INDICATORS TO MONITOR THE PROGRESS OF INTEGRATED COASTAL ZONE MANAGEMENT: A REVIEW OF WORLDWIDE PRACTICE

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**The views expressed in this report are those of the researchers and
do not necessarily represent those of the Department or
Scottish Ministers.**

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EXECUTIVE SUMMARY

The Scottish Coastal Forum (SCF), together with local coastal management partnerships, is pursuing the sustainable management of Scotland's coastline through the introduction of a process of integrated coastal zone management (ICZM). A key component of this work is the development of a National Strategy for Scotland's Coasts and Inshore Waters.

As part of this Strategy it will be important to identify indicators that will help monitor the condition of Scotland's coastline on an ongoing basis. In this way the contribution of the Strategy's aims, objectives and actions towards maintaining or improving such conditions can be assessed, reviewed and altered as necessary.

It will also be important to identify indicators that will monitor the ICZM process followed. This is necessary to allow the added value of ICZM, and its role in the move towards more sustainable conditions at the coastline, to be clearly demonstrated in order to maintain political and financial support for ongoing work.

Therefore, the aim of this project is to produce a set of recommendations, based on worldwide best practice, for:

1. Monitoring progress towards sustainable development for Scotland's coastline;
2. Using indicators to determine the effectiveness of the Scottish approach to ICZM.

The approach to this project has been based around a desk-top review of current practice from around the world, and discussions with coastal management practitioners and key academics.

Conclusions from the work are split into two categories:

<u>i) Indicators to measure the State of the Coastline</u>

Findings suggest that most indicators for monitoring the state of the coastal environment are based around Sustainable Development Indicators (SDI), and groups of such indicators generally form coastal and/or marine themes within larger State of the Environment Reports (SER). The establishment of a baseline to which performance can be compared is key to the process. Such a baseline usually takes the form of an initial SER. Many indicators in SER play a monitoring role for sustainable development strategies and action plans. Most sets of indicators for SER follow the Pressure-State-Response (PSR) technical framework derived by the OECD in 1994.

Some countries have good examples of 'tiers' of indicators from the local to national level. Coupled with a formal reporting system this allows indicators at different scales and localities to be fed into national reporting procedures for inter-country comparison.

Various techniques for disseminating the findings of SER and measuring progress towards sustainable development objectives have been developed and tailored to different target audiences, from the general public to policy makers and politicians.

There are very few examples of indicators within SER that are intended to show the state of ICZM at the coast although many include the state of various qualities of the coast.

<u>ii) Indicators to measure the effectiveness of integrated coastal zone management</u>

Findings suggest that ICZM as a process follows a standard project or policy development cycle which has long-term outcomes. The work of the SCF and the local coastal management partnerships can be seen to be replicating this cycle and support for its continuation is required.

The worldwide development of indicators and assessment systems that link 'on-the-ground' change at the coast, the outcome, with ICZM effort is still in its infancy. ICZM researchers and academics are still trying to develop frameworks and methods that will assist formal reporting of ICZM effort.

There are many approaches to evaluation of ICZM effort. 'Outcome evaluation' is key for linking 'on-the-ground' change with such effort, however, as a process it is faced with many difficulties. The approach requires clear objectives and specific ICZM indicators to measure progress against these objectives. There are few good examples of such indicators.

Successful evaluation would appear to require a combined approach, linking SER with objective based ICZM evaluation. The key is for clear objectives against which ICZM can be measured, and sufficient data and a baseline on which to base the coastal SER.

Recommendations from the work include:

- An objective based outcome evaluation approach for inclusion in the National Strategy for Scotland's Coasts and Inshore Waters should be adopted.

- A partnership approach to data and information collection for indicator development and maintenance should be adopted.

- A State of the Environment Report for Scotland's Coasts should be prepared.

- Recognition and support is needed of the fact that Scotland is following a standard ICZM development cycle with proven long-term outcomes.

- Advanced outcome based evaluation systems being developed overseas require ongoing monitoring to determine best practice applicability.

- Pilot ICZM Headline Indicators should be developed.

- Indicators that link ICZM effort to the development of the Scottish national indicator series should be developed.

CHAPTER ONE   INTRODUCTION

1.1   Aims of this project

The aim of this project is to produce a set of recommendations, based on worldwide best practice, for:

1. Monitoring progress towards sustainable development for Scotland's coastline;

2. Using indicators to determine the effectiveness of the Scottish approach to Integrated Coastal Zone Management (ICZM).

These recommendations will inform the work programme of the Scottish Coastal Forum (SCF), in particular, in its work to develop a National Strategy for Scotland's Coasts and Inshore Waters.

In the longer-term, for this developing coastal strategy to be successful, early consideration needs to be given as to how its effectiveness could be monitored. This will require the development of an ongoing monitoring system based around the use of indicators.

Using examples from around the world, this project investigates how indicators have been developed to monitor the state of coastlines and how they have been used to track the progress of ICZM effort.

Many indicators for individual sectors and different coastal resource use already exist for Scotland and are currently collected as part of the day-to-day activities of some of the SCF's partners. These indicators may be suitable for use by the SCF as part of its work programme, however some new ones may also be required. Therefore, this project intentionally does not suggest any new or existing indicators, rather it suggests the manner in which indicators could be developed and included within the work of the SCF.

By its very nature ICZM is a participatory process whose success depends upon ownership by the stakeholders involved. Therefore, the indicators to be finally used will need to be developed and agreed by all partners within SCF. The project is designed to inform what has been successful or unsuccessful elsewhere, and what challenges are being faced in the development of suitable indicators. It is not intended to replace the individual views of SCF members as to what indicators may be used in the future.

1.2   Context for this study

The SCF is pursuing the sustainable management of Scotland's coastline through the introduction of a process of ICZM, a key component of this process being the development of the National Strategy for Scotland's Coasts and Inshore Waters. This strategy will set a national context for the various local coastal management strategies prepared, or in preparation, by local coastal management partnerships.

As part of this national coastal strategy it will be important to identify indicators that will help monitor the condition of the coastline on an ongoing basis. In this way the contribution

of the coastal strategy's aims, objectives and actions towards maintaining or improving such conditions can be assessed, reviewed and altered as necessary.

It will also be important to identify indicators that will monitor the ICZM process followed, which includes the partnership approach of the SCF itself. This is necessary so that the added value of ICZM and its role in the move towards more sustainable conditions at the coastline can be clearly demonstrated in order to maintain political and financial support for ongoing work. The traditional 'sectoral management approach' to the coast is sometimes thought to result in adverse interactions between activities. An 'integrated approach' will still give such management its place, but is intended to develop linkages between sectors to maximize all opportunities available. It is required to prove that this integrated approach is beneficial when compared with the extra resources required to support its operation.

An inherent characteristic of ICZM evaluation is the strong tendency to assess the outputs, such as the number of plans, strategies, and newsletters and not to connect the outputs with the desired outcomes of the work. The ultimate question is: to what extent have the plans, strategies, meetings, publications and all such outputs served to achieve the ICZM goals and objectives, be they improved water quality, an increase in biodiversity, or improved integration of management.

There is a paucity of information in the UK derived from evaluation of ICZM initiatives on the extent to which ICZM really does make a difference. Currently there is comparatively little information on which to base any conclusions. The development of a monitoring system using suitable indicators to evaluate progress is vital.

If such a system is to be successful, it will be important that it is developed and owned in partnership. Information will be required from a wide range of stakeholders and partners on a continuing basis. Suitable data and information sharing agreements, administrative arrangements, and technical systems will need to be developed. The collective use of the internet, geographical information systems and individual databases will also be required. How this could be achieved on a Scottish wide basis provides an interesting challenge.

The SCF is only at the beginning of the process of developing a Scottish Coastal Strategy. The whole partnership is starting to work together, providing pools of information, and laying down a strategic work programme for the future. The time is therefore right to provide specific recommendations to aid this process and introduce a means to monitor the ultimate success of this Strategy, its effect on Scotland's coastline and the contribution played by ICZM.

1.3   Study Method

The approach to this project has been based around a desk-top review of current practice and discussions with coastal management practitioners and key academics.

The review has covered three main areas:

- International experience on sustainable development indicators for the coast;

- International experience on ICZM indicators;

- International experience on ICZM project evaluation and monitoring.

In addition to the review, a standard ICZM model has been utilised to demonstrate the need for assessment involving indicators, evaluation reports from mature ICZM programmes have been studied and current academic thinking on the subject has been taken into account through appropriate peer reviewed journals and discussions with key researchers.

CHAPTER TWO   INTEGRATED COASTAL ZONE MANAGEMENT AND INDICATORS

2.1   Sustainable Management and the Coastal Zone

The Brundtland Report and Agenda 21 both identified the need for the sustainable management of the 'coastal zone'. This implies the maintenance of wealth creation without undue consequences for coastal processes and resources. Implicit is the maintenance of the coastal resource; ecosystems, water quality and so on, whilst at the same time using these natural assets for activities e.g. aquaculture, tourism, recreation, fisheries, trade and industrial production. For economic activities that depend on renewable resources, continued development can only be maintained if the ecosystem and other natural assets that generate the resources can be managed in a sustainable manner. To manage and maintain these activities effective management of the coast is required (Gallagher 1999).

2.2   Integrated Coastal Zone Management

There are many definitions of Integrated Coastal Zone Management (ICZM). For the purposes of this study, ICZM is the name given to the multidisciplinary process that brings all those involved in the development, management and use of the coast within a framework which facilitates the integration of their interests and responsibilities. The aim is to achieve common objectives, and to provide programmes for the protection and sustainable management of coastal resources and environments (Coastal Zone Canada Association 2000).

2.3   The Scottish Approach to ICZM

The early 1990's saw a plethora of activity on the issue of ICZM in the UK. A number of key reports were produced with probably the most significant by the House of Commons Select Committee on Coastal Zone Protection and Planning (HMSO, 1992). As part of the Government's response, , the Scottish Office published "**Scotland's Coast – A Discussion Paper",** in March 1996 (Scottish Office, 1996). The main proposals set out in the paper were:

- The encouragement of local coastal fora to take forward integrated management of local coastal areas;
- The creation of a Scottish Coastal Forum, bringing together representatives of bodies with a major interest in, or responsibility for, coastal issues to provide a national context for the work of local fora;
- The preparation of a series of national guidance and advice publications, drawing upon the work and experience of the Scottish Coastal Forum and of the local coastal fora.

The proposals in the consultation paper received widespread support and the Scottish Coastal Forum was formed by Government, under independent Chairmanship, in November 1996 to:

- Encourage the formation of local coastal fora providing a point of co-ordination for these as well as acting as a central point for their views and concerns;

- Encourage debate on coastal issues at national level;
- Seek opportunities for better co-ordination of national frameworks and policies; consider the need for further advice and guidance; and assist in its preparation;
- Gather information about approaches to coastal management and disseminate good practice to local fora.

These proposals were further supported following the publication of "Integrated Coastal Zone Management: A Strategy for Europe", (European Commission 2000) and a draft Recommendation (European Commission 2000) on the subject. In the strategy the European Commission outlines its policy on delivering ICZM across Europe, mainly through its own actions but also encouraging Member States to undertake active ICZM. The draft Recommendation, which is for the Parliament and Council to consider, encourages Member States to prepare national ICZM strategies and to report on progress after two years.

The SCF had also been examining the need for a national strategy and began initial development in 1997. Its aim is to develop a new, integrated strategy for Scotland's coast and inshore waters which will look for ways of making the best use of Scotland's coastal resources, and address the challenges presented by emerging technologies and the sustainability agenda.

For this strategy to be successful careful consideration needs to be given as to how its effectiveness will be monitored. This will undoubtedly require the development of a monitoring and evaluation system and extensive use of indicators.

2.4   Indicators and ICZM

An indicator provides a simplified view of a more complex phenomenon, or provides insights about a trend or event that cannot be directly observed. Thus, indicators both quantify information and simplify information. They can also improve communication.

There is no single 'perfect' indicator or set of indicators, rather indicators must be tailored to their expected use. Good indicators must be useful to their intended audience, be it the general public, policy makers, financial backers or even the EC. Also indicators must provide meaningful, readily understandable information that is directly related to the goals of a project or specific policy. A good set of indicators will include the smallest relevant set of indicators, and may aggregate sets of indicators into indices. Good indicators will also be theoretically well-founded and will be supported by reliable and valid data.

In ICZM, indicators can be used in two basic, overlapping ways: as a means of communication and as a means for measuring. These uses include: informing decision making, increasing understanding of important issues, assessing conditions and trends, comparing conditions in different geographical areas, projecting trends, measuring performance and results of policies or actions, and showing the connections between environmental, social and economic concerns.

In Scotland, indicators will be required in two main areas:

1. To monitor the condition of its coastline on an ongoing basis. In this way the Strategy's aims and objectives and actions towards maintaining or improving such conditions can be assessed and altered as necessary.

2. To monitor the effectiveness of the ICZM process followed, and to demonstrate the added value of ICZM and its role in the move towards sustainable management of the coastline.

Chapters three and four now consider experience from around the world in the development of indicators for each of these two areas respectively.

CHAPTER THREE   INDICATORS TO MEASURE THE STATE OF THE COASTLINE

3.1   Sustainable Development Indicators and the Coast

Sustainability at the coast can only be maintained if the ecosystem and other natural assets that generate the resources used by man can be managed in a sustainable manner. To manage and maintain these activities indicators are essential to gauge and monitor progress.

ICZM requires robust indicators of sustainability that gauge the 'health' of the coast in relation to both environmental, social and economic activity, whilst using fewer resources (materials, fuels, or land), and whilst managing the impacts of the resources that are used so that their adverse effects are minimised (ENTEC, 2001). Such indicators are essential tools for monitoring the state of the coastal environment, to inform managers and policy makers of the effectiveness of strategies in achieving sustainability. These indicators need to be based on rigorous scientific, social and economic research (Gallagher 1999).

In an attempt to achieve this there has been increasing focus, both nationally and internationally, on a number of techniques with which information may be utilised. One technique that has been focused upon is 'State of the Environment Reporting' (SER). SER is the development of objective, comprehensive and science-based information on environmental conditions and trends, and their significance from an integrated, holistic perspective. Three objectives can be specified for SER:

- To increase awareness and understanding of environmental trends and conditions, and their causes and consequences among all stakeholders;
- To provide a foundation for improved decision making at all levels, from the individual consumer to national governments and international organisations;
- To facilitate the measurement of progress towards sustainability.

Information on the "State of the Coastal Environment" could help identify urgent common pressures, assess the effectiveness of alternative policy options and communicate to the public.

Focus has also increased on the use of 'Sustainable Development Indicators' (SDI's). SDI's measure the extent to which any action is sustainable, and consequently, the effect of any change in that action. SDI's are receiving a considerable amount of attention and are essentially and attempt to answer the question; "How might I know objectively whether things are getting better or getting worse?" (Gallagher 1999).

There is a clear demand for SDI's because not only does their development fulfil national and international obligations, but indicators can monitor the progress towards sustainable development. Thus, they can reveal the extent to which sustainability targets and objectives are being met, including those for the coast.

Work on SDI's is taking place at a variety of levels and has concentrated mainly on urban and terrestrial ecosystems. However, there are examples of Coastal Sustainability Indicators from which we can learn a great deal.

3.2   A Review of Coastal Sustainability Indicators

During the study a number of existing Sustainable Development Indicator sets from the International, European, UK, Scottish and the local level were reviewed, and those that had specific coastal and marine components, identified. Most sets are part of larger State of the Environment Reports, and represent a 'stand-alone' Coastal and/or Marine theme within these reports.

The review has not attempted to promote any approach as being better than any other, because they were all designed to meet specific and different purposes. However, comments are made on any common elements between the different indicator sets and/or any common approaches utilised that may indicate best practice.

The coastal and marine indicators reviewed are presented in summary form in Appendix 1 under the following headings:

- European
- National   - World-wide
                      - UK
                      - Scottish
- Local   - UK
                      - Scottish

3.3   Findings of the Review

The findings of the review are summarised under the following titles:

    a) Common Themes
    b) Technical Framework
    c) Scale
    d) Target Audience
    e) Headline or Key Indicators
    f) Dissemination Methods
    g) Coastal Management
    h) Stakeholder Participation and Involvement

a)   Common Themes

A very common characteristic of all the coastal indicator sets reviewed is the use of 'themed' sets of indicators. Sets of indicators are grouped together to represent the main issues of concern and the key topics on which progress needs to be monitored.

Figure 3.1 presents a comparison of the different indicators used in each coastal SER reviewed and draws out the common themes that have been used. Although the indicator sets

Figure 3.1 – Review of Coastal Indicators: Common Themes

Theme	Indicator Sets Reviewed											
	European	Worldwide			UK		Scottish			Local		
	EEA	SA	NZ	A	DETR	EA	SEIG	SEPA	SE	KCC	DCALCP	FC
Protected and Cited Species		X	X	X		X	X			X	X	
Habitat extent	X	X	X	X			X		X	X	X	
Habitat quality		X	X	X	X		X		X	X	X	X
Renewable Resources	X	X	X	X	X	X	X			X	X	
Non-Renewable Resources	X			X			X					
Water/Sediment Quality	X	X	X	X	X	X	X	X		X	X	
Coastal Integrated Management		X	X	X	X		X		X	X	X	
Climate Change	X	X		X		X	X		X	X	X	
Marine Accidents			X		X	X				X	X	

Key:

A	Australia	SEIG	Scottish Environmental Indicators Group
SA	South Africa	SEPA	Scottish Environment Protection Agency
NZ	New Zealand	SE	Scottish Executive
EEA	Europe Environment Agency	KCC	Kent County Council
DETR	Department of the Environment, Transport and the Regions	DCALCP	Devon & Cornwall Atlantic Living Coastlines Project
EA	Environment Agency	FC	Fife Council

represent different geographical scales and conditions, and direct comparisons have to be made with care, the indicators used in the SER's were found to fit into the following common themes:

- Protected and Cited Species
- Habitat Extent
- Habitat Quality
- Renewable Resources
- Non-Renewable Resources
- Water/Sediment Quality
- Integrated Coastal Management
- Climate Change
- Marine Accidents

The majority of indicators used represent the 'environmental' component of sustainability. There were fewer examples of 'economic' or 'social' indicators.

b)   Technical Framework

Most sets of indicators follow the 'pressure-state-response' (PSR) technical framework derived by the OECD (OECD, 1994).

The three key parameters of this framework are:

- *Pressure Indicators* – describe the pressure (stress) on the environment of the coastal zone as caused by human activities.
- *State Indicators* – describe the environmental condition. They comprise environmental quality, and aspects of both quantity and quality of natural resources.
- *Response Indicators* – represent the measures of different policy options as a response to environmental problems.

Modifications of the PSR framework have resulted in a number of alternatives which have approached the measurement of sustainability by further classifying environmental functions and incorporating social and institutional indicators. For example, the New Zealand indicator set, 'environmental performance indicators for the marine environment' has merged existing ecological models of the marine environment (including functions and attributes) with the simple PSR framework.

The EEA have also introduced a Driving Forces/Pressure/State/Impact/Response model. This introduces two additional parameters:

1. *Driving Forces* – contain human activities and economic sectors as well as societal developments which lead to the pressures; i.e. sources of pollution. Examples are population growth, fisheries and industry.
2. *Impact Indicators* – monitor the effect on ecosystems and human health. Impacts are the result of changes in state.

The PSR framework is based on the concept of causality and is often chosen as a starting point because of its simplicity, wide acceptance, and the fact that it can be applied on any scale. However, it is considered that this framework is not very good for identifying social or

economic indicators, perhaps being the cause of the small number of this type of indicator identified during the review.

c)   Scale

As we have seen, SDI's for the coast are available at a variety of scales, from European, to national, to regional and local. Although examples of SDI's are available at the global level, e.g. the Commission on Sustainable Development, none of these are specific to the coast.

Indicators chosen to represent reporting at the national level have often been selected on the basis of allowing comparison with other countries and, therefore, provide an indication of a particular country's performance. At the local level the target audience is quite different and indicators have been chosen to inform progress on local sustainability issues within a specific geographical area, particularly those amenable to local action (Gallagher 1999). Local indicator sets provide more detail and are specific to the environmental and socio-economic characteristics of a particular area, e.g. the coastal tourism issues associated with the Kent coastline.

Few indicators have been identified that on their own could consider local progress towards more national sustainability targets or goals.

d)   Target Audience

Most SER's and their associated indicators have been chosen and presented in a manner intended to be clear and easily understood by a wide audience.

The Australian Commonwealth State of the Environment Report specifically states that it intends "to provide the Australian public, managers and policy makers with accurate, timely and accessible information about the condition of and prospects for the Australian environment". However, care must be taken that in targeting more than one audience confusing, too detailed or meaningless messages are not sent to certain groups, or that insufficient information is sent to those who require detailed and clearly justifiable scientific data.

At the local level, SER and indicators have generally been chosen to be meaningful to local communities and the general public. They relate to issues people are more likely to identify with and be concerned about, and are therefore more likely to engage a wider audience.

e)   Headline, Key or Core Indicators

SDI's cover a very broad remit including social, economic and environmental issues. Dependent on the detail of reporting desired, this can result in a large number of indicators being employed, for example under its eight themes, the Australian SER contains over 600 different indicators.

To simplify the situation, a number of the examples reviewed have used summary indicators called headline, key or core indicators. By summarising information, Australia reduces its 600 indicators into 75 'Core Indicators'. These serve several purposes:

- To provide a subset of indicators from a larger set of detailed indicators;
- To raise public awareness and focus public attention on key issues;
- To provide a broad and easily understood overview of whether progress is being made towards sustainable development;
- To link local or regional level indicator sets with national level sets to help build a national picture of trends and conditions of the environment.

Core indicators can be supplemented by additional indicators that go into particular management, scale or environmental issues in more detail as necessary.


f)   Dissemination Methods

Most SER's are available in hardcopy and via the internet. Documents are generally non-technical, well designed, and intended to raise awareness of the many issues and assets being monitored as part of the process. At the local level this awareness raising is all part of the process to help empower local action towards improving or maintaining conditions.

The challenge for SER for the coast is to integrate all relevant information on various issues and demonstrate the connections between seemingly disparate factors to a wide audience.

To aid understanding there are examples of tools to help visualise, summarise and track progress in a simple and easily understood manner. None of the coastal examples reviewed have used these techniques, they have relied on well produced documents to put across the message. However, as an example, the Commission on Sustainable Development have developed a 'Dashboard of Sustainability' that presents indicators of Sustainable Development as gauges similar to the control panel of a car. The instrument turns a complex array of economic, social and environmental performance indicators into a simple graphic representation of a country's current position relative to an agreed concensus about sustainability. The aim is to enable a quick assessment of the weak and strong points of a nation's performance. On-going data updates facilitate tracking of trends over time. An example of the dashboard is given in Figure 3.2.

Similarly, Aberdeen City Council has set targets for various sustainability themes. For each theme the overall movement towards or away from these targets is presented by a 'swingometer'. This is intended to aid communication with and understanding by local communities.

Figure 3.2 – Dashboard of Sustainability

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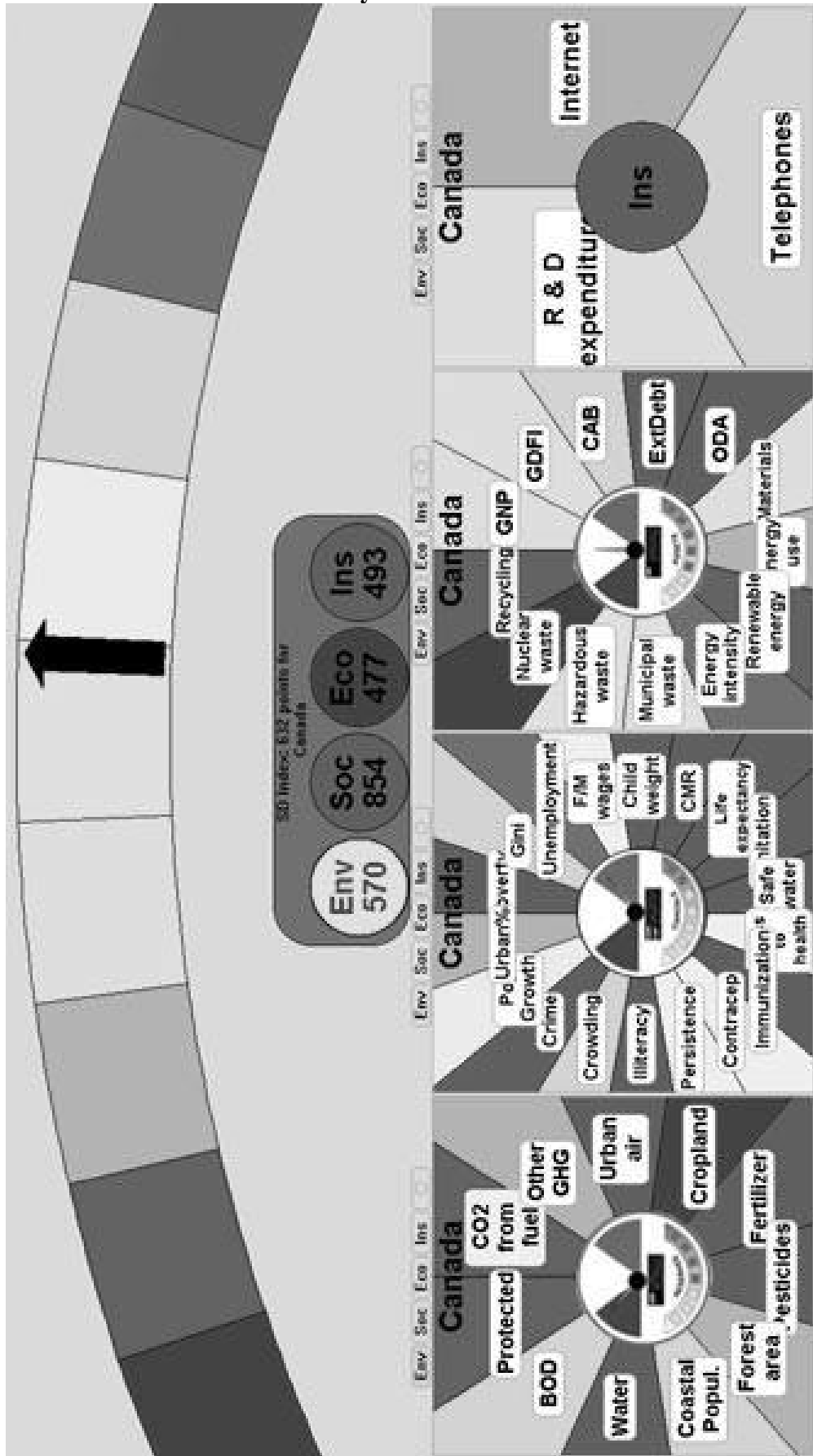
g)   Coastal Management

Although some of the indicator sets reviewed mention some form of coastal management activity, these management indicators tend to show a response to the problems in the coastal zone in quantitative terms, i.e. the number of protected areas or the area of coast covered by ICZM initiatives, e.g. Australia. The European Environment Agency include the number of ICZM programmes currently established throughout Europe as an indicator of progress in its 1999 yearly indicator report. There is no connection, however, between the effectiveness of all these activities and the state of the coastal environment.

The Atlantic Living Coastlines Project, (ALC 1999), which undertook a critical evaluation of the role that indicators of sustainable development could play in the coastal zone of Devon and Cornwall, although successfully highlighting indicators that could be used to monitor the state of the coastal system, concluded that further work was required to develop indicators for Integrated Coastal Zone Management. They felt indicators were needed to monitor all aspects of effort to integrate the management of factors that affect the condition of estuarine and marine ecosystems in Devon and Cornwall in order to achieve sustainable development.

h)   Stakeholder participation and involvement

In some of the examples reviewed, stakeholder participation played an important part in the selection and choice of indicators used. The maintenance of indicators often requires large data and information sets from a wide variety of sources. For the coast, this information may need to come from a range of different organisations and will need to be maintained, coordinated and updated regularly.

Some countries have developed 'Coastal Observatories' to facilitate the collection and maintenance of data and information. These Coastal Observatories can be established at various geographical scales of coverage from local to national, and act as a focus for all data and information pertaining to the coastal zone. Information is stored and maintained on behalf of the wide range of organisations that collect such data, and synthesis and integration of information allows for regular reporting on trends and patterns of resource use and management. It has been suggested that such observatories could be 'virtual', based on the use of internet type technologies.

An example of a Coastal Observatory is found with Kent County Council although details of its operation are beyond the scope of this study.

j)   Links to Strategic Goals and Objectives

Many of the indicator sets and SER reviewed were part of much larger programmes of work and often underpinned strategic documents and action plans intended to address issues and problems facing the coastal zone. This relationship serves the dual purpose of both demonstrating the effectiveness of a particular strategy's aims and objectives and allowing for a continual process of review and adjustment of the strategy's various policies and actions.

3.4   Chapter Summary

In summary, there are many good examples of indicator sets developed for measuring the state of the coastal zone. However, they have concentrated on the state of the coastal 'environment' with little consideration for the economic or social aspects of a sustainable coastline. The technical frameworks, reporting and data management systems, and dissemination methods adopted do provide good examples of how indicator sets can be used for reporting at a national level. As such, their use could provide best practice for replication by the SCF for a Scottish State of the Coastal Zone system of reporting.

CHAPTER FOUR   INDICATORS   TO   MEASURE   THE EFFECTIVENESS   OF   INTEGRATED   COASTAL   ZONE MANAGEMENT

4.1   Introduction

Chapter Three has concentrated on international experience in the development of indicators to assess the state of coastal regions. The use and further development of similar indicators for Scotland, if properly monitored, should allow the condition of the coastline and the human activities that affect it to be tracked. Recommendations made in Chapter Five suggest how this could be achieved.

Unfortunately, the great majority of SER's do not attempt to link change in environmental, social or economic variables with management effort, even fewer link change to an integrated management approach such as ICZM. Indicators for "Coastal State of the Environment Reporting" are very different to indicators for measuring the success of ICZM in contributing towards the condition of the coastal resource.

If the sectoral approach to the management of the coastline is performing reasonably, how do we prove that ICZM can enhance this effort? How do we show that ICZM is providing added value? How do we prove that ICZM is actually integrating management, policy, and effort? How do we show that ICZM effort is benefiting the coastal resources and/or the associated human society?

To answer all these questions, we need ICZM specific indicators that can be used to assess the success that a process of ICZM is having, i.e. indicators that measure the effectiveness of ICZM.

Chapter Four now reviews international progress in the development of ICZM indicators, and outlines the difficulties faced in their use.

4.2   ICZM as a process to be measured

In response to a degradation of coastal resources, the process of ICZM has been developing for over three decades in various parts of the world *(Sorensen 1997)*. As a result of this work, there is much recent documentation and many field demonstrations to illustrate that the ICZM process follows a typical and widely accepted policy or project development cycle *(e.g. Olsen et al. 1998, 1998(b), European Commission 2000, Jennison and Harding-Hill 2001)*.

The cycle breaks the process into the following five key steps: *(Olsen et al. 1998)*:

1. Identification of issues;
2. Plan preparation;
3. Formal adoption and funding;
4. Implementation;
5. Monitoring and Evaluation.

Experience demonstrates that projects or programmes mature through the successive completion of management cycles, and that an initial cycle requires 8 to 15 years to complete *(Olsen et al. 1998).* Each cycle may be termed a 'generation' of a Coastal Management project (Figure 4.1). The first cycle usually tackles a few urgent issues, often in a confined geographic area. Through adaptive learning over successive cycles, the geographic scale of the project is increased and new and more complex issues are addressed.

In its simplest form, the development of ICZM in Scotland can be demonstrated by this cycle. Looking at the work of the local coastal fora shows that they have all developed through the five key steps, and many are now at the implementation or evaluation stages preparing to begin a new cycle where a new work programme will be followed. Likewise, the SCF can be seen to be replicating this cycle as it too begins to prepare a Strategy for implementation. The work of the SCF can even be seen as a progression of the local fora cycle as the impetus for action moves from the local to the national level.

It is essential to recognise the time it takes to complete a sequence of coastal management cycles. Experience with mature coastal management programmes from outside Europe suggests that it often takes a sustained effort measured in decades and spanning several generations of a given programme, to achieve tangible expressions of improvement in coastal resource or socio-economic conditions. This time scale is often beyond the duration of funding and support for the majority of projects and programmes.

A recent assessment of ICZM effort by the US Agency for International Development (USAID 1998) summarised, "Real change is real hard and takes real time." To maintain support, it is therefore vital to be able to demonstrate the benefits being accrued as this series of ICZM cycles develop. Such a demonstration relies on the application of sound monitoring and evaluation techniques including the use of appropriate indicators.
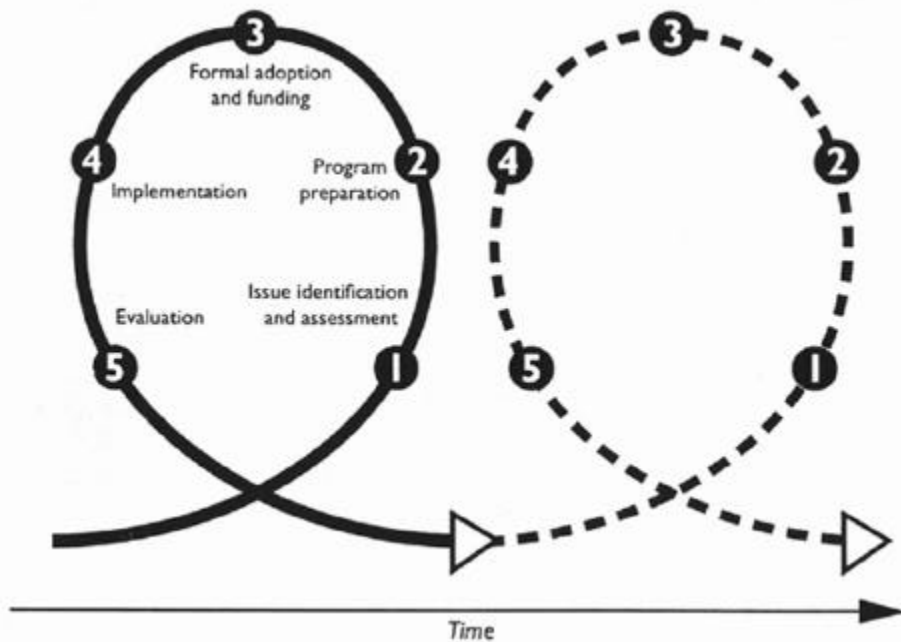

Figure 4.1 – The steps of the coastal management cycle
(Source: Adapted from GESAMP, 1996, as found in Olsen et al. 1998)

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4.3   ICZM Evaluation

Evaluation is a process that assists in answering the question, 'Is ICZM working?' and, if it is not working, 'What future actions are needed to make it work'.

At its 1996 annual meeting, the International Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) identified the following "priority emerging issue":

> *"There is an urgent need for an accepted ICZM evaluation methodology... .When an evaluative framework is in place it will be possible to document trends, identify their likely causes and objectively estimate the relative contributions of ICZM programmes to the observed social and environmental change."*

More recently, the US Agency for International Development carried out an examination of its integrated coastal resources management programmes (USAID 1998). In this it summarises its efforts at verifying performance and results as:

> *"As we approach the 21st century, one major trend that has emerged in nearly all significant fields of endeavour is the need to evaluate and assess the results that one achieves versus the stated goals and objectives. Finding indicators that can reliably be used to measure performance will be a test for all ICZM practitioners."*

Evaluation is a well established component of many environmental management programmes. Its application in planning has been well recognised, but much less so in ICZM. Designing an evaluation programme and associated indicators for ICZM is so recent that academics and practitioners are still experimenting on how to approach the problem.

4.4   Approaches to ICZM Evaluation

There are many different approaches to evaluation, however, experience shows that existing evaluations of coastal management initiatives can be grouped into three major types (Olsen et al. 1997. Kay and Alder 1999):

a)   **Performance Evaluations** are designed to address the quality of the execution of an ICZM project or initiative and the degree to which the initiative meets the requirements of funders. Here the measures are accountability and quality control.

b)   **Management Capacity Evaluations** are designed to determine the adequacy of management structures and processes. The purpose is to improve project design and make adjustments to the internal workings of a project or programme.

c)   **Outcome Evaluations** assess the impacts of an ICZM programme upon coastal resources and/or the associated human society. This type of evaluation will determine how effective the implementation of ICZM has been i.e. what effect there has been on the resources and socio-economic conditions, such as coastal erosion rates, water quality, and improvements in certain elements of the quality of life of coastal residents.

To monitor the effectiveness of the process of ICZM, including the development and eventual implementation of the Scottish Coastal Strategy, will require the design of an evaluation system that includes all three types of evaluation mentioned above. This will require different types of indicators to be developed. Some indicators, particularly those to be used to evaluate performance and management capacity, will be easier to develop as they will be monitoring areas of work for which clear objectives can be set. As such, this report does not consider these types of indicator any further. However, if a link is to be made between ICZM effort and its impact on the coast, then suitable outcome indicators are needed. This is more difficult to achieve as the development of outcome objectives is not straightforward. The report now concentrates on this aspect of evaluation.

4.5   ICZM Outcome Evaluations

Evaluative studies of ICZM initiatives focusing on outcomes are rare and are also the hardest and most infrequently completed type of evaluation. However, they are the most important if it is to be demonstrated that all this effort is having a beneficial impact 'on- the- ground'. This area appears to be currently receiving great attention from the international ICZM community, however, they are facing various challenges in the design of a suitable framework. These include:

- There is no consensus on appropriate indicators for measuring specific outcomes;
- There is an absence of good quality baseline and time-series data on which to base indicators;
- The inherent difficulty in modeling many types of cause and effect relations;
- The number of years needed for the effects of human activities to become apparent;
- Determining causation (e.g. determining the extent to which ICZM, rather than other factors, caused the outcome being measured);
- The amount of time and money required to assess the performance;
- Absence of a structured approach to measure the effectiveness of an ICZM initiative;
- Case studies, surveys and anecdotal information are often the only means used to measure the effectiveness of an ICZM initiative;
- The non-rigorous and easily biased information produced by poor evaluations is having less and less impact upon decision-makers who ultimately determine the fate of an ICZM effort;
- Managers of ICZM initiatives are, on occasion, reluctant to being evaluated by independent institutions.

Olsen (a) et al (1997a) identify potential problems in assessing ICZM projects. Projects may be seen to protect themselves from unfavourable assessment by adhering to one of the following:

- Adopting vague goals and targets;
- Choosing objectives that cannot be measured;
- Selecting indicators that identify effort rather than outcomes;
- Maintaining original objectives, ignoring change and a need for adaptation.

Lowry et al (1999) surveyed the experience of 19 agencies and international organisations to see how they approached evaluation of ICZM programmes. Their observations can be summarised as:

- Outcome evaluations are far less numerous than performance or capacity evaluations;
- The design of coastal management initiatives rarely calls for documenting baseline conditions in sufficient detail so that evaluators can make quantifiable, rigorously objective assessments of how key outcome variables change during project implementation and the degree to which change may be attributed to the efforts of a programme;
- The absence of adequate baseline information combined with the absence of control sites has led to a reliance in existing outcomes evaluations upon descriptive information and on the perceptions of evaluators and key informants on the success and quality of a project's efforts;
- Data to assess on-the-ground intermediate and end outcomes of ICZM programmes are insufficient;
- A major reason for limited outcome evaluations is that coastal management is a new endeavour and the time frames required to realise the end outcomes are long term;
- The paucity of outcome evaluations is also due to the difficulties inherent in confidently ascribing change in a society, its institutional structures, its policies, and the condition of its coastal ecosystems to the efforts of an ICZM programme;
- Rigorous impact evaluations are typically considered too complex and expensive. They require control groups, large data sets on a range of indicators, and substantial expertise in data manipulation and analysis;
- The more complex the programme, the more difficult it is to establish valid cause and effect relationships;
- In some cases, political resistance of programme managers to outcome studies can be an obstacle. Managers often fear that at least some of the determinants of programme outcomes are out of their control or that judgements will be made about programme effectiveness prematurely;
- Recognising that "What gets measured, gets done". A fear that an outcome emphasis will divert programme resources to focus on activities that have impacts that are more easily measurable;
- Also, coastal managers have become sufficiently certain about the effectiveness of their programmes, that they no longer see the need for studies assessing cause and effect relationships. For many managers, the causal theory linking ICZM effort, e.g. partnerships and strategies, to improved conditions on the coast are well understood;
- Another reason for the scarcity of outcome evaluations is that public debate about management effort focuses less on whether particular efforts "work" as intended and more on associated costs and benefits.

ICZM results in many 'outputs' that include publications, web-sites, strategies, plans, conferences, meetings, etc. They also produce various 'outcomes' that can be linked to the specific objectives of an initiative, such as the reduction of coastal pollution, or the development of different forms of sustainable tourism. A recurring issue for successful outcome evaluation is the lack of these objectives.

Burbridge (1997) presents a framework for measuring the success of integrated coastal management based on specific objectives. He states that "to measure 'success' in coastal management it is necessary to have clear and unambiguous objectives". However, he also states that "this may seem straightforward but in practice presents serious difficulties".

Difficulties faced in objective-based evaluation include:

- Objectives are often not set, or are difficult to monitor;
- Many of the potential benefits of ICZM are intangible and difficult to demonstrate objectively;
- Many objectives which are set for ICZM are not clear and their interpretation can vary among different interest groups;
- Even when benefits are demonstrable, it may be difficult to attribute them specifically to ICZM;
- Comprehensive and accurate baseline information is often lacking.

The major task of outcome evaluation is measuring change in outcome conditions and confidently attributing some or all of these changes to the ICZM initiative. For this specific ICZM indicators are required.

4.6   Progress in ICZM Indicators

Inherent to outcome evaluations is the need for indicators to measure performance and to determine what data needs to be collected to monitor performance. However, examples of indicators successfully developed for outcome evaluation of ICZM effort are limited.

A review of world-wide progress in their development is now presented as a series of individual experiences together with a consideration of the strengths and weaknesses of each approach. Not all can be classed as 'true' ICZM outcome indicators, however, all have elements that could be relevant to the development of suitable indicators for Scotland. The review cannot be considered overly comprehensive given the time and resources available for this study. It does however, provide a snap-shot of experience gleaned over the last decade, and highlights best practice that could have applicability within Scotland.

EXPERIENCE 1 – Simple quantitative output indicators for ICZM

Colt (1994) identifies simple quantitative output indicators for ICZM. By reviewing certain data, such as water quality, a simple and clear indication of the coastal environment is established. However, coastal water quality cannot be directly related to ICZM, as the quality could have been attained through increased sectoral activities alone rather than ICZM. Specific environmental, social and economic indicators, such as those proposed by Colt, whilst good to show the condition of Scotland's coastline, would be of relatively limited value if adopted as sole indicators of ICZM success.

EXPERIENCE 2 – Australia: State of the Environment 1996

The first independent and comprehensive assessment of Australia's environment, *Australia: State of the Environment* in 1996 proposed 17 indicators to measure aspects of efforts to integrate the management of estuarine and marine ecosystems in order to achieve equity – both within and between generations – in the conservation and use of living and non-living resources of the estuaries and oceans.

The indicators proposed were:

1   Beach stabilisation
2   Catchment development
3   Catchment management programs
4   Coastal care community groups
5   Coastal discharges
6   Coastal population
7   Coastal tourism
8   Fishing effects on non-target biodiversity
9   Great Barrier Reef management
10 Integration of management
11 Marine network participation
12 Marine protected areas
13 Commonwealth Government marine management
14 Ship visits
15 Shipping accidents
16 State Government marine management
17 World Heritage Area tourism

Most of the indicators are quantitative and show the level of management effort underway in terms of the number of management initiatives, the number of protected areas or the level of funding for management schemes. They also indicate the scale of the pressures facing the coast in terms of populations, development and fishing effort.

The indicators show the level of effort applied to the management of the coast, however, there is no connection between this effort and the effect it may be having on the coastal resources; i.e. it is a performance evaluation rather than outcome evaluation.

EXPERIENCE 3 – US: review of 30 years of ICZM

In his review of lessons learnt from 30 years of ICZM experience within the US, Sorensen considers the use of indicators for assessing the success of ICZM (Sorensen 1997).

Indicators suggested include:

- The number of ICZM efforts initiated;
- The number of plans or strategies adopted or implemented;
- The willingness to pay for an initiative by partners;
- Measurable outputs – including publications, websites, conferences, meetings, education and training, guidelines, models, and management plans.

Unlike previous experiences these indicators are more process and output focussed and are geared towards assessing effort rather than coastal conditions. Indicators that rely on the successful integration of people and management effort are also proposed, (i.e. the adoption of an integrated management plan), thereby focussing attention on ICZM as a separate process. However, Sorensen concludes that if there are to be more ICZM successes than failures, then further work is required to develop specific outcome indicators that link effort with changing coastal conditions.

EXPERIENCE 4 – UK: evaluation of estuary management partnerships

Fry and Jones (2000), have developed a series of indicators to evaluate Estuary Management Partnership (EMP) success in England and Wales. 27 indicators are proposed under four categories:

- Stakeholder Participation;
- Leverage and Long Term Funding;
- Steering Group Participation;
- Involvement in other Strategic Initiatives.

Successful inclusion of these indicators within the annual work programme of an EMP is intended to allow the degree of success of that partnership to be measured. A typical example indicator is: *"The degree of representation on the EMP's steering group within and between sectors for estuary interest groups"*.

The indicators developed by Fry and Jones again tend to focus on process and outputs rather than outcomes, and are tailored to one specific aspect of ICZM, namely partnership working. Their use in the evaluation of a wider ICZM initiative may be limited as a result. However, proof that a successful partnership has been developed is certainly an indication of a move towards more integrated working although not proof that the integrated working caused any of the intended outcomes.

Indicators proposed by Fry and Jones under the fourth theme 'Involvement in other Strategic Initiatives' do start to measure the degree of coordination or integration of management by the partnership for its estuary. A typical example indicator under this theme is:

- "Has the EMP developed or facilitated estuary wide Local Agenda 21 strategies?", or
- "Has the EMP facilitated co-operation between Local Planning Authorities?"

Further exploration of this type of "integrated working" indicator could be of use in evaluating ICZM's effectiveness. In Scotland, good examples of integrated working include:

- The Forth Estuary Forum's facilitation of Local Biodiversity Action Plans or
- The Moray Firth Partnership's development of a Special Area of Conservation for Bottlenose Dolphins.

EXPERIENCE 5 – US: assessment of USAID funded ICZM

The US Aid Agency and the University of Rhode Island Coastal Resources Centre have developed a series of "Coastal Management Indicators" as part of a performance monitoring plan to assess USAID funded IZCM work around the world (CRC, 1996. CRC, 1999).

The indicators are intended to track progress in coastal management efforts over time and to assess the impact of the efforts and results achieved.

They use 12 indicators, including;

- Improved Strategies and Policies
- New Institutional Structures
- Stakeholder Participation
- Index of Improved and Effective Management
- Improved and Effective Management
- Publications
- Media Coverage
- Training Programmes
- Hands-on Experience
- Additional Field Support
- Additional USAID and International Support
- Leveraged Resources

The indicators are all used as part of a formal reporting system. Some of the indicators require the collection of numerous data sets, and need to be linked to a separate SER for the area of coast on which the assessment is being undertaken. No results from the use of this recently introduced system are currently available.

The indicators given are a mix of process, output and outcome types and are specific to developing country situations. Of note is the need for a baseline description of the conditions under which management is taking place. In addition, a monitoring programme must be in place to track any environmental change occurring at the management site.

The results from the use of this system, when available, may provide some valuable lessons for a similar Scottish system.

EXPERIENCE 6 – US – development of outcome indicators

Perhaps the most advanced attempt to develop outcome indicators has been by Hershman et al (1999) whilst evaluating the effectiveness of Coastal Zone Management in the United States. Here the emphasis was on an "effectiveness evaluation", defined to mean the impact of the state coastal management programmes relative to national objectives as measured by "on-the-ground" outcomes of ICZM programme actions and decisions and the processes used to achieve the outcomes.

Effective ICZM in their view had to show a clear link between the goal they deemed important, the processes they set up to achieve that goal, and the outcomes resulting from those processes that advance the goal.

The work developed "Issue Importance Indicators" (social, economic, environmental and political), "Process Indicators" (polices, processes and tools), and "Outcome Indicators" (on-the-ground outcome measures). Outcome indicators were defined as "measures of on-the-ground protection provided by the ICZM processes and tools". An example of an outcome indicator suggested includes:

> *"The area of wetland compensatory mitigation required in an ICZM regulatory programme".*

Hershman concludes that although the indicators developed could show how well ICZM was meeting the national ICZM objectives, they could not be used to determine whether the health of the coastal resource was improving or deteriorating. That is the role of SER. However, he states that if outcome indicators and SER are used in combination then ICZM's effectiveness on-the-ground could be measured. The key is the need for clear objectives against which ICZM can be measured, and sufficient data and a baseline on which to base coastal SER.

EXPERIENCE 7 – Europe: integration indicators

The European Environment Agency (EEA) has recently undertaken work to look at integration indicators which could be used to measure the integration of the environment and sustainable development policy into various sectors of the economy, including energy, the Common Agricultural Policy and enterprise policy (Hertin et al. 2001. EEA 2000).

Integration indicators are intended to evaluate the integration of sustainability considerations into policy, as well as the contribution of policy to the achievement of sustainable development. The need for these indicators is based on the assumption that sectoral policies tend to take insufficient account of sustainable development issues.

The work developed a system of integration indicators that distinguishes between three categories of indicators. These are concerned with economic, social and environmental outcomes (**headline indicators**), with identifying significant overlaps between policy and sustainability (**integration indicators**), and with monitoring how policy processes take into account sustainability objectives (**process indicators**). Taken together, these indicators can provide a broad picture of the process and outcomes of the integration of sustainable development objectives into various sectors of the economy. These are shown in table 4.2.

Headline Indicators	Headline indicators monitor key economic, social and environmental trends. They highlight favourable developments as well as unresolved problems in the area of sustainable development.
Integration Indicators	Integration indicators link economic objectives to social and environmental objectives. They assess whether policy is exploiting potential 'win-win' opportunities.
Process Indicators	Process indicators describe activities within businesses and policy-making institutions, which can improve the integration of sustainable development into policy.

Table 4.2 - Categories of policy integration indicators

An example integration indicator proposed by Hertin which could be relevant to the coast is:

> *"The number of policies, programmes and plans for which a Strategic Environmental Assessment has been undertaken at the planning stage."*

Integration indicators and reporting mechanisms are intended to support learning within the policy- making process, aiming to open procedures to a wider set of social and environmental concerns. They are also intended to allow external stakeholders to monitor progress towards integration. All worthy aims that have applicability within the ICZM process.

The interactive process used by the EEA to develop these sectoral integration indicators represents a complex area of work and contributes significantly to the ongoing discussion regarding indicators for monitoring integration processes. At the moment this work is very sector specific. It concludes that there is a lack of a harmonised methodology that can be widely applied to many sectors. However, further recommendations have been made which, if pursued, may lead to applicability within the field of ICZM. These include the development of cross-sectoral integration indicators that would perhaps have more relevance to the more holistic and sectoral integration objectives of ICZM.

4.7   Chapter Summary

In summary, the worldwide development of indicators and assessment systems that link 'on-the-ground' change at the coast, the outcome, with ICZM effort is still in its infancy. ICZM researchers and academics are still trying to develop frameworks and methods that will assist formal reporting of ICZM effort.

The introduction of a process of 'outcome evaluation' is key for linking 'on-the-ground' change with IZCM effort, however, as a process it is faced with many difficulties. Successful evaluation would appear to require a combined approach, linking SER with objective based ICZM evaluation. The key is for clear objectives against which ICZM can be measured, and sufficient data and a baseline on which to base the coastal SER.

CHAPTER FIVE   CONCLUSIONS

5.1   Indicators to measure the State of the Coastline

Most indicators for monitoring the state of the coastal environment are based around Sustainable Development Indicators (SDI), and groups of such indicators generally form coastal and/or marine themes within larger State of the Environment Reports (SER). As SER techniques have matured over the last decade, the indicators used have also developed, moving away from representing the coast by broad-brush or single tokenism indicators, e.g. water quality, to include more detailed and issue specific indicators e.g. the levels of certain pollutants, that can provide a very thorough assessment of coastal resource conditions.

Most sets of indicators for SER follow the Pressure-State-Response (PSR) technical framework derived by the OECD in 1994. This framework is based on the concept of causality and is often chosen as a starting point because of its simplicity, wide acceptance, and the fact that it can be applied on any scale.

Indicator types differ depending on the scale of area under consideration and the target audience for the SER. Local indicators tend to address issues in more detail and are often aimed at empowering local communities to help resolve specific local issues. National indicator sets are broader, less detailed, and generally aimed at reporting progress towards achieving national targets driven by national policies.

Some countries (e.g. Australia) have good examples of 'tiers' of indicators and formal reporting systems that allow local indicators and SER's to feed into national reporting procedures. This allows a national picture of conditions around the country to be built up, or even a comparison of performance with other countries. Summarising large indicator sets (e.g. very detailed local sets from a particular area of interest, i.e. the Great Barrier Reef) with headline, key or core indictors, can help this process, as well as aiding understanding and disseminating large volumes of information to different audiences.

Various techniques for disseminating the findings of SER's and progress towards sustainable development objectives have been developed, but need to be tailored to different target audiences, from the general public to policy makers and politicians.

Many indicators in SER's play a monitoring role for larger and widely applicable sustainable development strategies and action plans. The aims and objectives of such documents are intended to be reviewed and amended dependent on the findings of the SER's, thereby providing an active means to both monitor progress and accurately target future action. The establishment of a baseline from which progress can be measured is key to this process.

There are very few examples of indicators within SER that are intended to show the state of ICZM. Those that exist are generally quantitative and show the level of effort in terms of the number of ICZM initiatives being undertaken, there is no connection between effort and desired outcomes on the coast.

5.2 Indicators to measure the effectiveness of integrated coastal zone management

Experience shows that ICZM as a process can be considered to follow a project or policy development cycle. The development of ICZM in Scotland to date can be seen to have followed this cycle. Experience from around the world shows that completion of the cycle is a long-term process, and 'on-the-ground' outcomes or change associated with such effort is only evident after a number of decades.

The worldwide development of indicators and assessment systems that link 'on-the-ground' change at the coast with ICZM effort is still in its infancy. ICZM researchers and academics are still developing frameworks and methods that will assist formal reporting of ICZM effort.

There are many approaches to evaluation of ICZM effort. The one that is required to show the link between ICZM effort and its impact on the coast is known as 'outcome evaluation'. However, outcome evaluation is faced with many difficulties, and there is currently no standard format or accepted method that can be applied to ICZM.

One of the greatest challenges faced is the need to measure any progress against objectives. However, this is not straightforward. ICZM objectives are often not set, and when they are, are difficult to measure and attribute directly to ICZM effort.

The major task of outcome evaluation is measuring change in outcome conditions and confidently attributing some, or all, of these changes to the ICZM initiative. For this specific ICZM indicators are required.

Although considerable work has been undertaken researching indicators for ICZM, experience shows that their application is far from straightforward. Input, output and process indicators are relatively straightforward and have been successfully developed, but good examples of outcome indicators are rare. Those that exist are specific to certain circumstances (geographically or issue specific) and their application beyond these situations is limited.

Those that appear to be the most realistic, are being developed alongside SER, e.g. Coastal Resources Centre/USAID. This combination provides both an assessment of change 'on-the-ground' together with any ICZM effort intended to facilitate that change. The key is for clear objectives against which ICZM can be measured, and sufficient data on which to base the coastal SER.

Indicators require an established baseline from which progress can be monitored. The level of ICZM success is difficult to measure without baseline information on the local coastline's environmental, social and economic context. Given this background, progress may then be both quantitatively measured and compared to the original conditions at the start of any ICZM effort.

Recent research work on sectoral policy integration indicators may provide good practice for the further development of indicators specifically to show the benefits that an integrated approach to management may provide.

CHAPTER SIX   RECOMMENDATIONS

This report represents a brief overview of relatively easily accessible information regarding indicators and ICZM. As such it may not be representative of the latest thinking or results available within certain institutions or organisations. The science for the subject matter is not yet well developed and in many cases is still undergoing a trial period. The recommendations that follow are, therefore, based upon an objective view of the findings presented and the needs of the SCF and ICZM in Scotland.

Recognising the SCF's future work programme and the aims and aspirations for ICZM in Scotland, the following recommendations are made:

1)   Adopt an objective based outcome evaluation approach for inclusion in the National Strategy for Scotland's Coasts and Inshore Waters.

The SCF should adopt an objective based outcome evaluation approach. As part of the development process of the coastal strategy, outcome indicators should be developed that will measure the success of its aims and objectives. Early consideration of such indicators and their inclusion in the development programme will ensure that the strategy can be monitored, reviewed and adjusted over time. In addition, the contribution played by the ICZM approach promoted by the strategy can be measured and justified.

2)   Adopt a partnership approach

Many SCF partners currently collect data or information as part of their day-to-day duties. Many maintain their own indicators that could be used as part of the overall process. A partnership approach to monitoring is key and will help strengthen ownership of the indicators for the emerging strategy. Such an approach should be promoted.

3)   Prepare a State of the Environment Report for Scotland's Coasts and Inshore Waters

Consideration should be given as to how stakeholders that currently use indicators to monitor certain aspects of the coast could contribute their existing information and data to a central source. A mechanism to create a central record, or a regular exchange of data between stakeholders, would allow a SER for the coast to be prepared. This could be used as a baseline from which progress towards sustainable management could be measured. Such a system could be part of a wider 'Scottish Coastal Observatory' where, in addition to data collection and coordination, results and progress could be disseminated to a wide audience through a variety of media. Figure 6.1 presents a schematic illustration of how such an arrangement could work.

4)   Recognise the ICZM policy development cycle

There is a need to recognise and promote the ICZM policy development cycle and to demonstrate that the work of the SCF and local coastal management partnerships are following this cycle. This will ensure that those who provide political and financial support to Scottish ICZM will give due recognition to the long-term nature of such work and that, given time, (which overseas examples demonstrate is needed), successful 'on-the-ground' outcomes

will be achieved. A conference or seminar utilising speakers and experience from advanced overseas projects or ICZM programmes could be developed to demonstrate this cycle.

5)   Monitor other outcome based evaluation systems

Further research and a watching brief should be kept on the most advanced outcome based evaluation systems such as the USAID system of ICZM performance monitoring and the recent EEA work on integration indicators. These systems are relatively new and performance results are yet to be determined. They may provide further good practice that can be adopted in Scotland in due course.

6)   ICZM Headline Indicators

A few simple 'Headline Indicators' for ICZM should be developed. The 'Headline Indicators' would serve the purpose of trialing methods for a more complex monitoring system and would provide the means to disseminate key messages about ICZM's achievements. As a first step a workshop or seminar could be held in conjunction with the SCF to determine from key partners and organisations what indicators they would like to see developed to prove that ICZM was having an effect on the ground. The seminar could also serve the dual purpose of finding out what data and information organisations are prepared to provide to a monitoring system in the longer-term.

7)   Link to the national indicator series

Any indicators or evaluation systems developed in the process of preparing a coastal strategy should be developed with a view to linking with the current Scottish Executive work to develop a national indicator series. The link could be in the form of a few coastal headline indicators developed from larger and more detailed datasets and specific indicators of coastal conditions
.

Figure 6.1 – Co-operative arrangements for Scottish State of the Environment Reporting

SCOTTISH COASTAL STRATEGY

OBJECTIVES & GOALS (THEMES)

BASELINE

CURRENT INDICATORS COLLECTED BY SCF PARTNERS

INDICATORS

CO-OPERATIVE STEERING
ARRANGEMENTS   GROUP

MONITORING STRATEGIES

INFORMATION SYSTEM

EXISTING SUSTAINABLE DEVELOPMENT INDICATOR WORK

SCOTTISH COASTAL OBSERVATORY

META DATA

PUBLIC AWARENESS (HEADLINE INDICATORS)

RESEARCH AGENDA
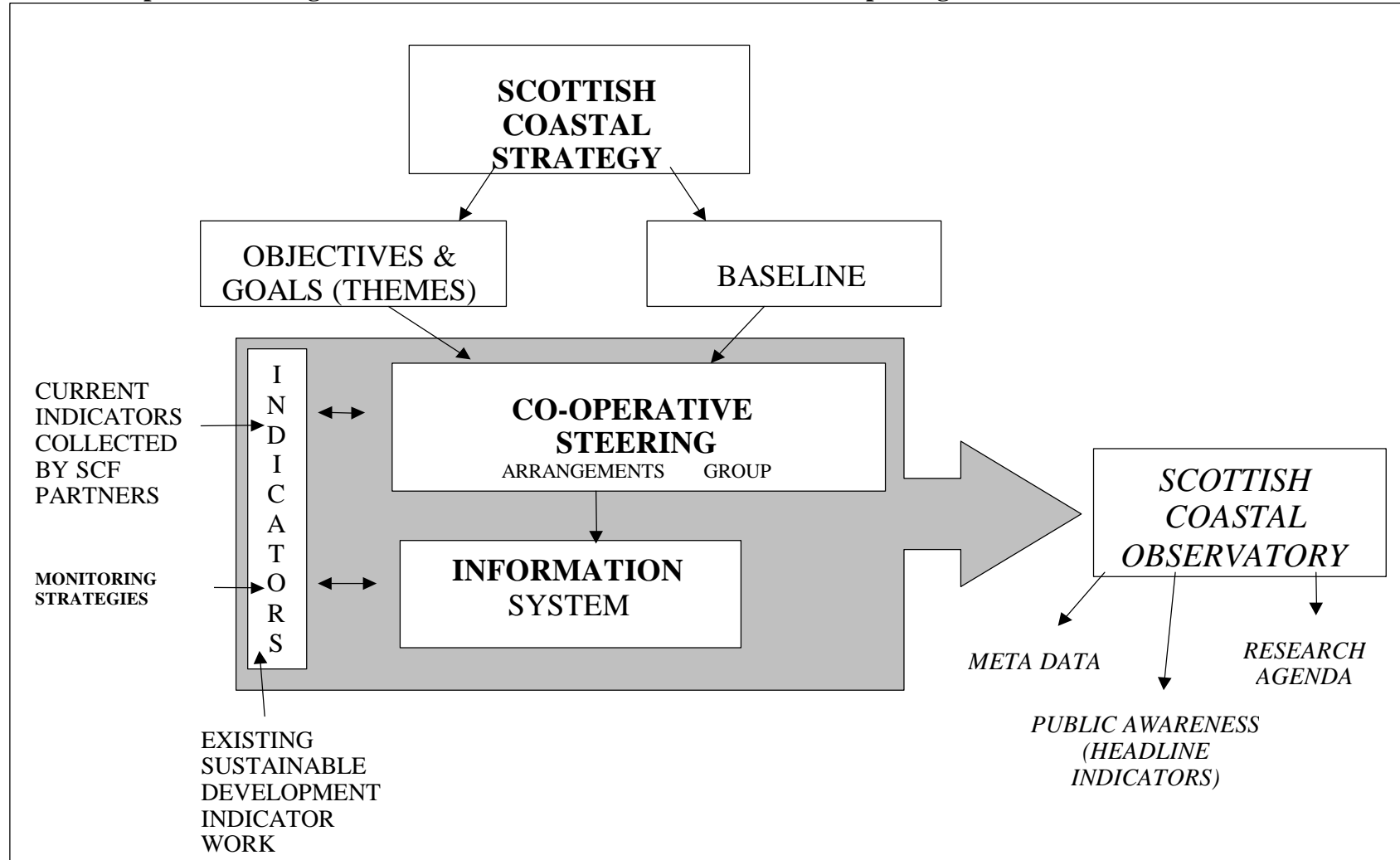
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APPENDIX 1   COASTAL SUSTAINABILITY INDICATORS

This appendix presents examples of indicators selected from around the world at various scales of geographical coverage from the regional, to the national and local level. Most sets are part of larger and more comprehensive 'State of the Environment Reports' (SER), and represent a single Coastal/Marine theme within these reports.

The indicators are presented at the following scales:

1. European   European Environment Agency

2. National   - Worldwide   Environment Australia
                                            South Africa State of the Environment reporting
                                            New Zealand Ministry of the Environment

                     - United Kingdom   DETR
                                            Environment Agency

                     - Scottish   Scottish Environment Indicators Group

                                            Scottish Environment Protection Agency

                                            Scottish Executive

3. Local   - United Kingdom   Kent County Council
                                            Atlantic Living Coastlines

                     - Scottish   Fife Council

1) EUROPEAN

European Environment Agency

Title of Indicators: Overview of Issues with Pressure and State Indicators
Date: 1997
Internet URL: http://www.eea.eu.int/

Overview: The European Environment Agency's 'European Environment, the Dobris Assessment' (1995) gives a comprehensive integrated assessment of the EU Environment, and is updated on a three yearly basis. 'Europe's Environment: The Second Assessment' was published in 1998 (EEA). This second report developed a system of indicators, which could be used to assess the state of the EU coastal zones and to identify the pressures on them. Though not extensive the list is considered to be representative of the key issues affecting Europe's coastal zone and provides the basis for a further elaborated framework of indicators.

The issues are listed below with both Pressure and State Indicators. The matter of integration does not appear to be covered.

Environmental Issues	Human Activities	Pressure on Coastal Zone (Pressure Indicators)	*State of Coastal Zone (State Indicators)*
Eutrophication	Agriculture, urbanisation, fishery & shell fisheries, mariculture	Loads tonnes N+P/ year enter sea (river, dredged material, coastal zone point sources, air, diffuse)	Total concentration (mg/l) P,N in water in winter season-identification of blooms
Heavy metal pollution	Industry, urbanisation, harbour activities (dredging and dumping)	Loads of heavy metals (PB, Cd, Hg) (river, coastal zone point sources, air, diffuse) tonnes heavy metal/year entering coastal zone)	Concentration of heavy metals (Pb, Cd, Hg) in sediment
Overfishing	Fishery & shell fishery, mariculture	Sum of HP-capacity of fishing vessels	Fishing mortality
Depletion groundwater	Tourism and recreation, urbanisation, agriculture	Griund water abstracted in coastal zone	Sustainable use of groundwater
Coastal erosion	Mining, harbour activities (dredging and dumping), coastal protection	Recession of shore in m/year	Land loss in m^2/year
Climate change	Energy conversion, industry, transport & shipping, urbanisation, tourism & recreation	Relative sea level rise	Land under flooding risk
Habitat loss	Mining, harbour activities (dredging and dumping), tourism & recreation fishery & shell fishery, coastal zone protection, agriculture, mariculture	Land use /marine function in coastal zone	Loss of priority habitats

2)   NATIONAL

a)   Worldwide

i)   Environment Australia

Title of Indicators: Environmental Indicators for National State of the Environment Reporting
Date: 1998
Internet URL: www.environment.gov.au/soe/envindicators/index.html

Overview: The first independent and comprehensive assessment of Australia's environment, *Australia: State of the Environment 1996*, was released by the Commonwealth Environment Minister in September of that year. Following this, reports were issued recommending indicators for each of seven major themes around which Commonwealth state of the environment reporting is based. One of these themes is estuaries and the sea. Monitoring strategies and approaches to interpreting and analysing each of the indicators are discussed, and possible sources of data are noted.

Overview of Coastal Indicators: The estuaries and sea theme recommends 61 key indicators. These are grouped in 8 classes: *(The numbers in brackets represent the number of indicators in each class).*

1   Protected and Cited Species and Taxa (3)
2   Habitats Extent (9)
3   Habitat Quality (17)
4   Renewable Products (6)
5   Non-renewable Products (2)
6   Water/Sediment Quality (5)
7   Integrated Management (17)
8   Ecosystem Level Processes (2)

The indicators fall into one of three categories, a condition (C), a pressure (P) or a response (R). These equate to the standard PSR technical framework for indicators as proposed by the OECD (OECD 1994).

<u>*Class 1:*</u>   *Protected and Cited Species and Taxa.*   This group of indicators comprises all the species and other identified taxa explicitly protected by name under any relevant Commonwealth or State/ Territory legislation.

The indicators are:

1   Marine species rare, endangered or threatened (R)
2   Protected species populations (C)
3   Seabird populations (C)

<u>*Class 2:*</u>   *Habitat Extent*
This group of indicators documents the extent of the major marine and estuarine habitat types, with boundaries defined largely on the grounds of technological feasibility.

The indicators are:

1   Algal bed area (C)
2   Beach and dune area (C)
3   Coral reef area (C)
4   Dune vegetation (C)
5   Intertidal reef area (C)

6   Intertidal sand/mudflat area (C)
7   Mangrove area (C)
8   Saltmarsh area (C)
9   Seagrass area (C)

Class 3:   ***Habitat Quality***
This group of indicators is designed to permit the integrity of the major habitats (from Class 2 above) to be assessed in a more detailed manner. Typically, these indicators rely on biological (species or assemblage-level) information. They have been selected to provide more detailed information about habitats than those in Class 2, and to be capable of detecting regional changes much earlier than those in Class 2.

The indicators are:

1   Algal bed species (C)
2   Algal blooms (P)
3   Beach species (C)
4   Coral reef species (C)
5   Dune species (C)
6   Fish populations (C)
7   Intertidal reefs species (C)
8   Intertidal sand/mudflat species (C)
9   Islands and cays species (C)
10 Mangrove species (C)
11 Pest numbers (P)
12 Saltmarsh species (C)
13 Seamount species (C)
14 Seagrass species (C)
15 Species outbreaks (P)
16 Subtidal sand/mudflat species (C)
17 Chlorophyll concentrations (C)

Class 4 :   ***Renewable Products***
These are indicators that document the various aspects of the nature and production of marine and estuarine living resources.

The indicators are:

1   Aquaculture effort (P)
2   Aquaculture production (P)
3   Fish stocks (C)
4   Seafood quality (contamination) (C)
5   Trawl fishing area (P)
6   Fishing gear (P)

Class 5:   ***Non-renewable Products***
These indicators document various aspects of the exploitation of minerals, oil and gas, sand and other non-living and non-renewable resources of estuaries and the sea.

The indicators are:

1   Ocean exploration (P)
2   Ocean mining (P)

Class 6 : *Water/Sediment Quality*

These indicators document the levels of contaminants in the water, sediment and related aspects of marine and estuarine ecosystems; they are considered to be pressures on living components and biological processes of estuarine and marine ecosystems.

The indicators are:

1   Sediment quality (contaminants) (P)
2   Sentinel accumulator program (P)
3   Turbidity
4   Water nutrients (nitrogen) (P)
5   Seabird eggs (contaminants) (P)

Class 7 : *Integrated Management*

Of particular interest is the Integrated Management class. The 17 indicators recommended measure aspects of efforts to integrate the management of estuarine and marine ecosystems in order to achieve equity – both within and between generations – in the conservation and use of living and non-living resources of the estuaries and oceans. Of particular interest is the 'integrated management' indicator which links environmental performance with organisational and governmental activity. Although primarily quantitative in terms of the number of effective management initiatives in a region, this indicator does attempt to link effort with outcomes on the ground.

The indicators are:

1. Beach stabilisation (R) – this documents the nature and cost of beach rehabilitation and stabilisation works in estuaries, lagoons and bays, and on the open coast.
2. Catchment development (P) – this documents the nature and types of land uses in the coastal river and stream catchments for estuaries, lagoons and bays.
3. Catchment management programs (R) – this documents the number and nature of formally implemented catchment management programs covering coastal river and stream catchments.
4. Coastal care community groups (R) – this documents the number of 'Coastcare' and allied groups, the number of members in each group and the costs of programmes administered by them.
5. Coastal discharges (P) – this documents the location and number of licensed point-source discharges into estuaries, lagoons, bays and coastal waters, including the type and volume of materials discharged.
6. Coastal population (P) – this documents the locations and numbers of people in coastal cities, towns and agricultural regions, and shifts in populations, based on census boundaries.
7. Coastal tourism (P) – this documents the annual number of tourists undertaking local (day trips) and extended (overnight) trips.
8. Fishing effects on non-target biodiversity (R) – this documents the number of fisheries management plans (State and Commonwealth) that contain effective indicators for monitoring the level of, and extent of reduction in, impacts on non-target organisms, and the number of such indicators.
9. Great Barrier Reef management (R) – this documents the annual allocation of funds from government sources to the Great Barrier Reef Marine Park Authority (GBRMPA) and the Queensland Department of Environment for management of the Great Barrier Reef (GBR), and to Australian scientific institutions for research on the GBR.
10. Integration of management (R) – this documents the number of regions covered by an effective integrated ecosystem management framework that includes environmental performance indicators for assessing and reporting on ecosystem attributes related to the various responsibilities of the three levels of government and the activities of the private sector.
11. Marine network participation (R) – this documents the participation (number on the mailing list) in the Marine and Coastal Community Network (MCCN) by IMCRA subregion and Marine Region.

12. Marine protected areas (R) – this documents the number, extent and classification of marine protected areas (classification based on IUCN (World Conservation Unioin) criteria), and other similar arrangements such as RAMSAR Sites and World Heritage Areas.

13. Commonwealth Government marine management (R) – this documents the annual expenditure of the Commonwealth Government funds on national, regional and local-scale programs for coastal and marine management, including in the environment, conservation and resource sectors. It includes funds raised by government authorities in the form of levies and charges to offset changes in consolidated revenue outlays.

14. Ship visits (P) – this documents the frequency of ship visits to Australian ports by types of vessel, port of origin, and nature of cargo (imported or exported).

15. Shipping accidents (P) – this documents the frequency of shipping accidents in Australian waters, together with the nature of the main cargo carried, materials lost to the environment, estimates of damage caused to the environment, and the number of ships inspected annually for safety compliance and problems consequently identified.

16. State Government marine management (R) – this documents the annual expenditure of State and Northern Territory funds on regional and local-scale programs for coastal and marine management, including in the environment, conservation and resource sectors. It includes funds raised by government authorities in the form of levies and charges to offset changes in consolidated revenue outlays.

17. World Heritage Area tourism (P) – this documents the number of tourists visiting Australia's two marine World Heritage sites (Shark Bay and the Great Barrier Reef) and estimates of the annual tourism fees, levies and direct charges ($) contributed by users of the two sites. It may also be appropriate to track tourism at marine sites near other World Heritage sites (such as South West Tasmania).

Class 8 : Ecosystem-level Processes

These are broad-scale indicators that are, or are related to, various important functions or processes in marine and estuarine ecosystems. They also have an important role in interpreting trends that might be detected in the other indicators.

The indicators are:

1 Sea level (C)
2 Sea surface temperature variability (C)

ii)   South Africa State of the Environment Reporting

Title of Indicators: The National State of the Environment Report
Date: 1998
Internet URL: www.ngo.grida.no/soesa/nsoer/indicatr/index.htm#Marine

Overview: The South African state of the environment reports are the result of the first year of a pilot project on state of the environment reporting in South Africa. Indicators for the reports are grouped according to main issues covering:

1   Climatic and Atmospheric Change
2   Sustainability of Terrestrial Ecosystems
3   Sustainability of Water Resources
4   Sustainability of Coastal and Marine Systems
5   Social Dimension
6   Economic Dimension
7   Political Dimension

Overview of Coastal Indicators: The coastal and marine systems theme covers 5 indicators
 Ship traffic rounding the Cape
1   Number and status of estuaries off the east coast
2   Trends in mean sea level rise
3   Stocks of marine resources: South African catches
4   Number of marine protected areas in each province which serve preservation, fishing, education and tourism functions

The matter of integration of management does not appear to be covered.

iii)   New Zealand Ministry for the Environment

Title of Indicators: Environmental Performance Indicators Programme
Date: 1998
Internet URL: www.marine.mfe.govt.nz

Overview: The New Zealand Ministry for the Environment is developing environmental performance indicators for the marine environment. These indicators are used to track key environmental issues such as the sustainability of harvest fish stocks, impacts from human activities on the coastal/marine environment, maintaining biodiversity, and population trends in threatened species. The indicators are used to report the state of the marine environment on a regular basis. The marine environment set of indicators is currently under development but will include:

Overview of Coastal Indicators:

1 Beach Water Quality	11 Alien species
2 Land use	12 Algal blooms
3 Sedimentation	13 Litter
4 Chlorophyll 'a' or trophic index	14 Area under public ownership
5 Toxic and ecotoxic contaminants	15 Public access
6 Marine spills	16 Natural character
7 Extent of marine habitats	17 Fish stocks
8 Biodiversity condition	18 Fishing impacts
9 Areas under protection	19 Area covered by marine farms
10 Threatened taxa	

Although still under development, indicators considering management or integration of management do not appear to be covered.

B)   UNITED KINGDOM

i)   The Department of the Environment, Transport and the Regions

Title of Indicators: National Indicators of Sustainable Development
Date: 1997 and 1999
Internet URL:
http://www.sustainabledevelopment.gov.uk/sustainable/quality99/annexa.htm

Overview: Two series of indicators have been prepared by the DETR. The first one in 1997 'Indicators of Sustainable Development for the United Kingdom' included a section on marine issues containing 6 indicators. The second series was published in 'Quality of Life Counts' in December 1999; a core set of about 150 indicators of sustainable development, which will be used to monitor national progress towards sustainable development targets. These indicators underpin the Strategy 'A better quality of life: a strategy for sustainable development in the UK' (May 1999). They cover numerous themes one of which is 'Seas, Oceans and Coasts'.

Overview of Coastal Indicators:

1997 – Indicators of Sustainable Development for the United Kingdom' - *Marine Indicators:*

> 1   Estuarial water quality
> 2   Concentrations of key pollutants
> 3   Contaminants in fish
> 4   Bathing water quality
> 5   Inputs of contaminants
> 6   Oil spills and operational discharges

1999– Quality of Life Counts *- Marine Indicators:*

The 'Seas, Oceans and Coasts' theme details 5 objectives with associated indicators:

Objective	Indicator
1 'Reduce or eliminate inputs of hazardous and radioactive substances of most concern'	1 Estuarine water quality, marine inputs
2 'Aim to raise consistent compliance with the European Bathing Water Directive'	2 Compliance with Bathing Water Directive
3 'Protection of marine habitats and species'	3 Biodiversity in coastal/marine areas
4 'Improve the management and conservation of fish stocks'	4 Fish stocks around the UK fished within safe limits
5 'Work with other countries to achieve effective management and conservation of fish stocks'	5 State of the worlds fisheries

The matter of integration does not appear to be covered.

ii)   Environment Agency

Title of Indicators: Indicators
Date: *2001*
Internet URL: http://www.environment-agency.gov.uk/Indicators/index.html

Overview: The Environment Agency has a suite of about of 70 indicators, which they use in order to gather information on the overall state of the environment. There are 9 themes including 'Water' which covers both inland and coastal waters. Using these indicators regular state of the environment reports are produced for different themes, including one for Coasts.

Overview of Indicators:

Indicator	Theme
1 Compliance with the Bathing Water Directive	Water
2 Dangerous substances in water	Water
3 Estuary water quality	Water
4 Occurrence of otters	Water, Wildlife
5 Major flooding incidents	Water
6 Coarse fish catches	Water
7 Loads of major contaminants to coastal waters	Water
8 Beach litter in the UK	Lifestyles, Use of resources
9 Sea level change	Natural forces

The matter of management or integration of management does not appear to be covered.

C)   SCOTTISH

i)   Scottish Environmental Indicators Group

Title of Indicators: Potential Environmental Indicators for Scotland
Date: 2000

Overview: In November 1996 representatives from a range of environmental organisations in Scotland, including SEPA, SNH, SE, SAC and others, discussed the feasibility and merits of defining a suite of environmental indicators for Scotland. One of the aims was to identify indicators relevant to international, national and local issues. A candidate list of 138 indicators is presented within the report although it is stated that this cannot be regarded as comprehensive. The report covers 18 themes one of which is the 'Marine Environment'.

Overview of Coastal Indicators: The 'Marine Environment' theme details 12 indicators:

   1   Coastal water quality
   2   Estuarine water quality
   3   Organic enrichment from aquaculture
   4   Commercial fish stocks
   5   Commercial fish catch
   6   Size of major commercial species at first spawning
   7   Non-target fish catch
   8   Commercial shellfish stock
   9   Commercial shellfish catch
   10   Oil and gas extraction

11 Toxic effect of hydrocarbon in the North Sea
12 Toxic substances in the marine environment

Additional indicators not listed under the marine environment theme but which have a coastal aspect are listed below:

13 Trends in the state of sites protected for habitats and species
14 Loss of coastal habitats to various land uses
15 Extent and nature of coastal defences
16 Sea surface temperature indices
17 Sea level change
18 Marine litter
19 Bathing waters

The matter of integration does not appear to be covered.

ii)   Scottish Environment Protection Agency

Title of Indicators: Scottish Environmental Indicator Series
Date: *2000*
Internet URL: http://www.sepa.org.uk/indicators.htm

Overview: SEPA have so far developed two sets of indicators under the themes of:

1. Air Quality
2. Surface Water Quality

Further sets are currently under development.

Overview of Coastal Indicators: Surface Water Quality contains 5 indicators, 2 of which cover coastal issues:

1   Estuarine water quality
2   Coastal water quality

The matter of integration does not appear to be covered.

iii)   Scottish Executive

Title of Indicators: Sustainability indicators for waste energy and travel for Scotland
Date: 2001
Internet URL: www.sustainable.scotland.gov.uk

Overview: This report by consultants, ENTEC, represents the first stage in the development of a set of sustainable development indicators for Waste, Energy and Travel in Scotland. It presents ideas for how Scotland can use indicators to help its transition to sustainable development. The report has led to the publication of a consultation document entitled: "Checking for Change" (April 2001), which asks for public and organisational debate on the indicators proposed by ENTEC.

Overview of Coastal Indicators: The following indicators within the report are of relevance to coastal issues.

1   Loss of natural habitat for development
2   Homes with access to the internet (for the purposes of awareness raising and information dissemination)
3   Public awareness of sustainable development and Waste-Energy-Travel issues
4   Biodiversity – trends in biodiversity action plan species
5   Climate change –sea level change

3)   LOCAL

a)   United Kingdom

i)   Kent County Council

*Title of Indicators***:**   Sustainability of Kent Coast and Seas
Date: 2001
Internet URL: http://www.kent.gov.uk/

Overview: The first local attempt to develop a system of coastal indicators in the UK has been in Kent where sustainability indicators have been identified and recently validated by the Kent Coastal Forum (March 1999).   The project stemmed originally from the Kent County Council Environment Programme, which developed a set of 69 individual indicators for the county of Kent as a whole. A report 'Sustainability of Kent Coast and Seas' will be published later in 2001.

Overview of Coastal Indicators: The 'Sustainability of Kent Coast and Seas' report will cover 8 themes with various indicators under each theme. These are:

Theme 1: Land Use and Development

  1   Area of Developed Land
  2   Use of Brownfield Sites

Theme 2: Tourism and Recreation

  1   Kent Coast Tourism
  2   Waterfront Development

Theme 3: Nature Conservation and Biodiversity

  1   Area of Important Coastal Habitats
  2   Designated and Protected Areas
  3   Indicative and Threatened Species`

Theme 4: Coastal Processes

  1   Coastal Defences
  2   Coastal Erosion
  3   Coastal Storms and Flooding

Theme 5: Resource Use

  1   Freshwater Use
  2   Fish Stocks and Landings
  3   Renewable Energy

Theme 6: Pollution

  1   Bathing Water Quality
  2   Contaminants in Coastal Waters
  3   Eutrophication
  4   Treatment of Sewage
  5   Industrial Discharges

6   Marine and Coastal Oil Spills
7   Disposal of Navigational (Capital and Maintenance) Dredging Spoil
8   Litter on Kent Coasts
9   E.coli in Shellfish
10 Heavy Metals, Pesticides and PCBs in Fish

Theme 7: Traffic, Transport and Shipping

1   Traffic on Coastal Roads
2   Public Transport
3   Kent Port Traffic and Shipping Flows

Theme 8: Socio-environmental Quality

1   Deprivation in Coastal Districts
2   Health in Coastal Districts
3   Rate of Crime in Coastal Districts
4   Town Centre Vitality
5   Coastal Air Quality

The matter of integration does not appear to be covered.

ii)   Living Coastlines Project

Title of Indicators: A Framework for Managing the Coast of Devon and Cornwall
Date: 2000
Internet URL: http://www.alc.plymouth.ac.uk/

Overview: The Atlantic Living Coastlines project examined current coastal zone management in Devon and Cornwall, to assess the degree of integration, and to determine how to meet the challenges of the 21st century. As part of the project a suite of sustainability indicators were developed for monitoring change and sustainable development on the coast.   The project was supported by the European Commission as one of a number of 'Demonstration Projects' around the coasts of Europe.

Overview of Coastal Indicators: The report covers 10 themes on Coastal issues with potential indicators identified within each. These are:

Theme 1: Biodivesity

1   Extent of observed intertidal habitat change
2   Breeding Bird counts for Auks and Waders
3   Abundance of the Pink Sea Fan Eunicalla verrucosa Observation of cetaceans
4   Distribution of Zostera spp

Theme 2: Water Quality

1   Comparison of temporal trends between estuaries to establish patterns in water quality
2   Relationship between Directive compliance and results of local water indicators

Theme 3: Coastal Processes and Defence

1   Rate of sea level rise
2   Length of defended coast (%) by category- hard, soft
3   Average rate of eroding coast

4   Frequency and duration of floods
5   Cost of flood defence

Theme 4: Historic Environment

1   Coastal historic landscape character types
2   Damage to protected historic and archaeological sites
3   Number of scheduled sites
4   Number of ships and buildings on the 'At Risk Register'

Theme 5: Economic Development/Resource Use and Efficiency

1   Diversity of the industrial base on the coast
2   Levels of local investment rates
3   Proportion of journeys taken by public transport
4   Proportion of development projects taking place on brownfield land as opposed to greenfield land

Theme 6: Tourism/ Recreation

1   Trends in the use of the coastal zone in relation to economic value
2   Numbers of car parking spaces and income from these
3   Numbers of hotels, B&Bs, guest houses, (+ bed spaces)
4   The number of recreational amenities/opportunities (+ access for the disabled
5   Intensity of use of recreational activity (land and water based)

Theme 7: Fisheries

1   Total fish landings – quota and non quota
2   Size of target spawning stocks
3   Catch per unit effort (CPUE) for target fisheries
4   The number of marine mammals and seabirds caught by species/fishery method/area/year

Theme 8: Awareness and Participation in Decision Making

1   Level of personal involvement in community groups
2   Awareness of sustainability issues and Local Agenda 21

Theme 9: Communication and Information Transfer

1   Proportion of population with internet access
2   Internet access in public libraries
3   Number of computers in schools
4   Proportion of population with a personal computer

Theme 10: Quality of Life in the Coastal Zone

1   Unemployment levels (seasonal)
2   Perceived quality of coastal landscape
3   Perceived 'quality of life'
4   Availability of affordable housing
5   Population age structure

The matter of integration does not appear to be covered.

b)   Scottish

i)   Fife Council

Title of Indicators: Sustainability Indicators for Fife
Date: 1999

Overview: Indicators to measure the quality of life and the quality of the environment in Fife.

Overview of Coastal Indicators: One coastal indicator is included within this report for Fife.

   1   Quality of Bathing Waters