NATIONAL ESD REPORTING FRAMEWORK FOR AUSTRALIAN FISHERIES:

The 'How To' Guide for Wild Capture Fisheries

VERSION 1.01

Ecologically Sustainable Development

Catching Sustainabilty

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

Government of Western Australia

Department of Fisheries

BRS

CSIRO

The University of Queensland

Fish for the future

May 2002

This 'How To' Guide for ESD reporting on fisheries is part of an on-going process to develop a reporting framework for ESD and fisheries within Australia. This edition will not be the final version, changes are expected to be made at regular intervals when further information indicates that significant improvements can be made.

The material may be copied for use in completing assessments and reports as long as appropriate acknowledgement of the source is given.

Whilst this project was originally conducted under the auspices of the SCFA, and is now a project endorsed by the Marine and Coastal Committee of the Natural Resources Management Committee (NRMC), it should not be taken as being the policy of any individual fisheries management agency.

Version 1.01 May 2002

ASBN: 1877098019

Project Team

Rick Fletcher (Principal Investigator)	Department of Fisheries, Western Australia
Jean Chesson	Bureau of Rural Science
Melanie Fisher	Bureau of Rural Science
Keith Sainsbury	CSIRO
Tor Hundloe	University of Queensland
Tony Smith	CSIRO
Benj Whitworth	Bureau of Rural Science

Correct Citation

Fletcher, W.J., Chesson, J., Fisher M., Sainsbury, K.J., Hundloe, T., Smith, A.D.M. and B. Whitworth (2002) *National ESD Reporting Framework for Australian Fisheries: The 'How To' Guide for Wild Capture Fisheries.* FRDC Project 2000/145, Canberra, Australia.

This report forms Publication No. 1 of the FRDC - ESD Reporting and Assessment Subprogram.

The latest version of this report and other material related to the ESD Subprogram may be downloaded from the web site
www.fisheries-esd.com

Postal Address – PO Box 20 North Beach WA, 6020 AUSTRALIA

Table of Contents

SECTION 1 EXECUTIVE SUMMARY

1.1 Background

Ecologically Sustainable Development (ESD) is:

"*Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased" (CoA, 1992)*.

Achieving ESD requires the integration of short and long-term economic, social and environmental effects in all decision-making. Fisheries agencies in Australia are committed to incorporating the principles of ESD into their management of fisheries resources - an important element of which is the ability to report on performance. Consequently, fisheries need a framework that enables them to report on their performance with respect to ESD.

In early 2000, the Fisheries Research and Development Corporation (FRDC) funded a study to develop an ESD reporting framework for Australian fisheries. One of the major outcomes required from this project was the production of a 'How To' Guide to assist individuals, agencies and the industry to provide comprehensive accounts of the current performance of their fisheries.

1.2 What does ESD mean for fisheries?

Implementing ESD in fisheries means that we not only need to consider the effects of the fishery on the target species, but also what effects there may be on the rest of the ecosystem. We also need to recognise the economic health of a fishery (such as the profits to commercial fishers or the satisfaction of recreational fishers) relies on maintaining essential ecological processes.

Furthermore, the ongoing utilisation of fishery resources requires the community (with its often seemingly competing interests) to be satisfied with the management of the fishery and be convinced that it is providing sufficient social and/or economic benefits to justify any negative impacts it may have. Finally, the processes and procedures involved in managing a fishery (its governance) have to be appropriate to meet the ESD challenge.

1.3 Why are we completing these reports?

There are many internal and external pressures on fisheries agencies and the industry to report on their performance. First, since the national strategy on ESD was released in 1992, ESD has become, either explicitly or implicitly, a major objective within most Fisheries Acts in Australia and management agencies are accountable for achieving their objectives.

The urgency to develop a comprehensive and practical reporting system has increased substantially in recent years through changes in Commonwealth legislation. In particular,

the *Environment Protection and Biodiversity Conservation Act* now requires assessment for export approval.

There are also developments associated with industry gaining market access or increased leverage by obtaining some form of environmental accreditation. A nationally recognized reporting framework that can cover all these issues and minimize duplication is therefore highly desirable.

The development of a national ESD reporting system for all Australian fisheries forms a major turning point in fisheries management. This initiative received the support of all fisheries agencies in Australia and, importantly, received strong support and involvement from a number of stakeholder groups.

The Standing Committee for Fisheries and Aquaculture (SCFA)[1] working group met in June 2000 with a reference group of major stakeholders and agreed on a set of ESD objectives relevant specifically to Australian fisheries.

1.4 What is the ESD Reporting Framework?

Many previous attempts to assess ESD for fisheries have failed, largely because the frameworks used have been too restrictive, often attempting to develop a single set of indicators that could be used across all fisheries. The issues and information levels vary too widely across fisheries for such a prescriptive approach to be meaningful.

Furthermore, indicators by themselves are of limited value. Effective performance evaluation requires an objective, an indicator, plus a statement/definition of what is acceptable (performance measure). These three form a package; all are needed before any one of them is useful. A flexible process is required to systematically identify issues, develop operational objectives and then work out what indicators need to be measured.

1.5 What are the Major Components of ESD?

To assist in the process of identifying issues, ESD has been divided into eight major components (within three main categories) relevant to fisheries:

Contributions of the fishery to ecological well-being

1. Retained species
2. Non-retained species
3. General Ecosystem

Contributions of the fishery to human well-being

4. Indigenous well-being
5. Community and regional well-being
6. National social and economic well-being

[1] Following the revisions to all Ministerial Councils, the SCFA is mostly covered within the Marine and Coastal Committee of the Natural Resources Management Council.

Factors affecting the ability of the fishery to contribute to ESD
7. Impact of the environment on the fishery
8. Governance Arrangements

1.6 What is the Scope of these ESD Reports?

The reporting unit is "the fishery", as defined by the management agency. This provides a direct link between reporting on performance and the taking of management actions to improve performance.

The National ESD framework allows a fishery to report on its contributions to ESD – both the benefits and the costs.

1.7 What is the Process to Complete the ESD Reports?

There are four main elements in the process to complete an ESD report which include:
(1) identifying the issues relevant to the fishery;
(2) prioritising these issues;
(3) completing suitably detailed reports on the performance of the fishery for each issue (dependent upon their priority and complexity); and also
(4) the compilation of summary background material on the fishery, the major species affected and the environments that the fishery operates within. This enables the reader to put the material within the assessment report into an appropriate context.

A number of tools have been developed to assist completing each of the four elements. A feature of these tools is the high level of involvement and input from each of the major stakeholder groups.

1.8 How are the Issues Identified?

The first step in the ESD reporting process is to identify the relevant issues for the fishery under consideration. This is assisted through the use and modification of a set of *generic component trees*.

There is one *generic component tree* for each of the eight components of ESD (see above). Each of these trees was developed by the ESD Reference group to cover the suite of issues that are relevant to fisheries.

The generic component trees are used as a starting point, with each fishery tailoring them to suit their individual circumstances, expanding some sub-components and collapsing or removing others, depending upon the fishing methods areas of operations and the species involved.

Using these component trees assists the process of issue identification by moving through each of the eight components of ESD in a comprehensive and structured manner, maximising consistency and minimising the chances of missing issues.

1.9 How are the Issues Prioritised?

Tailoring the component trees to a fishery often results in a large number of issues being identified, the importance of which varies greatly. In many cases, it will be helpful to prioritise the issues so that the level of management actions and the details of the reports generated are aligned with the importance of the issue.

Risk assessment methodology has been adapted to assist in determining the relative priority of issues and specifying an appropriate level of management response.

The outcome of the risk assessment evaluation for each issue must include the justifications for the levels chosen. This enables third parties to review the logic and assumptions behind any decisions. It also facilitates future amendments if alternative information becomes available.

1.10 How are Performance Reports Completed?

Two levels of reporting are suggested, depending on the appropriate level of management response:

(1) Where specific management is not undertaken, the reports only need to justify this conclusion. In some cases, only a few lines or a few paragraphs may be needed to achieve this. However, in other cases, this may require a number of analyses and several pages of justification.

(2) Where specific management actions are needed, a full performance report that details all elements of the management system is required. These performance reports must complete the following headings:

Performance Report Heading	***Description***
1. Operational Objective (plus justification)	*What are your trying to achieve and why?*
2. Indicator	*What are you going to use to measure performance?*
3. Performance Measure/Limit (justification)	*What levels define acceptable and unacceptable performance and why?*
4. Data Requirements/Availability	*What monitoring programs are needed?*
5. Evaluation	*What is the current performance of the fishery for this issue?*
6. Robustness	*How robust is the indicator & or the performance measure in assessing performance against the objective?*
7. Fisheries Management Response	
- Current	*What are the management actions currently being used to achieve acceptable performance?*
- Future	*What extra management is to be introduced?*
- Actions if Performance Limit is exceeded	*What will happen if the indicator suggests performance is not acceptable?*
8. Comments and Action	*Summarise what actions will happen in the*

	coming years
9. External Drivers	*What factors, outside of the fisheries control may affect performance against the objective?*

In summary, this ESD Reporting process provides a logical framework for a management agency to justify that the current and proposed management actions (or inactions) appropriately address the issues, given the levels of risk and current knowledge available.

1.11 What Background Material is Necessary?

An appropriate level of background material on the fishery is necessary to put the other sections of the report into context. The material presented should include a detailed description of the history of the fishery, its area of operation, fishing methods used and species targeted.

A summary of the biological and ecological characteristics of the main species and habitats that are affected by the fishery should also be provided.

1.12 How can you use the ESD Reports?

There are a number of uses for the information compiled within these ESD reports. They provide an excellent compilation of the information available on the management of each fishery. This is of great value to the management agency in its own right – both for strategic planning purposes and for transferal of information when there is turnover of staff.

Explicitly documenting the operational objectives and performance measures/limits for each fishery provides for greater certainty of performance by industry, the management agency and the wider community. In some jurisdictions, these reports will become part of processes for auditing performance by a relevant third party agency (e.g. Environmental Protection Authority, Auditor General, Parliamentary Committee, etc.).

These reports are already being used as the basis for applications to Environment Australia so the fisheries can continue to receive exemption for export approvals. They are also likely to be great assistance for industries seeking some form of environmental accreditation through groups such as the Marine Stewardship Council.

Ultimately, once all fisheries in a region have been assessed through this process, the material could be used to assist with debates on the allocation of access amongst competing sectors. Finally, they would also be of value for regional marine planning initiatives such as those being completed by the National Oceans Office.

SECTION 2 BACKGROUND

2.1 Introduction

Ecologically Sustainable Development (ESD) is: "*Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased" (CoA, 1992)*.

Achieving ESD requires the integration of short and long-term economic, social and environmental effects in all decision making. The objectives and principles from the National Strategy for Ecologically Sustainable Development (CoA, 1992) have been agreed by all Australian governments representing a fundamental shift in public policy (PC, 1999).

Fisheries agencies in Australia are committed to implementing the concept of ESD into their management of fisheries resources. An important element of any implementation strategy is the ability to report on performance. Consequently, fisheries need a framework that enables them to report on their performance with respect to ESD.

In early 2000, the Fisheries Research and Development Corporation (FRDC) funded a study to develop an ESD reporting framework for Australian fisheries[2]. Using a consultative approach involving most fisheries agencies and representatives of most stakeholder groups - including the commercial and recreational sectors, the conservation movement and indigenous groups - a draft ESD Reporting Framework was developed.

This framework was tested and modified through a series of case studies and workshops to maximise its usefulness and applicability across the wide spectrum of fisheries that occur in Australia (Fletcher *et al*., 2001).

One of the major outcomes required from this project was the production of a '*How To*' *Guide* to assist individuals, agencies and the industry to provide a comprehensive account of the current performance of a fishery. This document represents the first edition of this *Guide,* which is likely be updated regularly, as further experiences are gained and more insights are developed.

The *Guide* describes a comprehensive process to complete a report on ESD for a fishery, including its current status and future actions that could be necessary. The process could be considered as completing a self-assessment.

Given that the reports generated using this process will rely upon the information available/provided, simply completing this ESD reporting process will not necessarily result in the fishery/industry meeting the performance expectations of some external agency/group – no process can guarantee this. Meeting a credible auditing process requires the information provided is sufficiently detailed and reliable.

[2] A complementary project (2000/146- *Green Chooser*) was funded to develop tools for industry to generate Environmental Management Systems (see www.seafoodservices.com.au)

Even though this *Guide* should not be seen as a 'magic bullet' to some of the current issues facing fisheries agencies and the industry (see below), the processes outlined should, if correctly applied, provide a comprehensive account of the current performance of a fishery. This should enable a fair and comprehensive assessment to be made of the fishery concerned, which can be used for a multitude of purposes.

To complete this process, a description of what the fishery is presently trying to achieve, the justification for current management actions (or inactions), and whether or not targets are being met, are all required. These reports should also identify areas where the current objectives or targets are either inadequate or are under initial development.

Hence, completing this process provides an excellent planning tool, helping to identify what needs to be done in the future, what current programs assist with these needs, and which of these programs need to be improved.

Whilst the maximum benefits and outcomes will flow from completing assessments across all elements of ESD (i.e. the ecological, economic and social), the process is sufficiently flexible that it can be used to assess some - or only one - elements, depending upon the requirements or priorities at the time. The other elements can be added, when appropriate or logistically possible.

Finally, the information generated by this process can be used for a number of purposes. Thus, a full ESD report can be considered as a *Curriculum Vitae* for a fishery. It is likely that this information will be needed to meet both internal requirements (such as reports to Parliament) and external requirements (e.g. applications to the local/jurisdictional Environmental Protection Authority, or Environment Australia, or the Marine Stewardship Council, etc.).

The *Guide* briefly describes ESD and why we need to implement changes to enable effective reporting. More complete descriptions of ESD are located at the National Fisheries ESD Website (see www.fisheries-esd.com). The rest of the *Guide* focuses on the methods that have been developed to generate the ESD reports, in particular, what techniques have worked during the case studies so far, what short-cuts have been identified, and where problems have been identified and overcome.

A number of companion documents are being prepared that will contain the more detailed technical information – such as the full list of identified objectives, performance indicators, etc. generated during the case studies. It is also planned to develop a 'best practice' manual that would outlines the appropriate combinations of indicators, objectives etc for the main fishery types.

These are being produced as separate documents as they are likely to be updated at much greater frequency than the *Guide*. To facilitate distribution of this information, all updates will be lodged on the fisheries-esd.com website, with notifications e-mailed to registered users.

2.2 What is Ecologically Sustainable Development (ESD)?

The concept of *sustainable development* emerged during the 1970s and 1980s, following concerns about the impacts that unrestrained economic growth and development were having on the environment. It was recognised that we need to ensure that: *"development…meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987).*

The term *Ecologically Sustainable Development (ESD)* was adopted in Australia to emphasise the importance of the environment to long-term survival and to ensure that there was a balanced approach in dealing with environmental, social and economic issues. The National Strategy on ESD *(CoA, 1992*) was agreed to by all Australian governments and includes three key objectives:

- *To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;*
- *To provide for equity within and between generations; and*
- *To protect biological diversity and maintain essential ecological processes and life-support systems.*

Whilst ESD has often been wrongly assumed to address only environmental issues, these three objectives, along with the seven guiding principles within the national strategy, recognise that continued development (i.e. utilisation of resources in a sustainable manner) is a necessary element in meeting the overall objectives. It is the integrated approach of including the wider economic, social and environmental implications within decision-making processes that is the cornerstone, and major innovation, of ESD.

What does ESD mean for fisheries?

In relation to fisheries, implementing ESD will mean that we need to consider not only the effects on the target species, but also the rest of the ecosystem.

We need to recognise the economic health of a fishery (such as the profits to commercial fishers or the satisfaction of recreational fishers) relies on sustaining the essential ecological processes.

Furthermore, the ongoing utilisation of fishery resources requires the community (with its often seemingly competing interests) to be content with the management of the fishery.

Additionally, the processes and procedures involved in managing a fishery (its governance) have to be appropriate to meet the ESD challenge.

Finally, the issues addressed within ESD are not fixed; instead, they are likely to be subject to an ongoing process of evolution. In this respect, ESD should be seen as a means, not an end.

2.3 Why should we report on ESD?

Since the national strategy for ESD was developed in 1992, ESD has become - either explicitly or implicitly - a major objective within most Fisheries Acts in Australia, and therefore management agencies are accountable for achieving these objectives. A fundamental component of this accountability must be the measurement and reporting of progress against the objectives of ESD.

Whilst the objectives of ESD, which include inter-generational equity and the maintenance of ecosystem functions, are simple in concept, the development of a comprehensive set of working definitions has proved difficult to complete. Most fisheries agencies have measures for some components, particularly those related to the target species, but without operational objectives and measures for all aspects of ESD, agencies risk being unable to demonstrate that they are achieving or even pursuing ESD objectives.

The urgency to develop a comprehensive and practical reporting system has increased substantially in recent years (Table 1). The requirements for assessment include the need for third party auditing at the Commonwealth Government level that resulted from Environment Australia (EA) amending Schedule 4 of the *Wildlife Protection Act (1982)*. These sections have now been incorporated into the *Environment Protection and Biodiversity Conservation Act (1999)*, and require assessment of each export fishery against a set of guidelines to allow continued export approvals to be granted. These changes have been implemented as part of the Commonwealth's Oceans Policy strategy.

The principles of ESD are also consistent with a number of international treaties and initiatives such as UNCLOS and the UN Code of Conduct for Responsible Fisheries and the 1992 Rio Summit, all of which Australia is a signatory.

Whilst each jurisdiction needs to meet the Commonwealth government commitments to ESD, some are also required to report on the performance of fisheries to agencies within their own government structures (e.g. State EPAs, and Audit Offices).

Table 1 Relevant Issues/Policies

Pressure	Requirements	Agency/Group Responsible
Legislative Commitment to ESD and Fisheries	Government Policy	Each Fisheries Jurisdiction
Community Expectations and Auditing	*Wildlife Protection Act (1982), Environmental Protection & Biodiversity Conservation Act (1999)*, State-based Environmental Protection Legislation, Oceans Policy UNCLOS UN Code of Conduct	Other Government Agencies, Non-Government Organisations (NGOs) and Industry
Market Access/Leverage	Environmental (and other) Accreditation	Marine Stewardship Council, ISO, NGOs, Markets (WTO), Industry

In addition, there are developments associated with gaining market access or increased leverage for industry by obtaining environmental accreditation for their products. Within the fisheries, the most well known of these is the Marine Stewardship Council's (MSC) accreditation process. In general, however, the best-known environmental accreditation system is the ISO Environmental Management System (EMS) standard.

There are a large number of reasons why ESD assessments need to be completed, but an even greater need to ensure that the reporting schemes developed are sufficiently comprehensive to restrict the level of duplication.

Why do we need to report on ESD?

There are many internal and external pressures on fisheries agencies to report on how they are performing on aspects of ESD, therefore we need a reporting framework that can cover all these issues and minimize duplication of effort.

These are the reasons that the fisheries management agencies around Australia (through the then Standing Committee for Fisheries and Aquaculture - SCFA) embarked on a program to develop a nationally agreed system for ESD reporting system for Australian fisheries and aquaculture.

2.4 The National Framework for Reporting on ESD in Australian Fisheries

2.4.1 History

Fisheries management has always been about more than just setting minimum biological limits. It has been about improving human quality of life from fishing, while having an acceptable environmental impact.

Societal goals and values often influence the acceptable levels of exploitation, often well above any biologically-based limit and these attitudes develop, evolve and change over time. At present, there is a widespread view that whales and other cetaceans should not be harvested, irrespective of whether a sustainable rate of harvesting is possible.

Furthermore, economic factors can result in the harvest of a species occurring at considerably lower levels than is possible using purely biological parameters.

ESD covers a very broad range of issues, so much so that it can be argued that everything could fit within these principles. Consequently, there is a need to clearly define ESD within the context of fisheries management.

This clarification has involved sub-dividing ESD into a number of components that cover the issues associated with:

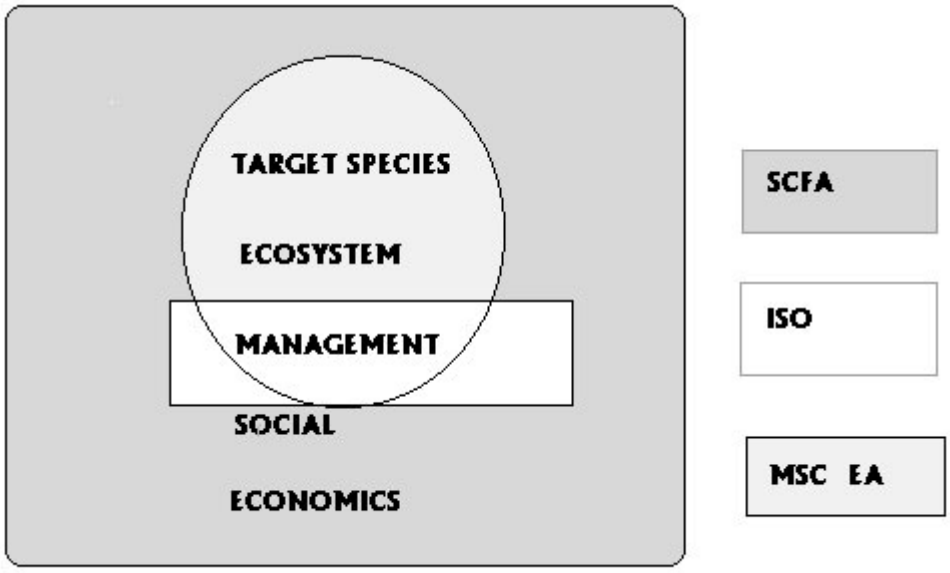
- the target (retained) species;
- the ecosystem (e.g. non-retained species, other species interactions and more general ecological and physical processes);
- social and economic issues; and
- management/governance arrangements.

The ESD Reporting Framework described in this *Guide* covers all the necessary components to fully meet the commitment to ESD. Requirements of other agencies and groups (see Figure 1) are generally not as comprehensive and do not cover all these components.

For example, assessments for ISO 14000 and Codes of Conduct largely focus on meeting process based arrangements, based on user nominated objectives/targets. Assessments completed under the Marine Stewardship Council only address the target species, the ecosystem and some management arrangements.

A similar subset of issues is assessed by Environment Australia for the both the *WPA* and *EPBC* (which is a function of their process having been developed using the MSC guidelines). Only the ESD framework developed during this FRDC project addresses all elements of ESD.

Figure 1 Comparison of Assessment Schemes and the ESD Components



2.4.2 The SCFA - FRDC Project on ESD

At its planning session of 19-20 July 1999, the Standing Committee on Fisheries and Aquaculture (SCFA)[3] agreed to establish a Sustainability Indicators Working Group to facilitate the development of nationally agreed criteria and sustainability indicators, building on the previous work of the SCFA Research Committee which had begun this process in mid-1998.

The Working Group was composed of a mix of members from the SCFA, Policy Committee and Research Committee, to ensure the rapid development of a unified approach across jurisdictions.

The development of a national system to report on ESD for all Australian fisheries forms a major turning point in fisheries management. This initiative received the support of all fisheries agencies in Australia and, importantly, received strong support and involvement from a number of stakeholder groups.

With the intention that this approach would be adopted within each of their respective jurisdictions (e.g. Fletcher, 2002). The SCFA working group met in June 2000 with a reference group of stakeholders and agreed on a set of ESD objectives relevant specifically to Australian fisheries.

Most previous attempts to assess ESD for fisheries have failed, largely because the frameworks used have been too restrictive, often attempting to develop a single set of indicators that could be used across all fisheries (Staples, 1997). The issues and

[3] Following the revisions to all Ministerial Councils, the SCFA is now incorporated within the Marine and Coastal Committee of the Natural Resources Management Standing Committee.

information levels vary too widely across fisheries for such an approach to be meaningful.

Furthermore, indicators by themselves are of limited value. Effective performance evaluation requires an objective, an indicator and a statement of what is acceptable (performance measure).

These three form a package; all are needed before any one of them is useful (Chesson *et al.*, 2000). A flexible process is required to systematically identify issues, develop operational objectives and then work out what indicators need to be measured.

ESD Reporting Frameworks

Many previous attempts to report on ESD have failed because one size does not fit all. What is required is a process to systematically identify issues, develop operational objectives and then work out what indicators need to be measured.
The objectives and acceptable range needs to be developed with all stakeholders' assistance and the level of information presented needs to be appropriate to the issue.

2.4.3 Major Components of ESD Reports

To assist in the process of identifying issues, ESD has been divided into eight major components (within three main categories) relevant to fisheries:

Contributions of the fishery to ecological well-being[4]

1. Retained species
2. Non-retained species
3. General Ecosystem

Contributions of the fishery to human well-being

4. Indigenous well-being
5. Community and regional well-being
6. National social and economic well-being

Factors affecting the ability of the fishery to contribute to ESD

7 Impact of the environment on the fishery
8. Governance Arrangements

[4] For aquaculture the retained and non-retained species components are replaced by "within facility" and "within catchment/region" components –these should be covered in later editions of this *Guide*.

2.4.4 Scope of the ESD Reports

Defining the scope is necessary as the first step of any assessment of performance. During the case studies, there was often considerable discussion about what should or should not be included in the assessments.

The conclusion was that there is no definitive rule except that the reporting unit is most usefully set at the level of 'the fishery' - however this is defined by the management agency. Thus, the assessment is not completed using the biological or physical entity or a geographical region in which fisheries operate, unless this is the unit that is managed.

Several species are often caught and retained within a fishery. In addition, the area in which a fishery operates typically overlaps with other fisheries that may or may not catch the same species. Finally, other fisheries outside of the area of operation often catch the same species. Thus, whilst it appears arbitrary to choose the management unit as the entity to report upon, invariably any other separation leads to its own set of difficulties anyway.

There are a number of advantages of using the managed entity as the reporting unit. Principally, as these units are subject to controls by the management agency, therefore, reporting at the fishery level allows a direct link between reporting on performance and the taking of management actions to improve performance.

If a fishery, as defined by the relevant management agency, is restricted to one method (e.g. trawling) or one sector (e.g. recreational) then this should be the scope of the report. By contrast, if the management unit includes more than one method or more than one sector *explicitly*, then all of these need to be covered by the report.

If the fishery only covers one method/sector, this does not mean that the impacts of other methods or sectors would be ignored in the generation of the report if they affected the same stocks or habitats. For example, the catches by all sectors (commercial, recreational, indigenous, illegal) need to be included in any stock assessment performance report within the retained species section.

Where this occurs, the production of a report on a species must detail not only how this managed unit can be held accountable, but also how the other fisheries units are accountable. It would be preferable, but almost certainly impractical, for all interacting fisheries to be fully assessed simultaneously. In reality, where there is significant overlap in issues amongst fisheries, these issues at least need to be completed in a holistic manner.

Finally, when reports have been done for fisheries that cover more than one sector (e.g. both recreational and commercial), for most of the issues they usually end up being separate assessments anyway. Thus, except for the retained species component tree, all the others component trees have required separate examination.

This separation occurs because the different sectors generally fish in different ways, usually resulting in them capturing different bycatch species and having different

impacts on the ecosystem. Not surprisingly, the types of social-economic issues vary substantially amongst sectors and need separate examination.

Scope of the ESD Reports

This ESD framework develops reports that show the contribution of the {insert name here} fishery to ESD - both the benefits and the costs.

In summary, the ESD Reporting Framework examines the contribution to ESD of an *activity*, which differs from other reporting frameworks. Furthermore, the ESD reports on fisheries are not designed to show that a fishery will continue indefinitely or how it can remain viable, which is the intention of some other reporting frameworks. Instead, they are designed to show how a fishery contributes to ESD, whether this contribution is positive or negative.

For a full comparison of the National ESD framework compared to other reporting frameworks, see Chesson *et al*., (2000) which can be downloaded from the www.fisheries-esd.com website.

SECTION 3 OVERVIEW OF THE NATIONAL ESD REPORTING PROCESS FOR AUSTRALIAN FISHERIES

Completing a report on ESD performance for a fishery is largely about detailing all the things that a fishery does and with what it interacts. This includes both the 'good things' and the 'bad things'. The reports also provide an outline of what the fishery intends to do in the future and how it will measure whether it is achieving the goals that have been set.

The reporting framework outlined in this *Guide* has been developed to make the completion of these reports as efficient and effective as possible. This does not mean, however, that the process is easy. The level of difficulty in applying these techniques will depend upon the:

- complexity of the fishery;
- degree of knowledge already available;
- sensitivity of the ecosystems affected; and
- sophistication of current management arrangements and amount of documentation already available.

There are four main elements in the process to complete an ESD report (see Figure 3 for summary)[5]. Sections of the *Guide* outline in detail how to complete each of these major elements, providing detailed descriptions of the methodology, examples of outputs from case studies and, where necessary, the theoretical foundations to the methods used.

Given that each of these descriptions are rather long and thorough, it is sensible to provide an overview of the whole process so that each of the elements can be read in the context of being parts of a complete process. Furthermore, for those who are not going to be a full participant in the development of an ESD report, but require a general understanding of the process, the following description should be sufficient.

First Step - Identifying the Issues

The first step in the ESD reporting process is to identify what are the issues relevant to the fishery being assessed[6]. This step is equivalent to the 'hazard identification' process used in most risk assessment procedures.

Identifying the issues for a fishery is assisted through the use and modification of a set of *generic component trees* (see Figure 2). There is one *generic component tree* for each of the eight components of ESD (retained species, non-retained species, general ecosystem, indigenous, community and national well-being, impacts of the environment and governance).

[5] These elements are equivalent to completing a standard risk analysis process -see full description in section 6.

[6] This assumes that the scope of the report – i.e. the fishery to be examined - has been identified clearly

Each of these *generic component trees* was developed by the ESD Reference group to cover the suite of issues that may be relevant to fisheries. The generic component trees are used as a starting point, with each fishery tailoring them to suit their individual circumstances, expanding some sub-components and collapsing or removing others, depending upon the fishing methods, areas of operation and the species involved.

For example, the generic component tree for *general ecosystem issues* shown below covers all the major categories of possible effects on the biological community, and on air, water and substrate quality by fisheries. However, in practice, an abalone fishery is unlikely to require a number of the sub-components shown in Figure 2 (e.g. bait collection, ghost fishing), while a trawl fishery may require more detailed assessments of the impacts of trawling on the benthic biota, by using a number of different habitat categories.

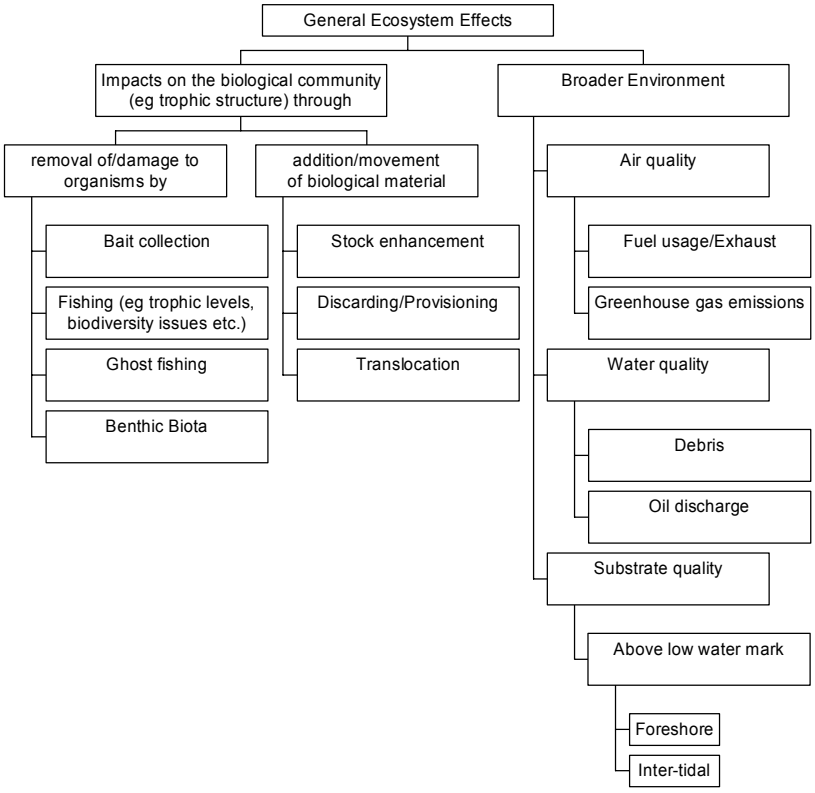


Figure 2 One of the eight generic component trees (see next section for full details).

Second Step – Prioritisation – (Using Risk Assessment tools)

The generation of component trees for a fishery often results in a large number of issues being identified, the importance of which varies greatly. For example in reporting on a lobster fishery, there will almost certainly be a different level of direct management and reporting needed to ameliorate the impacts of the fishery on the stocks of lobster compared to the impacts the fishery may have on manta rays from entanglement in ropes.

Consequently, in many cases it will be sensible to prioritise the issues so that the level of management actions and the details of the reports generated are aligned.

To determine the priority of issues and the appropriate level of response, the second step of the *Guide* outlines the Risk Assessment methodology that can be used as a tool to assist this process[7]. This methodology operates by completing an assessment of the 'risk' associated with each of the identified issues as an initial screening exercise. However, for many issues this initial screening is likely to be just the first step in a hierarchical process for determining what actions need to be taken.

The Risk Analysis tool used in this ESD process is based upon the AS/NZ Standard, but adapted for use within the fisheries context. It works by assigning a level of consequence (from negligible to catastrophic) and the likelihood of this consequence occurring (from remote to likely) for each issue.

From the combination of consequence and likelihood, an overall level of risk is generated. This risk can then be used to assist in deciding whether an issue requires specific management or not.

To be of value for the ESD reporting process, it is not sufficient to only quote the levels of consequence and likelihood levels chosen and the subsequent risk ratings generated. Instead, appropriately detailed justifications for why these levels were chosen and why any decisions were made are also needed. The key element is that other parties who were not part of the process to generate the report need to be able to see the logic and assumptions behind the decisions that were made.

Consequently, the completion of appropriately detailed performance reports on each of the identified issues, including any justifications generated during the risk assessment process, are the major outputs from the ESD reporting process.

Third Step - Performance Reports

In general, two types of reports are completed on issues.

1) Where specific management is not undertaken, the reports only need to justify this conclusion.
2) Where specific management actions are needed, a full performance report that details all elements of the management system is required.

For issues with risk ratings sufficiently low to not warrant having *specific* management actions, the reports only need to cover the rationale for coming to this decision. In some cases, only a few lines or paragraphs may be needed to achieve this (e.g. justifying no specific management actions to control the impact on limestone reefs from rock lobster potting).

[7] It is not essential to complete a risk assessment

By contrast, to justify that the trophic level impacts of rock lobster fishing would already be covered by management actions designed to maintain lobster biomass would require numerous analyses and several pages of justification.

If an issue does require specific management actions then the performance reports must include the following suite of information:

- An operational objective for that issue/sub-component - what are you trying to achieve? *For example: Maintaining the spawning biomass above levels that will have minimal chance of causing recruitment overfishing.*
- The indicator and the level(s) where performance will be viewed as acceptable with respect to that objective (performance measure/limit). *For example: The level of spawning biomass, as measured by independent surveys, must be above the performance limit, which is set at 20 per cent of the unfished level.*
- The associated management responses to achieve acceptable performance also need to be documented, in addition to what will be done if performance is not acceptable - this is where you detail all the management arrangements that are in place. *For example: restrictions on boat numbers, pot numbers, size limits, closed seasons/areas etc. Along with the harvest strategies/rules, reviews etc. if the performance limit is reached.*
- Each of the objectives, performance limits and management responses needs to have appropriate levels of justification for why they were chosen.
- Where data are already available, the report should include this information (e.g. a graph of the indicator over time) and whether current performance is acceptable or not.
- Where data are not available, the report should describe the processes that will be undertaken to obtain the data.

Fourth Step (although this may need to be completed first) - Background Material

It is sensible and appropriate to include a relatively comprehensive description of the fishery and the environment that the fishery operates in as background material. This allows the other sections of the report to be put in context: This material is also needed to complete the Risk Assessment process.

The material covered should include:

- the history of the fishery.
- where the fishery operates.
- the kind of fishing methods used.
- the major species, habitats and environment that could be affected.
- summaries of the biological characteristics of the main species and habitats involved.

Summary of Reporting Process

The National ESD Reporting process provides the framework in which to justify that your current and proposed management actions (or inactions) appropriately address the issues, given their levels of risk and current knowledge.

Outcomes of ESD Reports

There are a number of uses for the information assembled within these ESD reports. It provides an excellent compilation of information on each fishery that is of great value to the management agency – particularly when there is turnover of staff. The documentation of explicit objectives and performance measures/limits for each fishery will provides for greater certainty of performance by industry, the management agency and the wider community.

It will minimize the risk of having 'random drift' in the application and development of policies related to the fishery, which often occurs where such documentation is unavailable.

In many jurisdictions, these reports may become part of processes for auditing performance by a relevant third party agency (e.g. EPA, Auditor General, Parliament Committee, etc.).

The ESD reports can also be used to complete applications to Environment Australia (EA) for continued export approvals. All the criteria within their guidelines for sustainable fisheries are covered in one or other section of the ESD framework (for a direct comparison, see the website www.fisheries-esd.com). Because the format of these applications to EA were developed for auditing purposes - whereas the ESD framework was developed to meet the needs of the management agencies - a small level of information re-arrangement is required.

The ESD reports should be great assistance for any industry wanting to obtain some form of environmental accreditation through groups such as the Marine Stewardship Council. Again the material covered by the framework covers all the issues that are assessed under their guidelines. In particular, these reports could greatly assist in the preliminary step to determine whether a full MSC assessment should occur.

Ultimately, once all fisheries in a region have been assessed, the material may be valuable for discussions related to the explicit allocation of access amongst competing sectors. They would also be of use for regional marine planning initiatives, such as those being completed by the National Oceans Office.

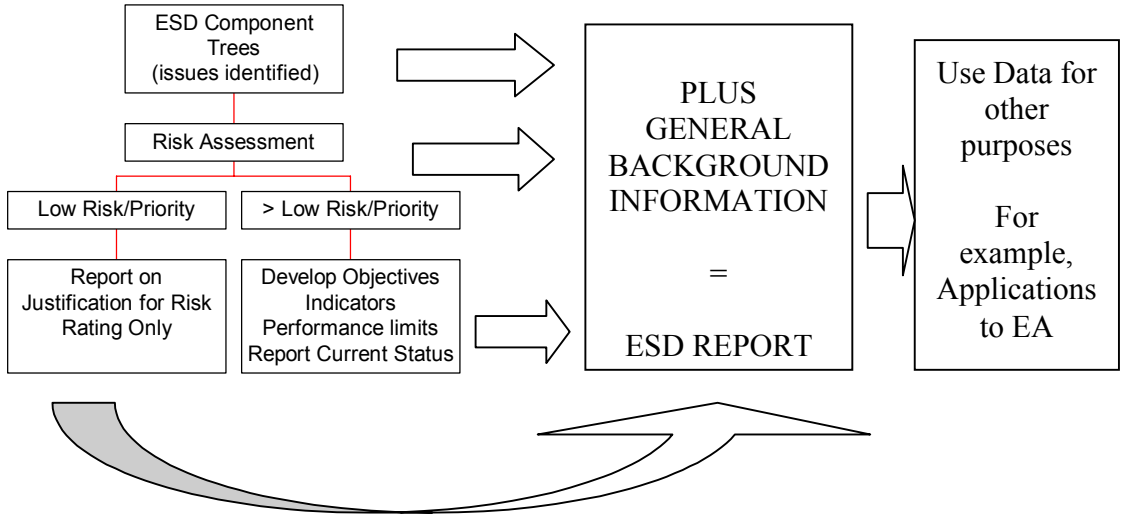


Figure 3 Summary of the National ESD Reporting Framework Processes

1. Identify issues using component trees.
2. Conduct a Risk Assessment on each of the identified issues.

3(a). For relatively low risk issues (not needing specific management), complete a report that justifies why it is low risk.

3(b). For issues needing management, complete performance reports that detail the operational objectives, indicators and current performance.

4. Add general background information (e.g. descriptions of the fishery, area of operation and biology of the species) to put reports into context – this completes the ESD report.
5. The information in the ESD report can be used to generate applications or submissions to other agencies.

SECTION 4 HOW TO IDENTIFY ESD ISSUES FOR FISHERIES

4.1 Background

The overview of the National ESD process presented in the previous section, identified that the most important step in the development of an ESD Report is determining the issues that need to be examined - if you haven't identified an issue, you can't deal with it.

Furthermore, to be managed effectively, issues need to be identified at a level that will allow the development of sensible operational objectives and indicators – if you can't measure the performance of something, you can't manage it. Finally, to assist in the efficiency of dealing with issues, they should be grouped appropriately to illustrate their affinities and relationships.

The identification of issues is the first step of many processes and frameworks used to report on performance, including Environmental Management Systems (EMS) and Risk Analyses. Such systems generally do not specify the way that this identification process should occur, often relying on rather haphazard techniques such as 'brain storming' to produce the list of issues (hazards).

Consequently, they may be subject to errors by omissions, lack of clarity in the relationships amongst issues and problems in the level of detail that issues are addressed. Given the wide nature and complexity of the issues associated with ESD reporting, it was essential to develop a system that was both more robust and simpler in operation.

4.1.1 Agreed National ESD Components for Fisheries

The National ESD reference group divided ESD into eight major components, grouped within three main categories relevant to fisheries – contributions to environmental well-being, contributions to human well-being and ability to achieve.

Contribution to Ecological Well-being

Retained Species *(those species that the fishery wants to capture and use)*

To manage the take of retained species within ecologically viable stock levels by avoiding overfishing and maintaining and optimizing long-term yields.

Non-Retained Species *(those species caught or directly impacted by the fishery but not used)*

To manage the fishery in a manner that does not threaten biodiversity and habitat via the removal of non-retained species (including protected species and ecological communities) and manage the take of non-retained species at ecologically-viable stock levels.

General Ecosystem Impacts *(this covers the potential indirect and more general environmental impacts the fishery may have).*

To manage the impacts *of* fisheries such that only acceptable impacts occur to functional ecological relationships, habitat and processes.

Contribution to Human Well-being

Indigenous Community Well-being *(How does the fishery affect indigenous communities in the area where the fishery operates?)*

To satisfy traditional (customary) fishing needs, cultural /economic development and sustainability of indigenous communities.

Community Well-being *(Are there local or regional communities that are dependent on the fishery, and whether they are supportive or negative about its operation?)*

To contribute to community and regional well-being, lifestyle and cultural needs.

National Well-being *(How does the fishery contribute to national issues such as employment rates, supply of fish, economic returns, reductions in trade deficit etc?)*

To contribute to national well-being, lifestyle and cultural needs.

Ability to Achieve

Governance *(Does the fishery have sufficient management processes and arrangements in place to enable the other elements to achieve an adequate level of performance?)*

To ensure that ESD principles are underpinned by legal, institutional, economic and policy frameworks capable of responding and taking appropriate peremptory and remedial actions.

To allocate the resource to maximise/optimise community benefits.

Impacts of the Environment *(Are there issues that may reduce or improve performance of the fishery that are outside of the direct control of the management agency/industry?)*

To recognise the impacts of the environment on fisheries from both natural and non-fishery human induced sources and incorporate these within management responses.

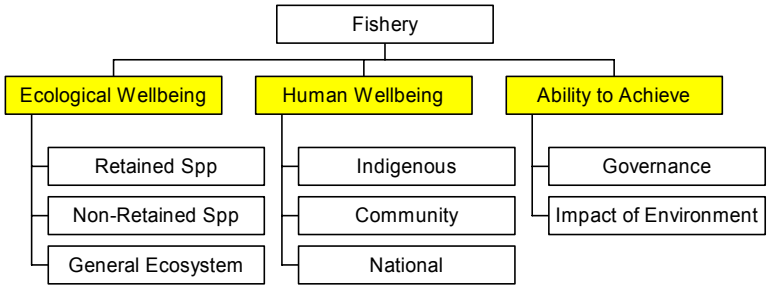


Figure 4 A Diagrammatic Representation of the eight major components of ESD for fisheries.

4.1.2 Origin and Description of the ESD Generic Component Trees

Each of the eight major components of ESD described above will be, in virtually all cases, at too high a level to develop sensible operational objectives for an individual fishery. Consequently, each of these components needs to be 'deconstructed' into more specific sub-components for which ultimately operational objectives can be developed.

The method adopted to facilitate this flexibility (and visibility) is the BRS component tree approach (see Figure 5). This design is very flexible and has already been shown to be applicable to completing reports on ESD for commercial fisheries (Whitworth and Chesson, 2000).

To maximize the consistency of approach amongst different fisheries, the issues that were raised at the ESD reference group workshop under each of the eight main components were arranged into a series of 'generic' component trees. These generic trees are used as the starting point for each assessment and are subsequently adapted into trees specific to each fishery, generally using an open consultative process involving all relevant stakeholder groups (but other methods are possible).

This is achieved by expanding (dividing) or contracting (removing/lumping) the number of sub-components as required. For example, an abalone fishery is unlikely to require a number of the generic sub-components (e.g. bait collection, ghost fishing). However, in contrast, a trawl fishery may require the impacts on benthic biota issue to be divided further into different habitat categories (see Figure 3).

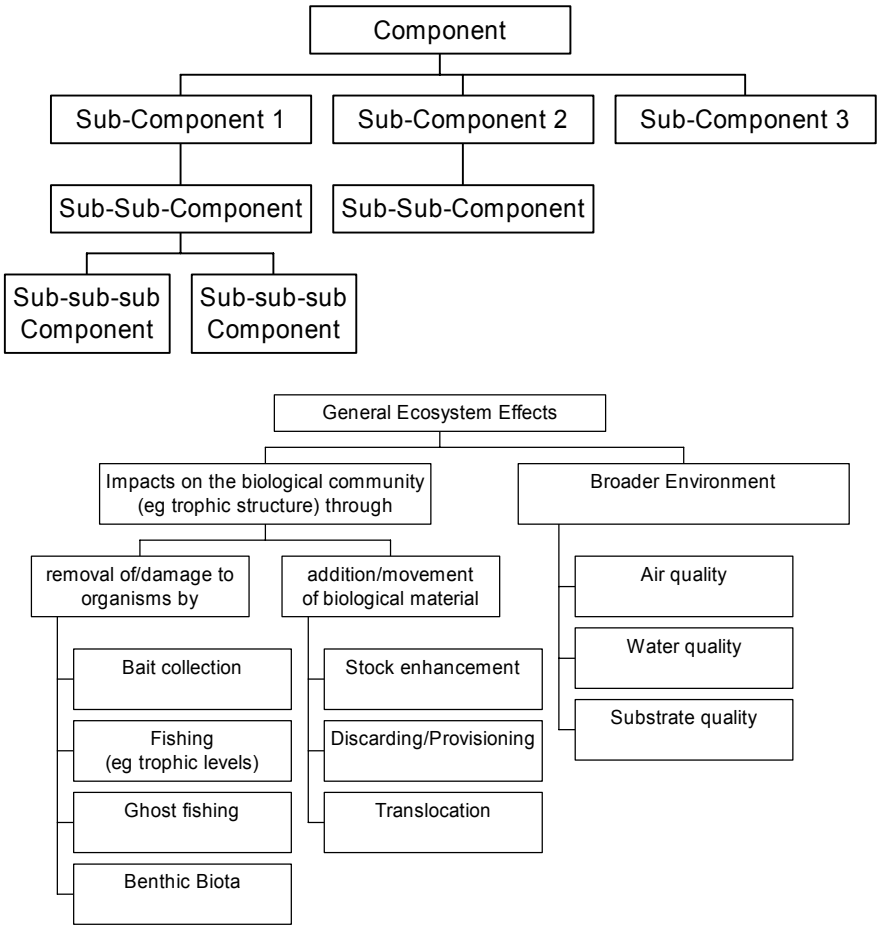


Figure 5 BRS Component, Sub-component Tree Structure (see also Chesson & Clayton, 1998) plus one of the National ESD Generic component trees for general ecosystem impacts

There are a number of benefits in using this system of generic component trees:

- It provides the mechanism for the assessments of fisheries to be completed in a consistent manner.
- The system requires the explicit determination of whether an issue is relevant for a fishery. Thus, in many cases it requires both the specification that each of the potential sub-components present on the generic component trees are NOT issues as much as determining what are issues. This should result in less issues being omitted purely because no one thought of them at the time when they were being generated.

- The tree structure helps focus peoples attention and deal with all the different types of issues in a structured manner.[8]
- Finally, the graphical depictions that are generated are very useful ways of disseminating and communicating these to others.

4.2 Details of the National ESD Generic Component Trees[9]

4.2.1 Retained Species

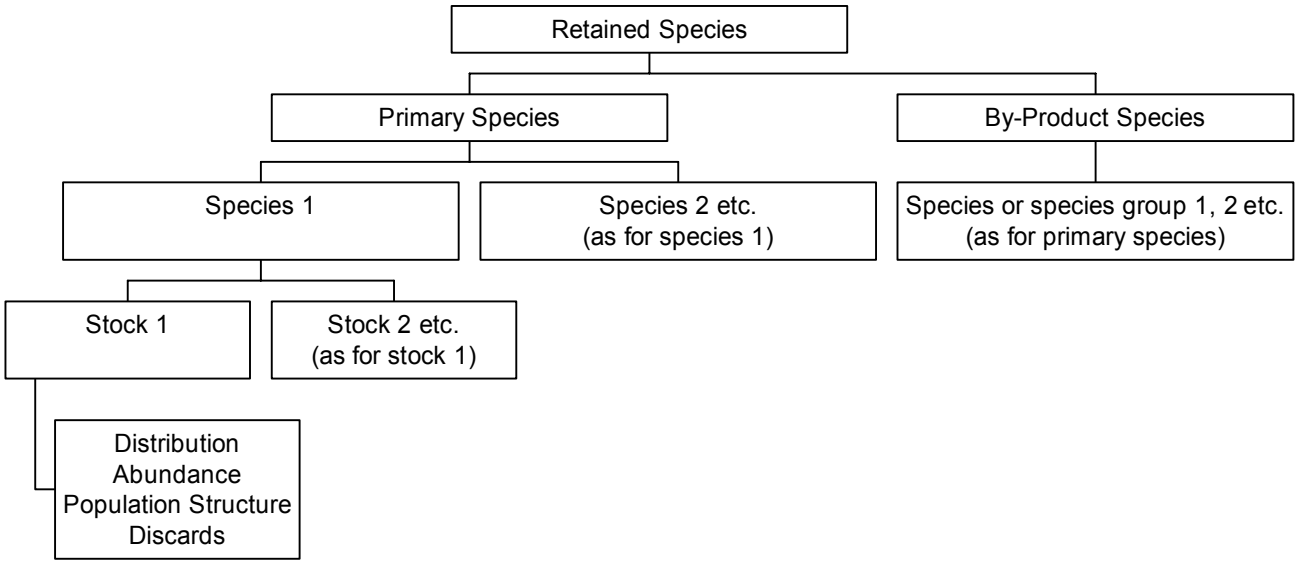


Figure 6 Generic Component Tree for the Retained Species

General Description

This component tree has been termed 'Retained Species' rather than target species to ensure that all the species (and all issues relevant to these species) that are retained by some fishers at least some of the time are dealt with here and not broken up and dealt with in multiple locations (which may occur if the terms target species and bycatch had been used).

Thus, in most circumstances for the species that need to be listed here, the fishers want to - and are allowed to - catch them and the management objective would not be to minimise/stop all catch. It is important that any discard issues associated with these species are dealt with here (see also next section).

[8] It is useful to have a 'parking space' where issues not relevant to the current topic could be recorded so they did not shift the focus of the discussion but enabled the person to get it off their chest. At the end of the session check to ensure they have been covered.

[9] A set of the generic component trees can be downloaded from www.fisheries-esd.com. They are developed in MS Organisational Chart V2 as part of an MS-WORD document.

Species Categories

There are two main groups of species on this tree:

1. Primary species – these species are often termed the target species. In general, these would need to be reported separately and in full in this assessment.
2. By-product species – these are the species that are caught in relatively small quantities by the fishery but are still marketed. There are two main sub-categories of by-product species:
    a. Mainly caught (greater than 90 per cent) by some other fishery. Given that the majority of information will probably be presented in the report of the other fishery, only a summary of how this fishery meets the overall objectives often needs to be presented;
    b. By-product species for which this fishery catches relatively minor amounts and no other fishery catches significant amounts.

Level of Subdivision

The level of subdivision required for the primary species depends upon the circumstances. In general, you only need to divide to the level that relates to the processes of management. For instances where separate stocks of a species are managed separately (i.e. most abalone fisheries manage at the stock level), then this is the level of subdivision that is needed – i.e. you would report on these stocks separately.

However, if the management is at the level of the whole stock (e.g. southern bluefin tuna) then this is the level that should be reported and only one box is necessary.

For the by-product branch, the component boxes may only need to be broken down to a few species or groups of similar species.

Examples

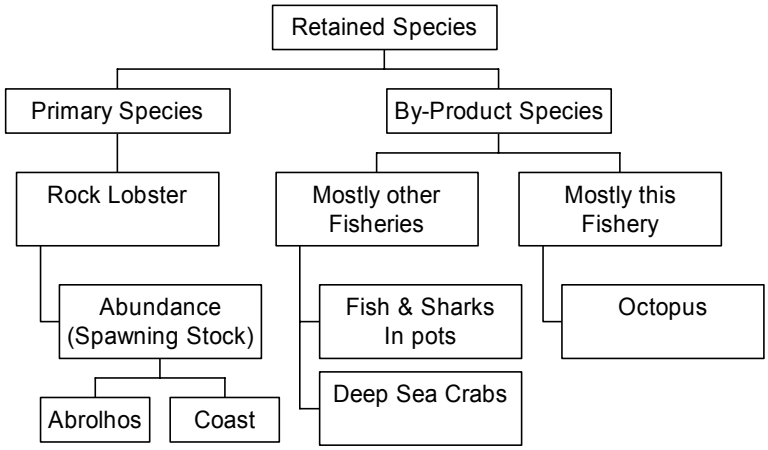


Figure 6a Example of a Retained Species Tree – Western Rock Lobster

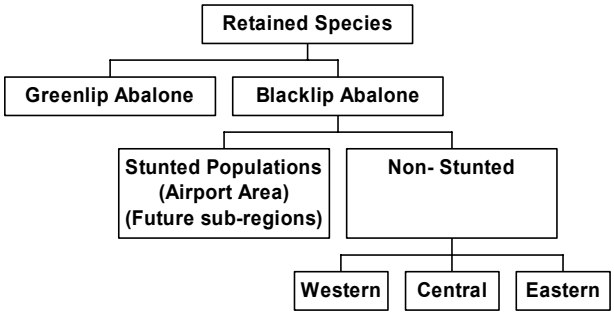


Figure 6b Example of a Retained Species Component Tree - Victorian Abalone Fishery

4.2.2 Non-Retained Species

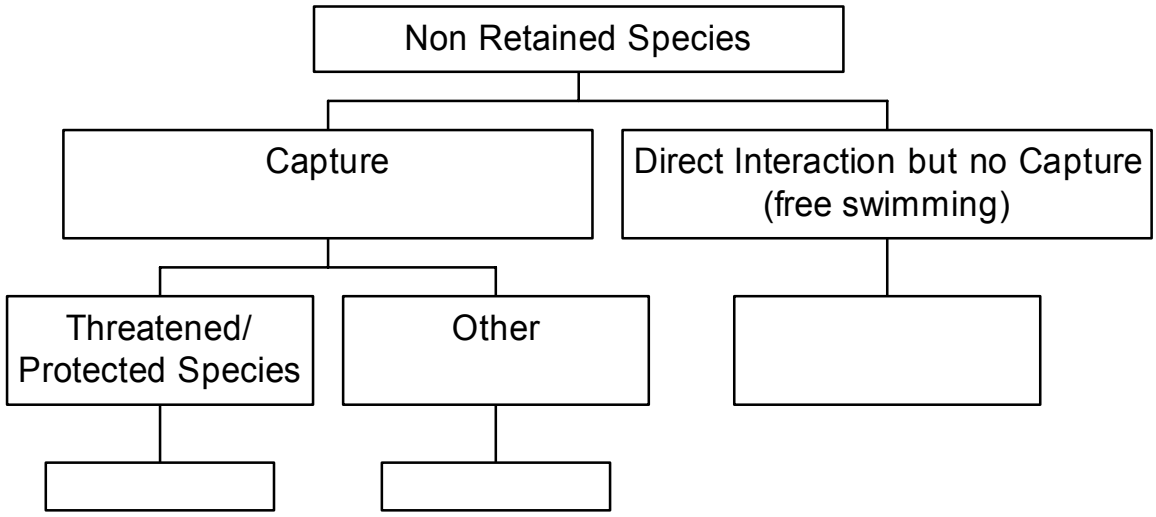


Figure 7 Generic Component Tree for Non-Retained Species

General Description

This component tree has been called 'Non-Retained' rather than bycatch because the latter can include the unwanted elements of retained (target) species and it most appropriate to manage the impacts on all elements of a species/stock in a comprehensive manner in one location.

For example, if the capture of certain sizes/sexes etc of a target species that are subsequently dumped as bycatch is causing a problem to the sustainability of this species, this issue should be dealt within the retained species issues. In addition, the term 'bycatch' means different things to different people and it was sensible to use another less ambiguous term.

The issues that are covered in the Non-Retained Species tree relate to those species that no-one in the fishery wants to catch at any time, irrespective of their size or life history stage. These species are likely, therefore, to have different types of objectives

relating to them than the retained species - in most cases these would be to avoid or minimise their capture.

If more than one catching sector is covered within the fishery (i.e. if both recreational and commercial sectors are assessed together), it may be useful to have separate trees for each sector, particularly in cases where the fishing methods vary greatly as these will often determine which species are captured, or if the commercial fishery uses a number of different methods (e.g. a long line – demersal gill net fishery).

Level of Subdivision

The 'capture' branch of the tree should be split into threatened/protected species and other non-retained species. This is to make it consistent with the environmental legislation of the Commonwealth and most other jurisdictions, which generally have specific requirements related to the former group of species. Hence, it is sensible to deal with these issues separately.

The 'other' category relates to the general group of non-retained species (sometimes referred to as 'trash fish'). These may be either lumped together as groups of species or separated into species depending upon the fishery, with the justifications for the level of lumping explicitly recorded.

The 'no-capture' branch of the tree is included, to allow for the situations where some species may be directly affected by fishing activities without actually being landed on the boat or even caught by the fishing gear– i.e. accidental collisions between fishing boats and dugongs. However, this is not the place to put in indirect effects such as trophic level interactions; these types of issues are covered in the *General Ecosystem Effects* component tree (see section 5.2.3).

Examples

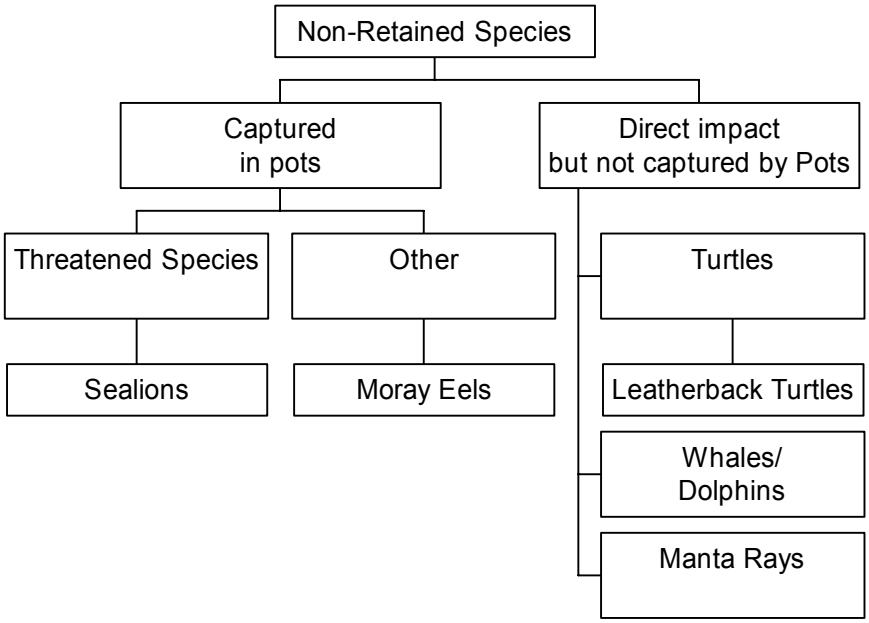


Figure 7a Example of the Non-Retained Species tree - Western Rock Lobster Fishery

4.2.3. General Ecosystem Effects

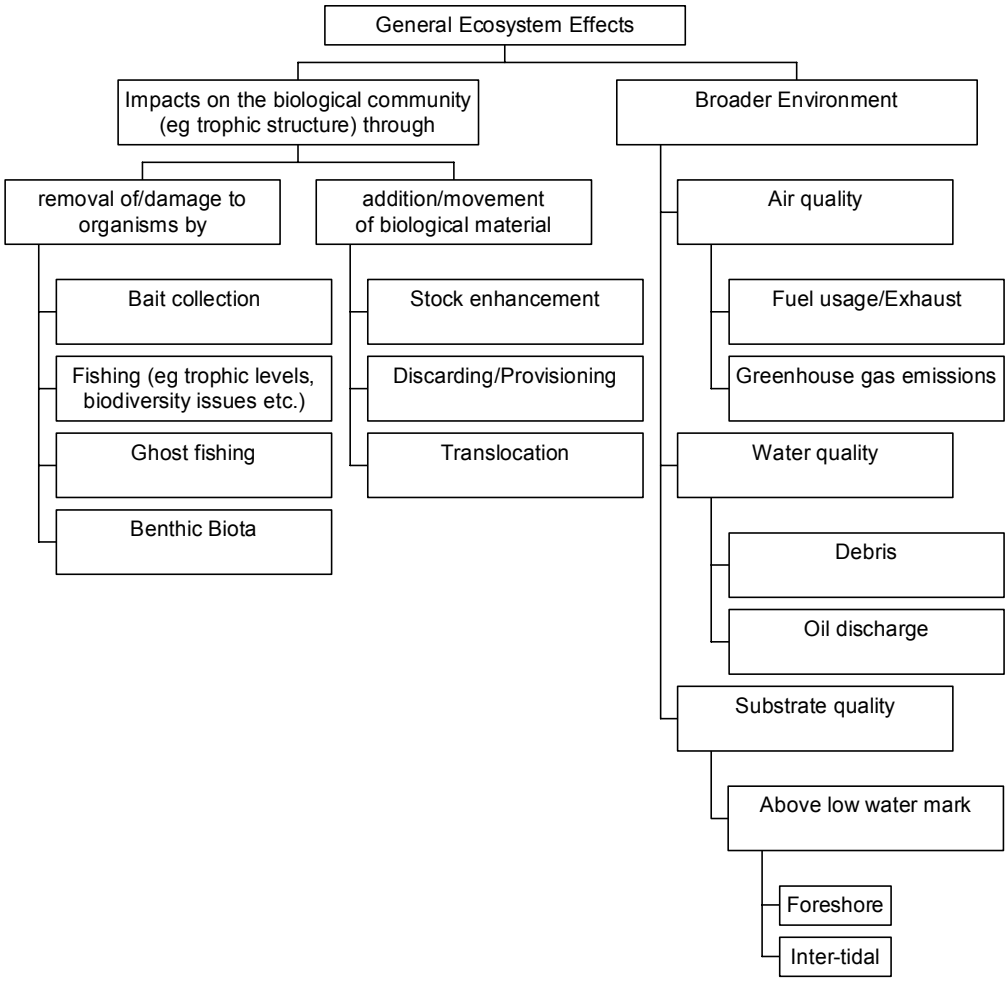


Figure 8 Generic Component Tree for General Ecosystem Effects

General Description

The issues in the 'General Ecosystem Effects' component tree are the most recent types of issues to be dealt with by fisheries agencies and the industry. They cover the indirect and more diffuse interactions of a fishery with the broader ecosystem and environment. Consequently, there will generally be a greater degree of uncertainty about what is, or is not, likely to be an issue for a fishery.

The tree is split into three branches that cover:

- Impacts from the damage or removal caused by the fishery to the rest of the ecosystem.
- Impacts associated with the addition or movement of material.
- The more general issues associated with fishing activities that could impact on the broader environment.

Each of these will be explained in detail.

Damage or Removal

The direct and indirect effects on the general ecosystem caused by damage to - or removal of - material due to the fishing operations are the highest priority issues for groups wanting fisheries agencies and the industry to take an ecosystem approach to management.

In particular, the potential for trophic interactions that may arise from the capture of and removal of species (such as taking too many predators or too many of their prey) is an issue that at least needs to be considered in every fishery. These issues are covered under the general removal from 'Fishing' component and also include any potential biodiversity effects.

The level of interactions will obviously vary, depending upon what species are being harvested (some species are more likely than others to have an impact if removed – i.e. keystone species) and how much is taken (the more you take or affect, the more likely for flow-on effects to occur).

Depending upon the fishery, this may be handled as a single issue or split issue, where there are clear differences in the likely effects from the capture of different components of the catch. Determining what may be an appropriate/acceptable level of impact is discussed in the next chapter.

For many fisheries, the possible impacts of 'ghost fishing' need to be considered. This term refers to fishing methods that use gear that continues to 'fish' even after it has been lost. One of the most well-known methods in this category is drift nets that have been lost. However, many other gear types, if poorly designed, can continue to capture fish when lost - this includes traps, pots, etc.

The other major category covers the possible impacts of the fishing methods on benthos and benthic communities. This is likely to be relatively significant issue for a trawl fishery, and on many occasions may require splitting into a number of sub-categories, depending upon the number of habitat types affected. However, it is unlikely to be an issue for hand-gathering types of fisheries, such those for abalone.

Finally, if the fishery actually catches their own bait (e.g. some pole and line fisheries catch their baitfish), the impact on these stocks needs to be assessed.

Addition/Movement

This branch covers the possible impacts associated with fisheries that add or move biological material as part of their operations. It is likely that the sub-components of this branch will be of relevance to a smaller number of fisheries than the previous branch.

A few fisheries, mainly recreational at the moment, utilise stock enhancement as a major tool in their management. If this is the case for the fishery, there needs to be an assessment of the potential environmental impacts of this operation – covering both

the impacts to wild stocks of the species being released (if relevant), and on the other elements of the ecosystem where they are released.

The possibility that there could be impacts from the discarding of unwanted catch and the provisioning that occurs from the addition of bait need to be considered. These will only need to be dealt with in fisheries where there is a significant level of unwanted catch (or old bait), particular if it is dead/or available for easy capture when discarded.

This process may be providing a source of food to other species that would not normally have access to it (e.g. birds), or at least not as readily. It also covers situations associated with loss of bait – especially when live bait is used.

The final category in this branch is the translocation of material by the fishery. This can cover both the movement of the target species or bait outside of their normal distribution, or even the potential for the boats to translocate fouling organisms.

Broader Environment

This branch covers the more general environmental impacts that could occur from fishing operations. This includes the potential for the fishery to contribute to air pollution and greenhouse gas emission, particularly as some fisheries consume a large amount of fuel. It also includes the impacts on water quality that could come from the possible accidental release of fuels, oils, etc, if appropriate codes of conduct/protocols are not in place.

The branch also covers the potential environmental impacts of debris from fishing operations, such as loss of bait boxes, bands and general rubbish in the water.

Possible impacts on the foreshore can also be included, particularly where fishing requires the fishers to drive along the beach in a 4WD to reach their fishing locations and launch their boats.

Many of these impacts may not appear particularly critical at this point, but as the debates over greenhouse gas emissions continue, the need for a fishery to have systems in place to report on this kind of environmental performance may become more necessary.

Examples

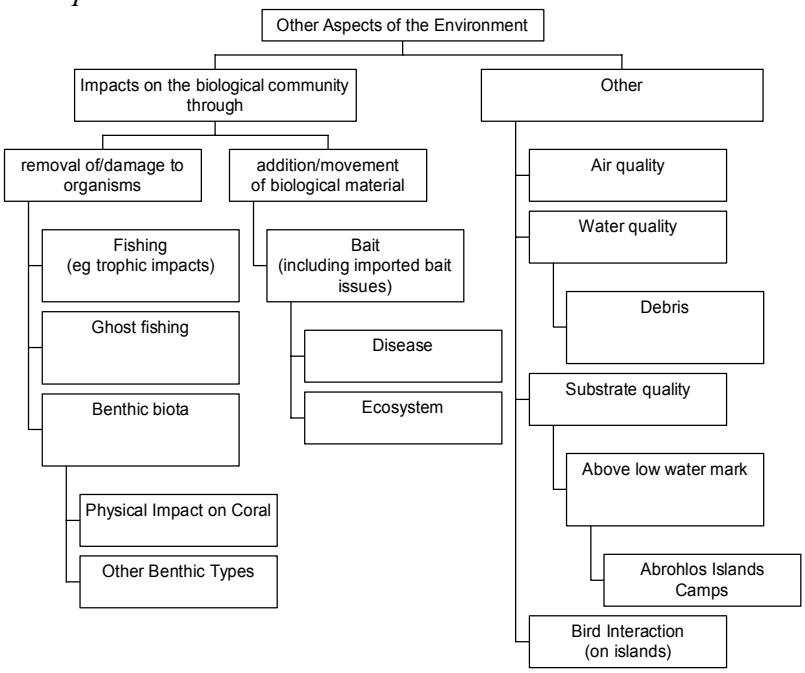


Figure 8a General ecosystem component tree - Western Rock Lobster

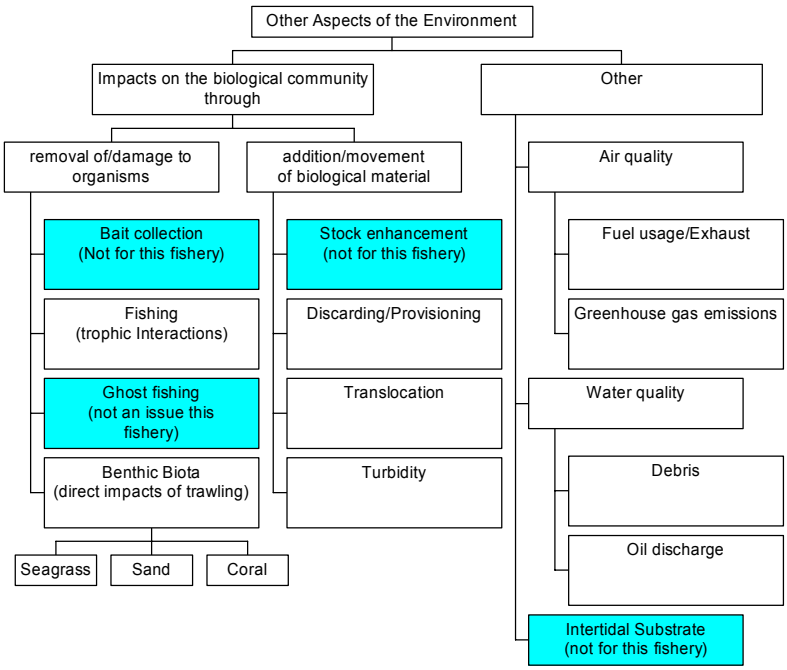


Figure 8b General Ecosystem Component Tree - Shark Bay Prawn Trawl (note the shaded boxes were not considered potential issues at all for this fishery).

4.2.4 Indigenous Community Well-being

Figure 9 The Generic Component Tree for Indigenous Well-being

General Description

This *Indigenous Community Well-being* tree is the starting point to cover the contribution of the fishery being examined with regard to the relevant indigenous communities that may be affected - either positively or negatively - by the operations of the fishery.

Consequently, the more the fishery interacts with - or has interacted with - indigenous communities, the more issues are likely to be identified. For deepwater offshore fisheries, there may be few issues (at least under current legislation) of relevance. However, for many inshore fisheries, particularly in areas where significant indigenous communities are present, there may be a substantial number of issues identified.

Categories

In terms of the major categories of contributions (which to repeat, can be positive or negative), a fishery may affect the community well-being by providing (or removing) employment opportunities, infrastructure and economic benefits. It could also affect the community's ability to complete cultural activities such as traditional fishing (either by direct exclusion or indirectly by a lowering of stock numbers) or access to areas for ceremonies.

Our understanding of this section is less well developed than that which deals with the environmental component trees. This is a function partly of the type of case studies that were completed (only a small number had significant indigenous issues). In addition, the techniques used to generate the case study component trees (i.e. small workshops of interest group representatives) were probably not appropriate to gather this information effectively.

As a result, it was concluded that a different approach was needed to involve indigenous stakeholders (see below for further details).

4.2.5 Community Well-being

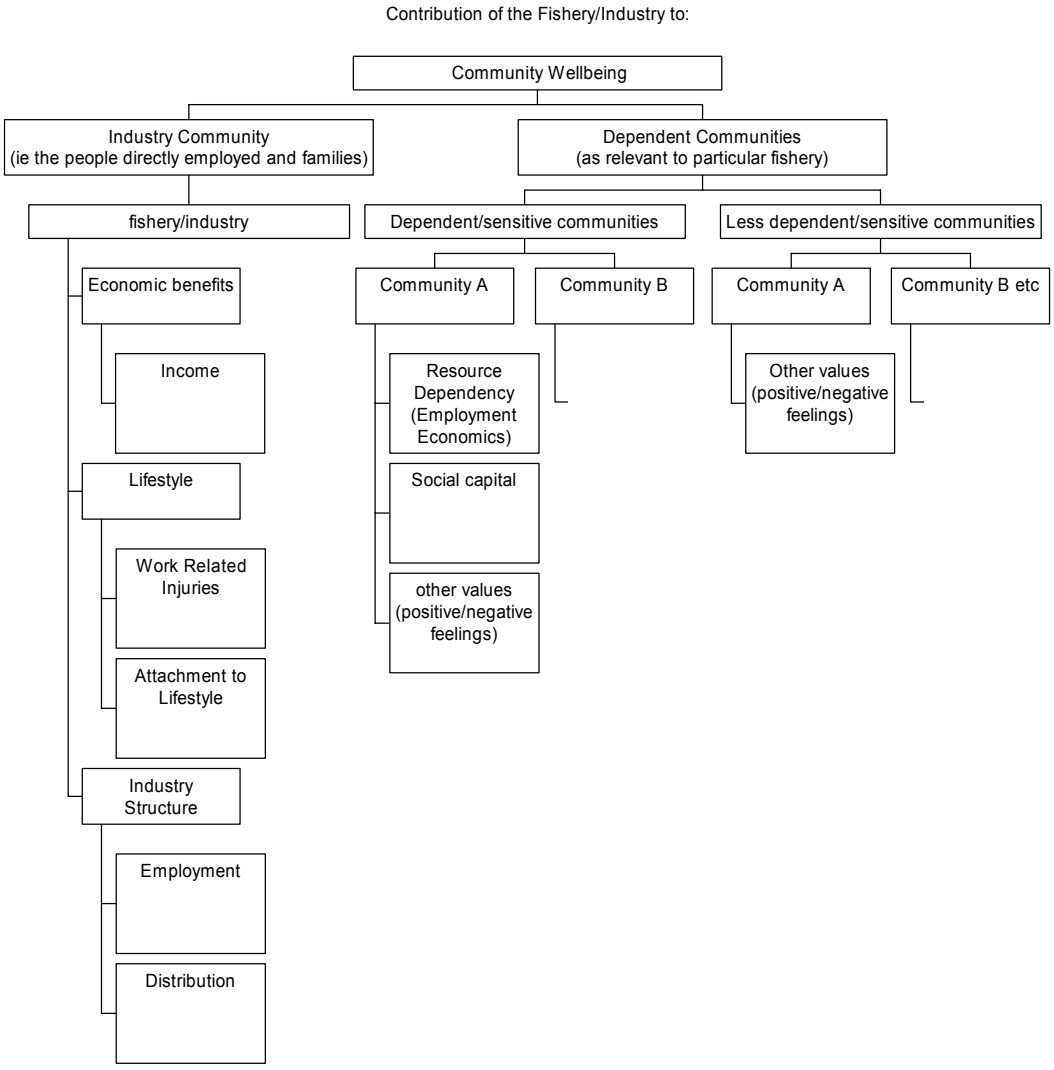


Figure 10 The Generic Component Tree for Community Well-being

General Description

The *Community Well-being* tree covers the potential effects of the fishery on the local or regional communities associated with that fishery. This includes the fishing community itself, from small local towns that may be directly and highly dependent upon the fishery for their existence, to communities that are only indirectly affected by the fishery.

For some fisheries, depending upon their size and location, there may not be a relevant community to assess separately. For example, the WA Aquarium Fishery contained 14 fishers who all lived in Perth. Being a capital city of over a million people, the aquarium fishery is only likely to have only a negligible impact, so there

would be little need to assess the fishery's impact at this regional community level (i.e. on Perth). In contrast, if we take the example of the WA West Coast Rock Lobster Fishery, many towns on the lower west coast are (or at least were) very dependent upon the lobster fishery for employment, income and the infrastructure generated by this fishery.

The *Community Well-being* tree covers both the financial benefits/costs to these communities of having the fishery operate, along with the social impacts of the fishery, including the general attitudes of the community towards the fishery. There has been a growing recognition of importance of different industries to rural communities that extends beyond the financial.

While the importance of local industries to income and employment opportunities is obvious, other impacts could include attracting or maintaining services and contributions to social capital. It should be noted that community attitudes may be *the* major driver of the decision for a fishery to continue or not.

It may also be somewhat difficult in some circumstances to identify and isolate for this tree the issues associated with a single fishery from those issues associated with other fisheries in the area - at least not without carrying out a significant data collection effort. This situation will be especially noticeable in circumstances where individual fishers operate in a number of different fisheries.

The *Community Well-being* tree is broken into two main branches, one dealing with the industry community (those directly employed in the fishery and their families) the other dealing with the local communities affected by the fishery.

Industry Community

The 'Industry Community' branch can include contributions to well-being through a range of factors directly associated with the fishery. Components of fishery contributions to Industry Community well-being identified during case studies included income, employment, industry structure, links to locally-based processing, contribution to lifestyle, family involvement in the industry, and occupational health and safety.

For some of these components, data may exist (for example, on reported occupational health and safety incidents) but for others it would need to be collected.

Community Well-being

The approach taken during the case study exercise was to break the local communities impacted on by the fishery into two categories. In the first category are those communities which are highly dependent on the fishery resource and which are sensitive to change, while the second group covers those communities which are less dependent on the resource and/or which are less sensitive to change.

Most of the data required to assess this group of indicators needs to be collected, as there is no existing data set for most fisheries. Breaking the local communities into these two categories allows a focus on the communities most likely to suffer as the result of a change to a fishery.

'Resource dependency' means, as the term suggests, how dependent a community is on the fishery resource. The dependency of a community on a resource, in this case a fishery, can be assessed in the traditional way of looking at the income and employment it generates.

If, say, 65 per cent of the total employment in a community is in fishing, the community is 'highly dependent' on the fishery resource. In contrast, if say less than five per cent of the total employment in a community comes from fishing, then it would seem to be 'less dependent' on the fishery. That being said, it is should be noted that it is likely that a fishery resource may contribute more to community employment than just those jobs directly related to fishing.

For example, the fishery resource may contribute jobs related to fish processing, retailing, provision of boat fuel and parts, accountancy, groceries for fishers and their families, school teaching for the children of fishers, and so on. These are the multiplier effects of the fishery. Each dollar earned fishing that is spent in the community generates employment and income for other community members.

As well as the direct and indirect employment/income/expenditure links between a fishery and local communities, access to services for a community may also depend to some degree on a fishery. Some government services are allocated on the basis of the number of the target group in a given area - for example, the number of schoolteachers provided to public schools depends on the number of children in the school.

Private sector services like banks, shops, doctors, pharmacies, etc, will only be present where there is enough demand to support their business. If the population of a town declines or people start shopping in other towns in the area, these services are likely to close down or move to larger regional centres.

So, in brief, the dependency of a community on a fishery could be considered in terms of:

- direct employment and income as a proportion of the total;
- indirect employment and income generated by expenditure made by those involved in the fishery; and
- the role the fishery and its dependents plays in qualifying a community for a government service and in attracting and retaining commercial services.

The term 'community sensitivity' is used to describe how well a community might be able to handle change. More attention is being paid by government and business these days as to how resilient or robust communities are.

One way of thinking about the impact of a significant change in an industry or a community is to assume that the community will adjust or cope with the change. For

example, let us imagine recreational and commercial fishing are banned in a region. This is likely to lead to a range of community impacts - some people will lose their jobs and some businesses will go broke. However, over a period of time, the people who lost their jobs will probably get new ones and the investment in the now defunct businesses will be put to some other profitable use - the community will adjust.

Even though some people might leave the area to look for new work or business opportunities, the assumption is that these human and financial resources will be put to more efficient use than they were previously. This has obviously occurred in the past in Australia - there are far fewer people employed as blacksmiths now than there used to be and far more employed as mechanics.

There are fewer businesses devoted to supporting and servicing the small-scale gold mining operations that flourished in WA more than a hundred years ago - and many more devoted to information technology. However, this adjustment process may take time, be painful for those involved and may lead to a long-term decline for a whole region.

Governments are now paying more attention to trying to improve the adjustment process after a significant decline or loss of an industry has occurred, so that the social pain involved is reduced and new opportunities for regions and communities are provided. This was a feature of the Regional Forests Agreement process and is being examined in the context of the National Salinity and Water Quality Action Plan and Regional Marine Planning (see Coakes, 1999 for overview).

Some communities are inherently more vulnerable to change than others. While some communities cope with adjustment pressure well, others find it more difficult. It appears that communities which have high levels of unemployment, low levels of education, low levels of skilled work and high levels of welfare dependency are less able to absorb and adapt to change than communities where this is not the case.

Assistance to cope with change can be targeted at those communities most in need. In the fisheries context, this assistance should be targeted principally at those communities that are quite dependent on fishing and are the most sensitive to change. Communities where fishing is relatively unimportant compared to the other activities that support the community, or who are strong and adaptable communities, are likely to be able to adjust to fishery impacts without outside assistance.

Communities that are highly dependent on fishing and are vulnerable will not only be the ones that most feel the effects of a change in the fishery, but who are also likely to have trouble absorbing the negative impacts of that change.

Of course, this does not mean that fisheries management decisions can be made in a way that prevents any community impacts. The value of understanding the community impacts of fisheries management actions is that:

- where a management decision is likely to have a severe negative social impact, the relevant government agencies can be informed so that they can target employment, business development etc assistance to the area;

- where there are two or more management options which are equally beneficial in ecological and economic terms, understanding the social impacts would allow managers to chose the option which causes the least community impact.
- an informed understanding of the social impacts of a decision will take some of the emotion and assertion out of the debate - as occurred in the Regional Forests Agreement process when Social Impact Assessment was introduced into the process. A social science model was developed by the Bureau of Rural Sciences for the Regional Forests Agreement process and details of the model are obtainable from the former.

Social Capital

'Social capital' is a concept that is being used more frequently in western countries. There are a range of ways of looking at it - and much disagreement amongst sociologists about what it means and how it should be measured. It is most frequently used to describe the 'glue' that holds communities together.

In language that is more academic, social capital can be defined as the norms and networks that enable collective action. It is an important concept because it is clear that understanding the economics and infrastructure - human and physical - of a community isn't enough to understand why some communities do well and others go into decline, even though they seem be very similar.

Communities with high levels of social capital are better able to respond to and deal with adverse change. For example, if there is a significant reduction in access to a fishery resource, the community with good social capital is likely to be able to pull together to find ways to rebuild. However, the community with low social capital may not be able to find ways to overcome the reduced employment and income resulting from a fishery closure.

Some of the elements that are seen as occurring in communities with high levels of social capital are

- high levels of trust amongst community members;
- good networks within the community;
- good networks from the community to outside;
- reciprocity - or a preparedness to help each other;
- high numbers of voluntary organisations;
- high levels of participation in voluntary organisations;
- these voluntary organisations are effective and 'get things done'; and
- effective government institutions that help rather than hinder community collective action

There are a number of methods for measuring community social capital that have been developed. The Commonwealth and State health departments are currently developing a measure that, if successful, could be added to the Australian Bureau of Statistics surveys.

At present the only existing data relating to social capital would be to look in the *Yellow Pages* directory and in local government directories for details of voluntary organisations. This would provide information on the number of organisations in a community, but would say nothing about participation rates or their effectiveness – or about any of the other aspects of social capital mentioned above.

Infrastructure

Fishery-related infrastructure was identified in some case studies as a component of the contribution of a fishery to community well-being. For example, a harbour and associated infrastructure that exists primarily to service commercial fishing provides benefits to other users.

Other values (positive and negative feelings)

Positive and negative community attitudes were raised in a number of case studies. The perceptions of the local community about the fishery and its impact on that community were seen as important.

Negative perceptions (whether accurate or false) were seen as presenting a danger to the fishery and potentially able to influence political decisions about who could access the fishery resource and under what conditions. These negative attitudes might include a preference to reduce commercial fishing to increase either recreational fishing or conservation; feelings that the fishery contributes to visual or actual pollution (e.g. aquaculture); or concerns about the impact of seasonal influxes of recreational fishers to a town.

Positive attitudes could include seeing the industry (including recreational fishers) as part of:

- the identity of the community;
- finding the harbour and boats, etc, visually appealing and adding to the character of the community;
- feeling that fishers contribute to the social fabric and support local community activities; and
- valuing the employment recreational or commercial fishing bring to a town and the opportunities fishing gives for local young people to stay in their home town.

Generally, attitude data on local perceptions of the local fishery is not available and would need to be collected.

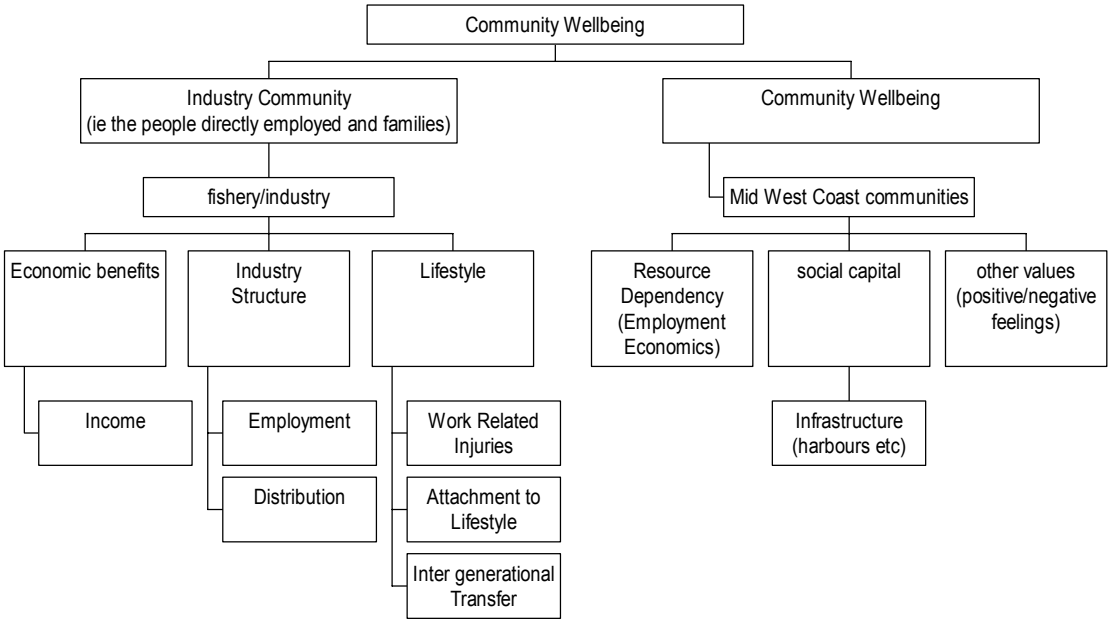


Figure 10a Community Well-being- Western Rock Lobster Example

4.2.6 National Socio-Economic Well-being

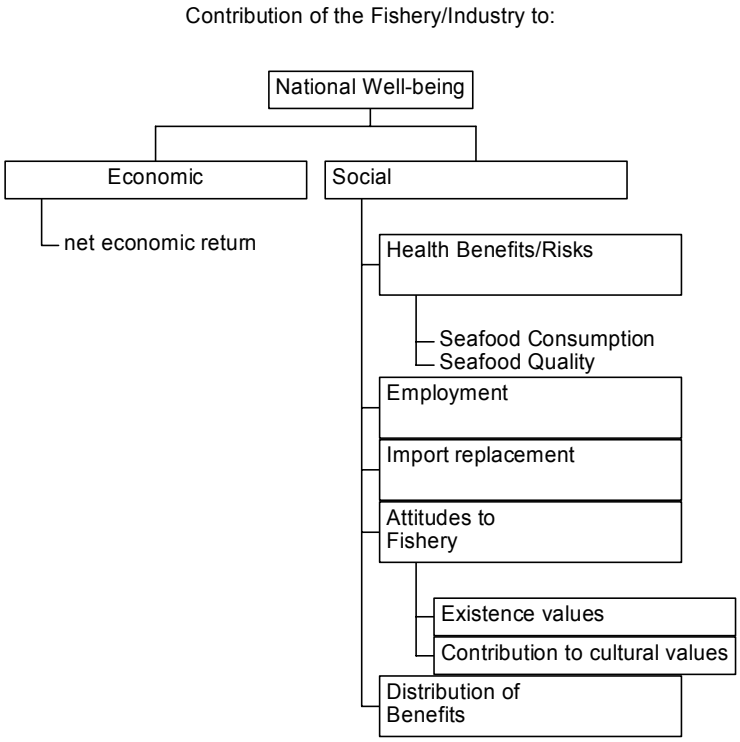


Figure 11 The Generic Component Tree for National Well -being

General Description

This tree covers the broader, non-regional, social and economic costs/benefits for a fishery. At a national level the economic value of the fishery may be important – this

covers issues such as the Net Rate of Return but not financial turnover and employment as these are social issues.

The social issues that may be important at a national level may include categories such as the:

- provision of seafood for the community - which has health benefits;
- levels of employment generated by the fishery; and
- level of either export replacement or export earnings which contributes to our balance of payments and therefore 'allows' the community to buy in overseas goods.

There may also be community attitudes at a national level that may be important to gauge. These could either support the existence of the fishery - because it may be seen as an important part of cultural heritage - or if the attitude is negative this could be impacting upon the fishery's longer-term existence.

Either type of attitude is useful to know about, as government and industry can take this information into account when planning their future actions.

The other national issues that have been identified in the case studies include the provision of sea rescue services by the fishing fleet and the increase in scientific knowledge that occurs through the research that is done as part of fisheries management.

Attitudes to the Fishery

General community attitudes towards fishing were seen as important in all the cases studies completed so far. The perception of community concern over commercial fishing and aquaculture and their impacts is seen as having a significant potential to influence government decisions over access to fishery resources.

The FRDC has funded a project that involves a national survey of community perceptions of, and attitudes, to commercial, recreational and traditional fishing and aquaculture. The results of this survey will be available in late 2002.

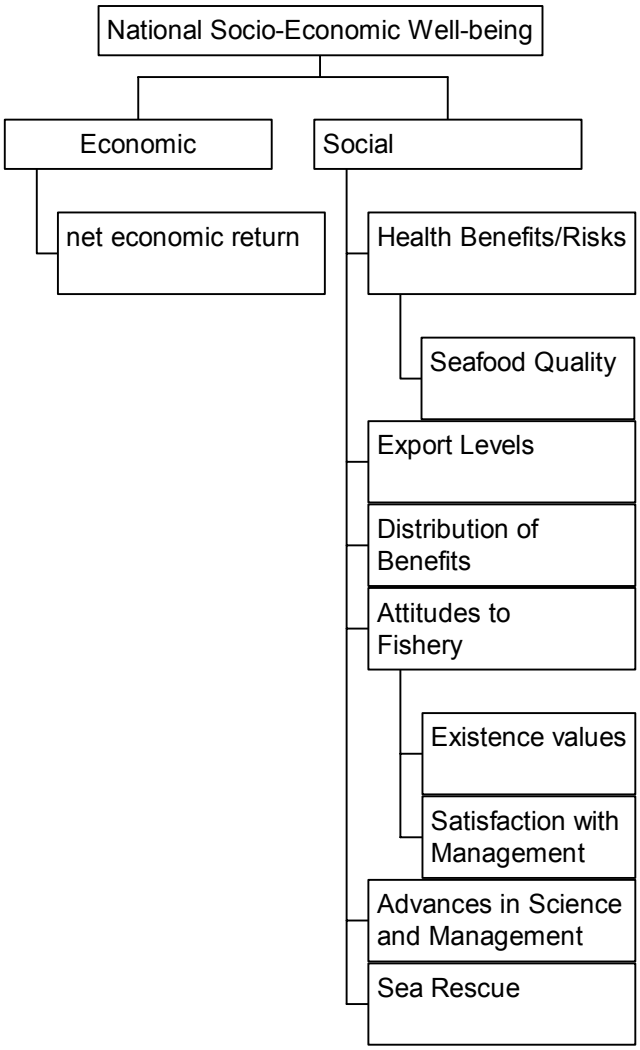


Figure 11a National Well-being – Western Rock Lobster example.

4.2.7 Governance

General Description

The Governance tree covers all the legislative, administrative and bureaucratic processes that need to be completed to enable the issues in the previous six trees to be dealt with effectively. These issues may cover a number of levels of government, the industry and in most circumstances now, even Non-Governmental Organisations (NGOs) and other groups.

The government branch of the Governance tree is usually split into those issues that are relevant to the management agency, which is usually the department responsible for the fishery concerned. These issues include having an overarching measure of the effectiveness of the management arrangements – in other words, are they producing an adequate performance from the fishery?

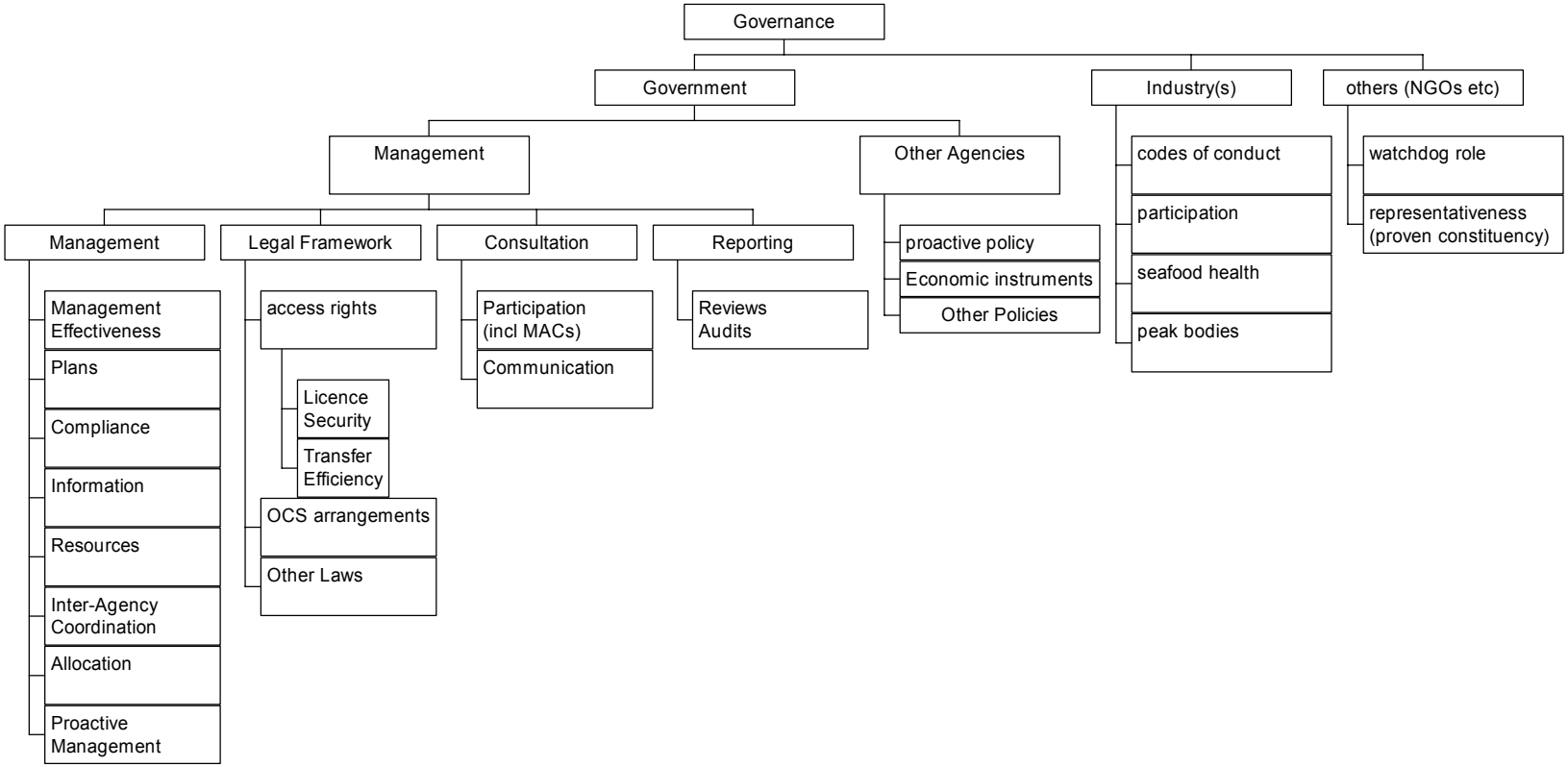


Figure 12 The Generic Component Tree For Governance

The more detailed components relate to the availability and comprehensiveness of the management plan associated with the fishery, whether there is adequate compliance in the fishery with the regulations and other arrangements in the plan (and are there measures of this); and are there appropriate levels of resources to manage the fishery effectively and gather information to know that this is happening?

The management agency also needs to report how it is handling any allocation issues amongst competing sectors within the fishery, or amongst competing fisheries. For many fisheries there are also inter-jurisdictional arrangements (e.g. the Offshore Constitutional Settlement) in place or required that could need to be reported.

The performance or policies of other government departments often impact on a fishery's ability to meet objectives and these issues may also need identification. Some examples of these include:

- the setting of taxation, monetary and financial policies in a national context (e.g. the federal National Competition Policy), but also in terms of inter-agency cooperation with respect to the approvals for licences, where more than one agency is involved; and
- the licensing by other departments of activities that ultimately have an impact on fisheries – (e.g. potentially causing land-based pollution of the aquatic environment).

At the industry level, the types of issues that may need to be reported include the structure and operation of any industry association, and the presence of any relevant codes of conduct/environmental management systems. There may also be the need to report on the existence and performance of any Occupational Health and Safety programs.

Finally, the issues associated with any relevant NGOs (e.g. World Wildlife Fund, Conservation Council) or other group (e.g. recreational associations) that have significant input into the operation of the fishery may need to be identified.

This tree is likely to be very similar for all the fisheries within a jurisdiction, at least within a sector. Depending upon the relationships and legislative arrangements, there may be some variation in structure required among jurisdictions, but in general just about every box in this tree will need to be considered.

4.2.8 Impacts of the Environment on the Fishery

General Description

The Impacts of the Environment on the Fishery tree has been designed to capture the major issues that are/or may at some time impact upon the performance of the fishery, but which are beyond the scope of the relevant legislation of the fisheries management agency. Even though they are not controllable directly, these issues still need to be taken into consideration when developing management arrangements because they are likely to affect what is possible, which directly affects how strong or cautious management may have to be.

There are two major types of issues in this tree. The first are the impacts that arise from natural changes to the environment, a good example of which is the strong link between the variations in the strength of the Leeuwin Current and recruitment levels in many fish species in WA.

The other branch covers the anthropogenic impacts from non-fishing activities on the performance of a fishery. These can include impacts on water quality such as those occurring from increased sediment loads or water pollution from land-based activities.

Other types of impacts come from the removal of nursery areas for coastal developments and the introduction of exotic species that may swamp or eat native species. In freshwater areas, the use and removal of water from the streams by agricultural activities is seen as probably the major potential issue for many of the native species living in these environments.

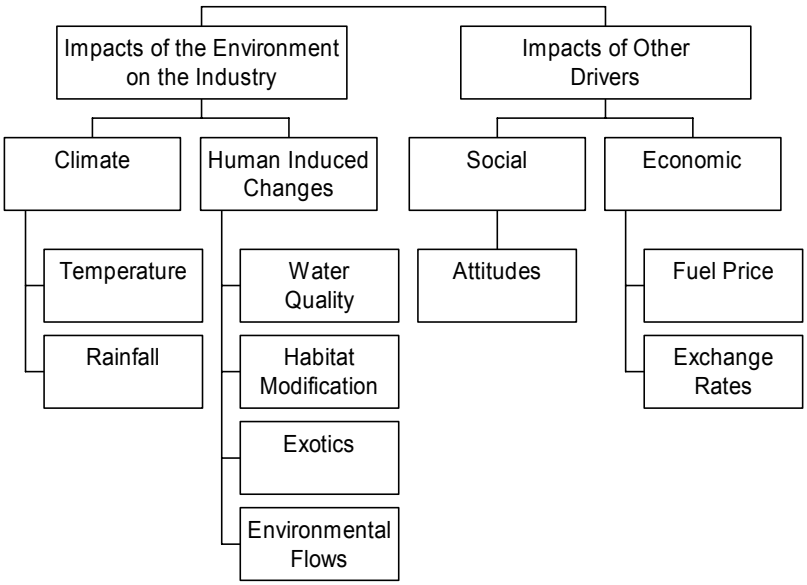


Figure 13 The Generic Component Tree for Impacts of the Environment on the Fishery

4.3 How to tailor the Generic Component Trees to suit your Fishery

The possible consultative methods that can be used to generate the modified component trees to suite a particular fishery includes:

1) The manager/scientist by themselves.
2) A small group of agency staff.
3) A sub-committee of a Management Advisory Committee.
4) A focused group containing representatives of all stakeholder groups.
5) An open, public meeting.
6) Some combination of the above.

The most efficient process for generating the modified component trees is using a combination of methods 1 and 4. This done by a manager/scientist coming up with an initial draft version of the component trees, which are then finalised through a workshop that includes representation from each of the main stakeholder groups.

The details of how these workshops have proceeded includes:

Before the Workshop

Send out background material to each participant at least two weeks before the workshop is to take place. This background material should include:

- the outline of what the process is trying to achieve – generate an ESD report for the fishery (i.e. send them this *Guide*).
- the draft component trees for the fishery generated by the manager/scientist as a starting point, along with the generic component trees, so everyone can see where they have come from.

The background material should also include an outline of the fishery, a summary of the biology of the species involved, and notes on the environment where fishing operations are occurring. This is needed to give context to the discussions.

At the Workshop

Preliminary - An introductory talk is normally given to both clarify the objectives for those who read the material and instruct those who did not. There are always a large number of participants that don't read material provided.

Modifying Trees - First, discuss the generic structure. These discussions will be more fruitful and efficient if each of the attendees has examined the component trees before the meeting and comes along with their suggestions as to what amendments will need to be made.

The group will need to modify the generic structure to meet specific issues for the fishery by adding sub-components that are not covered adequately by the sub-components already, showing or deleting sub-components that are not relevant. If any

of the generic sub-components are removed, you should provide written justification as to why they are not applicable to this fishery. For a sub-component to be removed this requires the issue to be not be significant, not just that there are no data available on it.

The discussions to adapt each of the eight generic component trees should be restricted to no more than 45 minutes each and preferably less than 30 minutes. Someone should provide a five-minute introduction on each of the component trees, to assist in the efficiency of the discussions.

Remember, this stage of the process is about issue identification, not prioritisation, so there should be virtually no discussion of how important an issue is unless someone raises an issue that is absolutely wrong/inappropriate. However, even this may be useful to document. In many cases, the articulation of what is *not* important is more valuable than what is. So, if someone raises something they think is an issue, deal with it.

Facilitation - Administration

In circumstances where there is likely to be a large degree of dissent on issues, particularly between fisheries agency/department staff and other stakeholders, it may be prudent - or more efficient - to use the services of an independent facilitator to manage proceedings. The alternative is to have the manager, or someone else from the agency/department, chair the proceedings.

However, a vital element in this is that the facilitator (be they independent or agency/department-based) needs to have a good understanding of the full ESD Reporting process and at least a passing understanding of the fishery. Unless this is the case, it may be difficult to control proceedings and achieve a sensible outcome.

Someone - not the facilitator - should be set up with a computer and computer-projector, so as to be able to assist the facilitator and display/amend the component trees, as the workshop progresses. Consequently, this 'assistant' can alter the trees when issues are identified or removed.

If this alteration can be done in 'real time', those involved in the workshop can see exactly what is happening, which helps the workshop to progress. Notes on why issues were removed should be kept, as this will need to be justified in the final report.

Indigenous Involvement

The initial series of case studies found that the method of holding small workshops in capital cities where only a few representatives of each sector are present were not appropriate to address indigenous issues. Obtaining input from indigenous groups with an interest in a fishery, or whom the fishery affects, may require a different approach.

For example, whilst there are a number of Non Governmental Organisations that have an interest in fisheries issues, it is common for them to represent each other at workshops. Similarly, there are likely to be a number of indigenous family groups with an interest in a fishery but it is often not appropriate for one group to be asked to speak on behalf of others, unless they have prior agreement to this proposition.

Holding workshops in capital cities means that they may be difficult for indigenous people to attend, particularly if this clashes with cultural events or other customary obligations. It is also possible that indigenous people may prefer not to participate in a situation where they are the only indigenous person in a room full of people.

The aforesaid means that it may be difficult to get indigenous representatives to attend a workshop in a city, and, if they do, these representatives may not feel comfortable speaking up in such an environment.

Getting genuine and effective indigenous input to this process may require talking to individuals and groups on their 'home ground' and using a different, more conversational approach. Advice on a more appropriate approach to obtaining indigenous input could be sought from the Aboriginal and Torres Strait Islander Commission, Indigenous Studies departments at tertiary institutions, and those people who have experience with effective communications with the relevant indigenous groups.

SECTION 5 HOW TO PRIORITISE ISSUES

5.1 Background

The process of identifying the relevant issues for a fishery - by the modification of the eight generic component trees - can often result in a large number of potential topics being identified. The importance of each of these may vary, from the relatively insignificant to the vitally important.

If an issue is relatively insignificant, it is unlikely to require specific management arrangements and monitoring programs. However, those issues that are important may need strong management intervention if unacceptable outcomes are to be avoided.

Given the variation of levels in the importance of issues, and the scarcity of resources to address all of them at equal levels, there will generally be a requirement to prioritise the identified issues, so that management actions and monitoring systems are only implemented where appropriate.

To assist in prioritising the issues, features of the Risk Analysis methodology have been adopted as a tool to help the decision-making process. This involves using the Risk Assessment component of Risk Analysis to provide a disciplined and consistent approach for the calculation of the relative level of 'risk' associated with each issue.

This relative level of risk can be used as a way of determining the appropriate level of management response and reporting.

How is Risk Assessment used?

The Risk Assessment, completed as part of the ESD Reporting Framework on each of the identified issues for the fishery, is done as an initial screening exercise that may be just the first step in a hierarchical process for determining what actions need to be taken. Those issues found to be of relatively high risk may require a more detailed analysis.

5.2 Risk Analysis

5.2.1 Overview

Given that readers of this *Guide* may not have been exposed to Risk Analysis techniques previously, it is important to understand how the process works in general before embarking on the detailed version developed for the analysis of fisheries issues.

The formal evaluation and management of risk via Risk Analysis is generally accepted as one of the basic instruments of good management practice. Risk Analysis involves:

- identifying the hazards/components;
- analysing those that pose a risk;
- determining appropriate management options;
- implementing the best of these options; and
- reviewing their effectiveness (see Figure 14 for details).

Many companies and government agencies now use this approach to assist in the development of their business plans. Consequently, there are now a large number of associations, consultants and institutes that specialise in completing and researching Risk Analyses[10]. Probably the industry with the longest history and most sophisticated approaches in this field is the insurance industry.

The processes that could be used for risk analysis/management are, in reality, a description of what should be done to effect the management of fisheries resources, but this has rarely been referred to in this manner.

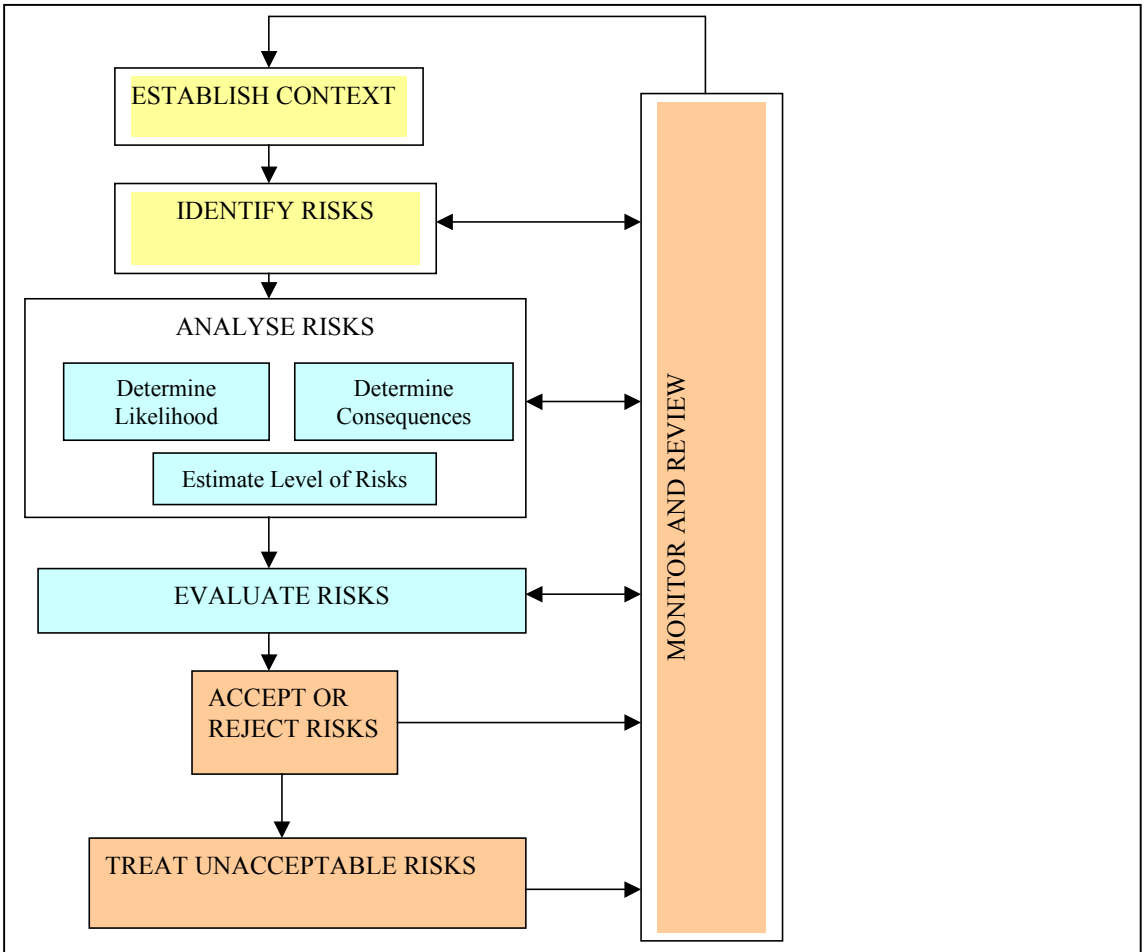


Figure 14 Outline of the Risk Management Process – adapted from the AS/NZS 4360: 1999

Note – issues in the 'Establish Context' and 'Identify Risks' boxes are covered in the previous section (Section 4 - Issue Identification), issues in the 'Analyse Risks' and 'Evaluate Risks' boxes are covered in this section (Section 5 – Prioritisation) and the 'Accept or Reject Risks', 'Treat Unacceptable Risks' and 'Monitor and Review' boxes are covered in the following section (Section 6 - Reporting Methods).

Not surprisingly, therefore, the ESD reporting framework outlined in this *Guide* are, to a large extent, merely a refined application of risk assessment principles.

The previous section on developing the component trees was merely a structured way of identifying the 'hazards' associated with a fishery – except that we called them by the less emotive term of 'sub-components'. What this current chapter describes is how to assess the risk associated with each of these sub-components, while the following chapter outlines how the management and monitoring of these risk should be generated.

5.2.1 Risk Analysis in the Fisheries Context

What is Risk?

"Risk is the chance of something happening that will have an impact on objectives (AS/NZS 4360- 1999)".

For a fisheries agency/department, 'risk' is associated with the chance of something affecting the agency/department's performance against the objectives in their relevant legislation. In contrast, for the commercial fishing industry, the term 'risks' generally relates to the potential impacts on their long-term profitability, while for the general community, 'risk' could relate to a possible impact on their enjoyment[11] of the marine environment.

The aim for each of these groups should be to ensure that the 'risk' of an unacceptable impact is kept to an acceptable level[12].

The calculation of a risk in the context of a fishery may be determined within a specified time frame (e.g. the life of the management plan, the generation time of the target species, the term of the current government) or 'for the foreseeable future'.

The management of risk is a sensible approach to take within the fisheries context because of the large number of potential issues and the impossibility of gaining a perfect understanding for any of these. The recent shift by many fisheries management committees to link their actions to the probability that stock assessment projections will meet agreed levels of performance is a good example of the application of techniques that acknowledge these uncertainties.

While not all elements of fisheries management will be able to use quantitative simulation modelling to predict the probabilities of performance given a set of proposed management arrangements, there is still value in utilising these principles across all relevant issues. The methods outlined below, developed to support the ESD reporting framework, use a formal risk assessment process that is consistent with the

[11] This enjoyment could include non-extractive and non-direct uses.

[12] In some cases there may be the opportunity to measure the 'risk' of having a beneficial outcome, particularly for social and economic issues.

Australian Standard AS/NZS 4360:1999 Risk Management and the companion paper on Environmental Risk Management – Principles and Process (HB 203:2000).

5.3 The Risk Assessment Process

5.3.1 General

What is Risk Analysis?

"*Risk analysis involves consideration of the sources of risk, their consequences and the likelihood that those consequences may occur."*
AS/NZS 4360 – 1999

As stated above, the major objective for using a risk assessment technique is to assist in separation of the minor acceptable risks from the major unacceptable risks. This assessment requires the determination of two factors for each issue – the potential consequence arising from the activity on this sub-component, and the likelihood that this consequence will occur[13].

The combination of the level of consequence and the likelihood of this consequence is used to produce an estimated level of risk associated with the particular hazardous event/issue in question.

Determining the levels of consequence and likelihood should involve an assessment of the factors that may affect these criteria, but this should be done in the context of what existing control measures - management arrangements - are already in place. For example, in determining the risks from fishing for the spawning biomass of a species of prawn, you would need to take into account the current management regime (such as whether there are any restrictions on boat numbers, closed seasons and areas, etc.) in assigning the appropriate likelihood and consequence values.

You should come up with very different values depending upon whether management is, or is not, included (if not, either you don't need management or your current management is having little effect). However, as the whole point of this exercise is to see whether current management is acceptable or not, the assessment *must* include the arrangements that are currently being used.

Consequence

The process of risk assessment begins by assessing the possible consequence level of an issue. The criteria used to assign a level of consequence can be:

- *Qualitative* – using a descriptive scale to describe the magnitude of potential consequences.

[13] Consequence and likelihood are sometimes described as impact and probability

- *Semi-quantitative* – in these cases the qualitative scales are given values. However, these numbers may not be an accurate reflection of the actual magnitude of the consequence.
- *Quantitative* – uses numerical values alone to assign the level.

In a qualitative system, the number of consequence levels used generally varies between four and six. The lowest level of consequence is usually assigned a value of zero or one, which should indicate a negligible consequence.

At the other end of the spectrum is the highest category, which should be a catastrophic/irreversible consequence, with the score being related to the number of categories. The assessment of the potential consequence of a hazard should be based upon the judgment of individuals or a group that collectively have sufficient expertise in the areas examined to provide credible assessments.

Likelihood

The likelihood of the consequence occurring is then assigned to one of a number of levels. Most systems use between four and six categories, varying from 'remote' to 'likely'.

In doing so, the participants should consider the likelihood of the 'hazardous' *event* (i.e. the consequence) actually occurring, - *not* the likelihood of the activity occurring. For example, in determining the likelihood of having a fatal car accident, you do not use the likelihood of driving a car. Instead, it is the likelihood that whilst driving a car you will have a fatal accident - i.e. likelihood is a *conditional probability.*

As with the consequence tables, the likelihood tables can use qualitative categories through to quantitative probabilities, depending upon the level of analysis needed and the level of data available.

Risk

The overall risk level for each hazard is generally calculated as the mathematical product of the consequence and likelihood levels (Risk = Consequence x Likelihood). From this product, which is called the *Risk Value*, each issue can be assigned a *Risk Ranking,* depending upon where a risk value falls within one of a number of predetermined categories.

In this *Guide*, five levels of risk have been suggested: 'Extreme', 'High', 'Moderate', 'Low' and 'Negligible'.

The cut-off values between the Risk Rating levels, and the management actions that flow from the different rankings, may be: "*based on operational, technical, financial, legal, social, humanitarian or other criteria" (AS/NZS 4360)* . In particular, you need to ensure that the outputs of the risk analysis correspond to the types of risks present and the outcomes that would be expected to occur.

5.3.2 Scope of Assessments

Risk assessment can be undertaken at a number of different levels of sophistication and detail. The level chosen greatly affects their complexity and cost to complete. Qualitative assessments are usually the least expensive, while quantitative are generally the most expensive.

Sophistication

The use of qualitative criteria for assigning consequence and likelihood is, according to the AS/NZS manual, common as an initial screening activity to identify risks that require more detailed analyses. This is the purpose for which the risk assessment process is being used in this ESD Reporting Framework.

Therefore, this *Guide* will outline the qualitative tables that have been developed to help assign the level of consequence and likelihood for use in the fisheries context. For some issues, the initial qualitative assessments may need to be followed up with more detailed semi-quantitative or fully quantitative assessments.

Detail

The issues assessed may be completed at very different levels of detail - from the very broad (e.g. impacts of the entire fishery) down to an assessment of the risk at a micro-level (e.g. rates of compliance for abalone bag limits in zone C).

For the purposes of this framework, we need to take a relatively high level approach, based on asking what is the risk to each issue of 'having a fishery'. In doing this, we need to recognise that this is actually integrating a large number of elements into an overall estimate of risk for the fishery.

If the overall level of risk for an issue were low, it would be unnecessary to complete a finer scale assessment. However, if the overall level of risk is high enough for specific management to be required, a second-phase risk assessment may be necessary, in order to identify the relative risks associated with each of the specific elements that led to the overall rating.

This finer scale analysis should assist in the development of appropriate management actions. These more detailed assessments may be needed as part of the process for completing the ESD component reports (see next section).

5.3.3 The Risk Assessment Process – Application to Fisheries

The value of any Risk Assessment depends upon the clarity and applicability of the consequence and likelihood tables that are used to classify each of the issues. When the development of the ESD framework began, no appropriate tables for the assessment of fisheries issues were available. Accordingly, one of the tasks has been to generate suitable tables by adapting those used for environmental impacts and by the adoption of first principles.

These range from developing the levels of consequence required to determining the appropriate scale to assess the issues.

For target species, the consequence of being caught during the process of a fishery needs to be assessed on the scale of the population of the species affected, not at the individual level. Obviously catching one fish is generally catastrophic for the individual caught, but usually not for a population.

Similarly, when assessing possible ecosystem impacts, this should be done at the level of the whole ecosystem or at least in terms of the entire extent of the habitat, not at the level of an individual patch or an individual of a non-target species.

Consequence Tables

With the Risk Assessment methodology recommended in this *Guide* largely being used as a first stage filtering process, only qualitative criteria[14] have been developed for the consequence and likelihood tables. In addition, it was recognised that more than one type of consequence table would be needed because the variety of issues - and the possible outcomes - differ both amongst the different component trees and, in some cases, within the same component tree.

Thus, a series of Consequence Tables, each with six levels of impact ranging from negligible to catastrophic, has been generated to cover:

1. General (described below);
2. Target species/major non-retained species;
3. By-product/minor non-retained species;
4. Protected Species (a category under both State and Commonwealth environmental Acts);
5. Habitat issues;
6. Ecosystem/trophic level effects; and
7. Political/Social effects

Tables 2 - 7 are described in Appendix 1.

[14] It is envisaged that this may develop into a semi-quantitative procedure over the coming years as we determine what numbers relate to the qualitative categories identified.

Table 2 The General Consequence Table for use in ecological risk assessments related to fishing (needs to be adapted to specific issue being assessed).

Level	General
Negligible (0)	Very insignificant impacts. Unlikely to be even measurable at the scale of the stock/ecosystem/community against natural background variability.
Minor (1)	Possibly detectable but minimal impact on structure/function or dynamics.
Moderate (2)	Maximum appropriate/acceptable level of impact (e.g. full exploitation rate for a target species)
Severe (3)	This level will result in wider and longer term impacts now occurring (e.g. recruitment overfishing)
Major (4)	Very serious impacts now occurring with relatively long time frame likely to be needed to restore to an acceptable level
Catastrophic (5)	Widespread and permanent/irreversible damage or loss will occur – unlikely to ever be fixed (e.g. extinctions)

The six more detailed Consequence Tables are described in full in Appendix 1.

Likelihood Table

The Likelihood Table that was developed also has qualitative criteria that range from 'remote' to 'likely'. Only one of these has been necessary so far (see Table 3)

Table 3 Likelihood Definitions

Level	Descriptor
Likely (6)	It is expected to occur
Occasional (5)	May occur
Possible (4)	Some evidence to suggest this is possible here
Unlikely (3)	Uncommon, but has been known to occur elsewhere
Rare (2)	May occur in exceptional circumstances
Remote (1)	Never heard of, but not impossible

Table 4 Risk Matrix – numbers in cells indicate risk value, the colours/shades indicate risk rankings (see Table 5 for details)

		Consequence					
		Negligible	Minor	Moderate	Severe	Major	Catastrophic
Likelihood		0	1	2	3	4	5
Remote	1	0	1	2	3	4	5
Rare	2	0	2	4	6	8	10
Unlikely	3	0	3	6	9	12	15
Possible	4	0	4	8	12	16	20
Occasional	5	0	5	10	15	20	25
Likely	6	0	6	12	18	24	30

Risk Rating Table

The matrix shown in Table 4 shows the resultant risk values, based upon the arithmetical calculation of the Consequence x Likelihood (0-30). These risk values have been separated into five risk ranking categories (See Table 5 for separation points) from 'negligible' risk to 'extreme' risk.

It is suggested that only issues of sufficient risk or priority (i.e. 'moderate', 'high' or 'extreme' risk), need to have a full performance reports completed. This should identify all those issues that require specific management actions.

Output from the Risk Assessment

The actual risk assessment is not just the scores generated during the assessment process but needs to include the appropriate level of documentation/justification for the categories selected.

For the negligible and low risk issues whilst full performance reports are not needed, a necessary element of the ESD Reporting framework is to document the rationale for classifying issues in these categories. These should form part of the ESD report so that stakeholders can see why these issues were accorded these ratings (and potentially supply additional or alternative information to affect subsequent assessments).

The level of justification required should be appropriate for 'low' compared to 'negligible' risk issues. It should be noted that if a full performance report is not needed, this by definition means that there are no specific management actions being taken.

If you need to take management actions, then you need to develop a performance report to assess the performance of this management. However, if you are not going to directly manage something, then having performance reporting is probably not a priority.

Finally, for issues that were rated as either having a 'high' or (especially) an 'extreme' risk, it is likely that extra management measures in addition to those already being applied may be necessary, or it may indicated that further information is needed to more accurately quantify the risks. These suggested outcomes are summarized in Table 5.

Table 5 Suggested Risk Rankings and Outcomes

Risk Rankings	Risk Values	Likely Management Response	Likely Reporting Requirements
Negligible	0	Nil	Short Justification Only
Low	1-6	None Specific	Full Justification needed
Moderate	7-12	Specific Management Needed	Full Performance Report
High	13-18	Possible increases to management activities needed	Full Performance Report
Extreme	> 19	Likely additional management activities needed	Full Performance Report

Operational Example

An example of how the process operates is as follows. If, given current management arrangements of a fishery, the greatest consequence that may happen to a particular harvested stock was that it could become recruitment overfished (which is a 'severe' consequence with a score of 4), but the likelihood of this occurring was 'unlikely' (which is a score of only 3).

This combination would generate a risk rating of 12. Using the Risk Ranking table, a score of 12 would be considered a 'moderate' risk – suggesting that continued management was required to ensure the risk was maintained at an acceptable level.

If the next time the fishery was assessed (or another stock is assessed) with the same potential consequence but this time the likelihood of recruitment overfishing was a higher – with this now being 'occasional' (perhaps due to an increase in the level of illegal fishing) this would increase the risk value to 15, which is a Risk Ranking of 'high'. This would identify the need for a probable increase in management actions to reduce this likelihood.

5.4 Tips and Guide to Use for Explaining these Concepts

It often takes a reasonable length of time for participants at any risk assessment workshop to become familiar with the process and what is required. It is useful, therefore, to run through a few examples that provide sufficient contrasts in consequence and likelihood to demonstrate how issues should be rated.

It is common for people to initially get confused in the assignment of issues to the correct categories within the consequence and likelihood tables. This confusion often arises because they try to directly rate the 'risk', not the two components of 'risk'.

Figure 15 (see below) has been used at the beginning of a number of workshops to illustrate the difference between 'consequence', 'likelihood' and 'risk'.

Some practical examples are shown below.

Example 1 – The pilchard mortalities that occurred around Australia's south coast some years ago. These caused a severe 'consequence' (Consequence level 3) but this only occurred rarely (Likelihood level 3). This is illustrated by the dark shaded section in Figure 15 – most of the time the consequence will be 'nil', but when a disease event hits, the consequence increases to 'severe'. Hence the overall Risk Rating for this issue is 9 – which is a 'moderate' risk.

Example 2 - The impact of the prawn trawl fishery on the king prawn stocks in Shark Bay. With the current levels of effort and the dynamics of this species, the 'likelihood' is that every year (e.g. Likelihood level 6) there will be a 'moderate' consequence (Consequence level 2) on the stocks. This is illustrated by the medium shaded section of Figure 15 – every year the line will be in the same place. The Risk Rating for this would be 12 - which is also only a 'moderate' risk.

Example 3 - The impact on the bycatch of tropical species by a South Coast trawl fishery. As these individuals are unlikely to contribute to any spawning biomass of these species due to their location outside of the spawning range, the impacts of their capture will at most be negligible (Consequence level 0). Furthermore, as this will only occur in the years when a strong Leeuwin current sweeps them south, the likelihood (illustrated by the light shaded regions) will only be 'unlikely' (Likelihood level 3). This produces a Risk Rating of 0 – a 'negligible' risk.

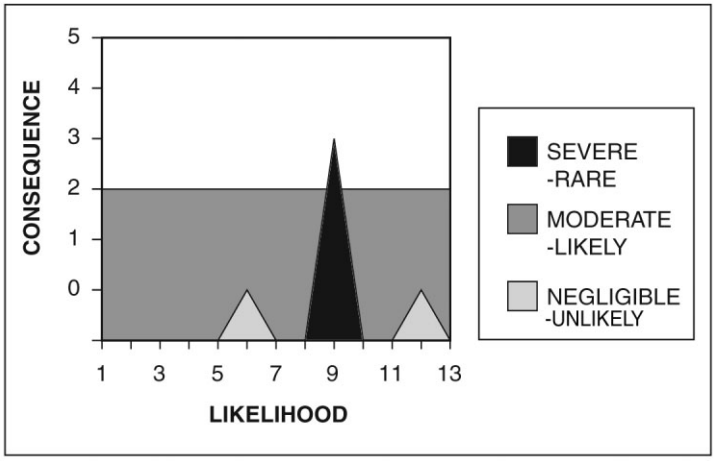


Figure 15 Pictorial representation of the differences between consequence and likelihood. The height (y axis) represents the relative level of consequence of an “incident”, with the frequency of the incident shown on the x axis for each of three examples.

SECTION 6 HOW TO WRITE PERFORMANCE REPORTS FOR EACH ISSUE

6.1 General Overview

For each of the lowest level or terminal sub-components/issues identified as greater than a low risk/priority[15], a detailed assessment report needs to be generated. The agreed set of standard headings for these ESD performance reports are listed below in Table 6.

Table 6 The list of agreed ESD report headings

1. Operational Objective (plus justification)
2. Indicator
3. Performance Measure/Limit (plus justification)
4. Data Requirements/Availability
5. Evaluation
6. Robustness
7. Fisheries Management Response
   - Current
   - Future
   - Actions if Performance Limit exceeded
8. Comments and Action
9. External Drivers

Using this set of headings for each of the sub-components:

- Assists in reducing confusion by having the same reporting format across all components/sub-components, especially for components where there is little existing experience with assessment.
- Separates discussions regarding the acceptability of performance measures/limits from discussions about the robustness of the actual indicator.
- Requires specific consideration of the management responses in relation to the information and risk. This should allow treatment for the situations where little data are being collected and assessed under a management strategy that can be shown to be safe (e.g. precautionary or robust).

The first step to completing the reports is to specify an operational objective for each sub-component. However, it should be noted that the setting of an objective for one sub-component might influence the performance of a number of other sub-components.

To be effective, the chosen objective needs to have a direct and practical interpretation in the context of the management of the fishery and, most importantly, performance against the objective needs to measurable and auditable. The objective should also be consistent with, and clearly linked, to any higher-level objectives that appear in legislation, policy

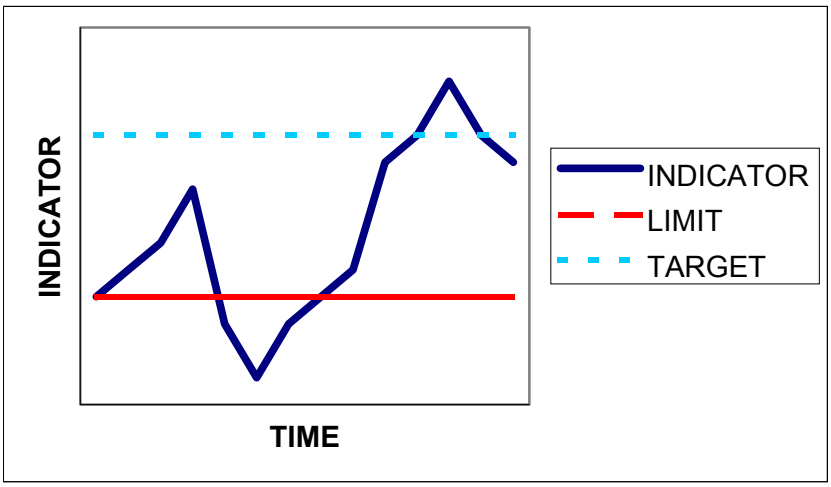
[15] Note, some low risk issues may still need to be reported at this intensity because they are of high public concern.

statements or management plans (i.e. provide the justification for selecting this objective compared to any other possible objective).

The indicator is the measure that is to be used to track performance with respect to an operational objective. The performance measures provide the means to enable interpretation of the indicator and can be expressed in relationship to one or more reference points (e.g. the biomass should remain as close as possible to the target X but go no lower than limit point Y – see Figure 16 for an example). It could simply be assessed in terms of a trend (e.g. increasing is desirable, stable is OK, decreasing is undesirable).

The operational objective, indicator and performance measure are a package. All three are needed before any one of them is useful. Indicators by themselves (as used in some reporting schemes) are of little value because without an objective and performance limit, you cannot interpret performance.

Figure 16 A summary of the relationships between the indicator and limit and target reference points that can be used for measuring performance. The measurement of performance can be 'binary' – acceptable or unacceptable - or it can be some function dependent on the distance the indicator is from the limits/targets (see also Sainsbury *et al*. 1998).



In addition to stating the operational objective, indicator and performance measure, there are headings for:

- data quality and availability;
- robustness of the indicators/performance measures;
- what the management responses are; and
- whether there are there any 'external'[16] drivers.

The inclusion of 'management response', particularly when it is discussed in relation to the data available, makes the explicit link between the operational objective, the measurement and reporting of performance and the action to be taken to maintain or improve that performance. This is an important distinction, and advantage of this National ESD framework, compared to other systems (Chesson *et al*., 2000).

[16] external to the fishery and its legislative basis (see more below)

Summary of Performance Reports:

Can you justify that the management actions you currently have in place are appropriate, given the level of risk and current knowledge of the issue?

It is envisaged that this reporting scheme for fisheries will evolve over time, as experience and understanding of the issues increases. This evolution is unlikely to end quickly, given that the standards and policies used to report on financial performance of companies are still being modified - despite having been in use for over half a century - to make them more relevant and effective. The development of effective fisheries 'accounting methods' is unlikely to be less elusive.

6.2 Description of Headings

6.2.1 Operational Objective

Each of the sub-components/issues requires an agreed operational objective. This must be an outcome-based objective, not a process or data gathering objective, i.e. "What, specific to this issue for this fishery, do you wish to achieve?"

It is not how you will achieve it, nor what you will need to achieve it, but, most importantly, performance against this objective must be measurable.

Generation of the objective:

- This could involve the recording of an existing objective listed in current management plan/arrangements.
- It may involve turning an implicit objective into an explicit objective (i.e. there has already been an objective developed, but it has just never been recorded formally before).
- The report may include a proposed objective that requires later ratification by the relevant MAC/Minister.
- The report may contain a series of alternative objectives for consideration and consensus at a later stage.

Irrespective of which method is used to generate the objective, the justification for choosing this objective must be recorded. This justification should also provide specific information as to how it relates to any relevant higher-level objective, such as those present in the relevant legislation/act.

It is important to emphasise that the justification required is for the selection of the objective, it is *not* where you describe what management arrangements will be used to achieve the objective (these should be detailed below in 'Management Responses'). The justification should change, depending upon what objective is chosen - which may vary due to the type of issue or the specific circumstances. The justification should signal what type of performance measure should be used (i.e. limit, target).

6.2.2 Indicator

For each operational objective, an indicator or indicators needs to be identified. This can be a direct measurement of performance (e.g. employment numbers for employment) or a surrogate (e.g. catch per unit effort as an estimator of abundance).

Initially, it was thought that having more than one indicator would not be helpful because they would need to be combined somehow to form an assessment of current performance. However, a composite of indicators can be used to provide a greater degree of confidence in the result, particularly where none of these by themselves is considered particularly robust.

It should be recognised that in some cases the collection of more than one indicator could suggest that different aspects are being addressed, hence you may need more operational objectives – one for each indicator. There is no definitive limit to the number of sub-components and hence operational objectives that can be developed.

Ultimately, it is not appropriate to collect indictors that are not used in the assessment of an objective or to collect a number of indicators without developing the protocol to integrate them into the decision-making process. So if more than one indicator is collected, the protocols for determining how they will be integrated into the decision process must also be developed.

6.2.3 Performance Measure

Is performance acceptable or not? Having some type of performance measure is necessary to define how you will interpret the indicator to enable a determination on whether performance against the objective is acceptable (see Figure 16 for examples).

The performance measure can take a number of forms which includes:

Specific value measures

- Limit reference points – the values which management avoids reaching (either exceeding or falling below, depending upon the issue); and
- Target reference points – the values which management should be directed to attaining

A range of values

- A range of values within which performance is considered acceptable, outside of which performance would not be considered acceptable.

A trend in values

- A positive trend could be good, but a negative trend would be bad (or the reverse – depending upon the issue and indicator).

Adequacy of Performance

1. Binary Method

Performance is either acceptable or not acceptable.

2. Continuous method

The adequacy of performance can be measured more precisely by using the distance the indicator is from either some target or limit reference point - the closer to the target or the further from the limit, the better is the performance. For trend indicators, the actual slope of the trend line, rather than if it is just positive or negative could be used.

Some monitoring schemes use non-linear functions to enable an even more precise measurement of performance. Again, the system used to gauge performance can be as complicated or as simple as you need to make it - you merely need to justify what you are using and why this scheme was chosen (see below).

Development of the performance measure may involve*:*

- Recording a performance measure that is already in use from the current management plan/arrangement.
- Turning an implicit performance measure into an explicit one (i.e. a limit, target, trend that is already being used to assess performance, but had not been written down).
- Agreeing to a proposed performance measure for later ratification.
- Listing a series of potential measures for later consultation (if possible recording the justification for the proposals made).

6.2.4 Justification

It is vitally important that the justification for choosing the level/limit/trend function for assessing the performance measure against the objective is provided.

This ultimately is the most important decision for the management of this issue and therefore the reasons for choosing this level, including any assumptions used (previous studies, historical trends in the fishery, preferably scientific references etc.), needs to be articulated clearly.

6.2.5 Data Requirements and Availability for Indicator

What data do you need to measure the indicator? This is where you should explain the types of data that are needed to generate the indicator – i.e. what monitoring schemes are in place or need to be put in place.

In many cases, this may require more than one sampling regime to generate all the information used to generate the indicator – particularly for more complicated measures involving simulations of population biomass.

You also need to ask:

- What data are currently available and how accurate are the data that will be used?
- What data will be available in the future?

This is often best depicted using a table/matrix see below:

Data Required	*Availability*
Description of Indicator/Supporting Data	Time period for which data are available or when data will become available

6.2.6 Evaluation

If data are available, how well is the fishery performing against the objective? Usually graphs such as that depicted in Figure 16 are useful – showing both the indicator and how it relates to the performance measure.

This should be accompanied by a description of the information and an explicit statement (somewhere near the front of the section) as to whether the assessment of the current performance of the fishery is acceptable or not. It should also have a textual description and interpretation of the information provided.

6.2.7 Robustness

What is the robustness of the current indicator/performance limit/evaluation? This could involve both a textual description and possibly choosing a summary level (e.g. High/Medium/Low – see Table 7 for examples of possible categories).

This is where you discuss how well the indicator and the performance measure are at measuring the performance of the fishery against the operational objective. Thus, if your objective relates to levels of employment and your indicator is employment numbers, then this indicator would normally be considered robust.

However, if your objective relates to the acceptable level of bycatch the fishery catches, but the only indicator available is total fishing effort, then this is likely to be less robust.

Furthermore, you may have very good measures of the indicator, such as estimates of bycatch, but the performance measures may be less robust. Thus, you may not have a precise understanding of what is, or is not, an acceptable level of bycatch.

Consequently, the robustness of the indicator and the performance measure may need to be determined separately.

Finally, you need to provide an overarching assessment of whether the combination of current indicator, performance measures and management strategy are suitable to meet the objective. Thus, it is not necessary to always have a highly robust indicator and performance measure if you can show that the management strategy is suitably precautionary.

Table 7 Possible Robustness Classifications for Indicators

Level	Description
HIGH	The indicator is a direct measure of the objective, or if indirect, is known to closely reflect changes in the issue of interest.
MEDIUM	The indicator is suspected to be reasonably accurate measure against the objective, or the known error is in the conservative direction.
LOW	The degree to which the indicator measures against the objective is largely unknown, or known to be low. Often this will involve surrogate indicators.

6.2.8 Fisheries Management response

This is the section where you describe what actions you are taking or going to take to achieve the operational objective. What is the total package of management arrangements (current, future, triggered) that have been developed? The types of responses should particularly note the level of information available and the reliability of the evaluation.

Current

What are the current management arrangements that are in place to maintain or improve performance and help you achieve the objective?

This is where all the current management arrangements can be listed. If these have been presented in detail in any background information, then a list of 'dot points' (brief statements) about them and a reference to the more detailed section should be sufficient. Somewhere (either in the background information or here) there should be an explanation as to how each of the arrangements will impact on performance.

Future

What, if any, are the proposed (i.e. extra or different) management arrangements/options (e.g. harvest strategies etc), including any possible changes to

current arrangements that have been identified and proposed to be implemented? These are *in addition* to the current arrangements - you should not simply state that the current arrangements will be used in the future.

These changes should also probably make some reference to the current level of the indicator (i.e. current performance); the degree of information available; and the reliability of the evaluation (i.e. why is there to be a change in the management?).

If the Performance Measure/Limit is 'exceeded'?

We must also consider what will be done if the Performance Measure is 'exceeded'. What will the management/industry response be if the performance targets/limits/trigger points etc indicate that performance is unacceptable? This may range from the instigation of a review that would determine the future actions that would occur, through to having explicit harvest strategies in which the management actions are totally pre-determined.

The degree to which the future actions can be predetermined will depend upon the fishery, the level of understanding of the dynamics, and the causes of changes to the indicator. In general, the more robust the indicator, the more likely it is that preset harvest strategies can be used. Where the indicator is not very robust then you would first need to ascertain why it has reached the performance limit before determining what management actions to take.

Issues for other agencies

Some indicators may require informing other relevant government agencies. This probably does not relate too much to retained species, but may relate to non-retained species such as interactions with seals or dolphins.

For example, if some agreed level of interaction is breached for these types of species, the relevant environment-conservation agency may need to be informed. For the social and economic issues, this could involve informing the social welfare agencies if there is to be a severe cutback in fishing operations that are likely to result in loss of employment/income, etc., in a region.

External groups appear keen to have the management responses in such circumstances as automated as possible, largely due to the seeming inaction so often associated with previous examples of 'trigger points' having been reached. It is therefore incumbent upon the agencies concerned to ensure that the limits imposed are appropriate and do not get triggered every second year when there isn't a real problem. This is required to maximise the confidence in the industry and the external.

6.2.9 Comments and Action

This section provides an overview of what future actions need to be done for this issue (e.g. begin new monitoring, alter management plan etc.), or what may need to be monitored more closely or looked at next time the issue is assessed.

6.2.10 External Driver Check List

This section is designed to articulate the factors that are known to potentially impact on performance against the objective, but which are outside of the legislative responsibility of the management agency.

Thus, issues such as climatologically-driven recruitment variations are acceptable as external drivers. However, the level of illegal catch is not.

The latter issue should be covered under the legislation of fisheries agencies and whilst it is an issue that affects performance, it is not an external one – there is even a specific section on compliance in the 'Governance' section of this document. A full discussion of the major external drivers is also covered within the 'Ability to achieve' section.

6.2.11 Further Details on Completing the Performance Reports

The complete descriptions, along with a set of tips and examples for completing the performance reports for each of the eight ESD components, are provided in Appendix 2.

SECTION 7 WHAT BACKGROUND INFORMATION IS REQUIRED?

It is sensible and appropriate to include a relatively comprehensive description of the fishery and the environment that the fishery operates in as background material. This allows the other material provided to be put into context[17]. This material should include the information covered in the following sections.

7.1 Information on the Fishery

This section should include a summary of the history of the fishery's operation and significant events that have occurred, particularly those that have had a major influence on the current structure of management. There should also be a detailed description of current fishing methods, and what species the fishery targets.

The current management arrangements should also be described in detail, with appropriate references to where these arrangements are located within the relevant legislation, regulation, ministerial policy arrangements, etc.

7.2 Information on the Environment

This section should describe the basic biological and ecological characteristics of the main species affected by the fishery. An adequate summary of the information on the biology, population dynamics and other relevant information should be presented for each of the target species. There should also be a discussion of the major areas where information is presently unknown or for which major uncertainties remain.

This material should be sufficient to allow the reader to gain a good enough understanding of these issues to comprehend both the risk assessment-prioritization outcomes and the rationale behind any management strategies.

A description of the main habitats that the fishery operates within should also be presented. In particular, whether the habitats are robust, fragile, widespread and/or unique to this area, etc., should be summarised. With respect to the ecosystem, if there evidence or not for strong trophic interactions occurring in these regions, this should be articulated.

You could also summarise what are likely to be the main causes of natural fluctuations (e.g. currents) and whether there are likely to be any major human-derived perturbations (e.g. pollution). Again, these descriptions should provide the reader with an overview that enables them to understand the sections on which issues were identified, how they were prioritized, and what actions were generated.

[17] It is sensible to compile this information as one of the first tasks in the process as it of great value when developing the component trees and completing the risk assessment

7.3 Information on the Social & Economic Environment

A short summary of the social and economic environment that the fishery is operating within should be provided. This should include:

- Whether it is a relatively big fishery or a small fishery.
- Whether it generates large amounts of export dollars.
- Whether it fills some local need, etc.

Again, this is to provide some context for the readers. Whilst detailed descriptions of this material will be provided in the relevant socio-economic component reports, it is valuable to have some of this information available prior to reading the detailed environmental reports.

7.4 Information on Methodology

There should also be a section provided that includes a description of the methods used to generate the material (Outline of Reporting Process). This should define the scope of the fishery being examined and why this was chosen.

The methods used to generate the component trees, complete the risk assessment and write the performance reports should also be described. This could refer to this *Guide* as a main reference but a summary of the techniques used is probably needed.

Moreover, the section should outline the level of stakeholder involvement for each of these tasks.

7.5 General

The following table provides a set of suggested headings and sub-headings for the background material. This set of headings could be further expanded or reduced, depending upon the specific circumstances of the fishery being examined. Examples of completed reports will be lodged on the website www.fisheries-esd.com for reference as they become available.

Table 8 Suggested Headings for Report

Background
- Description of Fishery
- Summary of Management Objectives and Arrangements
- Biology of Species
- Major Environments – Biophysical, Economic, Social

Outline of Reporting Process
- Scope
- Component trees
- Risk Assessment
- Performance Reports

Performance Reports
- Retained Species
- Non-Retained Species
- Other Impacts on the Environment
- Indigenous Well-being
- Community Well-being
- National Well-being
- Impacts of the Environment
- Governance

Bibliography

Appendices
- Attendees/Participants in Process
- Management Plan/Regulations

SECTION 8 BIBLIOGRAPHY

Chesson, J., and Clayton, H. (1998) *A Framework for Assessing Fisheries with Respect to Ecologically Sustainable Development*, pp 60, Bureau of Rural Sciences, Canberra.

Chesson, J., Clayton, H. and B. Whitworth (1999) *Evaluation of fisheries-management systems with respect to sustainable development.* ICES J. Mar. Sci. 56:980-984

Chesson, J. Whitworth, B. and T. Smith (2000) *Reporting on Ecological Sustainable Development: The reporting framework of the Standing Committee on Fisheries and Aquaculture in relation to national and international experience.* Bureau of Rural Science, Canberra, 100pp (available at www.fisheries-esd.com)

CoA (Commonwealth of Australia) (1992) *The National Strategy for Ecologically Sustainable Development,* AGPS, Canberra.

Coakes, S. (1999) *Social Impact Assessment: A policy maker's guide to developing Social Impact Assessment programs* BRS, Canberra 15pp.

FAO (1995) *Code of Conduct for Responsible Fisheries*, Food and Agriculture Organization of the United Nations, Rome.

FAO Fishery Resources Division. (1999) *FAO Technical Guidelines for Responsible Fisheries No. 8 - Indicators for Sustainable Development of Marine Capture Fisheries*, pp 67, Food and Agriculture Organization of the United Nations, Rome.

Fletcher, W.J. (2002) *Policy for the implementation of Ecologically Sustainable Development for Fisheries and Aquaculture within Western Australia.* Fisheries Management Paper No. 157, Department of Fisheries, Western Australia, 70pp.

Fletcher, W., Chesson, J., Sainsbury, K., Hundloe, T., Fisher, M. (2001) ESD reporting: Developing a framework for fisheries: progress, problems and benefits. *Proceedings of the National OUTLOOK Conference 2001*. Vol. 1 Natural Resources, pp157-161

Garcia S. M. (2000) The FAO definition of sustainable development and the Code of Conduct for Responsible Fisheries: an analysis of the related principles, criteria and indicators, *Marine and Freshwater Research - Special Issue: Sustainability Indicators in Marine Capture Fisheries 51(5)*, 535 - 540,

Garcia, S. M., and Staples D.J. (2000) Sustainability reference systems and indicators for responsible marine capture fisheries: a review of concepts and elements for a set of guidelines, *Marine and Freshwater Research - Special Issue: Sustainability Indicators in Marine Capture Fisheries 51(5)*, 385 - 426,

Hundloe T.J. (2000) Economic performance indicators for fisheries, *Marine and Freshwater Research - Special Issue: Sustainability Indicators in Marine Capture Fisheries 51(5)*, 485 - 492,

PC (Productivity Commission) (1999) *Implementation of Ecologically Sustainable Development by Commonwealth Departments and Agencies*, Report No. 5, Ausinfo, Canberra

Sainsbury, K.J, Smith, A.D.M, and H. Webb (1998) *Current use and recommendations for future development of sustainability indicators to measure performance of Australian Fisheries against ESD objectives*. FRDC project 98/168 Canberra, 105pp.

Standards Australia, and Standards New Zealand. (1999) *AS/NZS ISO 4360:1999: Australian/New Zealand Standard. Environmental management systems- - General guidelines on principles, systems and supporting techniques* pp 32, Standards Australia, Standards New Zealand, Canberra, Wellington.

Standards Australia, and Standards New Zealand. (2000) *Environmental Risk Management – Principles and Process (HB 203:2000),* Sydney, Wellington.

Staples, D. (1997) Indicators of Sustainable Development In: *Developing and Sustaining World Fisheries Resources* 2nd World Fisheries Congress, pp719-725

Stobutzki I.C., Blaber S., Brewer D., Fry, G., Heales D., Jones P., Miller M., Milton D., Salini J., Van der Velde T., Wang U.-G., Wassenberg T., Dredge M., Courtney A., Chilcott K., and Eayrs S. (2000). *Ecological sustainability of bycatch and biodiversity in prawn trawl fisheries*. FRDC Final Report 96/257, 512 pp.

Whitworth, B., J. Chesson, et al. (2000). *Reporting on ecologically sustainable development in Commonwealth fisheries*. Canberra, Bureau of Rural Sciences

WCED (1987) *Our Common Future*. World Commission on Environment and Development Oxford University Press, 400pp

SECTION 9 ACKNOWLEDGEMENTS

This report was only possible from the generous support and involvement of many people around the country. Obviously, the financial and logistic support from FRDC was a vital part of this project but there were also significant in-kind contributions from most fisheries management agencies and industry stakeholders.

The project team received a significant level of logistic support, particularly during the initial segment of the project from Tracey McVea (NSW Fisheries), Alex McNee and Tim Smith (BRS) along with Mike Drynan, Michaeli Fulton and Jennifer Doust (AFFA).

Derek Staples (BRS) helped immensely through his facilitation of the early meetings, knowledge of the issues associated with implementing ESD and his general encouragement.

We are indebted to the local case study managers in each jurisdiction that organized the case study meetings, the outputs of which formed the basis of this *Guide*. Most thanks, however, must go to the stakeholder participants at each of the case studies and the ESD Reference group meetings who gave their time to discuss and improve the processes outlined above.

Finally, the text was prepared for publication by Steve Ireland from the Community Relations Branch of the Department of Fisheries in WA.

APPENDIX 1 DETAILS OF THE RISK ASSESSMENT CONSEQUENCE TABLES

A1.1 General

The six detailed Consequence Tables were designed to assist in the process of rating issues. Because of the current priority to deal with the environmental issues (i.e. to meet the Environment Australia requirements for *Environment Protection and Biodiversity Conservation Act 1999* assessments), most of the tables created so far only cover these types of issues.

The criteria within each level of the tables are qualitative, based on the general table presented above, although in one instance (the Habitat Table), suggestions are presented about what quantitative levels may be relevant to the qualitative levels – but these are only suggestions.

To realistically assess the ecological impacts (not the social impacts, e.g. community attitudes to an activity), as stated above, the assessments must be completed at the level of the relevant local population (unit stock), habitats, and ecosystems within the local bioregion - not at the level of an individual or 'patch'.

The consequences must also be scaled appropriately - from virtually 'nil' through to 'widespread' and 'irreversible'.

The temptation to shift the assessment across into social issues, such as the wastage of non-retained species, beyond any true environmentally-based assessment of ecosystem impact, needs to recognised and allocated to the appropriate section. Such social/political and other non-ecological issues are likely to be just as important to assess as ecological impacts and may alter what happens to the priority of an issue, but it is important to distinguish whether something is a social/moral rating or whether it is an environmentally-based rating.

The suggested Consequence Tables that have been developed for use in the risk assessment do not mimic exactly the eight categories for ESD. This situation has occurred for a number of practical reasons.

In assessing the retained species, it was clear that there needed to be separate Consequence Tables generated for target species and by-product species. In contrast, the categories for major non-retained species are identical to those of target species, because they are both needed to assess the impacts of fishing on fish populations, so the same Consequence Table applies to both.

The 'Protected Species' (not threatened species) table was generated because the public's expectation for many of the species in this category requires that a 'higher' level of protection is expected for them than for other species. As a result, there are some categories of non-retained species that have been categorised according to social values. It is recognised that there may be some

inconsistency in this approach, but it is matter of trying to categorise species in a manner that is as 'realistic' as possible.

Ecosystem issues generally fall into two categories - those that may affect the habitat in a rather direct fashion and those that may impact on the ecosystem function in a more indirect manner. Hence two tables were developed.

For, both of these tables, the use of IMCRA-style definitions or other scientifically determined scales (e.g. for World Heritage Area listings) may be useful.

No tables have been generated for the broader environmental impacts (which include impacts on air quality and water quality). Many of these types of issues are already subject to other legislation/standards and over time these will be added to later versions of the *Guide*.

For the social and economic components, at the moment the only Consequence Table generated covers the political outcomes, and this has largely been included only to demonstrate that the concept can be used within these areas. Methods to determine the relative levels of social dependence and sensitivity to change are available from the Bureau of Rural Sciences (using ABS statistics) and these values can be used to identify which towns/communities/regions may be at significant risk following changes to management arrangements.

The following sections will explain each of the six tables in detail. This will include suggestions on how the assessments could be completed/utilised.

A1.2 Retained Species (Primary)

Table A1 Suggested consequence categories for the Major Retained/Non-Retained Species

Level	Ecological (Retained: target/Non-retained: major)
Negligible (0)	Insignificant impacts to populations. Unlikely to be measurable against background variability for this population.
Minor (1)	Possibly detectable, but minimal impact on population size and none on dynamics.
Moderate (2)	Full exploitation rate, but long-term recruitment/dynamics not adversely impacted.
Severe (3)	Affecting recruitment levels of stocks/or their capacity to increase.
Major (4)	Likely to cause local extinctions, if continued in longer term (i.e. probably requiring listing of species in an appropriate category of the endangered species list (e.g. IUCN category).
Catastrophic (5)	Local extinctions are imminent/immediate

A1.2.1 Scale of Assessment

The risk should be assessed at the level appropriate to the relevant reproducing population – or unit stock of the species, not some arbitrary spatially based unit.

A1.2.2 General Description

This qualitative table describes the suite of potential consequences that may occur to a population due to fishing. This extends from virtually no impact to complete extinction. This is the appropriate spread of consequences for this type of interaction.

The average target stock of a fishery will probably have at least a moderate level of consequence – this results from most fisheries having objectives related to fully harvesting species but not overfishing them. For those stocks where there is a chance that recruitment overfishing may occur, a higher consequence level should be chosen.

For example, abalone fisheries will often have values in the 'severe' to 'major' categories, depending upon the effectiveness of management controls and compliance because they are especially prone to overfishing. Species with more robust dynamics, such as prawns, are unlikely to ever get past a 'severe' consequence.

A1.2.3 Suggestions

In assessing the risk of the fishery on each of the target species, the risk assessment should integrate/incorporate the following elements (which themselves may have a number of more detailed factors):

- *The removals, by all sectors (i.e. commercial fishing, recreational fishing, indigenous, illegal and discards).*

How many fisheries capture this species? Do you know what these amounts are? The greater the relative amounts of catch being removed and the larger the number of other sectors catching the species, the higher the possible consequence is likely to be. This would be increased as the level of uncertainty about the quantum of catch (not the exact amount) by each sector increases.

- *Species biological characteristics/dynamics*

Does the biology of the species make it more likely to be susceptible to over fishing? For example, is it long-lived and low fecundity, short lived and high fecundity, widely dispersed, local populations only?. Thus, as suggested above, abalone are far more susceptible to over fishing than prawns or many finfish species.

- *The current knowledge and understanding available on these issues (including distribution versus area fished)*

Do you have a large amount of data on the species and the sources of mortality? The less data available, the higher the risk is likely to be.

- *Current management arrangements - their effectiveness and problems*

Are the current management arrangements, including compliance with rules and effort limitation methods, working? If not, then the potential consequence and/or the likelihood of an unacceptable consequence are likely to be higher. Obviously each of these elements interacts with each other. For example, you may be able to have a relatively large catch on a susceptible species if appropriate management arrangements are imposed combined with effective monitoring that enables external parties to see that these arrangements are working successfully.

A1.3 Retained Species (By-Product)

Table A2 Suggested consequence categories for the By-Product Species/Minor Non-retained species

Level	Ecological (RETAINED: By-product/Non-retained: other)
Negligible (0)	The area where fishing occurs is negligible compared to where the relevant stock of the species resides (< 1%).
Minor (1)	Take in this fishery is small (< 10%), compared to total take by all fisheries and these species are covered explicitly elsewhere. Take and area of capture by this fishery is small, compared to known area of distribution (< 20%).
Moderate (2)	Relative area of, or susceptibility to capture is suspected to be less than 50% and species do not have vulnerable life history traits.
Severe (3)	No information is available on the relative area or susceptibility to capture or on the vulnerability of life history traits of this type of species. Relative levels of capture/susceptibility suspected/known to be greater than 50% and species should be examined explicitly.
Major (4)	N/A Once a consequence reaches this point it should be examined using Table A1.
Catastrophic (5)	N/A (See Table A1).

A1.3.1 Scale of Assessment

This should be assessed at the level of a locally reproducing population – unit stock (if known).

A1.3.2 General Description

The species relevant to this table are those in the by-product branches or minor elements of the non-retained species, where there may not be a large amount of specific data available. This table was designed to produce reasonably robust consequence levels up to the point where this was appropriate – i.e. the moderate level. Anything higher than this must be assessed separately using the previous Consequence Table or by the collection of more information to determine if a lower consequence values is valid.

A1.3.3 Suggestions

Assessing the risk of having this fishery for each component should integrate/incorporate

- only the species affected by the fishery being examined,
- the relative impact of this fishery compared to the distribution of the species and other impacts on the stocks.
- the biological characteristics and dynamics of the species captured, and
- the current knowledge and understanding available on these issues and current management arrangements.

A1.4 Protected Species

Table A3 Suggested consequence levels for the impact of a fishery on Protected species.

Level	Ecological
Negligible (0)	Almost none are impacted
Minor (1)	Some are impacted but there is no impact on stock
Moderate (2)	Levels of impact are at the maximum acceptable level
Severe (3)	Same as target species
Major (4)	Same as target species
Catastrophic (5)	Same as target species

A1.4.1 Scale of Assessment

This is assessed at the level of a locally reproducing population – unit stock (if known).

A1.4.2 General

This table was generated because the criteria for assessing the impact on the species on the protected list appear to be more stringent than merely using ecological criteria. Thus, there appears to be a level of social/moral add-on attached to these species and therefore the criteria are different than species not on the list.

A1.5 Habitat Issues

Table A4 Suggested consequence levels for the impacts of a fishery on habitats.

Level	Ecological (HABITAT)
Negligible (0)	Insignificant impacts to habitat or populations of species making up the habitat – probably not measurable levels of impact. Activity only occurs in very small areas of the habitat, or if larger area is used, the impact on the habitats from the activity is unlikely to be measurable against background variability. (*Suggestion- these could be activities that affect < 1% of original area of habitat or if operating on a larger area, have virtually no direct impact)*
Minor (1)	Measurable impacts on habitat(s) but these are very localised compared to total habitat area. *(Suggestion – these impacts could be < 5% of the original area of habitat)*
Moderate (2)	There are likely to be more widespread impacts on the habitat but the levels are still considerable acceptable given the % of area affected, the types of impact occurring and the recovery capacity of the habitat. *(Suggestion – for impact on non-fragile habitats this may be up to 50% [similar to population dynamics theory] - but for more fragile habitats, to stay in this category the percentage area affected may need to be smaller, e.g. 20%)*
Severe (3)	The level of impact on habitats may be larger than is sensible to ensure that the habitat will not be able to recover adequately, or it will cause strong downstream effects from loss of function. *(Suggestion - Where the activity makes a significant impact in the area affected and the area > 25 - 50% [based on recovery rates] of habitat is being removed)*
Major (4)	Substantially too much of the habitat is being affected, which may endanger its long-term survival and result in severe changes to ecosystem function. *(Suggestion this may equate to 70 - 90% of the habitat being affected or removed by the activity)*
Catastrophic (5)	Effectively the entire habitat is in danger of being affected in a major way/removed. *(Suggestion: this is likely to be in range of > 90% of the original habitat area being affected).*

A1.5.1 Scale of Assessment

Habitat (attached species – e.g. seagrass/coral) assessed at the regional habitat level, defined as the entire habitat equivalent to that occupied by the exploited stock. The real extent against which impacts should be judged is not the current distribution, but what is considered the best estimate of the original extent of the habitat.

General

There should be some inverse relationship between the relative level of potential impact on a habitat from an activity and the relative extent of the habitat over which the activity can be allowed to occur. For example, the real extent over which dredging, which is usually classed as one of the most destructive forms of fishing, should be allowed, would be much smaller than that for less destructive methods such as line fishing.

Determining what is an acceptable level of loss or disruption to a habitat may involve examining the impacts on the dynamics of the habitat species, but also the indirect impacts of the species reliant on the habitat. Obviously, some habitats are more fragile than others, which will affect the levels of disturbance they can withstand sustainably. Furthermore, some habitats form important functions such as juvenile fish habitats and this may need to be included in the determination of the levels of acceptable disturbance for each region/activity.

A1.6 Ecosystem Issues

Table A5 Suggested consequence levels for the impact of a fishery on the general ecosystem/trophic levels.

Level	Ecological (ECOSYSTEM)
Negligible (0)	General - Insignificant impacts to habitat or populations, Unlikely to be measurable against background variability Ecosystem: Interactions may be occurring but it is unlikely that there would be any change outside of natural variation
Minor (1)	Ecosystem: Captured species do not play a keystone role – only minor changes in relative abundance of other constituents.
Moderate (2)	Ecosystem: measurable changes to the ecosystem components without there being a major change in function. (no loss of components).
Severe (3)	Ecosystem: Ecosystem function altered measurably and some function or components are locally missing/declining/increasing outside of historical range &/or allowed/facilitated new species to appear. Recovery measured in years.
Major (4)	Ecosystem: A major change to ecosystem structure and function (different dynamics now occur with different species/groups now the major targets of capture) Recovery period measured in years to decades.
Catastrophic (5)	Ecosystem: Total collapse of ecosystem processes. Long-term recovery period may be greater than decades.

A1.6.1 Scale of Assessment

The indirect impacts due to flow-on effects of food chain interactions should be assessed at the regional/bioregional level – this is equivalent to the 'species'/unit stock scale. Thus, this assessment should not be completed just for the area where the fishery operates, unless this is the entire extent of this community/bioregion.

A1.6.2 General

The changes to the ecosystem from the removal of prey/predators on the food chain are, in most cases, a difficult concept to even define. The qualitative criteria presented in the table are there to be functionally equivalent to the criteria generated for a species – i.e. from no measurable impacts through to extinction.

Unlike the impacts on target species or even impacts on habitats, documented examples of these effects are both fewer and more varied in their outcomes. In general, flow-on trophic-related effects only occur *after* the collapse of the target stock(s) - not before.

The only circumstances where these trophic-related effects may possibly occur before a collapse would be restricted to situations where the target stock plays a keystone role in the ecosystem – either as a 'predator'– (e.g. sea otters, urchins and macroalgae – leading to either kelp beds or barren grounds, depending upon whether sea otters are present or not), or the sole 'prey' of a predator.

A1.7 Social/Political Consequences

Table A6 Possible consequence levels for impacts of management of a fishery at a political level

Level	SOCIAL - POLITICAL
Negligible (0)	No impact - would not have any flow-on impacts to the local community. No fisheries department staff would need to make a statement.
Minor (1)	May have minor negative impact on the community (for example, small number of job losses) but these impacts would be easily absorbed.
Moderate (2)	Some increase in unemployment and decrease in overall income to which the community will adjust over time. Some community concern, which may translate to some political action or other forms of protest.
Severe (4)	Significant reductions in employment and income associated with the fishery. Significant employment and income flow-on effects to other community businesses, as reduced income and increased unemployment in fishing works its way through the local economy. Significant levels of community concern over the future of the community, which may translate to political action or other forms of protest.
Major (6)	High level of community impacts which the community could not successfully adapt to without external assistance. Significant level of protest and political lobbying likely. Large-scale employment and income losses in the fishing sector of the local economy. Significant flow-on effects in terms of increasing unemployment and income reductions as a consequence of changes to the fishery. Decline in population and expenditure-based services (e.g. schools, supermarkets, bank). Population declines as families leave the region looking for work.
Catastrophic (8)	Large-scale impacts well beyond the capacity of the community to absorb and adjust to. Likely to lead to large-scale rapid decline in community income and increase in unemployment in areas directly and indirectly related to fishing. May lead to large-scale and rapid reduction in population as families leave the region. Likely to lead to high levels of political action, protest and conflict. Significant reduction in access to private and public sector services, as businesses become unviable and target populations needed to attract government and commercial services decline below threshold levels.

A1.7.1 Scale of Assessment

In this case, the affected community would include those towns that derive a significant proportion of employment and or income from the fishery, either directly or indirectly.

A1.7.2 General

An understanding of the social impacts of fisheries management decisions does not assume either that fisheries management decisions will be made to minimise social impacts at the expense of ecological considerations - or that fisheries management agencies are responsible for intervening to minimise the social impacts of their actions.

At best, if a management agency is aware that a management action will have severe - or worse - social impacts on a local community, they should bring this to the attention of relevant state, local or Commonwealth agencies. For example, the decision to deregulate the dairy industry was taken and implemented by the relevant agriculture departments. At the time, an assessment of potential social impacts was undertaken and identified those rural communities least likely to be able to absorb any negative impacts.

As a result, assistance was provided in the form of employment and small business programs by the Commonwealth agency with responsibility for small business. The original decision was not affected and the agriculture agencies were not expected to respond to the community impacts, as this was outside their area of responsibility.

APPENDIX 2 ADVICE AND EXAMPLES FOR COMPLETION OF REPORTS

A2.1 Retained Species

A2.1.1 Objectives

The most common objective for retained species is:
*To maintain the spawning stock of {*insert species name here*} at or above an appropriate level that minimises the risk of recruitment overfishing.*

The justification for this objective relates to the normal fisheries management requirement to keep recruitment levels unaffected by a reduction in spawning stock. This does not mean that recruitment will necessarily be constant or high, just that it should only vary due to environmental factors – not from the impact of the fishery.

Meeting this objective should ensure sufficient spawning stock to continue recruitment at levels that will replenish that taken by fishing, predation and other environmental factors.

Depending upon the species and other issues, it may be required to have an objective that is more conservative than this (for example – if the decline in biomass that causes growth overfishing occurs before the level where recruitment overfishing occurs). There may be other economic or socially-based reasons for why this objective is not used, with either a more aggressive or more conservative approach taken. In either case, these would need to be justified.

For example, it may be that in order to keep the catch levels at an economically viable levels, the objective may need to keep a higher biomass than would be necessary if avoiding recruitment overfishing was the only issue.

A more interesting issue would be if the overall take of the fishery can only be maximised where one of the more vulnerable species are pushed to levels that may be beyond the point where their recruitment was being affected to some degree (this may happen in multi-species trawl fisheries). Justifying this on ecological grounds, whilst possibly being the most economic, may now be difficult given the introduction of various legislation – for example, the federal *Environment Protection and Biodiversity Conservation Act 1999*.

A2.1.2 Indicators

There are a variety of indicators that can be used to measure the performance of the retained species. A full account of these will be presented in the companion technical report that is being written.

However, in general the types of indicators and their robustness varies from relatively simple measures such as catch, to the use of sophisticated models that have estimates

of actual spawning biomass derived from multiple fishery-dependent and independent inputs.

There is little likelihood that all (or even a high percentage of) exploited stocks will have a very precise measure of spawning biomass as indicators. For stocks where current fishing effort is considered minimal, having detailed data should not be necessary (in fact, this would be against ESD principles because it is a waste of resources to measure them).

However, for others where the exploitation rate appears to be aggressive, larger levels of data are likely to be required. Consequently, there is a need to match the level of risk associated with the relative rate of exploitation with the types and quantities of data used to monitor performance (See Table A7).

Thus, where the risks (exploitation rate) are low, only crude indicators of performance are likely to be needed. Where the risks are higher and the management approach is more aggressive, leading to a relatively high exploitation rate, more robust and precise measures of abundance will be needed.

Table A7 Comparisons between the relative rates of exploitation of a stock and the different classes of indicators that could be used to measure performance.

Exploitation Rate/Risk	**Likely Indicators/Performance Limits Required**
LOW	Catch or Effort Only Crude (Catch Per Unit Effort - CPUE) (i.e. low robustness).
MODERATE	Reasonable CPUE, possibly some extra/occasional biological sampling (i.e. moderate robustness).
HIGH	Good CPUE &/or Fishery Independent Surveys, probably biological sampling - leading to estimates of biomass/exploitation rates (i.e. high robustness).

In completing the initial assessment for a fishery, where there is a mismatch between relative exploitation and the method of monitoring, there are two courses of action available. The level of exploitation may need to be reduced to a level commensurate to the data quality being collected. Alternatively, the level of data quality could be increased to an acceptable level.

This decision on which of these is the most appropriate is likely to be based on the value of the fishery - can the fishery 'afford' to increase the level of monitoring or not?

Where alternative or additional management actions are needed (including any additional monitoring) these should be described under the headings related to "Future Management Actions" and summarised under the "Comments & Actions" heading

A2.1.3 Performance Measures

The most common performance measures for the issues related to retained species are 'limit reference points' – which are the values for the indicator which the management arrangements are designed to try and keep the stock above (e.g. the spawning biomass must be kept above 20 per cent of unfished levels).

Such limit reference points may, or may not, be used in conjunction with a 'target reference point' – which is the value of the indicator that the management arrangements may be directed towards trying to achieve (e.g. the target for the exploitable biomass is to be 50 per cent of unfished levels).

Some fisheries do not only use the current level of the indicator against the performance limit to determine acceptability, but the probability that the indicator will be above the limit at some point in the future (e.g. there must be a 50 per cent or greater probability that the spawning biomass will be above the limit reference point of 20 per cent unfished levels in three years time).

This style of performance measure is often termed 'management strategy evaluation'. Its main advantage is that it tries to affect the management responses before a limit is reached, not after.

As with the indicators, there are a variety of variables that can be used as the performance measures for the retained species – but these must be relevant to the indicator being measured. If you are using catch per unit effort as your indicator, your performance measure must also be a level (or a trend) of Catch Per Unit Effort (CPUE).

This does not preclude the basis for choosing the level of CPUE that is used as the performance measure being based on an estimate of what this represents in terms of a 'real' biological level (i.e. the CPUE estimated to represent a particular percentage drop in the unfished biomass).

A full account of the performance measures currently in use will be presented in the technical report currently being developed.

A2.1.4 External Drivers

The impact of external drivers may be considerable for these reports. This includes those fisheries that catch species with patterns of recruitment related to ocean currents, temperature, rainfall, etc. The other fisheries where this may be particularly relevant are those that are affected by human activities, such as pollution or other water quality factors.

External drivers do *not* include any failures of the management arrangements – e.g. poor compliance, this is an issue that is under the direct control of the management agency and therefore needs to be addressed.

A2.1.5 Example of a Retained Species Component Report

(NB: this is a shortened version – in dot point form - of what would be expected in a real report. See the website www.fisheries-esd.com for full examples).

Operational Objective
To maintain the stock at levels that will avoid recruitment over-fishing, with high levels of probability.

Justification - This is a sensible objective to use for an exploited species that is consistent with the main objectives of the Act.

Indicator
Level of spawning biomass relative to unfished level – B/B_0

Performance measure
Probability that spawning biomass is greater than 20 per cent of unfished levels – $Y=P(B/B_0>0.2)$. Note that Y can vary between zero and one, and higher values represent a greater chance of achieving the operational objective.

Justification - Information on the relationships between recruitment and spawning stock for species from this family suggest that values above 20 per cent been associated with declines in recruitment levels.

Data requirements for indicator
Calculation of this indicator requires a quantitative stock assessment. This in turn requires, at least, a known catch history, some index of relative abundance, and some knowledge of life history parameters of the species (e.g. how long it lives).

Data availability (current – future)
Catch rate data available for 10 years, catch at age information for 5 years, most biological parameters estimated.

Evaluation
The last stock assessment calculated a probability of 0.8 that the spawning biomass is greater than 20 per cent of unfished stock.

Robustness
The classification table rated this evaluation as MODERATE.

Fisheries management response
Current - Exploitation rate managed using limited entry, gear restrictions, closed areas and variable length seasons. There is a limited number of boats in the fishery and the boats are further restricted in the gear that can be used and the number of days that they can each fish.

If Performance Limit is reached?
Close the fishery if Y<0.4, and otherwise set exploitation rates such that Y>0.8 at least half the time.

Comments and action
Evaluate the exploitation rates that should achieve the management objective. Update the assessments on a regular (e.g. annual) basis. Incorporate the harvest strategy explicitly in the management plan for the fishery.

External driver check list
A wide range of factors can affect this stock's biomass apart from the direct impacts of fishing. Examples include environmental influences on recruitment and availability (either random effects from year-to-year, longer-term cycles, or longer-term trends); and effects of habitat degradation on juvenile survival.

A2.2 Non-Retained Species

A2.2.1 Objectives

The types of objectives for non-retained species differ from the retained species in that *no* individual of these species are desired to be caught by those who participate in the fishery - i.e. they are not targeted in any way or viewed as desirable. Consequently, if it were possible to entirely eliminate capture of these species, this would be preferable.

The benefits of minimizing by-catch often flow to the fishers through improved efficiency in handling and reduced sorting time and improved quality of landed product – in addition to the expected ecological benefits that flow from reducing these impacts and also the benefits from the reduction in social conflict on this issue.

For some fisheries, the most practical objective is to reduce the levels of capture of non-retained species from the historical levels. For other fisheries, especially when dealing with threatened species, the total elimination of *all* capture may be the goal. Finally, for fisheries where the current levels are acceptable, the objective may merely be to avoid any future increases.

Consequently, the most common objectives developed for non-retained species so far are:

- *To minimise/decrease/eliminate the impact of the fishery on {insert name of species/group of species}.*

- *To maintain appropriately low levels of impact of the fishery on {insert name of species/group of species}.*

The question is whether the levels of removal are a real issue for the actual bycatch species, or whether the main impacts are generated from the discards they produce (i.e. provisioning) or whether the issue is largely socially driven community acceptance/wastage problems.

If it is largely a perception issue, or one only related to provisioning, then finding alternative markets for the species currently being dumped may be a sensible alternative. However, if it is because these species are being put at risk by the fishery, then the only alternative is to reduce/eliminate their capture in the first place. Finding alternative markets would probably exacerbate this problem.

A2.2.2 Indicators

The indicators for this obviously depend upon the objective chosen.

If the objective relates to a single species or a group of species then the indicator may need to be a direct measures of the levels of capture of these species.

Depending upon the species, the area of operation by the fishery compared to the area inhabited by the non-retained species may be a possibility to measure performance, with a justification that adequate refuge areas are available.

If the objective only relates to reducing a wastage problem or other perception issue, then processed based indicators relating to the percentage adoption of Bycatch Reduction Devices (BRDs), or some other fishing equipment based modification may be appropriate. These indicators are, however, unlikely to be appropriate in situations where the issue was related to specific concerns about one or more of the non-retained species.

A2.2.3 Performance Measures

In general, precise performance measures for these objectives have not been developed so far. The most common form of limit/trigger used in the examples seen to date relate to using historical levels as the benchmark with some reduction on these levels used to gauge future performance. For example in some fisheries acceptable performance requires the amount of bycatch to be reduced to 40 per cent of current levels within five years.

Where there is specific concern about the stock status of a non-retained species, it is likely that a direct measure of their catch will be required and some threshold level of acceptable catch would need to be determined. This will be especially likely where 'icon' or highly threatened species are involved.

A2.2.4 Non-retained Species Example Report

(Again, this is shortened version of what is required – see examples of complete reports on the website – www.fisheries-esd.com).

- ***Operational Objective***

Reduce general bycatch of finfish species from previous/historic levels to acceptable levels

Justification - general community concern about the level of impact of the trawl fishery on the sustainability of the non-retained species captured by the fishery. As a result, it was determined that this level should be reduced from current levels. There was no species identified as being particularly vulnerable in the first survey of bycatch levels, hence they are to be treated as a single group

- ***Indicator***

Three yearly estimates of total bycatch catch levels

- ***Performance measure***

The level of reduction required within three years is 25 per cent of current levels and within six years is 50 per cent of current levels

Justification - The initial levels of analysis on the first surveys of bycatch of non-retained species in this trawl fishery did not identify any species as being especially vulnerable. However, as these species are generally fished over most of their range, it was considered that if the level of exploitation was reduced to approximately half the current levels, this would minimise any chance of the fishery causing overfishing of any of these species.

- ***Data requirements and availability***

Data Requirements	Availability
Initial survey of current by-catch levels.	FRDC-funded study to determine current bycatch levels has just been completed.
Observer-based survey data on bycatch levels by species/groups. This would need to be done on a stratified basis across the fishery and across the year.	A survey is planned to be conducted using independent observers every three years.
Data on the total trawl effort by area by month for the fishery.	Daily logbook data are collected from each vessel in the fleet. VMS data will be collected from 2003.

- ***Evaluation***

This will be completed, following the survey in three years time.

- ***Robustness of indicator and performance measure***

The robustness of the indicator is high, as the survey techniques used to complete the estimates have been generated using known estimates of variation in the bycatch levels to optimise survey design.

The robustness of the performance measures is 'low' to 'medium' because these reductions in bycatch levels have been inferred, not generated from any quantitative modelling.

Using total levels of bycatch may miss specific issues related to vulnerable species/groups not identified in the original survey.

- ***Fisheries management response***

What is being done to not exceed the reference point?

The fishery will introduce Bycatch Reduction Devices (BRDs) over the next two years as compulsory. In the first year, only one of the two nets used by each vessel will have to have a BRD. In the second year, both nets will have a BRD.

Total effort levels will be reduced by 25 per cent over the coming three years.

Areas of the fishery will become permanent closures.

What will be done if the reference point is exceeded?

The BRD designs permitted may be altered to increase the level of escapement by this group of species.

If this proves unsuccessful or impractical, further reductions in effort or areas closures may be required.

- ***Comments and action***

Conduct a risk assessment (desk-top only) on each of the bycatch species/group to determine which should be treated separately (see Stobutzki *et al*.,(2000) – FRDC Final Report 96/257, FRDC Canberra).

Some species are likely to need to be moved to the categories requiring separate examination. Spatial distribution should be included in any assessment arrangements.

- ***External driver check list***

Variations in the recruitment levels of these bycatch species may either increase or decrease values that are caught by the fishery, independent of the management measures invoked.

A2.3 Ecosystem Issue Reports

A2.3.1 Objectives

This is probably the least well understood element of this reporting system. Consequently, the types of objectives developed for the issues in this category are probably the least well developed of the most common objectives developed so far:

To maintain any impact on the wider ecosystem within acceptable levels.

To maintain appropriate levels of biomass of target and other by-product species to minimize any significant impact on the broader ecosystem.

To maintain the spatial extent of the fishing activity to a comparatively small percentage of the habitat/community.

A2.3.2 Indicators

The type of indicators appropriate for these ecosystem issues include:

Process/Pressure Indicators
- area trawled;
- effort levels;
- biomass reduction; and
- relative levels of biomass removed.

Direct Indicators
- Monitoring area of habitat; and
- Monitoring the community.

The latter group of indicators are only likely to be required if the impact of the activity is likely to be major and/or the fishery operates over a relatively wide area of the habitat (see Table A8). Precisely what can be measured beyond process/pressure-based indicators is not clear in most cases, except for the possibility to choose one or more 'indicator' species to measure overall performance.

The selection of these species would need to be justified. It is possible that the use of some multi-species analysis could be used, but this has not yet been seen in the completed studies to date.

Table A8 Comparison of impact versus likely management actions

Likely Level of Impact	Habitat interactions	Ecosystem Interactions
Low	Activity can occur across a large percentage of the area of the habitat	Stocks can be exploited to levels based only upon their own sustainability
Moderate	Activity may require some level of restriction in area	Consideration may need to be given to the level of exploitation on other species
High	Activity will need to be constrained to specific areas	Exploitation rate should be set based on avoiding major changes to other species or community structure

A2.3.3 Performance Measures

Trophic Interactions/Biodiversity

Whilst much has been written in general about the need to maintain the ecosystem and have ecosystem-based management, there are few quantitative studies available upon which to base sensible performance measures for management. This is most notable in trophic level interactions, where studies in this area show that interactions of this kind are usually non-linear and vary greatly amongst systems and species within a system. Thus, there is no precise 'state' that an ecosystem should be at, as natural systems vary (particularly the individual components) even without any human 'assistance'.

Of note is that there are very few examples of strong trophic interactions leading to major changes in function (see Jennings & Kaiser, 1998 for review)[18]. Moreover, there are no examples of a fishery impacting indirectly on other trophic levels where the *initial* stocks targeted by the fishery are still in good shape.

The decision tree that could be used to assist in whether there is a high likelihood of interactions includes:

- Is there a single apical or keystone predator?
- Is there a keystone grazer in the system?
- Is there evidence or even a reasonable suspicion that strong interactions may be occurring in this system?

[18] Jennings & Kaiser (1998) *Adv. Mar. Sci*. 34:203-352

- Are there only one or two species within the affected trophic levels?

If all the answers to the above questions are "no", then it *may* be possible to argue that the mere maintenance of reasonable levels of the harvested species should be sufficient to maintain general ecosystem function.

If the answer to one or more of these is "yes", then there may be a need to directly monitor other elements of the ecosystem. Further, the level of reduction in target stocks may need to be set with this in mind – particularly with respect to minimising the risk of stock collapse.

Benthic Impacts

We have a reasonable understanding of the physical impacts of most fishing methods. A number of good reviews are available to start the analysis of what is likely to be acceptable or not.

The most valuable of these is the review by Jennings & Kaiser (1998) and there are also a number of more recent publications such as the Meta-analyses done by Collie et al (2000)[19], which could be most helpful. As a general rule of thumb, the more destructive the fishing method, the smaller the area that it should be allowed to operate (see Table A8).

The most logical approach to deal with these issues is to limit the area of fishing such that it is unnecessary to have detailed monitoring within the area affected (see below for example).

A2.3.4 General Ecosystem Example Report

(Again, this is shortened version of what is required – see examples of complete reports on the website – www.fisheries-esd.com).

- ***Operational Objective***

To maintain an acceptable level of impact on the shell/sand habitat in the trawled areas.

Justification - It is understood that prawns are predominantly targeted over sandy substrate, which harbour many infaunal and epibenthic assemblages. Whilst the trawl gear makes physical contact with the seabed, the regulations governing ground chains (maximum 10mm) minimises impacts, but may still result in interactions with species using the sand habitat. This impact needs to be kept to an acceptable level.

- ***Indicator***

The percentage of the sand/shell habitat of the region that is trawled.

[19] Collie *et al*. (2000) *J. anim. Ecol*. 69:785-798

- ***Performance measure***

Area of sand/shell habitat available for trawling needs to be kept to no greater than 40 per cent of the total sand/shell habitat in the region.

Justification - Maintaining a trawl impact of less than 40 per cent of the stock can be expected to keep all of the individual stocks above the reference point of 0.4 of virgin biomass, which is widely acknowledged as a safe point for the majority of species, even long lived species.

However, it should be noted that a number of studies have shown that even where prawn trawling occurs in such habitats, this does not cause significant effects to the infaunal community. A meta-analysis of fishing impacts by Collie *et al*., (2000) found that otter trawling had the least impact of all forms of trawling.

Specifically, Kaiser and Spencer 1996 found no detectable difference between trawled and untrawled areas (beam trawl) within mobile sediment (sand) regions. Van Dolah (1991) studied changes in infaunal communities over five months for areas closed to shrimp trawling. They concluded that the seasonal reductions in abundance and number of species sampled had a much greater effect than fishing.

Finally, Jennings and Kaiser 1998 suggest that light shrimp trawls do not cause significant disturbance to communities in poorly sorted sediments in shallow water. Consequently, a performance measure of 40 per cent is considered precautionary, while allowing for flexibility in the fleet for economic efficiency.

- ***Data Requirements for Indicator***

Data required would be:
- *Knowledge of spatial distribution of trawled and untrawled areas.*
- *Knowledge of spatial distribution of sand habitats within the region*.

- ***Data Availability (past - current – future)***

Knowledge of the spatial distribution of trawled and untrawled areas.

Based on logbook data, a good record exists of the location of trawled and untrawled areas. The recent introduction of a Vessel Monitoring System to this fishery will provide more detailed information of the trawled areas.

Knowledge of spatial distribution of sand habitats within the region.

The distribution of habitats within the region is well understood, from the extensive studies done by local universities and the Lands Department.

Evaluation

Currently, trawling is estimated to be occurring in approximately 25 per cent of the sand habitat within the region and is therefore meeting the objective.

- ***Robustness***

The indicator is considered highly robust as:

- Currently, trawling is only allowed within specific areas to provide protection to nursery areas and different habitats.
- Regulations do not allow fishing to occur in more than 40 per cent of this habitat.
- Compliance policing includes the use of a Vessel Monitoring System (VMS), which logs the positions of vessels throughout the fishing season.

- ***Fisheries Management Response***

Current **-** Trawling is only allowed within specified areas to provide protection for sensitive nursery areas and seagrass habitats. This system also affords protection to other habitats, including those based on sand. Trawl vessels are now required to have a Vessel Monitoring System (VMS) operating during the season, which logs their positions to ensure that trawling does not occur outside permitted areas.

Future - Fishing effort and distribution will be monitored to ensure that no more than 40 per cent of the available sand habitat is trawled.

Actions if performance limit is exceeded - Not applicable.

- ***Comments and Action***

The regulations do not allow fishing to occur in more than 40 per cent of the area, so the management of this issue is therefore about assurance and compliance.

- ***External Driver Check List***

None

A2.4 Social and Economic Reports

A2.4.1 Objectives

It is not clear at this stage whether specific objectives are needed for these types of issues, or whether all that needs to be done is report on their current status. Some jurisdictions are not keen to get directly involved in setting specific objectives and, in general, many of the stakeholders are only just beginning to understand what they are trying to achieve.

This could be a reflection of the view that most community level objectives are set by the government and that fisheries agencies only play one part of the achievement of adequate performance.

The types of objectives that have been suggested include:

- Minimise the negative community impacts of fishery management decisions (and maximise the positive impacts).
- To have a safe and healthy work practices that minimise deaths and injuries of persons involved in the fishing activity.
- Maximise/optimise net economic return from the fishery.

However, in many cases, a desirable outcome rather than an actual objective was identified. This includes recognition of the broader benefits to the community from having the fishery – such as increased sea-rescue readiness provided by the presence of the fishing fleet - rather than this being a specific objective of the fishery.

A2.4.2 Indicators

Some of the indicators for the social issues are available from Australian Bureau of Statistics data collected as part of the five-yearly population and housing census.

There are some social, economic and attitudinal data available for specific fisheries or jurisdictions. For example, community attitudes on aquaculture were surveyed in Western Australia and economic surveys were commissioned for South Australia.

The Australian Bureau of Resource Economics (ABARE) collects financial and economic data through this fishery surveys. Data on reported Occupational Health and Safety incidents should also be available from the relevant authorities.

A national survey on community attitudes to commercial, recreational and traditional fishing and aquaculture is currently being conducted. This information will be available later in 2002. However, much of the economic data required for indicators will need to be collected by specific surveys. A companion paper will be developed to assist in determining how to gather this information if needed.

A2.5 Governance Reports

The examples of the reports on governance are as follows:

A2.5.1 Management Agency

- *Management Effectiveness*

Reports on this issue may need to describe, in either a qualitative or hopefully a quantitative manner, whether overall the fishery is performing acceptably or not. The quantitative measures that have been used so far include having the total catch by the fishery (or for quota-based fisheries, total effort) remain within an acceptable range.

The justification for this approach is that if all the management arrangements developed for a fishery - including any restrictions on effective effort levels and compliance with the regulations - is being maintained effectively and there is an understanding of the dynamics of the stock, then the catch should be within a relatively small historical range of deviations from the predicted value. Any variation outside of this range would elicit the need to explain the cause of this deviation from the expected.

If there are any known variations on catch that can assist in the precision of this measurement – that is, recruitment variations linked to some environmental parameter - these can be used to 'fine-tune' what the accepted range should be within any one year.

- *Management Plans*

The report on this aspect of governance should discuss the comprehensiveness of the management arrangements developed for the fishery. This can be done in terms of what elements are currently contained within the current management plan (or other formal arrangement) of the fishery against what be deemed 'best practice" arrangements.

A series of 10 points covering the possible elements that could be presented in a management plan are listed below, but each jurisdiction must determine, based on their legislation, what their 'best practice' management plan would contain and then report against these criteria for the fishery being examined.

The suggested list of management arrangements that make up 'best practice' for a fishery should contain:

1. An explicit description of the management unit.
2. The issues addressed by the plan.
3. Descriptions of the stocks, their habitat and the fishing activities.
4. Clear operational (measurable) objectives and their associated performance measures and indicators.
5. Clearly defined rules, including what actions are to be taken if performance measures are triggered.
6. Economic and social characteristics of the groups involved in the fishery.

7. Management and regulatory details for the implementation of the actual management plan.
8. The reporting and assessment arrangements.
9. How and when reviews of the plan will occur (including consultation mechanisms).
10. A synopsis of how each of the ESD issues is being addressed.

The possible objective and justification for this component are:

Objective - In consultation with the relevant industry groups and other relevant stakeholders, periodically review the management plan, related legislation, regulations and arrangements to ensure they remains relevant and aligned with the fishery's management objectives and that collectively they cover as many of the 10 main principles as possible.

Justification - To have an effective and understandable plan for the management of this fishery, all 10 principles need to be covered within the suite of arrangements developed for the fishery.

- ***Compliance***

The success of any set of management arrangements depends upon how well they are complied with. Consequently, there needs to be some assessment of this issue within each fishery and any related fisheries.

The reports on this issue provide the opportunity to discuss the current levels of compliance with the management arrangements. These could either involve purely qualitative assessments, but preferably there should be some move to include quantitative data on rates of non-compliance. For recreational fisheries, in particular, these reports could include having data on the level of knowledge of the relevant regulations.

Projects to determine the best type of compliance data are only just beginning to get underway and it is likely that the most appropriate indicators will be developed over the next few years. There is also scope to have the relative efficiency of various types of compliance activities reported here, to use these data to plan and justify future activities.

- ***Allocation amongst users***

In situations where resources are utilised by groups outside of those covered in the fishery being assessed, there needs to be a discussion on how the allocation of access of these shared resources is being managed. Ultimately, the ongoing sustainability of species requires that the collective rates of capture do not exceed the safe level of harvesting.

This means at least some information is required about the catches of each sector – the precision needs to be related to the relative sizes of the catch – to ensure that this overall objective is being met.

There needs to be in the species reports described above, some description of the level of catch by all other relevant sectors. This can include two or more commercial sectors, in addition to any recreational take.

If the catch levels of other sectors are significant, or likely to become significant, some discussion should be presented as to how the longer-term allocations of each sector can be maintained, so as to avoid the total catch becoming too large.

There may also need to be a discussion of how any 'no-take' activities are included in the arrangements. Thus, there may be a wide range of sectors that have direct or indirect interest in the allocation of fisheries resources, including indigenous communities (although these are covered above in detail) and the general public. Understanding and incorporating their needs within a management framework will be a major element in the effective implementation of ESD.

- ***Offshore Constitutional Settlement arrangements***

Many fisheries in Australia operate with an Offshore Constitutional Settlement (OCS) arrangement between the Commonwealth and the various State and Territory governments. These OCS arrangements simplify the management of a fishery from the previous system where jurisdictional responsibility was split between state controlled waters, within three nautical miles of the coast and Commonwealth controlled waters, outside of this area.

The report can either include what OCS arrangements are in place –or what should be in place if none currently exist and whether the current arrangements are operating effectively.

- ***Consultation***

This report should describe all the formal, or semi-formal, consultation processes that are used to assist in the effective management of the fishery. Thus, it should describe how management plans are developed and amended – who is involved in these discussions, how do they find out about the issues and how do they have their inputs included.

There should also be a description of how ongoing management occurs – is there an 'Advisory Committee'? If so, what are their terms of reference, which sectors are represented, and who appoints them?

- ***Reporting***

What are the normal reporting arrangements for the fishery? It is important that the outcomes of the management processes administered by the fisheries department/agency are available for review by external parties. It is also important that the community is sufficiently informed on the status of the fishery, given that it is utilising a community resource.

The reports that may be provided on a regular basis include:

- Specific mention in the fisheries department/agency's Annual Report.
- Publishing an annual status report of each fishery.
- Less regular reports, possibly associated with some proposed change to management.
- Some jurisdictions also need to provide information to other departments for auditing purposes.
- All information should, in most circumstances, be lodged on the relevant fisheries department/agency website, in addition to being distributed directly to the main stakeholder groups.

A2.5.2 Industry

- ***Industry Associations***

The ability of fishers to effectively participate in the consultation and other aspects of the management of the fishery often depends upon the value of the relevant industry association(s). Consequently, some assessment of these groups is required in much the same way as the previous headings were an assessment of the management agency.

This could include – is there an industry association, are there more than one – if so how do they interact/compliment each other? What is the participation rate of industry participants in the associations?

- ***Codes of Practice***

There is an increasing trend for the industry to develop codes of practice and, more recently, environmental management systems (EMS) to document and manage a number of issues associated with their activities. This includes Occupational Health and Safety issues and potential impacts on the environment, especially those outside of the normal fisheries management area, or those for which it is hard to develop specific legislation.

The current initiatives for the development of these processes is well documented in the material developed by Seafood Services Australia (SSA) in their 'Green Chooser' guide and other material (see www.seafoodservices.com.au for details).

APPENDIX 3 AGREED TERMINOLOGY

ESD is a very complex issue that is made more confusing by the large reliance on terms and jargon. This confusion can be even greater if terms used are not defined adequately. Thus, the many terms associated with ESD are often used interchangeably, sometimes in the same document.

In particular, terms such as 'principles', 'objectives', 'goals' and 'criteria' are often used to mean the same thing. Moreover, confusion in terminology also arises when the adjective 'sustainable' is combined with other words to give terms such as 'sustainable fishery', 'sustainable stock', 'sustainable fishing', 'sustainable management', and 'sustainable catch'. However, the word 'sustainable', can have very different meanings to different people and such terms are therefore useless unless they are defined precisely to avoid misunderstanding.

It was considered vital to develop a list of definitions that included simple, minimalist terminology to assist communication during the implementation of the ESD initiative of the SCFA. Whilst alternative definitions are possible, for the purpose of this exercise the SCFA Working Group and the Reference Group have agreed on the following definitions that were initially developed by BRS.

Table A9 Standard SCFA Definitions for ESD Terms

Sustainable	This is the adjective of the word "sustain" which the Macquarie Dictionary defines as the ability "to hold up or bear a burden". In the context of fisheries, it means the ability to continue in the longer term. However, used by itself, it does not convey a great deal of information (sustaining what for whom?). The Fishwords[20] definition is – "*A process or state that can be maintained indefinitely"*
Sustainable development/ ecologically sustainable development	"Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased" (National Strategy for Ecologically Sustainable Development, Council of Australia Governments, 1992).
Sustainable fishery	A fishery that is consistent with ecologically sustainable development (i.e. a fishery that uses, conserves and enhances the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased).
Fishery	A unit determined by an authority or other entity that is

[20] Fishwords is a glossary of terms being developed by the Fisheries Ressearch and Development Corporation for Australian fisheries and is available on their website www.frdc.com.au

	engaged in raising and/or harvesting fish. Typically, the unit is defined in terms of some or all of the following: people involved, species or type of fish, area of water or seabed, method of fishing, class of boats and purpose of the activities.
Component	A major area of relevance to fisheries with respect to ESD (e.g. target species, bycatch species, marine environment, resource use/allocation, employment, income, lifestyle/culture, governance).
Sub-component, sub-sub-component, etc	Further sub-divisions of the components.
Core objectives	Core ESD objectives for fisheries (also sometimes called principles).
Operational objective*[21]	An objective that has a direct and practical interpretation in the context of a fishery and against which performance can be evaluated (in terms of achievement)
Indicator*	A quantity that can be measured and used to track changes with respect to an operational objective. The measurement is not necessarily restricted to numerical values. For example, categorical values may be used.
Performance measure*	A function that converts the value of an indicator to a measure of management performance with respect to the operational objective. It can be a limit, a target, or a trend, etc.)
Reference point	The value of an indicator that can be used as a benchmark of performance against an operational objective.

*Note: The operational objective, indicator, and performance measure (or some other form of interpretation) are a 'package'. Each of the three elements of the package is essential to properly define and interpret an indicator. One or more reference points may form part of the description of the performance measure.

[21] An objective can be made into a criterion by re-wording and replacing "to ... " with "should" or "must".