressing key public concerns. Fifty-three percent of respondents stated that coastal monitoring was undertaken to see if the health of the ecosystem was being safeguarded (Table 4), that is, the protection of ecological values. The next major public concern relates to the protection of fisheries and other living resources (38%). This can be included in either set of values. However, maintenance of aquatic life (fisheries) for human consumption has been classed as a cultural value (Department of Environmental Protection 1996). The last two public concerns in Table 4 (safe to eat local seafood and safe to swim in the ocean) are also classed as cultural values.

<table>
<thead>
<tr>
<th>General concerns</th>
<th>All respondents (n=64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the health of the ecosystem being safeguarded?</td>
<td>53%</td>
</tr>
<tr>
<td>Are fisheries and other living resources being protected?</td>
<td>38%</td>
</tr>
<tr>
<td>Is it safe to eat the local seafood?</td>
<td>17%</td>
</tr>
<tr>
<td>Is it safe to swim in the ocean?</td>
<td>14%</td>
</tr>
</tbody>
</table>
1.6.3.3 Key information types and their degree of relevance in achieving the objectives of coastal zone monitoring programs.

The percentage scores for the number of highly relevant responses and the total relevance rating (based on Likert score, refer to method section 4.2) correspond almost exactly (Table 5). Responses from State government managers followed the general trend. However, for Local governments there are some interesting differences. Local government included shoreline vulnerability (in third position), sediment movement (in eighth position); and tourism (in tenth position) in their top ten.

Table 5. Information types (Top ten out of 26) ranked in order of respondents' preference (n=64).

<table>
<thead>
<tr>
<th>Information type</th>
<th>Highly relevant response</th>
<th>Relevance rating (out of 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public concern (community priorities for the coastal zone)</td>
<td>83%</td>
<td>88</td>
</tr>
<tr>
<td>Protection of aquatic ecosystems</td>
<td>80%</td>
<td>86</td>
</tr>
<tr>
<td>Impact of Government policies</td>
<td>73%</td>
<td>78</td>
</tr>
<tr>
<td>Flora and fauna</td>
<td>71%</td>
<td>76</td>
</tr>
<tr>
<td>Pollution indicators</td>
<td>67%</td>
<td>78</td>
</tr>
<tr>
<td>Recreation</td>
<td>63%</td>
<td>75</td>
</tr>
<tr>
<td>Development activities</td>
<td>63%</td>
<td>73</td>
</tr>
<tr>
<td>Recreational water quality</td>
<td>55%</td>
<td>68</td>
</tr>
<tr>
<td>General coastal process</td>
<td>53%</td>
<td>70</td>
</tr>
<tr>
<td>Recreational aesthetics</td>
<td>53%</td>
<td>65</td>
</tr>
</tbody>
</table>
1.6.3.4 Amount of time committed to monitoring.

Responses to the time committed to all monitoring related activities, which included planning or programming for monitoring; data collection; analysis and reporting, are shown in Table 6. Most respondents committed less than 20% of their time to coastal zone monitoring.

Table 6. Time committed to coastal zone monitoring in Western Australia.

<table>
<thead>
<tr>
<th>Time (%)</th>
<th>All respondents (n=64)</th>
<th>State govt (n=39)</th>
<th>Local govt (n=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 20%</td>
<td>77%</td>
<td>54%</td>
<td>84%</td>
</tr>
<tr>
<td>21 to 40%</td>
<td>13%</td>
<td>13%</td>
<td>11%</td>
</tr>
<tr>
<td>41 to 60%</td>
<td>8%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>61 to 80%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>81 to 100%</td>
<td>3%</td>
<td>5%</td>
<td>0</td>
</tr>
</tbody>
</table>

1.6.3.5 Monitoring partnerships in the coastal zone of Western Australia (n=64).

Monitoring is undertaken in partnership with any number of other organisations. Joint monitoring with other government agencies were the major partnerships listed (59%). Monitoring operations, which included an association with the public ranked second (42%). The use of consultants in monitoring operations scored a surprisingly low third (34%). Educational Institutes and private industry were ranked last (27%).
1.6.3.6 Impact detection procedures.

Ideally, monitoring programs should include procedures for communicating both variances that exceed pre-established limits and impacts or changes in the receiving environment that were not initially predicted. Respondents were asked if there were clear predetermined procedures regarding what should happen if the monitoring program detected a significant, unplanned or unpredicted impact (Table 7). Generally, less than half of the respondents knew of any procedures in the event of the detection of unplanned impacts. The majority of respondents either had no procedures or did not know of any.

Table 7. Managers who utilised a range of procedures in the event that the monitoring program detects previously unplanned impacts.

<table>
<thead>
<tr>
<th></th>
<th>All respondents (n=65)</th>
<th>State government (n=39)</th>
<th>Local government (n=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>42%</td>
<td>46%</td>
<td>37%</td>
</tr>
<tr>
<td>NO</td>
<td>28%</td>
<td>26%</td>
<td>32%</td>
</tr>
<tr>
<td>DO NOT KNOW</td>
<td>30%</td>
<td>28%</td>
<td>26%</td>
</tr>
</tbody>
</table>
1.6.4 MANAGEMENT OF MONITORING INFORMATION

1.6.4.1 Sharing monitoring data

Sixty-nine percent of respondents (n=64) indicated that the results of monitoring programs are made available to other departments and organisations. The main recipients of these results are State government departments (95%), the public (66%), Local government (66%), and consultants (46%). Universities, private industry and the Commonwealth all scored lower (36%). Information is made available either on request (75%) or as part of a reporting arrangement (75%). Other means of disseminating monitoring information are via Web Sites (8%) and publications (6%).

1.6.4.2 Accessing results from other monitoring programs

Accessing results from other monitoring programs appears relatively easy according to 74% (n=64) of respondents who provided answers to this section. The remaining respondents (26%) stated that results were only available with some difficulty. The main sources of monitoring information in order of rank are shown in Table 8.

Table 8. Sources of monitoring information in Western Australia.

<table>
<thead>
<tr>
<th>Sources of Monitoring Information</th>
<th>All Respondents (n=64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Govt departments</td>
<td>93%</td>
</tr>
<tr>
<td>University</td>
<td>50%</td>
</tr>
<tr>
<td>Consultants</td>
<td>48%</td>
</tr>
<tr>
<td>Private Industry</td>
<td>48%</td>
</tr>
<tr>
<td>Local</td>
<td>34%</td>
</tr>
<tr>
<td>Commonwealth Government</td>
<td>34%</td>
</tr>
</tbody>
</table>
1.6.4.3 Combining monitoring data sets

In response to the question of combining data sets from different monitoring programs (which share common aims), only 28% (n=64) of respondents indicated that they used common standards for data collected. Of those who stated that they had common data standards 13 respondents were from State government and four respondents were from Local government.

1.6.4.4 Integrated Data Management Systems (IDMS)

The use of an Integrated Data Management Systems (IDMS) for the coordination, documentation and archiving of data obtained from monitoring programs is split evenly between: YES (45% n=29) and NO (45% n=29). The State government had the highest positive response to this question with 24 of the 29 managers stating that they had an IDMS. When respondents were asked if they had an IDMS for results from other organisations monitoring programs 8% stated that they had such a system, all from State government.

1.6.4.5 Quality Assurance (QA) programs

Quality Assurance (QA) programs were generally not included in monitoring programs. Only 30% of respondents stated that a QA program was included as part of the total monitoring program. Of those that utilised a QA program 12 were from the State government, one a local government and the remaining six came from the “other” category that includes industry, academics, and consultants. Surprisingly, 22% did not know, while the remaining 47% stated that no QA program was included. Reasons given for not including a QA program included: lack of funding and resources, lack of organisation and foresight, and no obvious benefits.
1.6.5 CONSTRAINTS TO UNDERTAKING COASTAL ZONE MONITORING IN WESTERN AUSTRALIA.

All respondents to the survey (n=88) were asked to list the major constraints to undertaking monitoring in the coastal zone (Table 9). Time (63%) and money (92%) were the two major constraints for all respondents irrespective of their employment sectors. Other constraints did not differ by either employment sector or location.

Table 9. Major constraints to undertaking coastal zone monitoring in Western Australia.

<table>
<thead>
<tr>
<th>Constraint</th>
<th>All respondents (n=88)</th>
<th>State government (n=49)</th>
<th>Local government (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial costs involved</td>
<td>92%</td>
<td>94%</td>
<td>87%</td>
</tr>
<tr>
<td>Time</td>
<td>63%</td>
<td>57%</td>
<td>73%</td>
</tr>
<tr>
<td>Administrative and logistical</td>
<td>31%</td>
<td>20%</td>
<td>50%</td>
</tr>
<tr>
<td>Complex range and nature of coastal planning and management issues</td>
<td>31%</td>
<td>31%</td>
<td>33%</td>
</tr>
<tr>
<td>No long term goal or objective to monitor (within organisation)</td>
<td>23%</td>
<td>14%</td>
<td>30%</td>
</tr>
<tr>
<td>Lack of expertise</td>
<td>23%</td>
<td>14%</td>
<td>30%</td>
</tr>
</tbody>
</table>
1.6.6 EVALUATION

The section on evaluation was deliberately kept short because it was clear from the initial phone contact that questions relating to evaluation resulted in a great deal of confusion for many respondents. Over half of the respondents could not make the connection between monitoring and evaluation. There was also confusion between evaluation and auditing. Key issues such as the use of measurable performance indicators were completely new concepts to some respondents. This first impression was supported by the questionnaire results which indicated that only half of the respondents utilised any measurable performance indicators.

Many respondents (79%) indicated that the information from monitoring programs was useful as an aid in the evaluation of the effectiveness of management actions and policies. However, only half of the respondents (55%) stated that their organisations had measurable indicators, 34% had no measurable indicators, and 11% did not know. The majority of State government organisations possessed measurable indicators in some form (69%) while the majority of Local government did not utilise any measurable indicators (67%). The most frequently listed indicators were:

- Key Performance Indicators (KPI);
- Community feedback;
- Compliance monitoring;
- Annual review of plans for works programs; and
- Auditing of management plans.
Review and evaluation periods for management policies vary considerably from every year to "as needed" (Table 10). Similarly management projects and actions are reviewed and evaluated anywhere between six months and "as needed" (Table 10). As a result of undertaking an evaluation program on management policies and plans, respondents noted that corrective measures were applied in only about half (55%) of the organisations to ensure that performance came in line with management's objectives.

Table 10. How often are management policies and projects reviewed and evaluated.

<table>
<thead>
<tr>
<th></th>
<th>All Respondents' (n=88)</th>
<th>State Government (n=49)</th>
<th>Local Government (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Policies</td>
<td>Projects &amp; Actions</td>
<td>Policies</td>
</tr>
<tr>
<td>Every six months</td>
<td>6%</td>
<td>10%</td>
<td>6%</td>
</tr>
<tr>
<td>Every year</td>
<td>22%</td>
<td>30%</td>
<td>28%</td>
</tr>
<tr>
<td>Every two years</td>
<td>9%</td>
<td>3%</td>
<td>12%</td>
</tr>
<tr>
<td>As needed</td>
<td>24%</td>
<td>23%</td>
<td>31%</td>
</tr>
<tr>
<td>Not at all</td>
<td>6%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Do not know</td>
<td>3%</td>
<td>6%</td>
<td>6%</td>
</tr>
</tbody>
</table>


1.6.7 MANAGEMENT APPROACHES UTILISED BY COASTAL ZONE MANAGERS IN WESTERN AUSTRALIA.

The primary approaches identified by respondents as being relevant to achieving the operational objectives of their organisation are listed in Table 11. Active utilisation of management approaches other than public participation was low. Typically, respondents commented that they had never heard of some approaches, for example, Integrated Coastal Management and Adaptive Management.

Table 11. Active Utilisation and Relevance of Different Management Approaches to Coastal Zone Managers in WA (n=88).

<table>
<thead>
<tr>
<th>Management Approach</th>
<th>Level of relevance out of 100 (based on five point Likert score)</th>
<th>% Of respondents who ranked approach as &quot;Highly Relevant&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Participation</td>
<td>79</td>
<td>58%</td>
</tr>
<tr>
<td>Environmental Sensitivity Analysis</td>
<td>65</td>
<td>28%</td>
</tr>
<tr>
<td>Integrated Local Area Planning (ILAP)</td>
<td>59</td>
<td>31%</td>
</tr>
<tr>
<td>Integrated Coastal Management</td>
<td>57</td>
<td>25%</td>
</tr>
<tr>
<td>Consensus Building</td>
<td>54</td>
<td>22%</td>
</tr>
<tr>
<td>Adaptive Management</td>
<td>48</td>
<td>33%</td>
</tr>
<tr>
<td>Integrated Management Catchment</td>
<td>38</td>
<td>5%</td>
</tr>
</tbody>
</table>

38
## 1.6.8 COASTAL MANAGERS BELIEFS REGARDING MONITORING

Table 12. Belief statements regarding monitoring in the coastal zone of WA.

<table>
<thead>
<tr>
<th>Belief statements</th>
<th>LEVEL OF AGREEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The primary function of monitoring is to provide timely and relevant information for use in decision making.</td>
<td>81</td>
</tr>
<tr>
<td>2. Monitoring attempts to identify cumulative impacts on a single resource.</td>
<td>65</td>
</tr>
<tr>
<td>3. Monitoring has played a significant role in coastal zone management decisions in the past.</td>
<td>55</td>
</tr>
<tr>
<td>4. Monitoring focuses on understanding how multiple resources in the coastal zone are affected by the combination of human activities (ie. ambient monitoring).</td>
<td>62</td>
</tr>
<tr>
<td>5. Clear objectives, stated quantitatively to the greatest extent possible, vastly improves the effectiveness of coastal zone monitoring</td>
<td>74</td>
</tr>
<tr>
<td>6. There is a pool of monitoring data from different government agencies in order to combat common problems.</td>
<td>46</td>
</tr>
<tr>
<td>7. Results from monitoring programs provide feedback to modify and improve the actual program itself as well as future programs.</td>
<td>72</td>
</tr>
<tr>
<td>8. Public expectations regarding monitoring programs are realistic.</td>
<td>34</td>
</tr>
<tr>
<td>9. Most monitoring programs utilise an integrated data management system.</td>
<td>41</td>
</tr>
<tr>
<td>10. There are common standards for the type and form of data collected from different programs in order to combine data sets if required.</td>
<td>37</td>
</tr>
<tr>
<td>11. Quality assurance programs must be included in the monitoring programs.</td>
<td>66</td>
</tr>
</tbody>
</table>
Table 12 shows the levels of belief and agreement regarding a wide range of statements about monitoring in the coastal zone of Western Australia. The higher score indicates a stronger degree of agreement with the statement while the lower score indicates stronger disagreement. Therefore, there was generally strong agreement with the first statement regarding the primary function of monitoring which is to provide quality information for use in the decision-making process. Conversely there was disagreement regarding statement eight in that respondents generally believed that the public's expectations were not realistic regarding monitoring programs.

1.6.9 Brown & Burke (1993).

Respondents in this survey were asked to identify, in priority order by ranking their top five types of information out of the 28 provided (as per Brown & Burke 1993). The collected responses are presented in rank order in Table 13. The results differed greatly compared against those of Brown & Burke (1993). Environmental Impact Assessments (EIAs) rated first as the most important source of information for Western Australian coastal managers. Perhaps the most surprising result was the placement of public participation in Table 13 as second compared to its ninth place in Brown & Burke (1993). Only 22% of respondents to Brown & Burke survey rated public participation in the five most important information types compared to 48% of respondents to this survey. Regulations and by-laws and water management ranked seventh and tenth respectfully in this survey yet they failed to make the top ten in Brown & Burke (1993) (Table 14). However, statistical comparisons are not possible due to different methodologies used in collecting information between this survey and Brown & Burke's.
The type of information was also classified according to the broad information categories used by Brown & Burke (1993). There were few differences in the top rankings between the two surveys for each category. In the lower rankings, however, there were often differences. Aboriginal issues were ranked higher in this survey (rank = 2) than in Brown & Burke (rank = 5). This may be due to recent Native Title issues that may have a significant impact in coastal areas. Industry performance in Western Australia (rank = 3) was higher than that for the national results (rank = 7), again this may be a reflection of regional priorities in Western Australia for coastal management and possibly a greater involvement of industry in Western Australia’s coastal zone management system than in other States.

**TABLE 13.** The TEN MAJOR types of information of importance to West Australian coastal managers (% respondents including item in top five) compared to Brown & Burke survey (1993)

<table>
<thead>
<tr>
<th>Information Type</th>
<th>THIS SURVEY</th>
<th>BROWN &amp; BURKE (1993)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental impact assessments</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Public participation</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Ecosystems, habitats and species</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Condition of rivers, estuaries, and oceans</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Recreation and tourism</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Integrated resource management</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Regulations and by-laws</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Community priorities for coastal areas</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Strategic plans</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Water management</td>
<td>10</td>
<td>16</td>
</tr>
</tbody>
</table>

**Note:** Ranking and % of respondents including item in top five most important
TABLE 14. Types of information from management, social, economic and environmental spheres in priority order of importance to coastal managers in Western Australia compared to Brown & Burke (1993).

<table>
<thead>
<tr>
<th>Information Type</th>
<th>THIS SURVEY</th>
<th>BROWN &amp; BURKE (1993)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MANAGEMENT SPHERE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental impact assessments</td>
<td>1 50%</td>
<td>1 43%</td>
</tr>
<tr>
<td>Public participation</td>
<td>2 47%</td>
<td>4 22%</td>
</tr>
<tr>
<td>Integrated resource management</td>
<td>3 28%</td>
<td>3 24%</td>
</tr>
<tr>
<td>Regulations and by-laws</td>
<td>4 23%</td>
<td>5 16%</td>
</tr>
<tr>
<td>Strategic plans</td>
<td>5 19%</td>
<td>2 26%</td>
</tr>
<tr>
<td><strong>SOCIAL SPHERE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community priorities for coastal areas</td>
<td>1 22%</td>
<td>1 33%</td>
</tr>
<tr>
<td>Aboriginal issues</td>
<td>2 11%</td>
<td>5 8%</td>
</tr>
<tr>
<td>Visual/aesthetic values</td>
<td>3 10%</td>
<td>2 13%</td>
</tr>
<tr>
<td>Community service needs</td>
<td>4 9%</td>
<td>3 12%</td>
</tr>
<tr>
<td>Heritage values</td>
<td>5 7%</td>
<td>4 12%</td>
</tr>
<tr>
<td><strong>ECONOMIC SPHERE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation and tourism</td>
<td>1 37%</td>
<td>1 33%</td>
</tr>
<tr>
<td>Development benefits and losses</td>
<td>2 12%</td>
<td>2 16%</td>
</tr>
<tr>
<td>Industry performance</td>
<td>3 11%</td>
<td>7 6%</td>
</tr>
<tr>
<td>Infrastructure costs</td>
<td>4 7%</td>
<td>3 11%</td>
</tr>
<tr>
<td>Dollar values of natural environment</td>
<td>5 3%</td>
<td>4 10%</td>
</tr>
<tr>
<td><strong>ENVIRONMENTAL SPHERE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecosystems, habitats and species</td>
<td>1 45%</td>
<td>1 44%</td>
</tr>
<tr>
<td>Condition of rivers, estuaries, and oceans</td>
<td>2 39%</td>
<td>2 41%</td>
</tr>
<tr>
<td>Water management</td>
<td>3 13%</td>
<td>7 14%</td>
</tr>
<tr>
<td>Pollution indicators</td>
<td>4 12%</td>
<td>5 20%</td>
</tr>
<tr>
<td>Condition of soil and beaches</td>
<td>5 11%</td>
<td>3 25%</td>
</tr>
</tbody>
</table>

ranking and % of respondents including item in top five most important
1.7. DISCUSSION

This survey highlights several issues regarding monitoring and evaluation that must be addressed if the recommendations from the Review of Coastal Zone Management (Donaldson et al., 1995) are to be achieved in Western Australia. Coastal zone management in Western Australia does not function as a cohesive unified process. Coastal managers generally do not use all of the components of the coastal management process referred to in section 1.1. This situation is attributed to:

- a poor understanding of the coastal zone as a discrete management unit;
- a range of constraints to monitoring which were identified by respondents;
- problems with the management of monitoring information; and
- a failure to make the link between monitoring and evaluation.

Coastal management appears to suffer from an identity crisis. Initial phone contact with respondents to this survey revealed that some did not know what or where the coastal zone was. Many assumed that the coastal zone started and stopped at the beach. Less than half were aware of WA’s formal coastal zone definition by Donaldson et al. (1995). The term “coastal manager” itself caused some confusion with respondents. Many Local Government officers did not consider themselves as “coastal managers” although they are often the primary manager and decision maker for their section of the coast. These difficulties were also encountered in the nation wide coastal survey of Brown & Burke (1993).
This underdeveloped sense of identity and place amongst coastal managers should be addressed before improvements are to be made in other areas of coastal zone management. Expansion of the “Coast Care” program to include promoting the role and function of the “coastal manager” in State and Local government agencies similar to the “land managers” concept/program operating under “Land Care” programs would be an initiative worth further research (Roberts, 1994). It must be acknowledged, however, that there is debate about whether Western Australia treats (or wants to treat) the coast as a district management unit (Dr Rob Kay, personal communication, 18 September 1997).

Monitoring and evaluation are the integrating and connecting links between the management process, actions, and issues that make up Integrated Coastal Zone Management (ICZM) (GESAMP, 1996). ICZM, however, was not rated highly in terms of relevance or usefulness by Western Australia coastal managers. Some respondents had no idea what ICZM was, of those who were aware, few utilised it in active management of the coastal zone. If the provision of an efficient and accountable mechanism for coastal planning and management is to be achieved in Western Australia then the merits and benefits of approaches such as ICZM must be incorporated into Western Australia’s coastal culture.

The recently released marine working papers for the Western Australia State of the Environment Report acknowledged that a strategic approach to monitoring must be utilised to develop and evaluate effective management strategies for coastal marine areas. This could be accomplished using an integrated management approach to coastal marine issues. A formal framework to coordinate coastal marine management has been recommended for the Perth metropolitan marine region and between these waters and their land catchments (Department of Environmental Protection, 1997b).
1.7.1 CONSTRAINTS TO COASTAL MONITORING

Monitoring is not a major activity undertaken by Western Australia coastal managers if the amount of time committed to it (<20%) can be taken as an indicator. Wiersma *et al.*, (1991) state that the success or failure of a monitoring program rests with the provision of adequate funding and time. Funding and time are the main constraints to undertaking coastal monitoring in Western Australia (Table 9). Time, as a constraint, should be viewed as a subset of funding constraints because extra funding would provide more staff and resources. Increasing the level of funding for monitoring does not guarantee effective monitoring programs, rather, it merely removes constraints. To be effective, monitoring must also be a major priority for coastal organisations.

Other constraints reported in this survey were also cited by the National Research Council (1990) in their evaluation of monitoring programs in the USA. These are administrative in regards to:

- the management of monitoring data;
- complex coastal issues; and
- a lack of expertise.

Alder (1996) notes similar constraints in regards to the management of Marine Protected Areas (MPAs). The issue of "lack of expertise" as a constraint to coastal monitoring is related to "complex coastal issues" being addressed by land-based agencies with little experience in coastal zone management (Alder, 1996). The coastal zone is a complex system. The nature, scope, structure and complexity of information relating to coastal and marine systems are very different from terrestrial systems. It is more difficult to collect and update coastal data because coastal zone boundaries often need to be re-established due to the dynamic and ever changing nature of the coastal zone (*Mahoney et al.*, 1997).
Considering the constraints to undertaking coastal monitoring in Western Australia, the issue of the costs of NOT monitoring or of monitoring ineffectively should be addressed. These potential costs can be summarised as:

- failure to obtain the information needed to assess environmental conditions and change;
- an inability to validate or verify achievement of management objectives in light of actual performance. Cost/benefit analysis could be undertaken to validate or verify benefits and as an aid to decision making, but, only if there is sufficient monitoring information available; and
- the possibility of exposure to the legal precedence of prosecution of an environmental manager for negligence. Coastal managers are liable for negligence where a ‘duty of care’ owed to an injured party has been breached and damage resulted. This situation occurred to a coastal zone management authority recently in Western Australia. In the case of Nagle v The Rottnest Island Authority (Nagle v Rottnest Island Authority, 1989; 1991 and 1993). In this instance, the Rottnest Island Authority was found negligent for failing to adequately signpost the dangers of diving and the occurrence of rocks at a popular swimming beach. Risk identification and management has become an increasingly important element in modern coastal zone management (Overman, 1996).

1.7.2 MANAGEMENT OF MONITORING INFORMATION

Hicks & Brydges (1994) affirm the importance of shared or common data management systems to provide ready and convenient access to monitoring data to provide effective CZM. This also applies to access to knowledge of research and monitoring activities related to common issues or spatial areas. Respondents in this survey agreed that a common monitoring data base was not available from different government agencies to combat common problems, nor were there common standards for the type and form of data collected from different programs to combine data sets if required.
There was general agreement among respondents that most monitoring programs did not utilise some form of Integrated Data Management System (IDMS). The results revealed that the use of IDMS were limited in scope and were mainly utilised by State government managers. Jacoby (1994) suggests that monitoring programs should include planning the design of an IDMS. IDMS should be considered since they can provide access to data for a wide range of different users whilst providing a high degree of data protection. These systems should be subject to a rigorous quality assurance program to ensure the accuracy and validity of data.

1.7.3 GREATER EFFICIENCY IN MONITORING

If funding is a constraint to monitoring, then improvements in the quality and quantity of monitoring information should be sought without significant increases in the level of funding.

1. Avoiding the duplication of monitoring and research efforts by different organisations is one way to address this issue. It is not unusual for two different, yet similar research or monitoring projects to be conducted concurrently either by government or academic institutions. An attempt to address this problem is currently underway by the Western Australia Department of Planning. The focus of the project is to construct a marine and coastal meta database that includes the following spatially referenced information:

- monitoring/research projects;
- publications and reports; and
- plans and strategies.
2. Similarly, the marine working papers for the Western Australia State of the Environment Report advocated that a centralised coastal marine database be established which could be directly accessed from both Perth and from within the regions (Department of Environmental Protection, 1997b). This database would contain monitoring and research data obtained from proposed strategic coastal marine monitoring and baseline study programs. These programs according to the marine working papers should be carried out by appropriate State Government departments together with research institutions and industry. They must be coordinated to avoid duplication and to allow valid comparisons between studies.

3. A strategic approach to managing information requirements and outputs from monitoring programs would improve the cost effectiveness of monitoring, while providing decision makers with access to better information. Program managers, decision makers, and evaluators must first agree on information management standards. These standards involve:

- focusing on clearly articulated and quantifiable goals and objectives that are linked to indicators capable of being monitored in a consistent, comparable, and comprehensive manner; and

- quality assurance procedures for the analysis, storage, exchange of, and access to monitoring information.
One example of a clearly defined program for the management of monitoring information is the system used to manage research projects relating to The Great Barrier Reef Marine Park (GBRMP). Bainbridge (1997) outlines an approach to data management taken by the Australian Institute of Marine Science which undertakes a range of monitoring programs on the GBR. Projects on the GBRMP were designed to be data centric with a strong emphasis on the management and quality of monitoring data to a set of standards. This includes sharing monitoring data with other research and management agencies, utilising well designed central database structures that have inbuilt quality assurance programs.

Achievement in Western Australia of information management standards such as those utilised by the GBRMP and recommended in the marine working papers of the Western Australia State of the Environment Report 1997 requires increased cooperation between coastal stakeholders (Department of Environmental Protection, 1997b). Coastal zone politics consists of coalitions of entrenched interests and agencies that attempt to buttress their independence by claiming an area of expertise. Classical examples are Local government and university departments (Power, 1973). Increasingly, some State Government departments are attempting to claim a dominant role as the lead coastal management agencies based upon either existing operations or legislative interpretation. This situation was highlighted from a series of interviews with several key coastal managers in the State government. The current level of coordination and integration between the many agencies and jurisdictions responsible for coastal zone management in Western Australia is insufficient and inadequate according to the Western Australian State of the Environment Report 1997 (Department of Environmental Protection, 1997b).
1.7.3 EVALUATION

Managers clearly see that monitoring provides information to modify and improve existing and future programs. The majority of respondents who undertook some form of monitoring stated that the results from monitoring were useful in the evaluation of the effectiveness of coastal management. Survey results, however, suggest that their understanding of the need to formulate evaluation criteria to guide monitoring and ultimately assist in evaluating coastal programs and policies was limited.

It was interesting that the most common measurable indicator was listed as being "Key Performance Indicators (KPI). These indicators are directly related to the organisations' operational objectives and therefore a major reason for undertaking monitoring. The nature of these KPI is worth further research to discover their effectiveness in the evaluation of coastal programs. Monitoring results and evaluation programs detected deficiencies in that many organisations failed to apply corrective measures to improve performance. This finding further highlights the problem that coastal management in Western Australia does not function as a cohesive unified process.

The findings of Western Australia's Review of Coastal Zone Management noted a complete lack of criteria to measure the performance, effectiveness and efficiency of the State's coastal zone management program (Donaldson et al., 1995). In fact, criteria to evaluate the performance of the coastal management system in Western Australia has never been developed. The key recommendations arising from this review, as they relate to monitoring and evaluation, involve the establishment, monitoring and maintenance of standards for CZM; and the determination and monitoring of performance indicators for CZM.
These recommendations were based on the fact that Western Australia has a poor information base on which coastal and marine management decisions are made (Donaldson et al., 1995). This situation is very similar to the recent coastal zone evaluation program undertaken in the USA (Bernd-Cohn et al., 1997). The conclusions from that program were that a lack of organised coastal monitoring resulted in ineffective evaluation. Shortcomings in coastal management policy relating to monitoring and performance standards were attributed as the reason for this.

1.8. CONCLUSION

ICZM is a learning process that must be responsive to feedback to remain effective. Monitoring and evaluation provides that feedback. This survey highlights the urgent need to expand the level of coastal monitoring and evaluation in Western Australia, both of which should be undertaken within an ICZM framework. The results from this survey will help coastal managers in identifying the essential types of information necessary to effectively manage the coastal zone of Western Australia. The coastal information base can be improved by targeting funding, time and other resources into the areas highlighted by this survey. The survey results will, in part, help in the formation of standards and performance indicators for CZM in Western Australia.
Key players in CZM acknowledge the increased need for monitoring and evaluation to be integrated throughout the process, preferably in a framework such as ICZM. The Western Australian State Government has an excellent opportunity to tackle these and other shortcomings in its current CZM program through the coordination efforts of the Coastal Zone Council, which was established exactly for such purposes. This survey has highlighted poor coastal zone awareness among coastal managers; funding and time as the main constraints to effective monitoring; and improved information management as the major monitoring and evaluation initiatives that need to be developed if ICZM is to provide for sustainable use of the coast. The need for integrated coastal management approaches is greater than ever. Yet these initiatives will not succeed without a greater level of personal and professional cooperation between coastal managers that is needed to protect, enhance, and manage our coastal zone, and herein lies the challenge for Western Australia coastal zone managers.
SECTION 2:
MONITORING & EVALUATION THE KEY TO
EFFECTIVE COASTAL PLANNING &
MANAGEMENT
2.1 MONITORING AND EVALUATION IN MODERN COASTAL ZONE MANAGEMENT

Throw together coastal marine researchers, statisticians, policy planners, biologists, administrative personnel, enforcement officers, and perhaps quite a few others with an interest in the coast. Call this a management agency. Duplicate the agency's functions and resources between other management agencies within different spheres of government. Now "interface" the agencies somehow with their constituents, ranging from politicians worrying about the next election, to concerned conservationists, to careful business entrepreneurs, to "cowboys" out to make a fast buck. Finally, consider the coastal zone itself, a complex ecological and social system that is too complex to monitor thoroughly, changes unpredictably in response to environmental and cultural factors, and generally offers a range of conflicting signals that are open to every interpretation from imminent disaster to grand opportunity. There you have the modern coastal zone management situation – which raises the question of how to best manage this situation?

This seriocomic management situation is familiar to coastal managers throughout the world. Within Australia, coastal management is a highly political activity (Kay & Lester 1997). All three spheres of Government have and claim varying degrees of planning and management responsibility for the coastal zone. All claim to have responsibility for monitoring various aspects of the coastal zone as well. One of the major constraints to effective coastal management has been confusing and poorly defined government policies. As soon as the Federal Government attempts to implement coastal policies the States rebel claiming "infringement of State's rights". Local Government which has a major "on-the-ground" role in coastal management must attempt to formulate management programs based on ever changing State and Federal Government initiatives. Poorly developed policies and programs also make monitoring and evaluation difficult to initiate and hence improving management of the coastal zone is further constrained.
Kay and Lester (1997), however, believe that not all of the problems are caused by governments, and claim that “people with good ideas and enthusiasm...” are needed to reinforce the management activities of government. Apart from the standard or lack of standards of our politicians and the political system, there are a number of other interrelated issues which need to be addressed before coastal management in Australia improves. Firstly, coastal managers in Australia generally have been unable or unwilling to become “coastal zone managers” (Kay & Lester, 1997). A recent survey of coastal managers in Western Australia confirms this observation (Refer to Section 1). Until recently coastal management programs in Australia have been concerned with management of the beach and foreshore, i.e. the physical processes and not necessarily the “system”. The focus however is shifting and now the coast is often broadly defined. In Western Australia, the coastal zone includes: coastal waters, the seabed, offshore islands, estuaries, the beach and dune zones (Donaldson et al., 1995).

This survey also concluded that coastal management in Western Australia appeared to suffer from an identity crisis. The interviewer’s initial phone contact with respondents to the survey revealed that some managers did not know what or where the coastal zone was. Many assumed that the coastal zone started and stopped at the beach. Less than half were aware of WA’s formal coastal zone definition by Donaldson et al., (1995). The term “coastal manager” itself caused some confusion with many respondents. Many Local Government officers did not consider themselves as “coastal managers” although they are often the primary manager and decision maker for their section of the coast. These difficulties were also encountered in the nation wide coastal survey of Brown & Burke (1993:3). In fact, there is debate within the community whether Western Australian government should manage (or wants to manage) the coast as a distinct management unit (Pers comm; Dr Rob Kay, 18 September 1997). Such debate adds confusion as to who should manage the coast.
The second issue of funding highlighted by Kay & Lester (1997) was also confirmed in the recent survey of coastal managers in Western Australia (Refer to Section 1). This survey found that funding was the main constraint to undertaking monitoring in the coastal zone. Wiersma et al., (1991) state that the success or failure of a monitoring program rests with the provision of adequate funding. Increasing the level of funding, however, for monitoring does not guarantee effective monitoring programs, rather, it merely remove a constraint. Therefore, monitoring must be also be integrated with an evaluation program and be a major priority for coastal organisations to be effective.

The third issue highlighted by Kay & Lester (1997) in their paper on the future direction of coastal management was that coastal managers find it difficult to evaluate the effectiveness of coastal programs in terms of on-the-ground improvements to the condition and use of the coast. This is due to the fact that monitoring and evaluation have not been accorded the same level of priority as has policy design, planning and program implementation. The next generation of coastal managers are likely to experience similar problems unless the currently limited coastal monitoring initiatives are extended and integrated with a deliberate program of evaluation. Kay & Lester (1997) conclude that “A clear future direction for coastal management in Australia is the development of effective and comprehensive monitoring and evaluation programs”. Clearly monitoring and evaluation should be the focus of further research and development if managers are to meet society’s expectations of good coastal zone management.
There is considerable philosophy and even more consensus on the desired outcomes for coastal planning and management. Even in the absence of monitoring and evaluation the product is often seen as falling far short of the philosophy. Current planning processes fail to effectively establish the link between philosophy and product. Part of the problem is that the philosophy is difficult to translate into quantitative actions and therefore the evaluation of whether management is effective or not is difficult to substantiate. For example, how do we monitor and evaluate issues such as social justice and ecological sustainability? Considerable attention has been given to the theoretical practice of coastal planning and management. This has been at the expense of focusing on development of the right (or best) process to determine if the desired product has been achieved.

The process appears to be the weak link between the philosophy and the product. In order that the rhetoric (Philosophy) can be converted into reality (Product) the following problems must be first addressed (Commonwealth of Australia, 1997):

- the difficulty in translating broad (often vague) concepts into meaningful objectives and goals which can then be applied to meaningful actions;
- greater focus on “What is the right process to achieve the desired product?”;
- integration of practices rather than just administrative coordination;
- reflecting regional, State or national principles in local practice and initiatives;
- providing the practical means to implement broader policies and strategies into the decision making processes at lower levels; and
- increased focus on monitoring and evaluation as a way of providing greater integration of process and product in order to ensure that the desired outcomes are actually delivered.
Part of the lack of focus on monitoring and evaluation can be attributed to the lack of a framework in current coastal management programs or plans which articulate clear coastal management goals and objectives. Without clear goals and objectives effective implementation can not be effected. It is vital to sustainable and effective coastal zone management that clear goals and objectives are set so that an effective implementation program can be designed and underpinned by an integrated monitoring and evaluation program. Preferably having evaluation criteria and monitoring programs developed interactively with the formation of objectives. This enables managers to efficiently evaluate the effectiveness of the plan in meeting its objectives.

The coastal survey (Section 1) confirmed the conclusions of Kay & Lester (1997) in that monitoring and evaluation are the integrating and connecting links between the management process, actions, and issues that make up most planning and management frameworks such as Integrated Coastal Zone Management (ICZM). ICZM, however, was not rated highly in terms of relevance or usefulness by Western Australia coastal managers. Some respondents had no idea of what ICZM was, of those who were aware, few utilised it in active management of the coastal zone (Refer to Section 1). If the provision of an efficient and accountable mechanism for coastal planning and management is to be achieved in Western Australia then the merits and benefits of frameworks such as ICZM must be incorporated into Western Australia coastal culture. One possible mechanism for this incorporation of integrated coastal principles is through training programs funded as part of the current “Living on the Coast” government program (Commonwealth of Australia, 1995b).
2.2 THE NEED FOR AN EFFECTIVE FRAMEWORK WHICH INTEGRATES MONITORING AND EVALUATION.

Managers within agencies charged with coastal management need a conceptual framework or system for effective management and decision making which utilises a mechanism by which the success or otherwise of management actions and decisions can be evaluated (Hildebrand & Norrena, 1992; Kenchington, 1994). Monitoring and evaluation are interrelated processes which assist in answering the most fundamental management question: 'is the plan or program working?'. To answer this question, monitoring and evaluation can not undertaken in isolation from other management activities, but rather, as integral steps in what should be an integrated planning and management system (Jacoby, 1994; CSIRO, 1994).

A worthwhile evaluation requires program objectives and indicators to be stated in clear and quantifiable terms, and monitored throughout the life of the program. It is however, often omitted or undertaken in a superficial manner in a great majority of coastal management initiatives. Results from the coastal survey (Section 1) revealed that evaluation is not seen as a major learning and improvement activity. Less than half of the respondents understood the connection between monitoring results and undertaking an evaluation. If an evaluation program was undertaken, respondents stated that corrective measures were applied in only about half of the organisations to ensure that performance came into line with stated objectives.
2.2.1. MANAGEMENT FRAMEWORKS.

There are a number of examples of management frameworks available, either general or specific to coastal zone management (Jacoby, 1994; Scura et al., 1992). Many are similar to the rational (comprehensive) model of planning and decision making outlined in Smith (1993) (Figure 1). While both models have not specifically stated a monitoring and/or an evaluation component, monitoring and evaluation are either implied or incorporated in the frameworks. For example Jacoby (1994) utilises a five stage management process (Figure 2). There is no separate evaluation component in this process, instead evaluation is incorporated within the monitoring component. According to Scura et al., (1992), while the management process is interactive and involves a number of main steps which are often viewed as being sequential as in Jacoby (1994), in reality, however, the situation is far more complex. The management process in Scura et al., (1992) are often overlapping rather than sequential and consist of up to eight main components with as many as 19 substeps (Figure 3).

Figure 1. The rational (comprehensive) model of planning and decision making outlined in Smith (1993).
Figure 2. A management framework. A process with five components and feedbacks between each stage. (Jacoby, 1994).

Scua et al., (1992) incorporates two evaluation steps into this expanded framework, one prior to implementation the other subsequent to implementation. After the management plan has been formulated, a detailed review and evaluation of the proposed plan is undertaken in relation to alternative management plans. The results are then submitted to decision makers for consideration. If the proposed plan is approved then it moves forward for adoption and implementation. A second evaluation stage occurs subsequent to implementation. This evaluation stage is linked to monitoring program which acts as a feedback mechanism to validate and assess the efficiency of the plan during, and after implementation. Monitoring and evaluation at this stage deals with any unanticipated social, economic and environmental consequences arising from management actions.
INTEGRATED COASTAL ZONE MANAGEMENT PROCESS.

The management processes in Scura et al., (1992) are often overlapping rather than sequential and consist of eight main components with 19 substeps.

Figure 3. The management processes in Scura et al., (1992).
Guidelines can also be used as frameworks to integrate monitoring and evaluation in the management process. Various sets of guidelines have been formulated for ICZM. This paper will highlight two of the most recent. The ‘Good Practices’ findings from an international workshop on Integrated Coastal Management (IWICM, 1996) and the Australian Good Practice Guidelines for Integrated Coastal Planning (Graham & Pitts, 1997) provide a basis to further investigate the integration of monitoring and evaluation. Together these two documents form the basis of a proposed set of standards for “Good Practice” in integrated coastal zone management.

The IWICM workshop identified a four step cyclic process as the basis for ICZM with each new cycle termed a generation (Figure 4). This process is underpinned by principles of sustainable development, precautionary approaches, and broad stakeholder participation (IWICM, 1996).

In the planning stage the program requirements are defined and initially evaluated. A management plan is developed that expresses, in realistic and tangible terms, the specific natural and cultural objectives of the program. Criteria to evaluate whether the objectives are being met should be designed and also used to assist in formulating the monitoring and evaluation program. Evaluation of options should be a continual process at this stage (IWICM, 1996).

The program then moves to the next stage which involves detailed scrutiny and evaluation of the program. Funding options often undergo evaluation in the form of cost/benefit and decision analysis. It is vital that the monitoring and evaluation framework is in place before formal approval. Upon implementation, a range of different monitoring programs is undertaken depending upon management objectives, for example; compliance, effects or surveillance monitoring (IWICM, 1996). Monitoring also provides the necessary information for evaluating the effectiveness of coastal zone programs in meeting the established objectives.
Figure 4. The stages of the ICZM cycle. (Adapted from IWICM, 1996; GESAMP, 1996).

The IWICM workshop identified a four step cyclic process as the basis for ICZM. Four consecutive stages form an ongoing, iterative process that may go through a number of cycles before the program is sufficiently refined to produce effective results. Each completion of the four stages may be termed a generation of a program. This process is underpinned by principles of sustainable development, precautionary approaches, and broad stakeholder participation. (Adapted from IWICM, 1996; GESAMP, 1996).
Evaluation is the stage where the greatest learning should occur. Since the results of monitoring are reviewed and analysed so that the effectiveness of the program can be measured (GESAMP, 1996). The evaluation stage addresses two broad questions:

- **What has the preceding generation of the program accomplished and learned, and how should this affect the design and focus of the next generation?**
- **Has the context of the management program and situation (values, priorities) changed since the program was initiated?**

Coastal management programs can therefore mature through the successive completion of management cycles. Each cycle or generation follows the same four stage process. The first cycle deals with a small number of the most important issues. As monitoring and evaluation indicates that the issues have been addressed, successive generations can incorporate more complex issues over a wider geographical scope (IWICM, 1996; GESAMP, 1996).

The other set of guidelines, the Good Practice Guidelines for Integrated Coastal Planning (Graham & Pitts, 1997), are intended to assist planners to better understand coastal planning techniques and to facilitate their implementation. The Guidelines describe a planning system which consists of three major components (Figure 5).

- **Philosophy** composed of global principles and statements of desired outcomes as they apply to coastal resources.
- **Process** which requires identifying values and needs, setting objectives and criteria, making plans, incorporating relevant information and decisions.
- **Product** which is the outcomes of the decisions taken on how coastal resources are developed and used, here monitoring and evaluation of comparisons of actual outcomes against desired outcomes are made.
Figure 5. The Good Practice Guidelines for Integrated Coastal Planning (Graham & Pits, 1997). These are intended to assist planners to better understand coastal planning techniques and to facilitate their implementation.
The process component according to Graham & Pitts (1997) is the point at which the philosophical concepts and policies can be linked to improved implementation, monitoring and evaluation. The focal point of this system is improved decision making throughout this process stage. This improved decision making requires that coastal resources are assessed and their values documented. The values that are selected can be used to identify a range of objectives, criteria and actions which link the overall philosophical approach of coastal zone management to the actual resources of the planning area.

In this process the values, objectives and criteria are incorporated into a planning instrument. This planning instrument is a tool for giving effect to the values and objectives. Often this is statutory but many States also utilise non-statutory plans or a combination of the two, for example, Western Australia. Planning instruments also set out the criteria to protect coastal values and the means by which the criteria are applied in decision making as well as the rules for decision making itself (Graham & Pitts, 1997).

The above five integrated coastal management systems clearly link objectives to monitoring and evaluation in a feedback or cyclic system and demonstrate how monitoring and evaluation can be integrated into “Good Practices”. The question remains on how to best deliver such systems from theory to “on-the-coast” practice.
2.2.2 DELIVERING THE PRODUCT

Planners have an intense involvement in the philosophy and process components of the planning system but they have traditionally played a minor role in the implementation of the product itself. When going from process to product, there is a transfer of responsibility from planners to managers, developers, and regulators. It is at this stage that monitoring and evaluation become the focus for the effective integration of philosophy, process and product (Graham & Pitts, 1997). Four main steps can be taken to ensure better integration:

- **Awareness**
  - those who are responsible for the implementation of planning and management decisions must be fully aware of their responsibilities for undertaking monitoring and evaluation.

- **Monitoring**
  - monitoring of implementation activities/programs to measure actual outcomes, and to provide information for evaluation;

- **Evaluation**
  - evaluation of the process, policies, and the actual outcomes against desired outcomes; and

- **Enforcement**
  - taking action to ensure convergence between desired and actual outcomes (based on information from monitoring and evaluation activities).

Within this model, the importance of monitoring and evaluation in program management are clearly evident. Of equal importance in a management framework is the relationship between monitoring and evaluation.
2.3 A FRAMEWORK FOR EVALUATION.

There are five different forms of evaluation according to Owen (1993). The selection and use of each is dependent upon the answers from five questions known as the components or building blocks of the evaluation. These questions and the different forms of evaluation form an evaluation framework and provide conceptual and practical guidance in deciding the most appropriate approach to evaluation in any given situation. Effective use of this framework necessitates a commitment to monitoring and evaluation throughout the life cycle of the program. A brief description of the major components of an evaluation program is outlined below, followed by the five forms which evaluation can take. The relationship between the life cycle of a coastal management project and this evaluation framework is provided in Figure 6.

2.3.1 THE COMPONENTS OF EFFECTIVE EVALUATION.

2.3.1.1 What is being evaluated?

**Policies:** Evaluation of policy involves the determination of the impact of policies on targets and criticism of policy direction.

**Plans:** Evaluation of the planning process should look at how effective rational processes have been used to nominate resources, define appropriate future action which will produce the desired outcomes.

**Programs:** A program has two essential components; a documented plan and actions or activities consistent with the information contained within the plan. Program evaluation according to Owen (1993) is the “process of delineating, obtaining and disseminating information of use in describing or understanding the program or making judgements or decisions related to the program”.

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Figure 6. The relationship between the life cycle of a coastal management project and this evaluation framework.
2.3.1.2. Why is it being evaluated? or what is the orientation of the evaluation?

It is vital that those involved in evaluations have a clear understanding of why the evaluation is being undertaken. The reasons for the evaluation should be clarified prior to the start of the evaluation because they impact and affect the methods of data collection, analysis, and information dissemination. Owen (1993) describes six reasons for carrying out program evaluations:

• **Enlightenment**

  - to document and provide relevant information regarding the impact of projects (and thus policies) in an usable and understandable form,

• **Accountability**

  - in short, checking to see whether stated outcomes have been achieved and resources allocated appropriately. This form of evaluation should be aimed at understanding what has or is happening rather than assigning praise or blame.

• **Program Improvement**

  - to provide information about ways in which programs can be improved, especially when programs are evolving. It focuses on impacts, and the design or delivery of the program.

• **Program Clarification**

  - The clarification of the links between ends and means, and causes and effects by the development of meaningful program goals.
• Program Development

- It is often referred to as 'up-front' evaluation since it occurs prior to plan implementation. The evaluation aids managers in making the most appropriate decision regarding the type of program or actions to pursue.

• Symbolic Reasons

- Symbolic evaluation is undertaken for show, giving an appearance of action but is in fact a whitewash.

Based upon the answers to these component questions, the most suitable form of evaluation can be undertaken for each stage of the programs life cycle. Owen (1993) has identified five forms of evaluation which are described below.

2.3.2 FORMS OF EVALUATION:

2.3.2.1. Evaluation for development.

Takes place before a program is designed. It assists planners to make decisions about what type of program is needed and the main design aspects to be considered. An example of this evaluation form can be seen in 'needs assessment'.

2.3.2.2. Design evaluation.

This form of evaluation concentrates on the clarification of the logic of the proposed program or to define the logic of an existing program.
2.3.2.3. Process evaluation.

This involves the collection of information regarding existing program activities. Its aim is to aid in decision making about a program during its early implementation.

2.3.2.4. Evaluation in program management.

Undertaken when a program has been well established. Goals have been clarified, program targets identified and implementation is well underway. Performance indicators are monitored. Management often express the need to acquire some evidence of the success or otherwise of the program. Often any further expenditure of funds is linked to the results of the evaluation.

2.3.2.5. Impact evaluation

Is undertaken in order to assess the impact of a settled (established) program. It is often used to make a decision regarding whether to retain the program or not and is typically based on the extent and level of attainment of objectives. While the emphasis is on outcomes a review of the process of implementation is also important as the process impacts on outcomes.
2.4 THE RELATIONSHIP BETWEEN MONITORING AND EVALUATION

Evaluation involves measurement, judgement, and analysis, and it is critical to ensuring that any project is moving towards and accomplishing its intended objectives. It should be relevant, timely, and accurate and should be based upon the information and data obtained from a monitoring program. Evaluation should be undertaken as a continuous and systematic activity during the lifetime of the project (Oakley, 1990; Douglas, 1992).

Over the past 25 years, formal evaluations of social-services programs have contributed to the development of concepts and methods for generating useful information on the effects, consequences, and outcomes of a wide range of programs, both social and scientific (Colt 1994). There are a number of case studies of how the tools of social science and program evaluation can be utilised in specific programs designed to contribute to environmental management (Kushler, 1989; Papalia, 1996). Program evaluations are utilised extensively in the fields of business; organisational management and Public Sector management (eg. Oakley, 1990; Jarvie, 1993; Amies, 1994). Evaluation, in these industries, has moved from an activity used to see if a program is working to an integral part of policy design. The objective now is not simply to evaluate, but to improve policy and program making (Craig 1986). Evaluation in coastal zone planning and management, however, is still relatively recent. Therefore, coastal managers have a prime opportunity to capitalise on the developments made in program evaluation over the last two decades.

If evaluation is undertaken prior to the design and implementation of a project, then a range of performance or outcome indicators can be developed. A key element to effective coastal zone management is ensuring a strong link between performance information, monitoring programs and evaluation activity. There is a natural interdependence between the three because they are focused on program objectives (Howard, 1991; Jarvie 1993).
These links occur in three main ways:

- performance indicators are used in the identification of key issues for evaluations;
- monitoring is designed to feed relevant information to evaluation programs based on a detailed analysis of performance information; and
- the evaluations are used to assess the validity of current performance indicators, to identify new ones, and to indicate where improvements can be made to monitoring information.

The primary way indicators are used in evaluation is in the identification of key issues for the evaluation to focus on. Good performance information and indicators gives any evaluation a flying start. It also means, that monitoring can be highly focused and limited in scope, thus saving time, money and staff (Jarvie 1993).

2.5 AUSTRALIAN EXAMPLES OF MONITORING AND EVALUATION

Examples of the possible application of the monitoring and evaluation components of the “Good Practice” guidelines outlined earlier can be applied to the Southern Metropolitan (SMCWS) and Perth Coastal Waters Study (PCWS) (Dept of Environmental Protection, 1996; Lord & Hillman, 1995) and recommendations arising from the 1997 West Australian State of the Environment Report (Dept of Environmental Protection, 1997a).
2.5.1 THE SOUTHERN METROPOLITAN & PERTH COASTAL WATERS STUDIES.

The Western Australian Environmental Protection Agency (EPA) has developed a philosophical approach to the long-term management of the coastal waters of Perth (Department of Environmental Protection (DEP), 1996). The approach is based on the principles of sustainable development and intergenerational equity and provide a sound foundation for a comprehensive environmental management strategy. This approach has been used for two areas, the Southern Metropolitan and Perth Coastal waters. These two areas provide a good case study to demonstrate the use of a philosophical approach. The Perth Coastal Waters study differed from the Southern Metropolitan study in its focus on the crisis management of the water quality at Marmion Marine Park. Otherwise the values, objectives and criteria were similar for the two studies. Both studies also overlapped technically and spatially.

2.5.1.1 The philosophical approach.

Wastes produced by society will ultimately cause a change in coastal waters which can be measured as a continuum from the state of no change (i.e. from natural variation) to the complete breakdown of ecological integrity. Along this continuum there will be a degree of change that society may (or will have to) accept as the cost for a range of social and economic benefits. There are, however, fundamental environmental attributes which should never be compromised, for example, the maintenance of biodiversity and ecosystem integrity. The DEP recognised that these attributes need to be evaluated within the principle of intergenerational equity. Fundamental definitions of unacceptable change and environmental values, however, are needed before this philosophy can be translated into management actions or products.
2.5.1.2 Defining ‘unacceptable change’ and environmental values

Levels of acceptable (and unacceptable) change are determined by the ‘use’ or ‘value’ society places upon the environment in question. These values have been termed Environmental Values (formally known as Prescribed or Beneficial uses) and defined as “any natural attribute or societal use of the environment that is conducive to public benefit, welfare, safety or health.” (DEP 1996). Environmental values, therefore require protection from the detrimental effects of any direct or indirect alteration of the environment. The DEP has defined five such values for water quality:

- ecosystem protection;
- recreation and aesthetics;
- raw water for drinking supply;
- agricultural water; and
- industrial water.

These values are then managed using strategies and protection programs. In both studies (SMCWS & PCWS) unacceptable changes were defined in terms of quantifiable departures from a range of clearly stated environmental quality objectives. Environmental quality objectives (EQO) represent the long-term aims or goals of an environmental management program and relate to both ecological and cultural values. Currently five EQOs have been drafted for the Southern Metropolitan and Perth coastal waters which reflect the environmental values defined above:

- maintenance of biodiversity;
- maintenance of ecosystem integrity;
- maintenance of aquatic life (including molluses) for human consumption;
• maintenance of recreational values; and

• maintenance of aesthetic values

Environmental quality criteria (EQC) have also been established to provide a benchmark to ensure that designated EQOs are met and environmental values are protected. One of the goals of coastal environmental management is to ensure that the relevant EQCs are never exceeded.

Environmental objectives must provide specific guidance to decision makers since they represent the aims and goals of the environmental planning and management program. Quality criteria provide a benchmark to ensure that the quality objectives are met and hence the specified environmental and cultural values are protected (Department Of Environmental Protection, 1996; Commonwealth of Australia, 1997). The relationship between 'Environmental Values'; ‘Environmental Quality Objectives’; and ‘Environmental Quality Criteria’ is illustrated Figure 7.
The monitoring approach being utilised for the Southern Metropolitan and Perth Coastal Waters Studies. Text adapted from Department of Environmental Protection (1996).
2.5.1.3 Deficiencies in the approach utilised by the Southern Metropolitan & Perth Coastal Waters Studies.

Coastal values are statements of the importance of aspects of the environment as perceived by individuals, groups or the wider community. The Australian Good Practice Guidelines for Coastal Planning (Figure 5) recommend the incorporation of “values, objectives, and criteria” into a coastal planning and management framework similar to the approach taken by the Western Australian DEP. The values in the Southern Metropolitan and Perth Coastal Waters Studies concentrate on aquatic issues whereas the Australian Good Practice Guidelines goes beyond this narrow focus to include social, cultural, economic and broader environmental values. The restoration, enhancement and protection of the coastal zone environment cannot, however, be achieved by independently targeting water quality to the exclusion of other values and objectives. The environmental values and objectives of the coastal waters are inexorably linked to a whole suite of other social, cultural, economic and biophysical values. These values and objectives must be identified, acknowledged and incorporated into the strategic planning and long-term management of Perth's coastal zone.

One step towards linking environmental and cultural objectives is to ascertain the priority information and management needs of coastal managers which relate to a wider suite of values and objectives other than aquatic ones. These can then form the basis of the various values and consequent objectives. The State-wide survey of West Australian coastal managers undertaken in 1997 (Refer to Section 1) identified several key information and management priorities for Western Australian coastal managers which are outlined in Table 15.
Table 15. Key information and management priorities for Western
Australian coastal managers, as identified from a state-wide coastal
survey undertaken in 1997 (Refer to section 1).

<table>
<thead>
<tr>
<th>VALUE TYPES</th>
<th>Key information and management priorities which could form the basis for possible objectives.</th>
</tr>
</thead>
</table>
| Cultural    | • Aboriginal issues; and  
              • Non-Aboriginal cultural issues. |
| Social      | • community priorities for coastal areas;  
              • public concern;  
              • impact of Govt policies; and  
              • recreation. |
| Economic    | • recreation and tourism; and  
              • development activities. |
| Management  | • integrated resource management; and  
              • regulations and by-laws. |
| Environmental | • ecosystems, habitats and species;  
                   • condition of rivers, estuaries and oceans;  
                   • flora and fauna;  
                   • seagrasses; and  
                   • pollution indicators. |
| Landscape   | • visual and aesthetic values. |

In recommending a broader suite of values and related objectives to be included in monitoring and evaluation programs, it must be acknowledged that there will be difficulties in applying appropriate EQOs and EQCs to some values. Environmental values which relate to issues such as maintaining water quality already have international and national objectives and criteria set. However, for less tangible values and objectives which relate to social and cultural issues the problem becomes very difficult since few such values have been identified and for identified values there are normally no objectives or criteria established. Nevertheless, where possible objectives should be set and criteria (qualitative or quantitative) be established.
2.5.2 COASTAL MANAGEMENT REVIEWS

The 1990's has been described as a "watershed" for Australian coastal zone management due to the increased interest by all three spheres of Government in coastal management (Haward, 1995). This increased interest has resulted in a number of reviews and evaluations of coastal management and planning over a range of spatial, temporal, and managerial boundaries. By way of example, three Australian Coastal Reviews which evaluated the effectiveness of coastal zone management at varying administrative levels are presented to investigate monitoring and evaluation at the Federal, State, and Local government levels.

2.5.2.1 Resource Assessment Commission's coastal zone inquiry (RAC, 1993) (Federal)

There have been thirty Commonwealth inquiries or reviews relating to coastal management issues since 1944, this averages out at one every two years (Kay et al., 1997). The Resource Assessment Commission's Coastal Zone Inquiry (1992-1993) was the Commonwealth's most significant and comprehensive coastal review. A nation wide consultation program attracted 734 submissions. Numerous reports and information papers were produced on almost every aspect of coastal management including 20 commissioned and published consultants reports. The Final Report was submitted to the Prime Minister on November 1993 containing 69 specific recommendations covering 13 different areas. The entire process cost more than $6 million. The major outcome of this Inquiry was a proposed National Coastal Action Plan as a vehicle for undertaking it's recommendations. This action plan has been initiated and some of the Review's recommendations are currently being implemented.
The results and findings arising from this review and it's recommended Action Plan attracted a great deal of criticism. The whole Review program was described as being "...most disappointing, costly, wasteful and largely superfluous to coastal management in Australia" (Centre for Coastal Management, 1993). In regards to the reviews analysis of monitoring and evaluation the Centre for Coastal Management (University of New England) comments were:-

- "...there was a complete failure of the RAC's Action Plan to propose specific actions to achieve any of its general objectives"
- "Even the general objectives are written in such imprecise and ambiguous terms that they are largely meaningless"

The submission from the Centre also noted that "...that the RAC Action Plan failed to take up the important recommendations of the HORSCERA Report", namely:

- “propose comprehensive environmental guidelines and standards (other than in general terms)” (HORSCERA, 1991).

Because of a failure to set clear goals and objectives by which comprehensive environmental guidelines and standards can be established, evaluations of federal programs will be severely constrained.

2.5.2.2 State government reviews:

Similarly, Western Australia has had a number of coastal reviews (Donaldson et al., 1995). The most comprehensive review was carried out 1994 to 1995. The primary task of the review was to evaluate the efficiency and effectiveness of the coastal management system in Western Australia, and if required, to make recommendations for improvement (Kay et al., 1997). The Review Committee noted that the effectiveness of coastal management plans are revealed by the state of the environment in which the plan operates.
The review team also noted a complete lack of criteria to measure the performance, effectiveness and efficiency of the State's coastal zone management program (Donaldson et al., 1995). As a consequence it is considered a major constraint to effective evaluation of Western Australian coastal zone management policies and programs.

In the absence of any established performance criteria for evaluating the performance of Western Australia's coastal management programs the Review Committee chose to use three simple criteria, namely:

• coverage of the State's coast by coastal management plans;

• perceived effectiveness by on-the-ground coastal managers; and

• qualitative assessment of the condition of the coastal zone of Western Australia.

For a detailed report on the evaluation outcomes refer to Donaldson et al., (1994) & Kay et al., (1997). Overall, the Review Committee believed that while coverage of coastal management plans was good there were major problems in the implementation of the plans. It was impossible to evaluate the success of management plans in terms of maintaining and improving the condition of Western Australia coast due to the lack of an effective mechanism for evaluation. One of the recommendations of the Review was the:

• establishment, monitoring and maintenance of standards for coastal zone management; and the determination and monitoring of performance indicators for coastal zone management.
One of the findings of the Review Committee was the creation of The Western Australian Coastal Zone Council (CZC) The CZC's Terms of Reference include "promoting standards and guidelines for coastal zone management" (Ministry for Planning, nd). As of October 1997 this Term of Reference nor the original recommendation from the 1994 Review had not been implemented (Pers comm, Vivienne Panizza: Western Australia Ministry for Planning) and is not a priority in the current state coastal program. Instead, yet another coastal survey and review has been initiated by the Western Australia Ministry for Planning. A questionnaire designed to assist the CZC to evaluate coastal zone policy implementation will be sent in October/November 1997 to coastal managers in Local councils (Ministry for Planning, 1997). It can only be hoped that this is not the start of another round of coastal information gathering which leads to little on-the-ground improvement.

2.5.2.3 Local government reviews

Coastal management in the City of Stirling has been guided by the 1984 Coastal Management Report (Evans et al., 1984). This report was primarily intended as a strategy for coastal management, and for interpretation in subsequent and more specific concept plans. It is focused on the determination of appropriate levels of utilisation relating to environmental, recreation, and social considerations. Identification of incompatibility in land use activities as well as areas requiring rehabilitation were also major objectives of the 1984 Report. In 1996 a review was undertaken which aimed to investigate and evaluate the effectiveness of the 1984 Coastal Report. The 1996 evaluation encompassed both the management procedures undertaken, and the structures set up to facilitate them. This was based on the premise that the structure of management determines the ultimate success of on-the-ground implementation (Overman 1996).
In regards to monitoring and evaluation, the 1984 Report contained no formal, interdivisional mechanism to facilitate information exchange back to the strategic management level. Nor were there any formal standards and performance indicators for gauging the effectiveness of management actions. This meant that even if there were informal evaluation opportunities, any subsequent findings of the coastal management program were lost (Overman 1996).

Planning legislation in Western Australia does not require monitoring of management plan effectiveness. This combined with the focus taken by most local planning departments explains why there was no strong, coordinated monitoring program included in the 1984 Report. As a consequence any existing monitoring programs were also downgraded. For example, the City of Stirling shoreline was surveyed from a fixed datum every month for several years, now it is undertaken only twice a year (Pers comm, Ian Elliot: University of Western Australia).

The lack of information exchange between divisions within council has also constrained the use of information in improving the council’s management of the coast. Any environmental information obtained over the last 15 years has been collected by individual divisions within the City. Data collected is then stored in individual database or in the City archives. There is no mechanism by which the information can be easily accessed and collated into an intelligent framework suitable for management purposes (Overman 1996).

Interviews with City of Stirling officers revealed that funding as a major constraint to undertaking monitoring, did not apply. The main constraint to coastal zone monitoring by the City of Stirling is in fact the very structure of Council itself who are reluctant to expend funds on monitoring (Pers comm, D Rajah. City of Stirling, 1997).
Overman (1996) noted that overall the 1984 Report was effective in addressing most of the coastal management problems in the City of Stirling. The report established management guidelines under which the City managed its coastline over the past decade. However, "...a significant deficiency of the 1984 Report lies in its lack of facility for evaluation and monitoring" (Overman, 1996). Local government are major coastal managers, therefore, they need to know if any coastal programs undertaken by them are working or not.

2.6 CONCLUSION

The above examples of monitoring and evaluation were conducted over different scales and for different reasons. Yet there are a number of common threads running through all the examples. Effective evaluations of coastal management plans and programs are hindered, and can become impotent, due to a lack of clear specific quantifiable criteria for evaluation. There must be specific standards and performance indicators built into the plan or program which have been monitored over the life cycle of the program. This monitoring information then forms the basis for any subsequent evaluation.

Because there has been very little program evaluation and when it has occurred, it was ineffective, Kay and Lester (1997) believe that, at present, the three spheres of Australian government will generally have a great deal of difficulty determining if coastal management programs are effective. Haward (1995) and Kay & Lester (1997) point out (diplomatically) that coastal management in Australia is a highly politicised process. This leads these writers to wonder with a degree of cynicism, could it be that evaluations of the effectiveness or otherwise of coastal programs are not carried out because the results may reflect badly on the government? Further, are there vested interests benefiting from the status quo who would actively discourage effective evaluation of coastal management arrangements?
It would be unfair to apply the cynical statements above to the Western Australian situation. The Review of Coastal Management was a small three person committee with a high degree of independence from the government. The Chairman of the Review Committee was a politician of high standing which provided a number of practical benefits to the review process. For example, the Review Committee were able to gain access to politicians from both sides of the house in order to gain bipartisan support for the review’s outcomes (Kay et al., 1997).

Local government coastal managers in Western Australia, however, undertake little coastal zone monitoring and evaluation. According to the State wide coastal survey (Section 1) the State government undertakes the majority of monitoring and evaluation in Western Australia. Nearly 30% of State coastal managers committed more than 20% of their time to monitoring related activities compared to just 16% of Local government coastal managers. Local government coastal policies and projects are reviewed and evaluated less often than are State government policies and projects. The majority of Local governments did not utilise any measurable indicators as part of their coastal management programs compared to the majority of State government coastal managers who did. It would not be unreasonable to assume that if evaluations of the effectiveness or otherwise of coastal programs are carried out by more Local governments the results may well reflect badly on the Councils concerned.

A desire for the best possible approach to coastal zone management requires vision and commitment from not only coastal managers and politicians but also all coastal users. This vision and commitment can in part be generated by a sense of “ownership” regarding management approaches. However, without accurate and timely information to aid and improve decision making and to ascertain whether the project is meeting its aims and objectives the commitment will not be sustainable and the vision will die.
From the evaluation framework presented in section 2.3 it can be clearly seen that evaluation can occur throughout the life of a coastal program and should not be regarded as an activity occurring after completion of the program. An integrated framework for monitoring and evaluation allows coastal managers to obtain and disseminate accurate and timely information which aids better decision making for managers as well as politicians and the wider community of stakeholders. Utilising an integrated framework of monitoring and evaluation when undertaking a coastal zone management program or plan offers substantial benefits to coastal managers, politicians and other stakeholders. The short term benefits are an improved understanding of the coastal zone environment; achievement of management goals and more cost effective management. The long term benefits are the preservation and protection of the productivity and biodiversity of coastal zone ecosystems while promoting sustainable and ecologically responsible development and utilisation of coastal zone resources.
SECTION 3.

MANAGEMENT OF COASTAL ZONE MONITORING & RESEARCH INFORMATION

A Discussion Paper
3.1 INTRODUCTION

The coastal zone has been typically described as the interface between land and water, however, it could also be defined as the interface between complex natural and cultural (human) environments. Interdisciplinary management and research activities in the coastal zone involve multifarious environmental, social, cultural, and economic considerations, often resulting in diverse scientific and social data that lead to technical difficulties in data management (Wei & Johnston 1995). As a result, specialised data management approaches are needed to catalogue and describe diverse coastal zone information effectively (Commonwealth of Australia 1997; Parent, 1992-1993).

Historically, environmental research in the coastal zone has been conducted as small-scale projects involving one or a few researchers in a single discipline and funded for short time periods. Currently, there is an emphasis on larger scale multi-disciplinary long term research and monitoring projects, for example the Perth Coastal Waters and the Southern Metropolitan Coastal Waters Study in Western Australian and the Jervis Bay studies in New South Wales. Because of this change in research emphasis there has been a greater demand for more effective data management systems that can address difficult and diverse issues, including the wide variety of spatial and non-spatial data in different temporal scales (Brown & Burke, 1993; Cassettari, 1993; Wei & Johnston 1995).

The ability to integrate data from various sources and disciplines is of major concern to many scientists undertaking monitoring and research. This intensified focus on effective data management has partly been driven by the realisation that data and information have become a significant organisational resource and a high value (capital and influence) product (Stafford et al., 1994; Milton, 1997).
Effective management of information from coastal zone programs is not an easy task due to the combination of environmental, social, cultural, and economic information which is measured over varying temporal and spatial scales. A state wide survey of Western Australian coastal zone managers undertaken in 1997 (Refer to section 1) highlighted major inefficiencies in the way in which monitoring information is managed. This paper examines a number of these issues in light of current and proposed initiatives for the management of coastal information.

3.2 THE ISSUES

There are a range of issues involved in the management of data originating from coastal zone monitoring and research projects. This paper examines and discusses the following:

- the current management of monitoring information in Western Australia;

- general data management problems which include the difficulties in collection, documentation and archival of coastal marine data; and

- the need for an effective coastal marine data management system.

Two frameworks communally used for inventory, maintenance and running of such a data management system will be contrasted:

- A specialised coastal meta database currently being developed by the Ministry for Planning; and

- The Western Australian Land Information System (WALIS) which is currently seeking to improve and upgrade its coastal marine capabilities.
### 3.3 Current Management of Monitoring Information in Western Australia

A recent survey of coastal zone managers in Western Australia had as one of its aims an investigation of the information management processes utilised for coastal zone monitoring data (Refer to Section 1: A survey of Coastal Zone Managers). A summary of the results follows.

Respondents in this survey agreed that a common monitoring data base was not available for different government agencies to address common problems. Combining data sets from different programs is often very difficult because there are few common standards for the collection of data. Sixty-nine percent of respondents indicated that the results of their monitoring programs are made available to other departments and organisations. However, the data can often be in a format that is incompatible with the receiving agency's systems. Information is made available either on request or as part of a reporting arrangement. Currently very little monitoring information is disseminated via Web Sites.

Accessing results from other monitoring programs was relatively easy according to 74% of respondents while the remaining respondents (26%) stated that results were only available with some difficulty. State government departments were the main sources of monitoring information.

Quality Assurance (QA) programs were generally not included in monitoring programs. Only 30% of respondents stated that a QA program was included as part of the total monitoring program, again the majority were from State government. Surprisingly, 22% did not know if a QA program was incorporated, while the remaining 47% stated that no QA program was included. Reasons given for not including a QA program included: lack of funding and resources, lack of organisation and foresight, and no obvious benefits.
There was general agreement among respondents that most monitoring programs did not utilise some form of Integrated Data Management System (IDMS). The results revealed that the use of IDMS were limited in scope and were mainly utilised by State government managers.

3.4 DATA MANAGEMENT PROBLEMS

The above profile of coastal information management in Western Australia does not inspire confidence in the current situation to meet the changing demands of government as they respond to environmental and social concerns. Currently, coastal managers and researchers undertaking monitoring and research in Western Australia are unable to ascertain whether similar initiatives are being undertaken elsewhere. For example, when a survey was being conducted as part of this research project there was also a similar one being undertaken and targeted to the same respondents by another university. This duplication has the potential to reduce response rate and reduce quality responses due to respondents being asked to complete two similar surveys. The lack of coordination among programs is reflected in the absence of an integrated data management system for monitoring and research data. Rather than one or two effective systems, there are a wide variety of approaches to data management, most inconsistent with one another (Cassettari, 1993). Research into information services to meet Australian coastal management needs found that many coastal managers were not only unable to access existing data collections but they were not even aware they existed (Brown & Burke 1993).
3.5. THE NEED FOR A COASTAL MARINE DATA MANAGEMENT SYSTEM

The coastal marine environment is expected to come under increasing pressures over the next decade due to developing industries such as aquaculture, tourism, and further industrial developments sited on coastal land (Kay et al., 1996; Government of Western Australia 1997). This situation has two important consequences for coastal data management.

3.5.1 OPERATIONAL BENEFITS

Firstly, it is the very fluid nature of the coastal marine environment which increases the likelihood of localised problems and conflicts impacting on other sections of the coastal zone, for example, oil spills due to tanker mishaps. A computer-based information system which integrates all coastal marine information would be useful to management agencies for combating environmental and social hazards such as marine oil pollution. A Coastal Resource Atlas (CRA) which is an extensive database containing the coastal resources along the Western Australian coastline is currently being constructed by the Coastal Management Branch of the Western Australian Department of Transport. The CRA is a GIS-based system which assists in contingency planning and contributes to the decision-making process in the event of an oil spill (Dames & Moore 1994). It aims to provide rapid access to data during an oil spill, without having to contact numerous agencies at short notice, thus providing effective identification of response strategies necessary to minimise the ecological, financial, and social costs associated with marine oil pollution (Milton, 1997).
3.5.2 RESEARCH AND PLANNING BENEFITS

The second consideration is avoiding the duplication of coastal and marine monitoring and research efforts by different organisations. It is not unusual for two different, yet similar research or monitoring projects to be conducted concurrently either by government or academic institutions. An example of current monitoring and research which runs the risk of duplication is in the area of hazard and risk assessment. Research by Kay et al., (1996) into the establishment of a suitable methodology to assess the impacts of future sea-level and climate change found considerable shortfalls in available information considered vital to improving future assessments. It is quite conceivable that this information could be gathered independently by a number of different institutions in the future, without each being aware of the data gathering operations of the other.

This situation has recently come to the attention of a number of university research institutions which have set up the National Graduate Research Database (NGRD). The NGRD was established to enhance opportunities for collaboration on common research projects as well as to make the research community aware of current research. The database is accessible on the internet at http://www.scu.edu.au/ngrd
3.6 APPROACH FOR THE ESTABLISHMENT AND ADMINISTRATION OF A COASTAL MARINE DATA MANAGEMENT SYSTEM.

There are three major approaches for the establishment and administration of a coastal marine data management system. The distributive, the centralist and a hybrid, (a combination of the first two)(Sherringham, 1996; Bolton, 1997).

3.6.1 THE DISTRIBUTIVE APPROACH

People closest to the data retain the data and look after their part of the inventory by maintaining the technical and meta data standards established by a group such as WALIS or the Australian New Zealand Land Information Council (ANZLIC). The advantages in this approach is that the people closest to the data look after it as they know it the best. Peer pressure by other data users has been claimed to improve data standards for those who submit “rubbish” or sub-standard technical and meta data. It has also been acknowledged that some organisations want to retain control of their own data records and believe that the distributive or decentralised approach is the only way they would contribute data (Sherringham 1996).
3.6.2 THE CENTRALIST APPROACH

The inventory and meta data is operated centrally by one organisation that has the responsibility for running, updating and maintaining it. Problems with this approach are that the people maintaining it are often remote from the data and some can lack the required expertise to effectively manage and maintain the system (Sherringham 1996). However, it must also be acknowledged that an organisation wholly committed to data management may often do a better job as they can ensure a standardised approach, they have the time and presumably the funds to maintain the inventory. Because they have total responsibility it has been argued that they would maintain quality as the result of pride in workmanship (Sherringham 1996).

3.6.3 THE HYBRID APPROACH

The *hybrid* system would ideally combine the best features of the centralised and distributed frameworks while hopefully eliminating the worst disadvantages of each. Coastal marine management agencies would have the option of either supplying data to a central agency or position their material on their own web site and index it with the central agency. There are some indications that a National Marine Information System (NatMIS) could utilise a hybrid approach (Sherringham 1996). For a detailed discussion on the merits and otherwise of these three approaches refer to Bolton (1997).
3.7 OPTIONS FOR WESTERN AUSTRALIA

In Western Australia there are a number of options available for the management of coastal marine monitoring information. As a starting point for discussion two possible considerations are presented. The first is a spatially referenced coastal meta database project currently being undertaken by the Western Australian Ministry for Planning. The second is the existing WALIS framework.

3.7.1 A COASTAL META DATABASE.

The Western Australian Coastal Zone Council (CZC) is charged with assisting in the development and review of government policies and priorities for coastal zone management. The CZC also monitors the implementation of coastal zone management programs. It undertakes these functions by coordinating with agencies with statutory responsibilities for coastal management. The CZC determined that it required a central coastal information database that would enable it to begin its work fulfilling these functions. The database was designed and implemented by the Western Australian Ministry for Planning. The aim is to collect data on:

- Documents with relevance to the Western Australia Coastal Zone;
- Community Groups active in the coastal zone;
- Aboriginal Interest groups;
- Development Proposals;
- Native Title tribunal Claims; and
- Data sets
The database has been designed in *MS Access* so that it may be compatible with other databases such as those held by The Australia New Zealand Land Information Council (ANZLIC) and the Western Australian Land Information System (WALIS).

Initial requests for data information were met with mixed responses. Local Government might aptly be described as recalcitrant considering the difficulty experienced by both the Ministry for Planning and this researcher with obtaining information from them (Pers Comm: Vivienne Panizza, Western Australian Ministry for Planning. 11 July 1997).

All spatially referenced records are linked to a spatial database by Local Government Authority (LGA). Each record is described by a polygon which encloses the relevant section of the coast. This enables searches to be conducted either by interactively describing an area of coast (linked to the relevant LGA's) or by document details. Currently, the Western Australian Land Information System (WALIS) and the Ministry for Planning are working together to ensure that this coastal database is compatible with existing and future systems as well as being accessible from the internet.

### 3.7.2 THE EXISTING WALIS FRAMEWORK

The Western Australian Land Information System (WALIS) is a distributive system by which Western Australia Government agencies share and make available a large amount of land-related information to each other, the private sector, and to the wider community. WALIS is not a centralised database, but integrates components established within 26 government agencies. It involves a high level of collaboration between agencies to meet each others data requirements and the data needs of others who require the information (WALIS, 1997).
The focus of WALIS agencies is on obtaining, providing and maintaining consistent, quality and accessible information. WALIS agencies are charged with ensuring that the information is up to standard (including quality) thus promoting widespread use rather than a single agency-specific need. The knowledge of the existence and location of the data is made widely known so as to be relatively easy to access and integrate with other data sets. Data collection and maintenance is expensive, therefore, WALIS agencies are encouraged to focus on the highest priorities and coordination of data capture programs to avoid duplication (WALIS, 1997).

### 3.7.2.1 WALIS custodianship

The custodian principle has been adopted by the Western Australian Government and WALIS as the means of ensuring accountability for the care and maintenance of information within the public sector. Custodianship is seen as being at the core of efficient and effective information management. The principle of custodianship assigns to an agency certain rights and responsibilities for the collection and management of information on behalf of the Western Australian Government and its agencies. These rights and responsibilities include the right to set marketing conditions for the information and responsibilities regarding the maintenance and quality of the information. It also ensures accessibility of the information and provides a recognised point of contact for the distribution, transfer and sharing of the information. The overriding philosophy of the activities associated with custodianship is that WALIS agencies manage the information as trustees in partnership together to enable the integration of information for the benefit of the WALIS community and the State of Western Australia. In addition to achieving accountability for information within the WALIS community, custodianship is also a means of:

- eliminating unnecessary duplication in the capture and maintenance of information;

- managing the information on behalf of others (WALIS, 1997).
3.7.2.2 Quality control

WALIS agencies are bound to ensuring that data sets are in a consistent, quality and accessible form. This requires an agreed set of standards (including technical and quality) to promote widespread use of the data sets rather than just an agency-specific use. Currently it is the responsibility of the custodian to develop standards appropriate to their data. These standards are then submitted to the WALIS Executive Policy Committee for approval (Dixon & Macduff, 1995).

Addressing the issue of quality and technical standards to promote the widespread use of data sets is absolutely fundamental to effective management of monitoring and research information. The importance of this issue is clearly seen in the problem of using data from different sources which often can compromise the consistency of the final product due to non-uniform sampling techniques, spatial resolution and accuracy. Whether as digital or hard copy, the custodial agency usually collects data for its own purposes. The result is that the data tends to be idiosyncratic and difficult to combine with other data sets. For the same reason, data sets are often not well documented with respect to currency, accuracy and resolution (Dixon & Macduff, 1995).

Metadata is not the data itself but rather “data about data”. It is analogous to library catalogues which describe books yet they are not the books. The metadata approach enables prospective users to find out about the data set without needing to actually access and investigate it. Metadata has two main functions:

- to provide a means to discover that the data set exists and how it might be obtained or accessed; and

- to document the content, quality, and features of a data set thus giving an indication of its fitness for any intended use (ERIN 1996).
Within WALIS there are draft standards for digital spatial metadata. These standards are intended to ensure that the:

- the standards requirements of all agencies and customers in the private sector are met;

- all essential information is provided that will enable users to ascertain if a data set is useful for their needs;

- all data transfers are provided with the mandatory metadata; and

- consistency and uniformity between agencies is achieved.

The Executive Committee of WALIS is developing a Memorandum of Understanding (MOU) that all agencies wishing to participate in WALIS will sign. The MOU will address issues such as adherence to WALIS policies and standards, access to information and support for a whole of government perspective on WALIS.

The WALIS community seeks to provide spatial data that is current, consistent, correct, and coherent (Milton 1997). However, it is acknowledged that this ideal is not always the case in reality. Problems with different systems and different data formats plague many State and Local government departments hindering inter-governmental access to coastal data. Another issue facing the WALIS community is the different approaches which must be adopted with coastal marine information compared to land based information. These issues are addressed below.
3.7.2.3 Is the coastal zone too wet for WALIS?

The coastal waters of Western Australia are managed by a number of State government agencies. The geographic data sets covering these coastal waters are covered by WALIS protocols, in a similar fashion to land-based data. These data sets are used for the management, development, and protection of both coastal waters as well as coastal resources. The important difference between the administration of the marine and land tenure is the lack of a unified formal process for the lodgment and archiving of coastal marine information. Each management agency has their own procedures for marine data management. There are no state-wide guidelines or a single source of all relevant marine information. This results in the State’s marine data sets being managed in an inefficient and less than effective manner (Mahoney et al., 1997).

The coastal marine environment is dramatically different from terrestrial environments. Firstly, it is difficult to collect and update coastal marine data compared to purely land based data. Coastal marine data are time-dependent and three-dimensional, for example water column-dependent variables. This complexity further includes the three dimensional use of the sea which can separately involve the airspace above the water surface, the waters at various depths, the seabed and it’s sub-surface (Lockwood & Li, 1995; Wei & Johnston, 1995; Mahoney et al., 1997).

The relatively simple methods used to describe, catalogue and register terrestrial land use and tenure cannot be applied to the coastal marine environment (Mahoney et al., 1997). For example, the two standard marine datums used as the boundary description in coastal marine tenure are High Water Mark (HWM) and Low Water Mark (LWM). However, Western Australia has extensive and continually moving sandy and muddy coastlines that change between seasons and years. Often these coastlines have a very low gradient which makes their upper and lower limits hard to define especially considering the tidal forces and meteorological influences which affect the position of the coastline (Mahoney et al., 1997).
In its current form the WALIS community is unable to fully meet the challenges presented by the complexity of coastal marine data generated from monitoring and research programs. Management of coastal marine data under WALIS is compromised by the lack of formalised processes for the lodgment and archiving of this data thus reducing the capability to effectively plan for and manage coastal waters (Mahoney et al., 1997). Currently, coastal data sets have not been allocated custodianship. This means that any number of agencies can, and are, collecting and storing coastal data often with little consultation with one another.

Another limitation of the current WALIS structure is the poor documentation of data sets and data sharing agreements by some of the WALIS agencies. Apart from fundamental data sets some agencies are not even aware that they are the rightful custodians of data. Data managers within the individual agencies may not be able to allocate the extra time and funding required to effectively manage monitoring information.

3.8 CONCLUSIONS

The Coastal Zone Council plays the major role of coordinating Western Australia’s coastal management. It has constructed a purpose built, central coastal meta database to aid planning and management of the coastal zone. The approach is simple, straightforward, easily adaptable and centralised in an agency with primary responsibility for coastal coordination.

The metadata from monitoring and research projects can be easily added to the database. Information regarding the spatial location and nature of monitoring and research in the coastal zone can be obtained without difficulty. Provided, of course, that agencies and organisations submit the data to the Ministry for Planning for inclusion.
The WALIS framework is a distributive model involving 26 government agencies. Monitoring and research information relating to the coastal zone are not easily incorporated into existing systems.

Currently there are a number of separate data management initiatives been either undertaken or considered. Duplication of the functions and aims of these systems should be avoided. Where possible all data management systems should have minimum standards of compatibility built in thus ensuring integration and sharing of data if needed.

Western Australia has an opportunity for the effective management of coastal monitoring and research information. For this to be achievable the coastal community must support the efforts of the CZC as the peak body for coastal zone management in Western Australia (Kay et al., 1997).
SECTION 4.

SUMMARY

&

RECOMMENDATIONS
If monitoring is to provide timely and relevant information for use in decision making, as the majority of surveyed coastal zone managers believed, the following questions need to be asked: “What is the nature and source of this information, and, under what structure or framework should it be gathered?”

In answer to the first question this project has identified what managers perceived as the information needed and identified several sources of that information. Decisions regarding management frameworks, however, should be addressed first because the framework of management determines the ultimate success of on-the-ground activities. This project has highlighted a number of existing and proposed management frameworks for an integrated approach to monitoring and evaluation. It was not the intention of this research to recommend one framework over another, rather, to highlight the importance of an integrated approach to coastal management activities, particularly monitoring and evaluation.

The final choice of management framework will depend upon management aims and objectives. However, there are several important issues which must to be considered before the implementation of policies or projects. The need for clear vision and commitment to providing the best possible framework in order to deliver the maximum benefit to all coastal users and the environment itself should be a central focus of any management approach. For coastal managers to function effectively within an integrated management framework they require a broad range of essential and relevant information. A number of information types which coastal managers stated as being highly relevant to the effective management of coastal environments was identified by this research.
Public concern regarding management priorities and public participation in the decision making processes were identified as been highly relevant and important to coastal managers in Western Australia. Environmental Impact Assessment (EIA) was cited as being one of the most important information providing processes available to Western Australian coastal managers.

In times of ever increasing funding constraints EIA is very cost effective in that the proponent or user pays for the impact study. Both public involvement and the EIA process should be viewed as relatively quick and cost efficient ways of gathering timely and relevant information for use in decision making. This is especially true when we consider that management in the coastal zone is a political process, and the decision makers (politicians) operate in three to four year time frames.

The provision of this information will have to be undertaken within the range of constraints placed upon coastal managers. This research highlighted various constraints, however, the main constraint was financial. These constraints necessitate that monitoring and evaluation are undertaken in an efficient and cost effective manner and are integrated into a whole of management framework. Integrated Coastal Zone Management (ICZM) is one such framework which can help in achieving the efficiencies needed.

Establishing a relationship between ICZM and evaluation throughout the life cycle of a project or policy allows coastal managers to obtain and disseminate accurate and timely information which aids in better decision making for managers as well as for politicians and the wider community of stakeholders. The management of this information, however, is a weak link in the current attempt to improve coastal zone management. The lack of a central coastal data base for the storage of information relating to coastal zone monitoring and research was singled out as being both the most important and the most achievable within the life span of this present State government.
This study has also provided an opportunity to make recommendations to strengthen the role of monitoring and evaluation in the coastal zone. These are summarised below.

RECOMMENDATIONS

• Target currently available funding into key information areas identified as part of this research. For example, strengthen the monitoring and reporting commitments of proponents under the EIA process to further enhance EIA as a key process for providing relevant information.

• Coastal zone managers should support the Western Australian Coastal Zone Council in their efforts to establish, support and maintain a data base for research and monitoring information relating to coastal zone management.

• Undertake information and training for managers regarding the benefits of management approaches such as Integrated Coastal Zone Management (Refer to figure 4).

• Promote and establish an integrated framework for effective monitoring and evaluation throughout the life cycle of a coastal management program. One possible model for this is outlined in figure 6.
REFERENCES


Carman-Brown, A. (1994). *Case studies in coastal plan formulation and implementation: Experiences from Western Australia.* In Royal Australian Planning Institute Conference, Hobart, Tasmania, 6-10 April.


APPENDIX A

Coastal zone survey questionnaire
Q1 Do you work in:
- Perth Metropolitan Region
- Main Regional Centre
- Country Town

Q2 Your employer is:
- Commonwealth Government
- State Government
- Local Government
- University
- Industry
- Consultant

Q3 Your MAIN area of work is in: (please tick the appropriate box below)
- Administration
- Education
- Primary industry
- Building/construction
- Engineering
- Recreation/tourism
- Business & Industry
- Environment
- Regulation/Law
- Community services
- Information services
- Research
- Design/architecture
- Planning
- Roads, water, waste
- Economics/finance
- Political office
- Senior management
- Other (please specify)

Q4 Your highest educational qualification is?
- School
- Diploma/Certificate
- Bachelor Degree
- Post graduate Degree

Q5 Are you involved in the preparation of:
- NO: Please go to question 6
- YES: Please tick the relevant boxes.
- Structure plans
- Resource plans
- Urban plans
- Social plans
- Rural strategies
- Coastal strategies
- Foreshore management plans
- Other (please specify)
- Coastal Management plans
Q6 The list below contains types of information which have been found to be of use to people whose work involves the coastal zone. Please rank the FIVE MOST IMPORTANT to your own work by marking "A" next to the item of most importance, then "B", "C", "D" and "E" in descending order of importance.

<table>
<thead>
<tr>
<th>Type of Information</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aboriginal issues</td>
<td>01</td>
</tr>
<tr>
<td>Ecosystems, habitats and species</td>
<td>15</td>
</tr>
<tr>
<td>Public participation</td>
<td>02</td>
</tr>
<tr>
<td>Business opportunities and risks</td>
<td>16</td>
</tr>
<tr>
<td>Recreation and tourism</td>
<td>03</td>
</tr>
<tr>
<td>Coastal hazards eg oil spills, cyclones</td>
<td>17</td>
</tr>
<tr>
<td>Industry performance</td>
<td>04</td>
</tr>
<tr>
<td>Water management</td>
<td>18</td>
</tr>
<tr>
<td>Development benefits and losses</td>
<td>05</td>
</tr>
<tr>
<td>Infrastructure costs</td>
<td>19</td>
</tr>
<tr>
<td>Dollar values of natural environment</td>
<td>06</td>
</tr>
<tr>
<td>Economic instruments</td>
<td>20</td>
</tr>
<tr>
<td>Environmental impact assessments</td>
<td>07</td>
</tr>
<tr>
<td>Regulations and by-laws</td>
<td>21</td>
</tr>
<tr>
<td>Community priorities for coastal areas</td>
<td>08</td>
</tr>
<tr>
<td>Heritage values</td>
<td>22</td>
</tr>
<tr>
<td>Social data eg age, income</td>
<td>09</td>
</tr>
<tr>
<td>Condition of rivers, estuaries, oceans</td>
<td>23</td>
</tr>
<tr>
<td>Strategic plans</td>
<td>10</td>
</tr>
<tr>
<td>Integrated resource management</td>
<td>24</td>
</tr>
<tr>
<td>Condition of soil and beaches</td>
<td>11</td>
</tr>
<tr>
<td>Pollution indicators</td>
<td>25</td>
</tr>
<tr>
<td>Waste management</td>
<td>12</td>
</tr>
<tr>
<td>Visual/aesthetic values</td>
<td>26</td>
</tr>
<tr>
<td>Community service needs</td>
<td>13</td>
</tr>
<tr>
<td>International obligations</td>
<td>27</td>
</tr>
<tr>
<td>Land ownership and tenure</td>
<td>14</td>
</tr>
<tr>
<td>Employment statistics</td>
<td>28</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>29</td>
</tr>
</tbody>
</table>
Q7 Briefly list your organisation's objectives?

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

Q8 Once managers form strategies, objectives and plans, they must ensure the plans are implemented. What performance measures are utilised by your organisation to gauge whether the above objectives ARE or HAVE been achieved?

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

Q9 Does your Organisation undertake any form of monitoring in the coastal zone?

Tick the appropriate box

No: □ please go to questions 27 to 44

Yes: □ please answer questions 10 to 44

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Q10 Is the monitoring undertaken in order to achieve one or more of your objectives?

Tick the appropriate box

No: [ ] please go to question 11
Yes: [ ] please answer the following:

• If YES: please state which objectives:

Q11. Why does your organisation undertake monitoring?

Please tick the MOST IMPORTANT to your own work.
1. [ ] For your own operational requirements,
2. [ ] As part of your involvement with the EIA process,
3. [ ] As part of consultancy work for an private organisation
4. [ ] To address public concern
5. [ ] Compliance with conditions
6. [ ] To be seen to be doing the right thing
7. [ ] International obligations
8. [ ] Work in areas of high conservation value
9. [ ] Formation of management plans
10. [ ] Academic interests
11. [ ] Effects monitoring (actual vs expected or predicted)
12. [ ] Other (please specify) ____________________________________

Q12. What percentage of YOUR time is committed to coastal zone monitoring
(include: planning/programming for monitoring; data collection; analysis, and reporting)

Please tick ONE only.
1. [ ] 0 - 20 %
2. [ ] 21 - 40 %
3. [ ] 41 - 60 %
4. [ ] 61 - 80 %
5. [ ] 81 - 100 %

Q13. What is the frequency of monitoring undertaken by your organisation?:

Please tick ONE only.
1. [ ] project-by-project basis
2. [ ] Ongoing for one or more projects
3. [ ] Ongoing for one or more projects but others on a project - by-project basis
4. [ ] Other (please specify) ____________________________________

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Q14 Does your organisation undertake monitoring with any of the following?

Please tick those which apply.

1. As part of a joint monitoring program with an Educational Institute?
2. In association with another government agency or agencies?
3. In association with the public?
4. With private industry?
5. With consultants?
6. We do not undertake any form of joint monitoring efforts.

Q15 If monitoring is undertaken as a joint operation is it or was it clear WHO was responsible for the overall management of the monitoring program?

No 1  Yes 2  Don't know 3

Q16 Did the monitoring program answer or attempt to answer the following general concerns of the public.

No: 1 If NO please go to question 17

Yes: 2 If YES Tick the appropriate boxes.

1. Is it safe to swim in the ocean?
2. Is it safe to eat the local seafood?
3. Are fisheries and other living resources being protected?
4. Is the health of the ecosystem being safeguarded?
5. Other (please specify) __________________________

Q17 How were the monitoring objectives stated.

Tick the appropriate boxes.

1. Quantitatively?
2. Qualitatively?
3. Both (mix)?
4. Do not know
5. Other (please specify) __________________________
Q16 How relevant and useful are the following types of information?

Relevance (how relevant is the information to achieving either your organisation's objectives and/or the monitoring programs objectives?)

Usefulness (how useful was the information that was obtained in terms of actually achieving objectives)

<table>
<thead>
<tr>
<th></th>
<th>Relevance</th>
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<th></th>
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<tbody>
<tr>
<td></td>
<td>Highly</td>
<td>Not Relevant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Relevant</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>Tourism</td>
<td>[ ]</td>
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<tr>
<td>Recreation</td>
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<tr>
<td>Heritage</td>
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<tr>
<td>Social Impact</td>
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<tr>
<td>Cultural</td>
<td>[ ]</td>
<td></td>
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<tr>
<td>Public concern (inc community priorities for coastal zones)</td>
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<td>[ ]</td>
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<tr>
<td>Impact of Govt policies</td>
<td>[ ]</td>
<td>[ ]</td>
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<tr>
<td>Protection of aquatic ecosystems</td>
<td>[ ]</td>
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<tr>
<td>Recreational aesthetics</td>
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<tr>
<td>Recreational water quality</td>
<td>[ ]</td>
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<tr>
<td>Pollution indicators (inc elevated nutrients)</td>
<td>[ ]</td>
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<tr>
<td>Flora and fauna</td>
<td>[ ]</td>
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<tr>
<td>Seagrasses</td>
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<td></td>
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<tr>
<td>Fisheries management</td>
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<tr>
<td>Aquaculture management</td>
<td>[ ]</td>
<td></td>
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<tr>
<td>Ballast water discharges (Introduction of exotic species)</td>
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<tr>
<td>General coastal process</td>
<td>[ ]</td>
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<tr>
<td>Waves and Tides</td>
<td>[ ]</td>
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<tr>
<td>Hydrological cycle (modification)</td>
<td>[ ]</td>
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<tr>
<td>Sea level rise</td>
<td>[ ]</td>
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<tr>
<td>Sediment movement (Ocean &amp; Beach)</td>
<td>[ ]</td>
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<tr>
<td>Shoreline vulnerability (Erosion)</td>
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<tr>
<td>Flooding</td>
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<tr>
<td>Mining (including oil and gas extraction)</td>
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<tr>
<td>Oil spill contingency</td>
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<tr>
<td>Development activities</td>
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</table>

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Q19 Are there clear predetermined procedures regarding what should happen if the monitoring program detects a significant impact which was not predicted or planned for?

NO [ ]  YES [ ]  DON'T KNOW [ ]

Comments ___________________________________________________________

Q20 To address common problems are the results of YOUR monitoring programs made available to OTHER departments and organisations?

NO [ ] or DON'T KNOW [ ] Go to question 22

YES [ ] If YES please tick the relevant boxes below.

Commonwealth Government Dept [ ] University [ ]
State Government Dept [ ] Private industry [ ]
Local Government [ ] Consultants [ ]

Q21 How is this information disseminated?

On request [ ]
As part of a reporting arrangement [ ]
By email [ ]
Via a Web site [ ]
Other (please specify) ________________________________

Q22 Does your organisation access results from other monitoring programs?

NO [ ] or DON'T KNOW [ ] Go to Question 23

YES [ ] If YES please tick the relevant boxes below.

Commonwealth Government Dept [ ] University [ ]
State Government Dept [ ] Private industry [ ]
Local Government [ ] Consultants [ ]

If YES is it obtained:
Easily [ ]
With some difficulty [ ]
Q23 Do you have an integrated data management system for the coordination, documentation and archiving of data obtained from:

a) YOUR organisations monitoring programs.

YES: [ ] NO: [ ] DON'T KNOW: [ ]

b) OTHER organisations monitoring programs.

YES: [ ] NO: [ ] DON'T KNOW: [ ]

Q24 Are there common standards for the type and form of data collected from different monitoring programs (which share common aims) in order to combine data sets if required?

YES: [ ] NO: [ ] DON'T KNOW: [ ]

Q25 Was a quality assurance program included in the monitoring program?

YES: [ ] NO: [ ] DON'T KNOW: [ ]

NO: Could you briefly list the main reasons why not.

-------------------------------------------------------------------------------

-------------------------------------------------------------------------------

YES: How was it included.

-------------------------------------------------------------------------------

-------------------------------------------------------------------------------

Q26 Did the monitoring program provide useful information to aid evaluation of the effectiveness of management actions and policies?

NO: [ ] YES: [ ] DON'T KNOW: [ ]

Comments

-------------------------------------------------------------------------------

-------------------------------------------------------------------------------

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Q27 Which do you consider are the major constraints to undertaking monitoring?

Please indicate by ticking one or more the following:

1. Financial costs involved
2. Administrative and logistical
3. Time
4. Lack of Incentive (or lack of encouragement from higher management)
5. No long term goal or objective to monitor (within organisation)
6. No long term goal or objective to monitor (From external political policies)
7. Complex range and nature of coastal planning and management issues
8. Pace of change
9. Territorialism of organisations
10. Compartmentalism of disciplines
11. Different planning and administrative regimes on land and at sea.
12. Lack of expertise
13. Lack of authority to undertake monitoring
14. Lack of statutory obligations
15. Others? ________________________________

Q28 Does your organisation have any measurable indicators to evaluate management policies and actions?

NO 1 □ YES 2 □ DON'T KNOW 3 □

Comments ______________________________________________________

Q29 How often are management policies reviewed and evaluated?

Every six months 1 □ Every year 2 □ Every two years 3 □ Not at all 4 □

Other 4 □ please specify ____________________________________________
Q30 How often are management projects and actions reviewed and evaluated?

   Every six months □   Every year □   Every two years □   Not at all □

Other □ please specify ________________________________

Q31 As a result of undertaking an evaluation program on management policies and plans, were any corrective measures applied to ensure that performance came in line with management’s objectives.

   NO □   YES □   DON'T KNOW □

Comments? ________________________________

______________________________
Q32. Does your organisation actively utilise any of the following management approaches.

NO □ OR DON'T KNOW □ Please go to question 33

YES □ Please answer this question - then go to question 33

<table>
<thead>
<tr>
<th>Relevance</th>
<th>Usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly Relevant 1 2 3 4 5 Relevant</td>
<td>Very Useful 1 2 3 4 5 Useful</td>
</tr>
</tbody>
</table>

1. Integrated Coastal Management ICM  
2. Integrated Local Area Planning ILAP  
3. Adaptive Management AM or  
4. Adaptive Environmental Assessment and Management AEAM  
5. Consensus Building  
6. Public Participation  
7. Environmental Sensitivity Analysis

Rank then according to the degree of relevance to your organisation. **Relevance** (how relevant is the approach to achieving either your organisation’s operational objectives and/or the monitoring programs objectives?)

Rank the usefulness of the results from using the approach. **Usefulness** (how useful in terms of actually achieving objectives was the approach that was used)
Below are a series of questions (Q 33 to Q 44) designed to gauge what coastal zone managers believe regarding monitoring. Please tick the box which BEST states your response to the question.

<table>
<thead>
<tr>
<th>Q33</th>
<th>The primary function of monitoring is to provide timely and relevant information for use in decision making.</th>
</tr>
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<tbody>
<tr>
<td>Q34</td>
<td>Monitoring attempts to identify cumulative impacts on a single resource.</td>
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<tr>
<td>Q35</td>
<td>Monitoring has played a significant role in coastal zone management decisions in the past.</td>
</tr>
<tr>
<td>Q36</td>
<td>Monitoring focus on understanding how multiple resources in the coastal zone are affected by the combination of human activities (ie. ambient monitoring).</td>
</tr>
<tr>
<td>Q37</td>
<td>Clear objectives, stated quantitatively to the greatest extent possible vastly improves the effectiveness of coastal zone monitoring.</td>
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<tr>
<td>Q38</td>
<td>There is a pool of monitoring data from different government agencies in order to combat common problems.</td>
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<tr>
<td>Q39</td>
<td>Results from monitoring programs provide feedback to modify and improve the actual program itself as well as future programs.</td>
</tr>
<tr>
<td>Q40</td>
<td>Public expectations regarding monitoring programs are realistic.</td>
</tr>
<tr>
<td>Q41</td>
<td>Most monitoring programs utilise an integrated data management system.</td>
</tr>
<tr>
<td>Q42</td>
<td>There are common standards for the type and form of data collected from different programs in order to combine data sets if required.</td>
</tr>
<tr>
<td>Q43</td>
<td>A great deal of effort is made to translate monitoring data into information that is useful:</td>
</tr>
<tr>
<td></td>
<td>a) for managers for decision making</td>
</tr>
<tr>
<td></td>
<td>b) for the public for measuring the success with which the environment is being protected</td>
</tr>
<tr>
<td>Q44</td>
<td>Quality assurance programs must be included in the monitoring programs.</td>
</tr>
</tbody>
</table>

I THANK YOU VERY MUCH FOR PARTICIPATING IN THIS RESEARCH SURVEY

Michael F Williams