

A Review of the Role, Status and Direction of State of the Environment Reporting

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University of Tasmania
Hobart
1995

Abstract

The present resurgence of interest in reporting on the State of the Environment (SoE) may be attributed, principally, to the information demands of sustainable development, and the need for policy makers and the wider community to assess progress in protecting the environment and allocate environmental expenditure to priority areas. SoE is far wider in its responsibilities than solely reporting on environmental condition; it must also report on human-environment interactions and management responses. The niche for SoE lies in providing a synoptic and integrated view of social, economic and environmental issues, spanning resource sectors and bridging the gap between science and community. However, SoE faces various dilemmas in achieving the multiple objectives which it has been assigned. Identifying and responding to the needs of the 'information starved' while hoping to extend the range of decision criteria of the 'information independent' are some of the challenges for SoE.

Acknowledgements

I would like to thank my supervisor Peter Hay for his assistance throughout this project. Many thanks also to my wife Sarah for her patience and encouragement, and her assistance in reviewing and editing. The establishment of the SoE program in Tasmania is in large measure due to the vision of Richard Bingham and Bob Davies.

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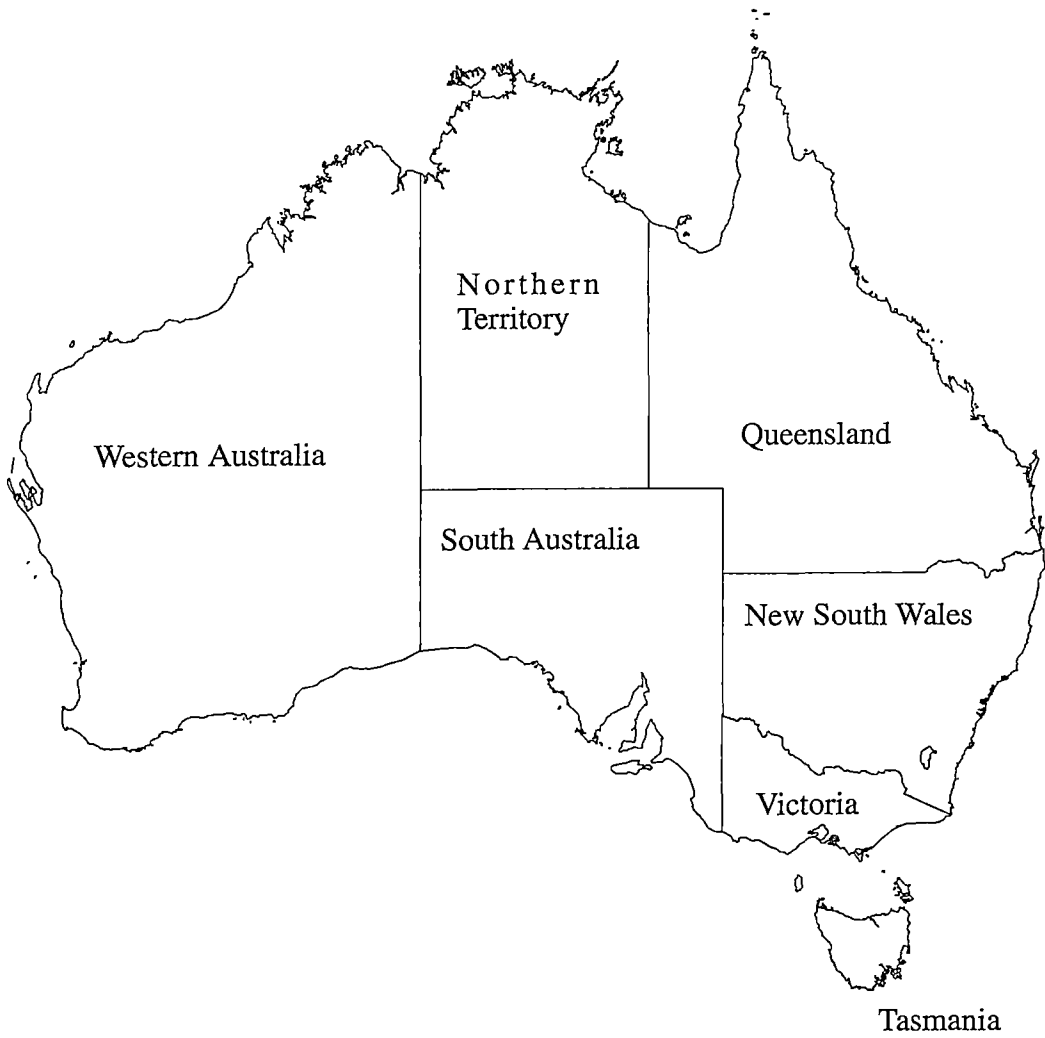
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Acronyms

ABS	Australian Bureau of Statistics
ANZECC	Australian and New Zealand Environment and Conservation Council
CEPA	Commonwealth Environment Protection Authority (replaced by DEST as the national State of the Environment Reporting Authority)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAHE DEST)	Department of Arts, Heritage and the Environment (subsequently DASET and now
DASET	Department of Arts, Sport, the Environment and Territories
DELM	Tasmanian Department of Environment and Land Management
DEST	Department of the Environment, Sport and Territories (the Environmental Information, Science and Reporting Unit in the DEST Environment Strategies Directorate is the national reporting authority)
ERIN	Environmental Resources Information Network
ESD	Ecologically Sustainable Development
GDP	Gross Domestic Product
GIS	Geographic Information Systems
IUCN	World Conservation Union (formerly the International Union for the Conservation of Nature)
NEPA	National Environment Protection Authority
NGO	Non-government Organisation
NHMRC	National Health and Medical Research Council
NPI	National Pollution Inventory
NRIC	Natural Resources Information Council
OECD	Organisation for Economic Co-operation and Development
SoE	State of the Environment: referring to the system of reporting
SoER	State of the Environment Report
SoF	State of the Forests
TSAC	Tasmanian Statistical Advisory Committee
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Program
WWF	World Wildlife Fund

Map 1.1

Australian States and Territories



Source: Mapped from digitised land data, Department of Environment and Land Management

1. Introduction

...as long as nature was treated as a free resource and an open pit for wastes, the key indicator of successful development was production, with productivity measured in terms of output per unit of land, capital and labour (Mathews 1991, p. 23)

There is a need, which this thesis will pursue particularly for the case of Tasmania, to establish and maintain systems for accounting, monitoring and reporting on the stock and condition of natural resources and the environment. This is certainly not a new concept and at one level it is simply a question of Tasmania adopting programs required under Agenda 21 (UNCED Agenda 21 chapter 40). OECD countries generally recognise State of the Environment (SoE) reporting as being as fundamental to government responsibilities as financial monitoring and reporting, and other Australian States and the Commonwealth have now produced or are in the process of planning for SoE. SoE in Tasmania is overdue and will provide, if properly resourced and executed, a vehicle to assess impacts on the environment and to review management responses to these impacts.

SoE is proposed to help deliver the information base needed to support the community's environmental objectives. In *Caring for the World: A Strategy for Sustainability*, (IUCN, UNEP AND WWF 1991, p. 73) four broad components of knowledge based action to support sustainability are identified. They are:

1. strengthening research capacity
2. establishing machinery for monitoring the state of the environment and progress towards sustainability
3. improving the availability of information about the environment to the public
4. ensuring that there is an effective transfer of new knowledge about the environment into the educational and training system.

This thesis will focus particularly on the machinery for monitoring the state of the environment (point 2) and its role in improving the availability of information to the public (point 3). This machinery includes the legislative basis for reporting, principles of reporting, frameworks for reporting and indicators of environment and sustainability. Examples and models of approaches to SoE will be reviewed and suggestions about preferred directions will be made.

In acting as a conduit between the scientific community and the wider community, SoE Reporting provides a platform to move towards each of the remaining points of "knowledge based action for sustainability" raised by the IUCN.

In relation to point 1 above, the process of compiling SoE Reports provides an immediate benefit for interdisciplinary research and research relating to synthesis of information and visualisation of environmental issues and trends. Consistent with the precautionary principle, SoE Reports should acknowledge ignorance and uncertainty.

Provided the machinery of SoE is responsive to some underlying principles, in particular, the needs of its readership, an improvement in the availability of information about the environment (point 3) can be expected. However, defining the public and tailoring information products to meet specific client needs is one of the challenges for SoE which will be discussed.

1.1 Outline

The scope of this thesis is directed towards Tasmania. National and international issues are included on the basis of their increasing influence on State Government reporting obligations. Chapter 1 contains key definitions of the issues and concepts to be addressed. Chapter 2

provides a review of the national and Tasmanian context. Chapter 2 examines the range of objectives driving SoE emphasising that any set of objectives reflects wider social, economic and environmental objectives.

Chapter 3 offers some principles of reporting which are viewed as important in framing an SoE system for Tasmania. These principles are then elaborated and applied in the remaining chapters. Chapter 4 describes the co-operative and organisational issues for establishing SoE. Chapter 5 focuses on indicators for SoE including the criteria for indicator selection and the roles of various types of indicators. Chapter 5 also considers the issues of data access, classification and quality, environmental research and monitoring, frameworks and classifications for SoE and reporting style, format and timing.

Chapter 6 discusses reporting systems and, in particular, spatial, temporal and organisational frameworks for reporting and the products and outcomes of an SoE system including SoE reports, compendiums of indicators, forecasting and modelling, decision support tools, environmental education and resource accounting. These and other products represent the 'value added' aspects of a reporting system. Some illustrations of methods for presenting environmental statistics and indicators are included in Chapter 6.

Chapter 7 presents information on known custodians of available environment, natural resource and relevant socio-economic data at State levels. Chapter 7 aims to provide a general assessment of the extent to which information needs for SoE may be met from existing data sets and monitoring programs. While the promise of SoE is very real, so too are its predicaments. The concluding chapter draws together some of these predicaments which will emerge in this examination of SoE. However, it is argued that these predicaments reflect the immaturity of SoE. Chapter 8 offers some conclusions and discusses some of the dilemmas and contradictions faced by SoE reporting.

1.2 Key definitions

1.2.1 State of the environment report

All data sets require frameworks and classifications to organise, analyse and present material in a scientifically and statistically accurate manner and in a form which is understandable and relevant to the end user. Spatial and organisational frameworks applied and integrated with environmental statistics and indicators may be defined as a State of the Environment Report. A State of the Environment Report therefore represents a systematic framework for presenting environmental information. This information will also include an assessment of current environmental objectives, standards, policies, regulations, corporate plans and legislation. This is the policy review or auditing function of SoE.

Accordingly, SoE may be defined as being a process which describes, analyses and presents information on the condition of the environment and its significance. It will also examine the effect of human activities on the environment and assess current environmental objectives, standards and policies.

SoE should reflect and represent, as accurately as possible, the dynamics of the environment and human interaction with the environment through providing a snapshot in time, taken at regular intervals, of environmental, social and economic indicators. The aim of SoE reporting is to communicate usable information to decision makers in order to achieve better environmental outcomes and improved targeting of resources.

The Commonwealth Government's first SoE Report (DAHE 1987a, p.10) aimed to:

...provide a view of the condition of the Australian environment, as it now exists, to assess changes which have taken place since European settlement and to identify trends, resource conflicts and major emerging issues. It outlines briefly

the distribution and current use of environmental resources, considers pressures from human activities and problems which arise from them and lists major events affecting the condition of natural resources.

CEPA has now proposed that (1992, p. 1):

...the purpose of SoE reporting is to document changes in Australia's environment, rather than detailing examples of poor environmental performance. The proposed national SoE reporting system would compile objective, coherent and scientifically credible information about Australia's environment (and its natural variability) for stakeholders. SoE reporting would also assist Australia to meet its international reporting obligations. It is proposed that future national SoE reports should be directed chiefly at decision makers and policy analysts, including the Government, while still meeting the public awareness objectives of past reports. This would provide information to identify patterns of environmental change, and therefore provide a basis for decisions on ecologically sustainable use of resources.

There are no prescriptions for SoE and considerable variations exist in spatial, organisational and temporal approaches to SoE. It is a long term and iterative process and it will evolve according to the lessons which we apply from the extensive international experience, the more limited lessons which we apply from our national and local experience and the environmental priority issues which are to be faced globally, nationally and locally.

Approaches and priorities for SoE will vary according to the level at which it is being undertaken whether at the level of an enterprise in the form of an environmental audit, or at local, catchment, State, national or international perspectives. Objectives may be business as usual, sustainable development or environmental quality; our philosophy may be anthropocentric, reflected in a focus on monitoring issues or areas of human importance, or with a more ecocentric emphasis.

1.2.2 Environmental research

The foundation for SoE is environmental research. The Australian Science and Technology Council (1990, p.1) has defined environmental research as:

...scientific work undertaken to acquire and to organise knowledge of natural systems that sustain life in Australia. Such knowledge embraces characteristics of natural systems, any impacts of human actions upon them, and measures to mitigate adverse impacts...Environmental research includes the study of terrestrial and aquatic ecosystems; wildlife and habitat conservation; quality of the physical environment, such as clean air and waterways; and the sustainable use of our natural resources.

In addition to environmental research in a strict scientific sense, environmental reporting is reliant on social and economic research and an understanding of the values people hold about their environment. Monitoring, whether it be economic, social, or environmental, is the 'systematic, continuous, institutionalised collection, analysis and exporting of data and information. The first step in a monitoring program is a baseline inventory' (Croze and Vandeweerd 1991, p. 105). Monitoring involves (Ward 1990, p. i):

...repeated measurement of particular environmental attributes such as temperature, pH, rainfall, plant density, animal numbers. From these environmental variables, indicators may be selected that inform us about the state of the environment omitting the need to peruse all the environmental variables that have been measured.

SoE demands more than the traditional single discipline approaches to environmental monitoring. Ward argues (1990, p. 1) that:

This single discipline monitoring has resulted in the inability to predict severe environmental problems, such as forest damage in central Europe from air pollution. A comprehensive understanding of the way in which elements of the environment interact requires an integrated approach to environmental monitoring rather than just physical, chemical, biological, or socio-economic aspects.

1.2.3 Environmental information

Environmental information, the product of research, monitoring and analysis, has been defined in the International Forum on Environmental Information for the Twenty-First Century (Environment Canada 1991, p.2) as:

...data, statistics and other quantitative and qualitative materials that decision makers require to assess conditions and trends in the environment, to determine and adjust policy directions, and to invest funds. Such information permits decision makers to analyse cause and effect, to develop strategies for action, to manage natural resources, to prevent and control pollution, and to evaluate progress made towards goals and targets.

The range of environmental information may be viewed as an inverted pyramid (Figure 1.1). Environmental indicators, at the top of the pyramid, are defined as '...key statistical series that capture trends in ways directly understood by policy makers and the public' (Mathews 1991, p. 24). Indicators can be used to assess important conditions and trends in the environment and in the agents of change which impact on the environment. Indicators may exist independently or as a compilation or compendium such as in the OECD publication *Environmental Indicators - A Preliminary Set* (OECD 1991) or the Canadian publication, *A Report on Canada's Progress Towards a National Set of Environmental Indicators* (Environment Canada 1991a).

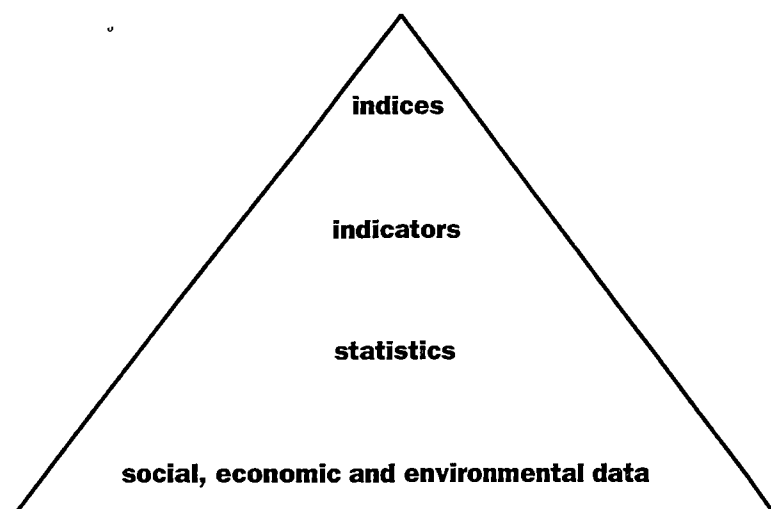
Environmental statistics summarise the extent or magnitude of an environmental stress or pressure rather than its specific impact. For example, increases in energy use, population increases and the level of recycling domestic waste can all be expected to have general impacts on the environment.

In its present stage of development, the content of SoE Reports is largely comprised of environmental statistics (Figure 1.1). The length of SoE Reports reflects the availability of this type of information. Conversely, the more highly refined and value added environmental indicator remains a comparatively rare inclusion in current SoE Reports. For example, statistics on stream flows may be provided (an environmental statistic), however, the relationship between stream flow and land-use is typically unknown.

Nevertheless, information on the background level of stress on the environment through environmental statistics is a legitimate inclusion in SoE Reports. However, the role of environmental statistics is misrepresented when SoE Reports describe a statistic as an indicator.

The ABS reports *Australia's Environment: Issues and Facts* (1992a) and *Striking a Balance: Australia's Development and Conservation* (1992b) are recent examples of compendiums of environmental statistics.

Figure 1.1 Environmental information



1.2.4 Environmental policy

The preparation of SoE reports should not be the end of responsibility. Environmental reporting systems do not generally possess any action authority of their own and are therefore reliant on linkages with the policy process to achieve environmental objectives. The policy response may be channelled at various levels through, for example, a conservation plan, planning policy, statutory or regional plan, or general government policy commitment.

The process of conversion of SoE information to policy action is a critical issue for the functioning of SoE. Accordingly, it is relevant to include a definition. Policy may be described as a mechanism through which community demands or expectations are converted into action and, may draw upon legislative, regulatory, educational, or market based responses.

Effective policy development is closely associated with effective strategic planning. Strategic planning is a process whereby the future is incorporated into decisions made on a day-to-day basis. Given these terms and tools, the following section examines the significance of SoE.

1.3 The primacy of financial information

The scene may be familiar: the representatives of stockbrokers and other financial institutions, with mobile phones in hand, gathered at the counter of the Australian Bureau of Statistics awaiting the distribution of Balance of Trade Figures or other indicators of economic performance. The advice is communicated in an instant to decision makers who react through responses variously motivated by the prospects of capital gain or the fear of capital loss. The aim of financial players may be to anticipate market movement; economic indicators are analysed to enable an evaluation of the type and strength of impending threats. This evaluation is followed by an immediate response.

However, the economy is an expression of labour, capital and the environment, and the information upon which Australia's sustainable long term economic, environmental and social welfare is dependent, the state of our environmental capital, is typically not collected, not available or not adequately presented to public and private sector decision makers and the community generally. The maintenance of the stock of natural wealth of a state, nation, or the Earth requires an understanding of the quality and quantity of that stock and the incremental changes which are occurring to it.

Decision making is failing to respond to the loss of natural capital. This is despite the fact that the IUCN has suggested that the annual cost of environmental decline in most developed countries is typically equivalent to about 6 per cent of their national income.

Air, water and noise pollution and soil degradation in Germany, for example, were estimated to cost more than US \$35 billion, or about 6 per cent of GNP (IUCN, WWF and UNEP 1990, p. 14). This decline in environmental quality is occurring despite environmental protection expenditures by industry and government in Germany of US \$7.5 billion a year (in 1985). The downward slide in the productivity of the nation and the globe is simply not factored into our accounting or our decision making, whether by government or financial institutions.

To take an Australian example: just on the basis of the issue of road traffic externalities and land degradation, Table 1.1 suggests that the magnitude of environmental costs is high and is likely to be similar to those referred to by the IUCN. It should also be emphasised that the annual costs of land degradation figures do not factor in the more recent impacts of the decline in water quality of the Murray Darling system. The land degradation figures also exclude the cost of weed infestation.

Table 1.1: Sample estimates of the cost of environmental decline

Annual Costs of Road Traffic Externalities		Annual costs of land degradation	
Description	\$m.	Description	\$m.
vehicle safety	4987	acidification/ salinisation	300
congestion	2000	erosion/ structural decline	300
noise costs	534	nutrient losses	
atmospheric pollution	787	nitrogen	350
		potassium	140
		phosphorus	60

Source: Inter-State Commission Report on Road Use Charges and Vehicle Registration 1990 (quoted in Naughten 1991) and Source: CSIRO Institute of Natural Resources and Environment 1990, p.14

The focus of both the last Tasmanian Labor Government and of the current Liberal Government on financial management, culminating in the Report of the Curran Commission (Independent Commission to Review Tasmania's Public Sector Finances 1992), emphasises, quite appropriately, that the financial condition of the State is of vital importance to the community.

However, 'telling it as it is', in the terms used by the Curran Commission, only represents one aspect of the story. It does not reveal the capacity of our environmental capital to sustain the current level of resource use or indeed the economic cost of running down our environmental capital. Whilst financial information is vital, the value of this information is enhanced immeasurably when it is analysed and presented in an integrated manner with social and environmental information. This crucial recognition is not present in the Report of the Curran Commission.

The Curran Commission is only symptomatic of the primacy given to financial reporting, economic indicators, and budget reviews to the neglect of the state of our environment. For example, the *Weekend Australian* produces a regular column entitled *State of the Nation* and *State of the World* containing a compilation of indicators such as prices and employment,

private activity, business activity, farm activity, trade, money and banking as well as indices such as Dow Jones and Financial Times.

A further example of approaches to financial reporting is provided through the State Authorities Financial Management Act (Tasmania) 1990. This Act was established to improve financial management and encourage a more commercial approach from authorities. Features of the Act are worthy of mention as its financial management and accountability role is analogous to that of environmental reporting. A number of these features were identified in the Report of the Curran Commission (1991, p. 90-91):

Performance measures relating to the achievement of objectives stem from the strategic plan, and are made public in the annual report. This is complemented by a system of independent quarterly performance monitoring by Treasury, which provides an assessment of authority performance to the Treasurer and the relevant portfolio Minister. The requirement is to produce each year strategic (business plans) with a five year focus, and operating plans with one year focus. Authorities and Ministers negotiate strategic directions and objectives annually in the process of strategic planning .

If a comparable system of environmental reporting was in place for government agencies, then government, the community, industry and commerce would be in a better position to monitor and review policies and programs for environmental performance. There should therefore be defined objectives for the evaluation of environmental performance. Unfortunately, while accountability in financial performance is an accepted objective, it has yet to be fully extended to the need for accountability in environmental and natural resource management.

1.4 Objectives of SoE

The objectives assigned to a system for reporting environmental information are in large part a function of the limits and perceptions imposed by politics, society, economics, and prevailing value systems. In other words, if we have no idea what we are aiming for, we cannot say what we need to know and the role of environmental information is thus problematic. This applies both at the broader societal level, government level and at agency and corporate levels.

The scope of environmental objectives or pathways to the future include the following: business as usual, sustainable growth, and the pursuit of environmental quality. There is little doubt that prevailing politics generally in Australia are strongly geared to business as usual with some expression of the importance of undertaking the planning measures needed to realise a path of 'sustainable growth'.

Through encouraging improved awareness of environmental trends and condition and supporting environmental education, environmental reporting will eventually be able to assume a more active role in promoting a community wide shift in thinking from 'Business as Usual' to the 'Pursuit of Environmental Quality'.

Having identified some of the issues which will serve to determine (openly or tacitly) the objectives which are assigned to SoE the principal outcome objectives of SoE are now discussed.

1.4.1 Outcome objectives

Outcome objectives relate to providing information to promote improved decision making leading to better environmental outcomes. SoE is important as a management tool to monitor the success of policies and programs undertaken by government, industry and the community. Its role is to maximise over time the environmental returns on investment; it may therefore be compared in function and importance to project management, performance appraisal or financial auditing.

McRae (1989, pp. 33-45) has identified a range of SoE objectives. These outcome objectives include:

- assess the condition of the natural environment
- monitor pressures on the environment
- monitor the degree of success of management policies
- raise the standard of public debate
- accelerate the understanding and approval of environmental policies
- provide and integrate information not previously available.

With the emerging role of environmental economics, environmental reporting has been offered as an appropriate vehicle for the economic evaluation of policies and programs and an assessment of the role of market based measures. In New South Wales, the legislation which has provided the mandate for SoE reporting, the Protection of the Environment Administration Act 1991, requires that the SoER includes a section on 'an examination of trends in economic analysis and of the costs and benefits (including economic evaluation) of environmental protection' (New South Wales Environment Protection Authority 1992, p. 29).

The New South Wales Environmental Protection Authority Discussion Paper (1992, p. 29) also notes that:

...work will need to be undertaken to estimate and measure environmental benefits as well as pollution control expenditures associated with alternative environmental policies to ensure greatest benefits are obtained at least cost to the community.

Outcome objectives may also be expressed with a greater emphasis on the environmental policy linkages. Elkin (1990, p. 55) has expressed this in the following terms:

Broadly speaking, the aim of preparing an (SoE) is to assess the impact of the development process on the environment over time; preparing a National Conservation Strategy provides the means of guiding the development process along a sustainable path. Thus the role of a National Conservation Strategy is to take a community from where it is (as depicted in an SoE) to where it should be - committed to sustainable development.

Particular clients will expect specific outcomes from an SoE system. From the local government user's perspective, SoE has been suggested to assist with the following areas of local government responsibility (Sanders 1993, p. 52):

- analysis of cumulative impacts
- environmental ceilings
- background information for project specific assessment
- analysis of short term fluctuations versus long term trends
- designing collection programs and EIAs which provide appropriate information
- input to, or evaluation against modelling techniques
- defining local environmental issues
- measuring irreversible change
- separating primary (e.g. motor vehicles) from secondary factors (e.g. vehicle emissions); and separating causes (e.g. emissions) from outcomes (ambient quality).

The academic use of the output of an SoE system would depend on the system. The suggestions for academic application include (Dovers and Lewis 1993, p. 54):

- detailed interrogation of the SER system and use of data by researchers in specialist disciplines
- use by cross-disciplinary researchers who seek to determine summarised, broader trends across sectors and issues
- considerable potential use of SER output for support of undergraduate teaching in areas such as environmental science, geography, resource policy, environment law and resource economics; and
- use by post-graduate students engaged in research in such areas.

1.4.2 Process objectives

Process objectives relate to the requirements for environmental reporting. These will include the following:

- integration of previously fragmented data sets
- enhanced levels of co-operation between government and commerce in establishing SoE
- enhanced levels of co-operation between spheres of government and government agencies in establishing SoE
- community participation in the development of SoE.

Environmental reporting should be undertaken in such a manner as to involve local communities in monitoring and reporting on their own environments. Public participation should not be restricted to the reading of environmental reports and statistics; rather it should involve an active popular role in monitoring and the determination of what information is needed and how that information is presented and disseminated. The development of community based monitoring would provide a potentially useful educational vehicle while also contributing valuable supporting information to a Tasmania-wide monitoring and reporting system. The information is collated centrally and disseminated to the community. Comparisons and analysis are provided and a central record is kept for later inclusion in a comprehensive SoE.

In this manner, communities will be able to contribute to extensive monitoring undertaken on a broad scale, and on a systematic and time series basis. Intensive monitoring programs, such as the present baseline monitoring program for Tasmania's northern industrial zone at Bell Bay, the nutrient study of the Derwent River and the Launceston Air Quality Study would focus on specific problem areas in detail. Government and community monitoring thereby become mutually supportive and environmental quality objectives are generated from community understanding. This is a primary process objective for environmental reporting in Tasmania.

Information must be made available to the public on a regular, and timely basis. The World Conservation Strategy, *Caring for the World* (IUCN, WWF, UNEP 1991, p.11), comments that:

Information must be disseminated through formal and informal educational systems so that policies and actions needed for the survival and well-being of the world's societies can be explained and understood.

Some of the tools which the National Workshop on SoE considered to be of merit in supporting community involvement in a reporting program include (1993, p. 71):

- agreement between scientists and community over standards
- tapping into/coordinating local data collection activities
- standards across data collection, including scale, terminology, and sampling technique, although the role of ERIN in this was recognised
- verification of results

A second process objective concerns the development of co-operation between custodians of data in relation to data access and the creation of appropriate indicators. Environmental reporting should be seen as an integrating exercise; one helping to break down traditional institutional barriers. Greater co-operation between the spheres of government, between government, industry and the wider community and between agencies in data exchange and the development of valid indicators should, in itself, assist in improving decision making and environmental outcomes. This is a likely consequence of a process that promotes integration and co-operation.

Productive partnerships among agencies, and between agencies, industry, spheres of government and the wider community aim to enhance compatibility and enable comparisons and collaboration in the production and processing of environmental information. The need for these partnerships is recognised in the Australian Manufacturing Council's Report, *Best Practice Environmental Management*. The Report has recommended (Australian Manufacturing Council 1992, p. iii) that:

...firms and government collaborate to provide community education and information programs to ensure that consumers have access to factual and objective information about the environmental impact of products; and that community groups take advantage of the opportunity provided by firms which actively pursue 'best practice environmental management' and assist them in their endeavours through a co-operative process of communication and consultation.

In order to be in a position to identify trends in environmental condition and establish progress towards or away from environmental objectives, regularity of reporting is a basic requirement for SoE. Although one-off assessments of specific environmental or resource issues occur, these are perhaps best placed in the context of a comprehensive reporting across a range of environmental indicators at intervals of no greater than 5 years.

SoE reports have the potential, when undertaken effectively, to greatly improve the community standing of environment agencies and the environmental and natural resource management role which is their charter. The Canadian experience has been highlighted by Rump (1993, p.14):

We do know, however, that there is considerable demand for our products. In total, over 120 000 fact sheets and special reports have been distributed, on a demand basis, since 1989. In addition, we have a mailing list of 8500 people who want to be advised of new publications and a subscriber list of 2300 for our newsletter.

In the nine months since the 1992 national SoE report was released, 12 000 have been sold - and this is a priced, albeit subsidized, publication. That makes it a best seller for a government publication in Canada. In fact, the report has become a standard, authoritative text on environmental change. This is due to its comprehensiveness and a writing style that is aimed at a non-scientific audience. So far, it has been adopted as a course text for environment studies by at least five universities in Canada.

We also know that the report has contributed to enhancing the reputation of Environment Canada. Recent opinion polls have shown a 15% increase in the confidence people put on information released by the Department. We are now in

the process of evaluating the report in terms of its effectiveness, changing user needs and the efficiency of the production process.

1.5 Review

The origins of this thesis lie in the basic position that there is a need in Tasmania to establish and maintain systems for accounting, monitoring and reporting on the stock and condition of natural resources and the environment. This need is demonstrated by SoE being mandated as a legislative requirement in several States of the Commonwealth, including Tasmania, and has also been demonstrated by analogy with financial reporting and management systems and by a general review of figures on the economic costs of environmental decline.

The value of SoE can be seen both from a community based perspective through measuring progress towards ecologically sustainable development, and from the perspective of individual client requirements. SoE provides an indication of performance against which to measure environmental progress.

Financial information is clearly vital for management of society, however, the value of this information is enhanced immeasurably when it is analysed and presented in an integrated manner with social and environmental information. This crucial recognition is not present in the majority of economic reports, such as the findings of the Curran Commission, which do not reveal the capacity of our environmental capital to sustain the current level of resource use or indeed the economic cost of running down our environmental capital.

It is clear that SoE will need to avoid single discipline approaches. The niche for SoE lies beyond simply providing environmental information but in supplying the tools to actively support decision making. A retrospective view of the state of the environment which is a consequence of past pressures is not sufficient; modelling, forecasting and backcasting will need to become key instruments in the SoE tool bag.

One of the key challenges for SoE is providing information which stands out above the 'white noise' of economic, social and environmental information. Linkages with the policy process have been highlighted as a central theme as this has been recognised as a key failing of many previous attempts at SoE. The following chapter reviews the origins and the national and international lineage of SoE.

Chapter 1 has identified outcome and process objectives for SoE. The former include: assess the condition of the environment; review the success of policies and programs; assist in the approval of environmental policies; improve community and decision maker understanding of the importance of environmental monitoring; and provide and integrate information not previously available. Process objectives relate to the benefits realised through the process of preparing a report and these include: opportunities for community input; integration of previously fragmented datasets; and the opportunity for co-operation between environment and natural resource agencies and between professional groups.

2. National and international review of SoE

SoE is currently undergoing a renaissance generally in Australia following an initial wave of development in the mid 80s. SoE may be described as one of the more dynamic areas of environmental policy and program development. This chapter reviews the national and international background to SoE emerging at a point of development where it is extremely unlikely that these programs will ever again be removed from either State or national environmental agenda. At the time of writing SoE has become institutionalised as a national priority and legislated in five States of the Commonwealth.

The renewed interest in SoE, in part, attributable to the information requirements and demands of Sustainable Development and its Australian manifestation, Ecologically Sustainable Development (ESD). A number of the State and Territory programs are attempting to integrate sustainability issues within their reports. For example, the New South Wales SoE report includes a final chapter entitled "Towards Sustainability". In Tasmania, the reporting authority is the Sustainable Development Advisory Council.

There are other reasons for the resurgence of interest in SoE. Fundamentally, there is a growing recognition that a fragmented and sectoral information base is hindering attempts at responding to the environmental crisis. The need for systematic and consistent approaches to environmental information collecting and reporting has been identified through many national and international enquiries, organisations and processes.

The enactment of new environmental management and planning legislation in many States and territories has created new environmental protection and management authorities with more proactive and strategic environmental mandates. SoE has been given an auditing and assessment role within these organisations in establishing progress towards the environmental protection mandate assigned to various agencies and programs across Australia (and elsewhere).

The new commitment to environmental reporting nationally may be attributed to other factors. The former Federal Minister for the Environment, the Hon Ros Kelly MHR, took a strong interest in the development of SoE. It has been argued that the Minister requires information to balance the pro development arguments of fellow Cabinet members. However, the major benefit to the Federal Minister for the Environment will come through a more aware community combined with decision makers who will be in a better position to make more informed decisions.

2.1 International level

SoE is not a new concept; it has an extensive international pedigree which can be called upon to establish suitable models. Reports on national environmental conditions have been published by the governments of a diverse range of countries, including Canada, Hungary, Kuwait, Japan, the Philippines, the Scandinavian nations, and the United States. Most OECD countries now produce national SoE reports.

Indeed, for as long as governments have been advancing legislation to protect the environment, mechanisms have been sought to establish whether the investment has been producing environmental dividends. There is no doubt that many of the motivations for past and present SoE Reports have been entirely genuine, however, there is also little doubt that reports have been prompted by a desire to give an impression of action or to hide the true state of affairs. In other cases, reports with high levels of scientific rigour have ignored the target audience and the basic goal of improving environmental decision making.

The United States Environmental Monitoring and Assessment Program (EMAP) seems to be a model of scientific veracity and has been described as (CEPA 1992, p. 21):

...the most advanced and ambitious SoE reporting system...in 1988 the Science Advisory Board of the US Environment Protection Agency (EPA) recommended implementing a program within the EPA to monitor the status and trends of ecological conditions and to develop methods to anticipate emerging environmental problems before they become crises. The Environmental Monitoring and Assessment Program which resulted from the recommendation has adopted a stress-response approach based on environmental indicators.

Outstanding reporting programs are not distinguished purely on the basis of the scientific rigour of the program and the independence and openness of the process. The linkage with the policy process is fundamental. The national reporting program has offered the following examples (DEST 1993, p.7):

The Dutch and Norwegian environmental reports are also thoroughly integrated into national economic policy formation. For instance in the Netherlands, an independent research institute, the RIVM, produces comprehensive environmental outlook reports (equivalent to SoE reports). These provide information about current conditions and assess projected trends against criteria for ecological sustainability.

These outlook reports are public audits which are also presented to their Parliament. They monitor the achievements of the National Environment Policy Plan, which is intended to guide economic and environmental policy towards ecological sustainability 'within one generation' - by the year 2010. The National Environmental Policy Plan is then adjusted in response to the findings of the RIVM environmental reports.

Other international developments include the International Forum on Environmental Information which was convened in Canada in 1991 and Agenda 21 (Chapter 40) arising from the United Nations Conference on Environment and Development (UNCED). Papers and the proceedings of the International Forum on Environmental Information have been referred to extensively in this thesis. In addition, there are also national reporting requirements to the United Nations Commission on Sustainable development under Agenda 21.

Reporting programs have been associated with intensive work on the identification and development of core environmental indicators. Indicator development is especially advanced in the United States, Netherlands and Norway. Canada, France, Norway and the Netherlands have also developed powerful environmental statistical capabilities to complement SoE reporting. In the Netherlands and Norway, environmental statistical reports are produced biennially by the central statistical base.

SoE reports have also been produced by a range of non-government organisations such as the World Resources Institute and Worldwatch Institute and by international agencies such as the United Nations Environment Program and the OECD (see Table 2.1).

Australia's developing SoE reporting program is increasingly being driven by a range of international obligations and treaties. These are summarised in Table 2.1. International reporting obligations for Australia translate, in principle, to a delegated State government responsibility for reporting. In addition, OECD questionnaires are circulated to State and Territory governments by the Commonwealth Department of Environment, Sport and Territories to assist in the compilation of the Australian return to the OECD reporting program.

Table 2.1: Australian international reporting obligations

Convention on the World Meteorological Organisation

This Convention, ratified by Australia in 1948, commits Australia to international co-operation in monitoring, research and data exchange in respect of the atmosphere, oceans and inland waters.

Global Convention on Climate Change

The Convention, signed by Australia in June 1992, has a strong focus on research, data collection and monitoring. The Convention commits countries to periodic reporting on greenhouse gas emissions and sinks. The Convention addresses all greenhouse gases not controlled by the Montreal Protocol. The Government is moving towards ratification.

Vienna Convention, and Subsequent Montreal Protocol, on the protection of the Ozone Layer

The Convention, which was ratified by Australia in 1990, has a strong focus on research, data collection, monitoring and periodic reporting in its commitment to control ozone depleting emissions of chlorofluorocarbons (CFCs), halons, carbon tetrachloride and methyl chloroform.

Basel Convention

This Convention, which was acceded to by Australia in 1990, requires tracking of imports and exports of hazardous wastes.

Convention on Biological Diversity

The Convention, which was signed by Australia at UNCED in June 1992, has a strong focus on research, data collection, monitoring and periodic reporting in its commitment to protect the biological diversity of the planet. The government is moving towards ratification.

Convention on the Protection of the World Cultural and Natural Heritage

This Convention, which was ratified by Australia in 1974, requires annual monitoring reports on the management of Australia's World Heritage Areas.

Madrid Protocol (on Environment Protection) to the Antarctic Treaty

The Protocol designates Antarctica as a 'natural reserve devoted to peace and science'. The Protocol, when in force for Australia, will have environmental reporting obligations.

London Convention

This Convention, which was ratified by Australia in 1985, requires annual reports of approvals to dump or incinerate wastes and other matter at sea.

Also, the Bonn Convention on Conservation of Migratory Species of Wild Animals, the Washington Convention on International Trade in Endangered Species and the Ramsar Convention on Wetlands have reporting requirements.

Reporting Requirements of International Organisations

Australia's membership of international organisations leads to reporting requirements on various aspects of the condition of its environment. These include the Organisation for Economic co-operation and Development, the United Nations Environment Program, the United Nations Economic and Social Council for Asia and the Pacific, and the World Meteorological Organisation.

Agenda 21

The United Nations Conference on Environment and Development (UNCED) agreed to create a high level Sustainable Development Commission (SDC) which will consider national reports on implementation of Agenda 21, the principal program document arising from UNCED (1992), and of various environmental Conventions. Agenda 21 also highlights the importance of bridging data gaps and improving environmental information availability, especially to indicate the status and trends of the planet's biosphere, natural resources and pollution as well as the need for inventories of natural resource and other environmental data relevant to the assessment of ecologically sustainable development. The SDC will investigate ways to improve the collection and dissemination of environmental data at a global level.

Source: CEPA 1992, p. 6-7

2.2 National and state levels

The importance of systematic approaches to monitoring at a national and State level has been acknowledged and pursued through various other national processes and reports. These include the Inter-governmental Agreement on the Environment, the ESD Sectoral and Intersectoral Issues Reports, the CSIRO Institute for Natural Resources and Environment and a Discussion Paper on SoER prepared for the Australian and New Zealand Environment and Conservation Council (ANZECC) by the Tasmanian Department of Environment and Land Management (Davies and Waight 1991).

The CSIRO Institute of Natural Resources (1990, p. 39) concluded that:

National, state and regional efforts to monitor changes in the status of Australia's environment are inconsistent, poorly co-ordinated and rarely presented in a coherent framework. The preparation of annual reports on the state of the environment, perhaps in an accounting framework, could significantly improve decision making.

Five years after this assessment by the CSIRO, the level of co-ordination has improved in some areas. The establishment of the ANZECC Taskforce on State of the Environment Reporting has facilitated greater national co-ordination. Nevertheless, little progress has occurred in key areas of co-ordination. For example, there is only tacit acceptance of the 'pressure-state-response' model and many variations in its application have occurred; little progress has occurred in the development of agreed national environmental indicators; and, there are almost as many variations in the frequency of reporting as there are reporting organisations.

All of the reports of the Commonwealth's Ecologically Sustainable Development Working Groups refer in some way to the urgent need for appropriate environmental information. The Forest Working Group, for example, proposed the preparation of annual 'State of the Forest Reports' and under S59D of the revised Forestry Act (Tasmania), Forestry Tasmania is now required to prepare for the Minister a State of the Forests Report.

The National Forest Policy Statement signed by all State Governments requires that each signatory provide the Australian Forestry Committee and Australian and New Zealand Environment and Conservation Council with appropriate information from which to produce a state of the forests review every five years.

The ESD Fisheries Working Group (Commonwealth of Australia 1991a, p. xxxvii) recommended that fisheries management authorities 'initiate development of natural resource accounts to provide information on fish stocks (stock account) and changes to the resource from both use and environmental factors over time (stock flows)'.

The Manufacturing Working Group (Commonwealth of Australia 1991b, p. 172) recommended that:

...the Commonwealth Government, State and Territory Governments, in the context of the Special Premier's Conference, implement a national approach to environmental monitoring and reporting to ensure effective coordination of pollution controls, environmentally acceptable waste disposal and recycling between jurisdictions...this should include the formation of a national environmental data base.

Recommendations of the ESD Intersectoral Issues Paper (Commonwealth of Australia 1992a) relevant to SoE include that:

1. a process of state of the environment reporting be instituted at the national level to complement environmental reporting at the State and Territory levels (1992a, p.xxi)
2. the Australian Bureau of Statistics, in consultation with Commonwealth and State and Territory environment agencies, develop a program of intergovernmental and broader

public consultation for the purposes of developing a set of environmental indicators for Australia (1992a, p.xxii)

3. a state of the environment reporting process should be coordinated through ANZECC and could usefully be guided by a community based advisory group, possibly the same group as that advising on environmental indicators (1992a, p.167)
4. ESD also has had a bearing on the type of data required: socio-economic data is equally important both in itself and in order to allow for more systematic and holistic ESD decision making and management. In this area the ABS has extensive data holding, not always readily accessible in the ESD context (1992a, p.227).

Progress has now been made in relation to (i) through the work of CEPA and, now, the new Environmental Information, Science and Reporting Unit in the DEST Environment Strategies Directorate. Progress has also been made in relation to (iii) through the contribution of the ANZECC Taskforce on SoE.

Schedule 1 of the Inter-Governmental Agreement provides for the development of a national approach to the collection and handling of environmental data and requires the development of consistent standards for the description and exchange of land-related information and improved mechanisms for making data more accessible across spheres of government.

Under the Inter-Governmental Agreement, the Australian Land Information Council (ALIC) has been charged with the task of developing a consistent set of guidelines for the description and gathering of 'all land related information'. Additionally, ALIC, through the National Resources Information Centre and the Environmental Resources Information Network, has been given the task of developing and maintaining comprehensive directories of natural resource and environmental data sets and developing and maintaining national natural resource data standards.

In summary, other developments in relation to national SoE include:

- Through DEST and the Great Barrier Reef Marine Park Authority, a National State of the Marine Environment Report has been completed. Its purpose is to provide baseline information for the marine conservation strategy being developed as part of the Ocean Rescue 2000 initiative.
- A Discussion Paper on SoE was released by CEPA in December 1992 and, as part of the associated consultative process, a National Workshop on SoE was held in Melbourne on 10-11 February 1993. CEPA is proposing to undertake a major facilitating role in the implementation of a national pollutant inventory. NPI would '...gather data on hazardous and toxic emissions to air, water and land, in a similar manner to the Toxic Release Inventory in the United States' (CEPA 1992, p. 43). Following the publication of a National Framework For SoER (DEST 1994) a SoE Council and a series of seven Reference Groups were established to support the preparation of the national SoE Report.

Given this policy setting, the following section reviews the present status of SoE programs in Australia and its States and Territories.

2.2.1 Reporting programs

Five States and Territories in Australia have legislative requirements to produce SoE Reports. These are: New South Wales, South Australia, Tasmania, Queensland and the Australian Capital Territory. While lacking legislation, the Government of Western Australia has produced one SoE Report and is currently preparing a second. Table 2.2 summarises the national status of SoE Reporting programs within the Australian States and Territories.

The Victorian SoE program was different in character to many of the current programs. In particular, it adopted a rolling cycle of reporting on key environmental themes, rather than attempting to produce a single consolidated SoE Report. Being under the auspices of a

Commissioner for the Environment, it also differed from the majority of present SoE programs.

The Victorian Office of the Commissioner for the Environment was responsible for the production of various SoERs on key sectors and environmental issues. These reports included "Agriculture and Victoria's Environment" (Victorian Office of the Commissioner for the Environment 1991). The Office of the Commissioner for the Environment was disbanded by the Kennett Government.

The demise of the SoE program and the Office of the Commissioner for the Environment in Victoria has resulted in the loss of the accumulated institutional knowledge from the most established SoE program in Australia. Despite the new interest in SoE, the demise of the Victorian program illustrates that SoE may sometimes occupy a precarious position. In some ways, an independent reporting authority or Commissioner, at arms length from the Government, represents the most precarious position.

Governments of New South Wales and the Australian Capital Territory are currently finalising their second SoE Reports.

Table 2.2: National approaches to SoE

State	Years	Agency	Notes
Victoria	1987 1988 1991	Office of the Commissioner for the Environment	SoE was established as an integral part of strategic planning for the environment in Victoria with SoE linked with the State's Conservation Strategy. The Office of the Commissioner for the Environment has since been disbanded and SoE put on hold. SoE reports prepared for Victorian inland waters and air quality; indicators for marine and coastal environments.
Western Australia	1987 and 1992	EPA	The first comprehensive SoE for Western Australia was released in 1992. A third report is currently in progress.
South Australia	1985 1989 1993	Department of Environment and Land Management	The first report was structured around priority issues e.g. flora and fauna, water quality, degradation of rural and pastoral land, pests and public use of rural and natural land. The 1993 report focuses on management responses to priority issues. A comprehensive SoE was released in 1994
Queensland	1990	Department of Environment and Heritage	Report in progress
New South Wales	1993	Environmental Protection Authority	Report was tabled in the New South Wales Parliament in October 1993; a second report will be released during 1995.
Tasmania	1996	Sustainable Development Advisory Council	Report in progress

2.2.2 Frequency of reporting

- An initial step is to consider carefully what scales are relevant to the system proposed, as this will define many other aspects, notably what is needed to be known, and by whom. The key questions with respect to temporal scale include over what time scales the relevant natural systems, production systems and institutional systems operate (Dovers and Lewis 1993, p. 55).

The first major reporting obligation, namely a national SoE report, is to be completed by December 1995, in time for an OECD review of Australia's environmental performance—current indications are that this schedule will not be met. An international panel is appointed by the OECD to report on OECD member country's environmental standards and responses. Such national obligations, including the various treaty obligations outlined in chapter 2 establish a State responsibility, by virtue of proper and effective management, for report preparation at an interval which is broadly consistent with the national interval.

The period of reporting varies between annual and five yearly reports. DEST has initiated a four year cycle for the national reporting program. The Australian Capital Territory Government's yearly reporting cycle compares with the Government of Victoria which had aimed at detailed reviews of environmental sectors with the intention of covering all sectors over a five to six year cycle. New South Wales has a legislative mandate to report on a two yearly cycle (the second NSW SoE Report is expected to be completed during 1995), Western Australia has an ad hoc approach with no set interval and Tasmania has a five yearly cycle. The State Policies and Policies Projects Act 1993 (Section 29) in Tasmania requires the Sustainable Development Advisory Council to submit a report to Parliament as soon as reasonably practicable. This task is expected to be completed during 1996.

Annual or biannual reporting will be costly and may present difficulties in highlighting changes over such short reporting intervals. At the same time, the Canadian experience is that a five year report will, by itself, not be sufficient (Rump 1993). Complementary products are required both for client needs and to support the program for the development of comprehensive reports. An example of a complementary product is the development of directories of datasets for SoE.

Other SoE products, aside from the comprehensive report, may be timed with other objectives in mind. Special information sheets may be released to coincide with the development and community discussion of State policies or conservation strategies. Academic products would need to be timed to broadly coincide with the academic year.

It is argued that a four or five yearly cycle is the most suitable interval for comprehensive State reports. A four or five yearly interval offers the opportunity to produce regional, sectoral or indicator reports in the intervening period. Further, an adequate period is provided to review the effectiveness of the comprehensive report and, in the case of the Tasmanian legislation, support the preparation of recommendations for action. The scale of the task may be prepared with the Census of Population and Housing which is also undertaken on a five yearly cycle.

2.3 Review

SoE is currently undergoing a renaissance generally in Australia following an initial wave of development in the mid 80s. This chapter has highlighted SoE as one of the more dynamic areas of environmental policy and program development. This is leading to the institutionalisation of SoE as a national priority with SoE now legislated in five States of the Commonwealth of Australia.

The national and international lineage of SoE Reporting was reviewed. The wave of SoE efforts in Australia appear to have stemmed principally from the information requirements of sustainable development and new environmental and planning legislation. In addition,

Australia's developing SoE reporting program is increasingly being driven by a range of international obligations and treaties.

The SoE program has developed to a position in which five States and Territories in Australia have legislative requirements to produce SoE Reports. These are: New South Wales, South Australia, Tasmania, Queensland and the Australian Capital Territory. Nevertheless, the demise of the Victorian Office of the Commissioner for the Environment highlights that SoE does occupy a precarious position in some jurisdictions. Legislation itself does not necessarily guarantee the continuation of SoE program.

The frequency of reporting varies across Australia. A four or five yearly cycle is the most suitable interval for comprehensive State reports and enables the preparation of regional, sectoral or indicator reports in the intervening period.

These matters may be described as the mechanics of SoE reporting—chapter 3 examines the principles of SoE Reporting.

3. Principles of State of the Environment Reporting

The establishment of an SoE system for Australia (and Tasmania more specifically) will need to be based around a series of binding principles, common classifications and agreed methodology.

The principles discussed are:

- Information for ESD
- Identifying clients and their needs
- Access to information
- Consistent methodology
- Legislative backing
- Policy linkage

3.1 Information for ESD

ESD highlights the indissoluble interconnections between political, social, economic, cultural and environmental aspects of human existence, and that traditional disciplinary approaches limit and constrain our understanding of this interdependence. Developing a comprehensive national system of SoE offers the first real opportunity to put this understanding to work. SoE is not only critical in making progress towards ESD, it is actually a case study of ESD.

Despite the shortcomings and disappointments in relation to implementation of the Commonwealth's ESD process, principally that agreed programs of action have failed to emerge, the idea of ESD would seem to be gaining acceptance. ESD has three basic implications for SoE. Firstly, in ESD terms, everyone is a user as well as a provider of information and a systematic and comprehensive approach to SoE should support such a participatory model. Secondly, ESD demands a systems approach to issues rather than traditional narrowly defined disciplinary approaches. Thirdly, ESD has extended the range of 'indicators' regarded as necessary components of any SoE Report. Examples of these sustainability indicators are outlined in more detail in chapter 5, Information for SoE.

SoE should aim to communicate the fundamental link between the economy, public health, quality of life and the environment. This is one of the most basic messages of ESD and yet, despite considerable investment by the Commonwealth Government in its ESD process, it is a message which has not been widely understood or accepted in Australian society.

The relationship between the environment and the economy is typically promoted by politicians, the media and some government agencies as being one of finding the right 'balance' (see Figure 3.1) rather than achieving integrated decision making. Chesson (1992, p 3) has commented that:

Balance is the wrong word. It suggests that there are only two opposing issues and that taking away a bit of one can be compensated for by adding or taking away a bit of the other. If a balance is achieved it is easily upset, as anyone who has ridden a seesaw can attest.

Figure 3.1: "Balance"



Source: Chesson 1992 p.3

The other major problem with the 'balance' approach is that it obscures potential compatibilities between what would seem, superficially, to be purely competing interests. Thus the balance approach may cause us to discount the many employment opportunities that are emerging in the environmental/ natural resource management area and in eco-tourism. Opportunities for resolution of conflict are limited as a result of the 'balance' philosophy. Community attentions are directed towards those with the authority to be able to move the fulcrum and opportunities for co-operative community based solutions are thus limited.

Helping to dispel the 'seesaw philosophy' is considered to be essential for ESD and should be one of the roles of SoE both nationally and in Tasmania. SoE is able to achieve this through taking a synoptic view focussing on systems and processes and highlighting the linkages between economy, environment and society.

There are a range of subsidiary principles within ESD which, together with SoE, are potentially mutually supportive. The 'precautionary principle', sometimes referred to as risk aversion or avoidance, is incorporated in Section 3 of the Inter-governmental Agreement on the Environment as one of the principles of environmental policy. The precautionary principle is defined in the following terms:

Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

- (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
- (ii) an assessment of the risk-weighted consequences of various options.

The Precautionary Principle is highlighted in the ESD Intersectoral Issues Paper (Commonwealth of Australia 1992a, p. 40) which notes that:

...risk and uncertainty can be reduced, using an anticipatory approach, by promoting research, environmental evaluation and long term integrated planning, and the application of new technology. Risk evaluation is likely to be assisted by the development of indicators of ecological sustainability in each sector of the economy.

A second key principle underpinning the establishment of SoE is the communication of usable information to decision makers in order to achieve better environmental outcomes. This requires consideration of which decision maker groups SoE should be seeking to target. Is it able to provide a service for all decision makers?

3.2 Identifying SoE clients

This is regarded as one of the areas where environmental reporting has not been particularly successful. Elkin observes that: 'few SOERs identify their role, their audience, or the means for implementing their report' (1990, p. 56). The tendency is to produce tomes of environmental data without defining the target audience and with insufficient regard for client needs.

Identification of the set of clients for environmental information should reflect the reality that all individuals and organisations have an environmental management responsibility. The corollary is that all individual and corporate citizens have a right to information on the condition of the environment in which they live.

This fundamental principle is detailed in *Caring for the World* (IUCN, WWF, UNEP 1992, p. 74):

...the information needed to integrate human development and environmental conservation depends on research; freedom of information should be guaranteed; governments should make information about the environment freely available; open records of pollutant discharges and other monitored activities for public inspection; regard environmental data as a public resource, not as a financial asset...

However, while the principles of everyone's right to information should underpin SoE, they do not necessarily assist in helping to target monitoring, analysis and reporting processes. An emerging focus on the needs of the policy maker is apparent internationally. The International Forum on Environmental Information (Environment Canada 1991b, p. 8) proposed that:

...data collection programs established to monitor the state of the environment and changes in it should increasingly be focussed on the needs of policy makers. This will require policy-makers to work together to set priorities for monitoring and collection programs, with ideas contributed by representatives of business, non-governmental organisations and academia.

Similarly, at the national level in Australia, CEPA have suggested that their reporting process will have a primary focus on the needs of policy decision makers as opposed to being 'environmental education' essays. This represents a narrowing of the target audience since the Department of Home Affairs and the Environment produced the first SoER for Australia in 1986. The CEPA Discussion Paper (CEPA 1992, p. 7) emphasises this:

It is proposed that the main objective of future national SoE reports should be to serve decision makers and policy analysts, including the Government. The change in emphasis from the past, when SoE reporting had mainly a public awareness objective, reflects the need for changes recognised overseas and in international organisations. This focus would not preclude the publication of descriptive summary reports for a more general readership.

As previously noted, in some respects the target audience has been narrowed considerably to focus primarily on the Federal Minister for the Environment. The argument is that the Minister requires information to balance the comprehensive economic information available to those Cabinet members with a resource and pro development responsibility. Environmental information is thus viewed in an adversarial manner akin to the 'balance' approach (Figure 3.1).

At State, catchment and community levels, the target audience will be extremely wide and could comprise government ministers and agencies, members of the public, consumer groups, financial institutions, local government, the media, non government organisations, researchers, industry, land care groups and educational institutions.

The single decision maker/highly centralised national SoE model is inappropriate for Tasmanian circumstances, where community interest is high and debate lively.

Responding to the information needs of a diverse audience is both the promise and the predicament of SoE. The task is one of ensuring usefulness for specific sections of the community while maintaining relevance for a diverse range of community interests, with all the variation in understanding, interests, perceptions and values that is thereby entailed. Further, in Tasmania SoE is occurring at a time when relatively few resources are being allocated to long term systematic environmental monitoring. Our general understanding of the state of the Tasmanian environment is poor, the incidence of global and local environmental problems is continuing to increase and cost-recovery/ user pays policies by government agencies at Commonwealth and State levels will restrict access to data for environmental reporting.

Tasmania is not unique in this regard. Some decision makers are having to deal with environmental and natural resource issues that are increasingly global, more complex, more uncertain, and longer in duration, whilst our understanding of these issues is based on local, regional, national and global data which is fragmented and unreliable. Other decision makers are locked into a political model of decision making and have a need only for short term and ad hoc information responding to a very narrow set of decision criteria. People in this group are unlikely ever to have a desire to draw upon the information products which SoE may make available.

Identifying and responding to the needs of the 'information starved' while hoping to extend the range of decision criteria of the 'information independent' are some of the challenges for SoE.

3.3 Identifying client needs

Defining needs in more specific terms is where surveys, client feedback and consultation are required. Client needs are not static, but change over time and at various stages in a project, issue or policy. The function of environmental information and the most appropriate format for presentation will vary at each stage in the policy process. This has been identified in a New Zealand Department of Statistics Paper on SoER (1991, p. 7). Table 3.1 and Table 3.2 summarise this perspective on the role of information in the decision making process.

Table 3.1: Function of environmental information at each stage of the policy process

Stages of Policy Process	Stages of Data Production		
	Monitoring and data collection	Processing and analysis	Dissemination
Identification and recognition of issues	Detection of changes in the environment	Transformation to concise information and identification of cause and effect	Education and enlightenment and consensus building
Evaluation and decision making	Provision of basis for evaluation and decisions	Cost-benefit analysis	
Implementation	Monitoring of policy performance	Evaluation of policy performance	Promotion of public awareness

Source: New Zealand Department of Statistics and Ministry for the Environment 1991, p. 7.

Table 3.2: Evaluation of environmental information at each stage of the policy process

Stages of Policy Process	Stages of Data Production		
	Monitoring and data collection	Processing and analysis	Dissemination
Identification and recognition of issues	Accuracy/ coverage of issues and historical and geographic coverage	Understandability of presentation	Quickness and periodicity consensus building
Evaluation and decision making	Comparability and consistency	Integration with other information	Appropriateness for target user
Implementation	Established methodology	Simplicity and measureability	Accessibility to the public

Source: New Zealand Department of Statistics and Ministry for the Environment 1991, p. 7.

The basic general requirement for meeting client information needs has been expressed in the following terms (Environment Canada 1991b, p.1):

Scientific, technical and policy information that is timely and accurate, and presented in a comprehensible manner, is essential to the achievement of sound decisions.

However, the range of circumstances in which individuals and organisations are required to make decisions about the environment is increasing commensurate with the scale and pervasiveness of environmental problems affecting Australia and the globe.

The business community is being required to make environmental choices in relation to products, production, marketing and disposal.

These decisions, moreover, are not confined to manufacturing sectors of the economy. For example, the Westpac Banking Corporation recently joined over 30 other international banks in signing a pledge to pursue common principles of environmental protection. Among these principles there is a commitment to ensure best practices in environmental management, including energy efficiency, recycling and waste minimisation. Aspects of the code, if it represents a model for future responsibility, have quite fundamental implications for the environmental information support offered to lending institutions. The following extract from the Statement of Banking and the Environment (Westpac 1993, pp.1-3) may illustrate:

- We subscribe to the precautionary approach to environmental management, which strives to anticipate and prevent potential environmental degradation.
- We expect, as part of our normal business practices, that our customers comply with all applicable local, national and international environmental regulations. Beyond compliance, we regard sound environmental practices as one of the key factors demonstrating effective corporate management.
- We recognise that environmental risks should be part of the normal checklist of risk assessment and management. As part of our credit risk assessment, we recommend, when appropriate, environmental impact assessments.
- We will share information with customers, as appropriate, so that they may strengthen their own capacity to reduce environmental risk, and promote sustainable development.
- We recommend that banks develop and publish a statement of their environmental policy and periodically report on its implementation.

The Statement of Sustainable Banking is, in principle, information intensive in its requirements. The service and financial sectors are increasingly being required to make decisions about the environment which will have corporate image, management liability and financial impacts. A comprehensive SoE program will have an important potential role in establishing the wider context in which these strategies will be developed.

In the case of Local Government, decision making situations where the environment needs to be taken into account are included in Table 3.3.

Table 3.3: Decision-making situations

Individuals making decisions in their private lives on:

- where they live: how far from work, how far from the shops, in a floodplain
- how they live: house insulation, cooking on gas, passive solar heating
- when they use their car, walk, use public transport
- what they buy in the supermarket
- how they spend their spare time

Businesses making decisions about:

- the nature of their product: its use, its characteristics after use, its repairability, recyclability, etc
- the choice of production process: end of pipe technology, clean technology, resource use efficiency, resource, recovery from waste products

Local Government making decision on:

- waste disposal/ treatment choices
- charging policies on waters supply, sewerage treatment
- purchasing noisy diesel busses or quiet trolleys
- using silent tarseal and other noise abatement measures in street construction
- parks and reserves management policies

Source: New Zealand Department of Statistics and Ministry for the Environment 1990, p. 13.

The 1992 TASQUE Project Report (1992, p. 12) identified the following increases in local government responsibility for environmental management in recent years:

- local conservation strategies
- involvement in Commonwealth Government and State Government programs such as Landcare and Better Cities
- pollution monitoring and control
- heritage protection programs
- coastal zone management
- integrated catchment management
- flora and fauna protection
- waste minimisation programs
- solid and liquid waste management
- energy management plans
- environmental impact assessment
- urban regeneration
- rural regeneration
- traffic calming
- environmental education.

The role of SoE in helping to provide the information to support these responsibilities will include (Sanders 1993, p. 51):

- background environmental data against which to assess development proposals
- identification of environmental issues to which local government policies, plans, projects and programs can respond
- broad scale review of the effects of the cumulative impacts of local government activities on the environment.

The key issues indicated for regional government in New Zealand parallel many State government environmental responsibilities in Australia. These may include (New Zealand Department of Statistics and Ministry for the Environment 1990, p. 13):

Regional Government making decisions on: standards for water; air quality; reducing vulnerability to natural hazards; tax system; integrating economic, social and environmental policy; monitoring environmental outcomes.

The commonality in the information needs of all potential clients is that everyone will need to know what is happening, why it is happening, the implications of change and the relevant management responses at all levels and in all sectors. Information should serve to highlight the dynamic nature of the environment, explaining, in a concise and focussed manner, such

complex relationships as the linkages between environment and economy, and between environment, health and quality of life.

Clarity of presentation and the design of a simple reporting framework that identifies critical issues are musts if readership is to be attracted and held. The Environmental Information Forum (Environment Canada 1991b, p. 5) has described the importance of the presentation process in terms of:

...widening the accessibility and sharpening the decision relevance of environmental reporting through...expanding the use of innovative media for presenting and interpreting environmental information in interesting and meaningful ways .

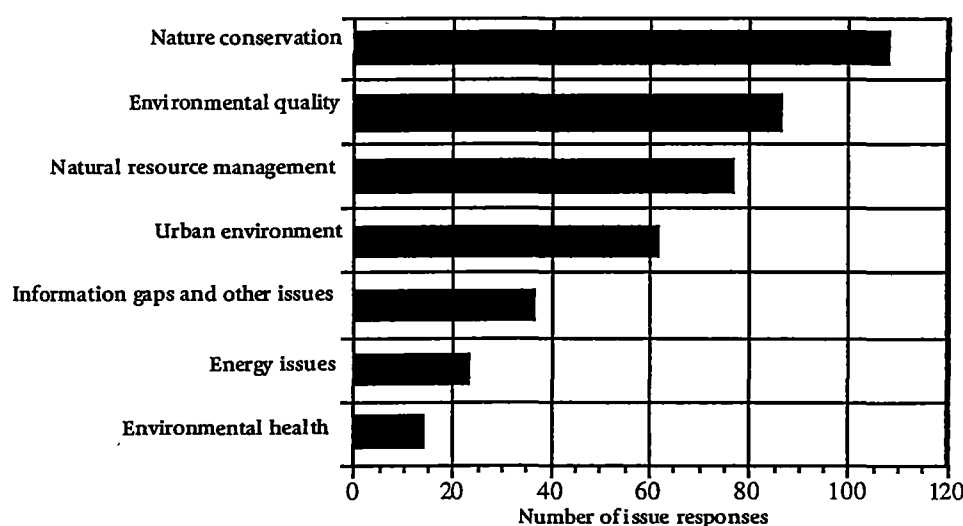
Presentation methods which may be valuable for environmental information in Tasmania are discussed in chapter 6, Reporting Systems for SoE.

In order to illustrate the range of client information needs, reflected in practitioner views of priority issues, the results of a questionnaire conducted by CEPA in the context of the National Workshop on SoE will be reviewed.

The questionnaire requested workshop participants and individuals and organisations who responded to the CEPA Discussion Paper on Development of a National SoER System (1992) to identify the priority environmental issues to be addressed by SoE. From 62 respondents, the total number of issues identified was 323 and the total number of issue responses was 563 (CEPA 1993, p. 83).

The significance of the survey lies in the range of priority issues identified by environmental practitioners rather than, necessarily, the particular weighting given to specific issues. The responses are presented in Figure 3.2 and Figure 3.3. Figure 3.2 highlights the total number of issue responses received across seven categories: nature conservation, environmental quality, natural resource management, urban environment, information gaps and other issues, energy issues and environmental health.

Figure 3.2: CEPA questionnaire— priority issue responses

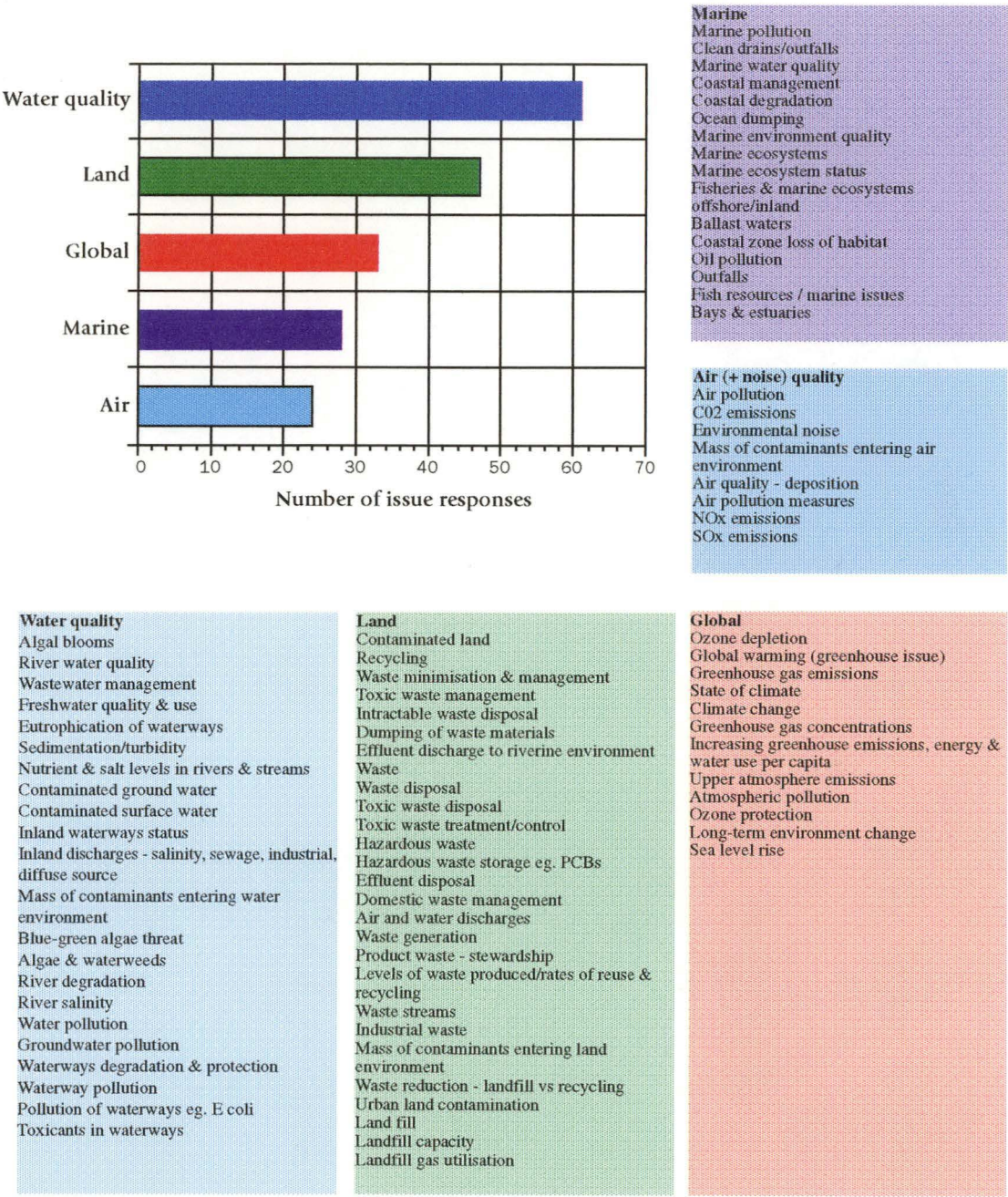


Source: CEPA Workshop Proceedings, 10-11 February, 1993

A priority issues analysis is viewed by CEPA as one possible approach to the identification of indicators for SoE. The task of identifying indicators for SoE is continuing through the work of DEST, the ANZECC Task Force on SoE and the work programs of various State reporting authorities.

The CEPA survey indicates the range of priority issues which warrant measurement and assessment. However, the survey findings provide little assistance in indicating priority areas for SoE—the findings simply confirm that practitioners are having to deal with a complex mix of issues, all of which are, in effect, priority issues.

Figure 3.3 Environmental quality issues



3.4 Access to information

The principle may be simply expressed as making the best possible use of existing data before new data collection efforts are mounted. The problem was identified in the ESD Intersectoral Issues Report (Commonwealth of Australia 1992a, p.32):

Many databases have been compiled for specific purposes and are not well known beyond the groups that have compiled and use them. Maximum use should be made of databases that are now available...significant gaps in existing databases should be identified and future efforts should be directed towards covering them...Ready access to, and co-ordination of information in databases should be facilitated and given high priority; information which is not used is a very expensive resource .

The development of an inventory of bio-physical and socio-economic data sets which is widely available and easily accessible will assist in maximising the use of existing sources of information. At a national level a research in progress database was intended to be one of the functions of the Australian Environment and Conservation Database proposed by the Australian Environment Council. The task has since been modified and pursued through the National Resource Information Centre (NRIC) which was established in 1988. One of its core activities is the development of a directory of natural resource information.

Directories add value to existing data sets through improving their availability and accessibility to a range of different clients, establishing relations, where statistically valid, with other data sets, and providing a synoptic view of the environment and human interaction with the environment. In short, the centralisation of summary information can bring economies of access to all users. Bradbury (1993, p.2) has identified 7 stages in the flow of information for sustainable development decisions. These 7 stages are highlighted in Table 3.4. Directories fit into the access and integration stages in the flow of information.

Table 3.4: The flow of information for sustainable development decisions

Stage	Description
Acquiring	Gathering the information to required standards
Managing	Organising and storing the information in database
Accessing	Making the information available to others
Integrating	Bringing different sorts of information together
Enhancing	Manipulating and analysing the information to create new information
Visualising	Displaying the integrated information as images
Assessing	Analysing the policy implications of the scientific and economic information

Source: Bradbury 1993, p.2

Maximising the use of existing information and the development of SoE in general is reliant on the establishment of high levels of inter-agency, inter-governmental and community co-operation and the development of a consistent methodology between reporting levels. For example, SoE will need to be integrated with the statistical portfolio of the ABS. Work on satellite resource and environmental accounts is already in train, and environmental statistics

might be recorded and reported as part of this process. Environmental, economic and social data have to be considered together if measures of ecological sustainability are to be designed.

On the other hand, there is also a case that over-reliance on existing sources of data will seriously compromise reporting. According to Griffiths (1993, p. 32) previous national reporting endeavours in Australia highlight that:

State of the environment reporting is not effective if it is based on literature reviews - one was hostage to the available information;

The consequence of being 'hostage to the available information' in Tasmania cannot really be assessed until the attempt is made to prepare the first Tasmanian SoE Report. Chapter 7 identifies some of the principal sources of available information for SoE.

3.5 A consistent methodology

Community based, local government reports will differ in form and content from state or national SoEs. Nevertheless, it is important that reporting efforts are integrated through a hierarchical format which links regional or catchment reports with regional, state, or national perspectives. Indicators and frameworks should be developed to provide an integrating presence. Case studies, drawn from local reports, can also be used to link reporting efforts with state and national programs drawing on the detailed knowledge from local government reporting.

Sampling and classification protocols for environmental information gathering, processing and reporting will need to be developed. ANZECC, DEST and state and local reporting authorities have an important role in supporting the development of such protocols. There is scope for developing common indicators while allowing sufficient flexibility for local and regional variations. The Victorian and New South Wales sets of indicators are to some extent already being considered for application in other States.

The need for standards in SoE has been noted internationally in the Environmental Information Forum and the IUCN's Strategy for Sustainability. The latter notes (IUCN, UNEP, WWF 1990, p. 75) that agencies managing information can help by:

- working together to develop standards and protocols to ensure the comparability and transferability of information between databases;
- collaborating to help establish and develop local and national databases, to meet the needs of the local users;
- paying particular attention to the need to present decision-makers and their advisers with relevant information in a comprehensible and useable form, with confidence limits clearly stated;
- developing and participating in networks for the free two-way flow of information.

Consistent methodology may also extend to the adoption of the same 'audit trail' for national and State reporting initiatives. An 'audit trail' has been identified in the Draft National Framework for SoE (DEST 1993, p.18) as:

...a feature which will include the requirement to assign 'labels' to both data held within, and outputs produced by the SoE database. These labels will hold information such as: data origins; confidence in data veracity and integrity; analysis performed; by whom, using what tools; status of analysis outputs (e.g. preliminary, checked and verified etc.); and the currency of data and outputs.

Underpinning all the principles outlined above is the basic necessity for legislative backing for SoE. It is imperative to ensure the maintenance of the basic character of SoE as a regular and systematic approach to reporting on conditions and trends in the environment.

3.6 Legislative backing

A legislative mandate to produce SoEs has now been implemented in Tasmania with the enactment of the State Policies and Projects Act 1993. At the present time five State or Territory Governments have enacted or are proposing legislation to mandate regular preparation of SoE reports. These Governments are Tasmania, Queensland, New South Wales, South Australia, and the Australian Capital Territory. The Commonwealth Government also considers the issue of legislative backing in the SoE Discussion Paper (CEPA 1992, p.27).

The need for legislative support is illustrated through both the national and Victorian experiences. The demise of the national reporting program established in the mid 1980s has been outlined in the national review earlier in this thesis. In the case of Victoria, having become the most advanced State through the establishment of systems and frameworks for SoE and preparing a number of reports, the Office of the Commissioner for the Environment, the responsible reporting authority, was disbanded by the Kennett Government.

The Tasmanian State Policies and Projects Act 1993 establishes a Sustainable Development Advisory Council. The SoE component is contained in S29:

- S29- (1)The Advisory Council must, as soon as reasonably practicable after the commencement of this Act and after that commencement at intervals of 5 years, produce a consolidated State of the Environment Report relating to-
- (a) the condition of the environment; and
 - (b) trends and changes in the environment; and
 - (c) the achievement of resource management objectives; and
 - (d) recommendations for future action to be taken in relation to the management of the environment
- (2) The Advisory Council must-
- (a) submit a State of the Environment Report produced by it to the Minister; and
 - (b) cause notice to be given, as prescribed, that the State of the Environment Report will be available to the public for inspection and purchase
- (3) The Minister must cause a State of the Environment Report to be laid on the table of each House of Parliament within the first 15 sitting days of the House after the Report is received by the Minister.

SoE legislation has recently been enacted by the Australian Capital Territory Government. The legislation establishes a Parliamentary Commission for the Environment with a responsibility to act as an environmental ombudsman and to prepare SoE reports. Under the legislation, reports will be prepared on an annual basis and the Parliamentary Commissioner is able to require that government agencies provide information to support the reporting task. In addition to the full-time staff of 2 people and part-time staff, the Parliamentary Commissioner is also able to second staff to the reporting unit for up to 3 months. The South Australian SoE system is also able to require that agencies contribute data for SoE.

Owing to a history of disjointed and ad hoc reporting arrangements at State and national levels, a key lesson arising from the national experience is that an SoE program requires legislative backing for it to be resourced on a long term basis.

be adequate and decisions will always need to be made in the face of ignorance and uncertainty (Section 3.8). SoE seeks to reduce uncertainty and to achieve greater evenness of understanding, but other political, policy and institutional mechanisms for handling uncertainty will be required over and above whatever SoE is able to deliver.

Table 3.5: Possible levels of environmental policies

	Business as usual	Sustainable growth	Environmental quality
Environmental outcome	Protection of outstanding values	Prevention and respect for the long term integrity of ecosystems	Global management of ecosystems; maximisation of diversity; recapture of lost ground
Type of risk Management	Removal of major and unacceptable risks	Probabilistic approach	Reduction of vulnerability
Economic approach	Meeting short term economic needs	Sustainable development: the integration of environmental concerns in economic decision making	Innovation and creativity; ecoproducts; best available technology; emphasis on quality; counting the environment as an asset
Social approach	Minimum standards of hygiene and safety	Information based on the citizen's right to a quality environment	Social innovation and reduction of ecological inequities
International policies	Defence of national interests	Alignment to the strictest standard; participation in multilateral action	Anticipation of problems and international challenges
Keywords	Stay with the status quo, catch up and clean up	Prudence and prevention	Innovation and recapture of lost ground

Source: French National Environment Plan 1990, contained in New Zealand Department of Statistics and Ministry for the Environment 1991, p. 44

Despite all the objectives which have been assigned to SoE, the inescapable test of value for SoE is whether and how it has influenced decision making and environmental outcomes. By the indicators which SoE itself presents of the state of the environment, its linkage with the policy development process would, at best, be described as tenuous and its contribution to influencing environmental outcomes could be considered as limited. (With the resumption of French nuclear testing, the commitment of the French Government to 'business as usual', using its own descriptions of international policy paths to the future in Table 3.5, could not be made any clearer.)

If information has failed to influence decisions (as with the French Environment Plan), the explanation may lie in a combination of factors. These may be firstly; the status, weighting, merit, timing or accessibility of the information which is provided and secondly; that decisions are made independent of the need for some or substantial amounts of information (they are political or substantially values based decisions).

are made independent of the need for some or substantial amounts of information (they are political or substantially values based decisions).

3.8 Acknowledge ignorance and uncertainty

It is vital in its early development that SoE is open about ignorance and uncertainty. The general lack of understanding of many aspects of complex environmental systems (and complex socio-economic interactions between human systems and environmental systems) should be conveyed in SoE Reports. This uncertainty is, however, the antithesis of what governments may wish to convey in SoE Reports and what decision makers need from SoE Reports.

The length of SoE Reports may give the impression to some of the readership that knowledge is extensive; the reality is that knowledge may be inversely proportional to the length of the report (refer to Figure 1.1 Environmental information). A nationally agreed set of environmental indicators, applied at local, regional and national levels, could be presented as a relatively succinct report card.

Openness about complexity and uncertainty in SoE Reports may help to engender community recognition of the precautionary principle and community values about the environment may be influenced as much by what we don't know as what we do.

3.9 Review

Chapter 3 has emphasised that the establishment of an SoE system for Australia (including Tasmania) will need to be based around a series of binding principles, common classifications and agreed methodology. The principles identified are:

- information for ESD
- identify the clients and their needs
- maximise access to existing information
- consistent methodology
- legislative backing
- policy linkages
- ignorance and uncertainty

A primary task for any SoE system is the development of co-operative arrangements and organisational structures aimed at securing a level of agency, industry and community commitment to participation. This is an evolutionary process and is dependent on the establishment of the credentials and credibility of SoE as a basic community, government and corporate resource. The following chapter considers some of the issues.

4. Co-operative and Organisational Issues

In its various dimensions, a climate of co-operation for national or State SoE includes co-operation between scientific and wider community interests; co-operation between the reporting authority and custodians of data in agencies, other spheres of government, industry, and NGOs; and co-operation between professional groups characterised by traditional disciplinary separation such as economists, ecologists and sociologists. These co-operative arrangements and tasks are discussed in this chapter.

4.1 Co-operation between science and community

A 'meeting of minds' between scientific and lay perceptions of the environment requires an interactive process able to identify and maximise the opportunities for community participation. These opportunities may arise through some of the following initiatives:

- encouragement of community based monitoring as a means to realise greater community ownership
- providing the opportunity for recognition of community values in SoE
- participation of community based environmental experts on scientific reference groups
- ensuring that reports are presented in a clear, interesting and understandable manner with confidence limits (and explanations of those limits) made clear
- providing opportunities for community review of reports.

Opportunities for participation will be supported through ensuring that clients are fully aware of progress in the development of SoE. A periodic newsletter reporting on progress would provide the means for communicating new issues and progress. Expressions of interest should be invited for community participation on scientific reference groups. However, this will not, by itself, ensure community involvement. Many people with a sophisticated knowledge of their local area will be reluctant to describe themselves as experts—advertisements will therefore need to be carefully worded.

If community contributors can be identified, their participation will need to be tailored. Extended contribution in the drawn-out process of research, drafting and re-drafting is unlikely and unproductive. Community input should be encouraged in the early stages of report production for the identification of issues and case studies. Extended periods of contribution from academic and industry expertise is also unlikely and, in many SoER programs, funding is insufficient to facilitate this participation. To encourage wider community input, the Victorian approach was to publish discussion papers on the topics to be included in the SoE report. This can serve as a prompt for community involvement.

Once an SoE is prepared, the report should be advertised in all media and a public presentation of the report and implications should then be undertaken. Feedback on reports will need to be actively encouraged.

The 'meeting of minds' between science and community perceptions will also be supported through ensuring that reports incorporate statements of community values. These statements are able to provide government with indicators of community awareness of environmental issues. People should be given the opportunity to communicate their values in circumstances

that are not in response to particular development proposals. It is unfortunate that the only time in which people are presently provided with the opportunity to voice their values is in response to a particular threat to the environment.

The development of SoE in New Zealand has included the identification of 'valued environmental components' or VECs. VECs provide a link between '...science and the lay perceptions of the environment...VECs may be identified by observation of people's behaviour and attitudes or by questionnaires and interviews, then periodic feedback through public participation' (Ward 1990, p iii).

Beyond science and 'lay' perceptions, the need for a 'meeting of minds' also extends to professional groups subject to the traditional disciplinary separations of knowledge.

The establishment of a community based/ scientific advisory and review process is considered to be important as a means to establish community ownership of the reporting program. Such a committee should be broadly based and could comprise selected representatives of organisations having an interest as providers of information, or as clients for SoE reports and products.

The community advisory group would meet at the beginning of an SoE development program and on an 'as required' basis during the preparation of a report. The composition of the community advisory group would vary according to the nature of the particular reporting program. The group would greatly assist in grounding the exercise as a community initiative.

A possible model is the Canadian SoE Advisory Committee (Rump 1993, p. 15):

This group was established in 1988 and consists of 10 members, regionally selected to represent universities, consumer groups, industry, and professional and environmental groups. It meets twice a year and provides strategic advice to the SoE reporting organisation. It has provided a valuable sounding board, for example, on indicator development and ecological monitoring. The committee has also taken a keen interest in new products, and closely monitored the preparation of the national report from the table of contents stage to the review of draft chapters.

The need for such consultative arrangements has also been noted at a national level (CEPA 1992, p. 3) and an Advisory Council structure has been proposed:

Because the state of the national environment must reflect local, regional and state conditions, it is essential that arrangements ensure the participation and collaboration of all levels of government and non-government organisations.

4.2 Professional co-operation

This issue of professional separation and disciplinary demarcations is viewed as one of the reasons why SoE Reports have yet to be given the same status as economic and social reports.

Existing monitoring programs are typically based around narrow sectoral or agency needs, however, SoE requires that wider biophysical and socio-economic issues are integrated in any monitoring and reporting program.

Another professional hurdle has been highlighted by Elkin (1990, p. 57):

The sheer complexity of human-nature interaction, the insufficient knowledge of critical cause-effect relationships, and the inadequacy of the existing indicators of environmental change have all contributed to experts' reluctance to make general statements about the state of the environment.

There are other reasons as to why scientists may be reluctant to communicate through SoE. Scientists may be prevented by employers from writing for as public a medium as an SoE report. It is also likely that scientific contributions to SoE reports will not be as favourably received by peers as are contributions to professional journals.

SoE is perhaps especially subject to the practical limits of knowledge identified by Daly and Cobb (1989, p. 132):

As more and more knowledge is gained about any bit of subject matter, the less is the possibility of any one person being informed of all of it. Similarly, the more methods are applied, the less likely it is that any person can practice them all or keep up with results by those who do.

These constraints apply to any individual in the SoE field as they do to the role of any reporting authority. Co-operation will be required between the reporting authority and the many custodians of data who will need to be associated with the development of SoE capability, whether nationally or in Tasmania.

4.3 Co-operation with data custodians

There is perhaps no other factor more critical to the success of SoE than the development of a co-operative relationship between the reporting authority and custodians of data. No government or agency can independently generate truly accurate and comprehensive SoE Reports.

There are several factors which are influencing the development of these relations both in Tasmania and nationally. Firstly, cost recovery pressures across government generally will affect the capacity of reporting authorities to obtain summary data for SoE. Secondly, data custodians are naturally protective of information and, regardless of cost recovery issues, will not necessarily always permit access to summary data for the purposes of SoE.

Thirdly, the accumulation of datasets often means that it is a difficult task for a reporting authority to establish and retain a knowledge of available data sources. Directories or registers of datasets will assist in this task. Finally, and acting as a more positive influence, government agencies and research bodies are increasingly aware of the importance of intersectoral or cross disciplinary approaches to decision making. It is now more likely that data custodians will regard SoE as the basis for meaningful and effective interdepartmental co-operation and be prepared to contribute to the process. The Intergovernmental Agreement on the Environment (1992) will also act to facilitate data exchange at a national level.

Nationally, organisations such as ERIN, NRIC and DEST have considerable expertise and resources which Tasmania will need to draw on if it is to be able to boost the more modest local resources presently available for monitoring and reporting. The Statement on the Environment by the Prime Minister (Commonwealth of Australia 1992) included an allocation of \$3.4 million for SoE nationally.

The need for support is not simply in one direction; DEST will require the input of data from each State both for its own reports and for input to international reports such as the OECD SoE program. The Inter-Governmental Agreement (Schedule 1) together with the activities of DEST should support co-operation between the spheres of government.

4.4 Industry and business co-operation

The International Forum on Environmental Information recognised that business must act as a facilitator and conduit for environmental information flows. The business community will increasingly become a participant in and a client for environmental information as a consequence of trends in the development of environmental auditing and as a means to support public information programs on environmental issues. The International Chamber of Commerce Business Charter for Sustainable Development sets forth as one of the 16 principles, voluntary public disclosure, by companies, of environmental activities (Connor 1991, p. 19).

Similarly, the Australian Manufacturing Council's Strategy on 'Best Practice Environmental Management' proposes an 'Open Door' to Community (1992, p. 41) noting that:

The environmental concerns of people are often related to perceived threats to personal and community safety and health. People are fearful of accidents and this can lead to a lack of trust in manufacturing industry.

Leading edge manufacturers have recognised that this public perception must be turned around. To achieve this requires two commitments from industry. Firstly, industry must improve its environmental management and, secondly, it has to share information with the public.

Industry must be prepared to 'open its doors' to the community; to provide information, to answer queries, to listen to concerns, to take ameliorative actions and to involve the community in environmental management issues.

The Australian Manufacturing Council also suggest a series of indicators for corporate environmental performance. The document presents an endorsement of the role of industry as a supplier of environmental information. At the same time the business community has a right to maintain the confidentiality of proprietary information.

Industry stands to benefit by active participation in SoE. Through the reporting process, commercial opportunities for the environmental management industry may emerge while the identification and access to data networks which will accompany the development of the reporting process will also benefit industry. Collaboration between industry and the reporting authority will be needed from the outset in the establishment of frameworks, systems and indicators for SoE.

As discussed previously, it is not only manufacturing industry which will benefit from participation in SoE; financial institutions are being made aware of the financial consequences and implications for their lending policies of environmental contamination and land degradation. These institutions are identifying issues such as corporate liability and decline of asset value as a consequence of land degradation and contaminated land. Thus it may be that, eventually, the broad trends established by SoE will be of interest to financial institutions.

4.5 Organisational issues in SoE

If SoE is to be accepted as an integral component of the management system for Tasmania, then the placement of responsibility for reporting needs to be at an elevated position in the administrative hierarchy. The authority of the agency concerned needs to be well established either through legislation or administrative power and the agency needs to be able to effectively influence the machinery of government to ensure that SoE is implemented and that its output is converted into policy action.

Under S 29 of the State Policies and Projects Act 1993, the Sustainable Development Advisory Council (SDAC) is established as the reporting authority in Tasmania. This will secure a more elevated position in the administrative hierarchy for SoE relative to, for example, the placement of the function within an EPA. An elevated organisational position may be of benefit in gaining access to data. In addition, in establishing a degree of independence from the environment agency, the auditing role of SoE is supported by separating day-to-day management from review. The issue was alluded to in the Tasmanian Department of Environment and Land Management Information Paper (1991, p. 25):

The success of (SoE) is dependent on political and administrative independence and the impartiality of the reporting authority. If protection of the environment is in the interest of long term human survival, then reports on environmental conditions should be public and made without fear or favour. Reporting structures should be able to both initiate and respond to environmental issues and concerns where the authority resides at State or national levels.

There are differing views regarding the relative advantages and disadvantages of such independent reporting authorities as Parliamentary Commissioners for the Environment (as now established in the Australian Capital Territory). One school of thought is that reporting authority independence will also mean isolation from information sources. The Australian Capital Territory legislation may overcome this to some degree by providing the capacity for the Commissioner to require agency contribution of datasets.

However, circumstances in which government agencies are vehemently opposed to providing data are likely to be rare and by far the major constraints relate to lack of monitoring or data that is not in a suitable format for analysis and inclusion in an SoE report. For example, water quality data may be held on computer tape based around monitoring for 365 days of the year with an absence of summary data required for SoE. In some ways this is as much an information constraint as the lack of monitoring data. A legislative mandate requiring agencies to contribute information will not necessarily assist in these circumstances.

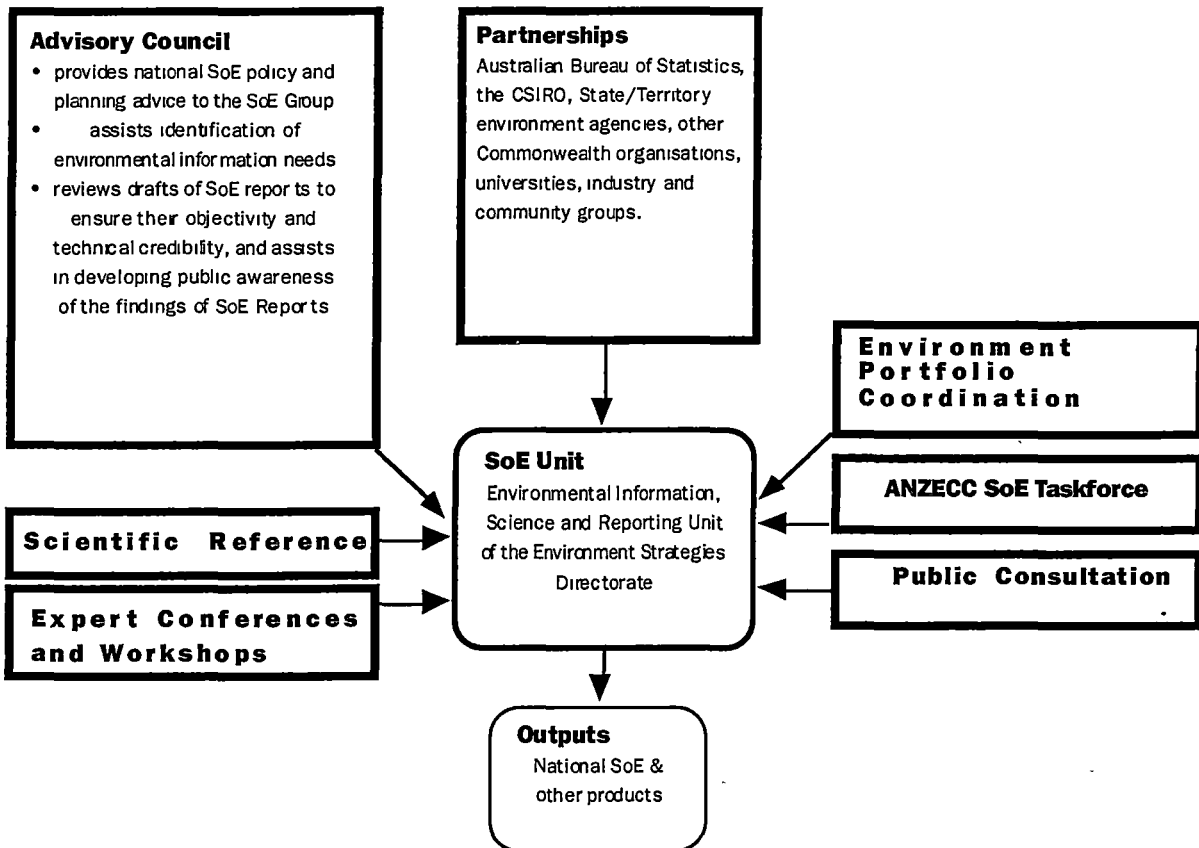
An 'arm's length' reporting authority is not being pursued in Canada (Rump 1993, p. 11) for the following reasons:

First, it was recognized that data acquisition from other departments or provinces could be more difficult. Second, small independent agencies have recently become susceptible to government cuts. And third, the concept of arm's length has not been favourably accepted in consultations with the Provinces and Territories or the SoE Advisory Committee.

While the Victorian Office of the Commissioner for the Environment, as an independent reporting authority, did not appear to experience significant problems from an information access point of view, it was certainly highly exposed to government cuts. A legislative mandate was being sought prior to the Kennett Government's election. However, this may or may not have preserved the Office of the Commissioner for Environment.

The conclusion which Environment Canada has made in relation to the role of reporting authority independence is that: '...credibility is not a function of organisational status but depends on quality products consistently produced over a long time' (Rump 1993, p. 11). This may be the case; progressive and open government may be more accepting of the legitimate audit function of SoE. On the other hand, there is also a case that the quality of the product will be influenced by the organisational independence of the reporting authority.

Figure 4.1: Draft national consultative arrangements for SoE



Source: DEST 1993, p.21

The Canadian experience raises some doubts about whether independence can be justified. The priority is the development of long term and systematic environmental monitoring by the environment and natural resource agencies with responsibility for those programs. In short, SoE is unconcerned about the source of monitoring data and, to the knowledge of the writer, no SoE authorities have suggested that they have a major role in collecting primary data for SoE. Given the scale of the analysis, synthesis, and writing task for SoE, this is hardly surprising.

Thus, SoE will continue to rely on datasets that were collected for reasons other than reporting on the state of the environment—that is, unless commitment is generated to a national program such as EMAP.

Finally, returning to the issue of the SDAC, this body also has responsibility for the preparation of State Policies. Given this, SoE is in a position to be able to achieve more direct

links with the policy process in the generation of, for example, State Policies on coastal management and urban consolidation.

4.6 Review

In summary, the co-operative and organisational issues identified are:

- co-operation between science and community
- professional co-operation between traditionally separate disciplines
- co-operation between the reporting authority and custodians of data
- industry/ business co-operation

The principal organisational issue is the degree of independence of the reporting authority from government. The arguments for independence are not conclusive, particularly, in the case of smaller States such as Tasmania. Irrespective of their independence, reporting authorities will continue to rely on environment and natural resource agencies to contribute data.

5. Information systems for SoE

The term 'information system' is used in a generic sense rather than a computer applications sense in this chapter. The development of an information system for SoE in Tasmania constitutes a task of making the most of a sub-optimal situation. It is sub-optimal for a variety of reasons:

- the complexity of environmental responses to human stresses
- complex arrangements of environmental space, decision making space and information space
- existing data sets which have been established to meet particular agency or other sectoral needs
- the many environmental issues of concern: indeed respondents to the CEPA SoE Discussion Paper identified 346 priority environmental issues on which an SoE system would be required to report—most of these warrant examination in Tasmania(CEPA 1993).

An ideal information systems design for SoE would proceed in a series of coherent and logical steps, in a manner such as described by Crain (1988, p. 1):

...from the identification of overall objectives, through user needs analysis to functional specifications, to selections of specifications and software, and so on until the final testing and operational implementation.

The information system for SoE would comprise spatially referenced summary data selectively extracted and converted to a consistent format from data bases. Summary data would then be applied to support a series of agreed indicators (agreed on a national as well as a State basis to ensure national compatibility and consistency).

The geographic information system would need to allow analysis and integration of a range of systems including census collector districts, catchments, biomes, local government boundaries, coastal zones, and marine zones. In addition, the SoE information system would also be reliant on the input of national and global information for questions of comparison and of assessment of the implications of global environmental change, such as climate change.

Spatial boundaries and issues for SoE in Tasmania are examined in more detail in Section 6.3 on page 61.

The primary purpose of an SoE information system would be to support SoE reporting in Tasmania, but there is a range of associated roles which an information system could perform. In particular, the database for SoE may eventually be publicly accessible through on-line access or through an Information Officer.

As discussed, the success of SoE is dependent on the development of indicators. This has been highlighted by Zuc (quoted in McMonnies 1988, p. 22):

The most efficient way to achieve cross sectoral environmental reporting and to link environmental and economic information is to identify a set of key environmental indicators, as surrogates for the total spectrum of environmental quality data and to integrate existing knowledge and data bases.

An appropriate starting point is therefore establishing the criteria and scope of a set of indicators to support system objectives.

5.1 Indicators for SoE

Indicators may serve a range of purposes and assume a variety of forms, whether qualitative or quantitative, subjective or objective. Nevertheless, some characteristics are basic to all effective and meaningful indicators.

Transparency is a central requirement. The message as well as the methodology of indicators must be easily explained. An indicator should be capable of accurately conveying an environmental condition, human impacts on the environment or the consequences of environmental change.

Indicators should be easily reproducible to verify results and for future reference and reporting. For this to be possible it is critical that the development of indicators be driven by a scientific/ community advisory process. Most of the audience for indicators will not need to understand the details of developing an indicator, but they do need to know that an indicator is accepted by a scientific/ community advisory process as being valid.

In order to establish a hierarchy of reporting allowing local and catchment reports to contribute to State, national and international reports, indicators should be transferable and replicable across jurisdictions and boundaries of reporting. While a particular indicator of sustainable agricultural practice, for example, may not necessarily be relevant across all of Australia, it would need to be transferable as required.

In order to support the transferability of indicators across jurisdictions, DEST has proposed the development of sampling and classification protocols for environmental reporting and indicators. This is an essential step in developing consistency and comparability in methodology.

Nevertheless, the limitations of the portability of indicators across environmental regions has also been highlighted (Hammond 1993, p. 58):

One constraining factor is that people have sought a set of indicators that work across a range of latitude, biogeographical provinces, etc. To get more robust indicators, it is more appropriate to segment Australia's environment, which leads to the question of classification. Evidence to date is that classification of marine environments is not easy, and it is difficult to achieve classifications which will stand up to ecological tests.

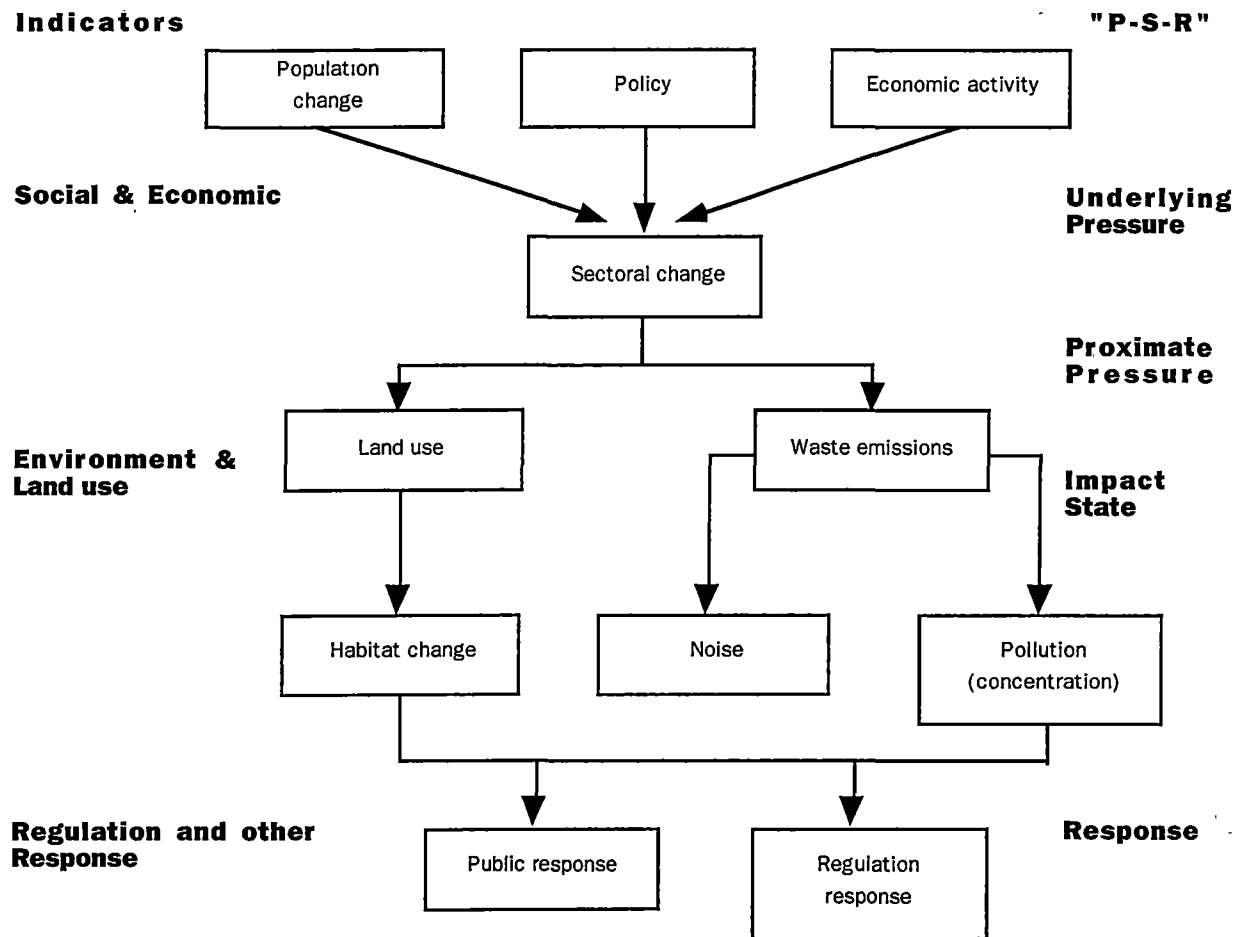
Indicators must be cost effective in order to provide some assurance that their role will be supported into the future. The cost of an indicator has to be weighed against its relevance and importance and the benefits it provides. Construction of environmental indicators will need to be predicated on an appropriate information flow as identified by Croze and Vanderweerd (1991, p. 111):

conditions in the field, generation of environmental data, validation, analysis, completion of evaluation techniques, indicator derivation, indicator validation by field testing, promotion of indicator use...

5.1.1 Indicator types

Figure 5.2 illustrates the broad range of possible environmental indicator classes within an SoE system. The model presented is based on 'pressure-state-response' (Pearce and Freeman 1991, p. 76), the concept being that environmental indicators need to reflect the underlying pressure on the environment, the state of the environment itself and the regulatory and public response to the state of the environment. Figure 5.3 elaborates on the 'pressure-state-response' model and includes examples of each of the components.

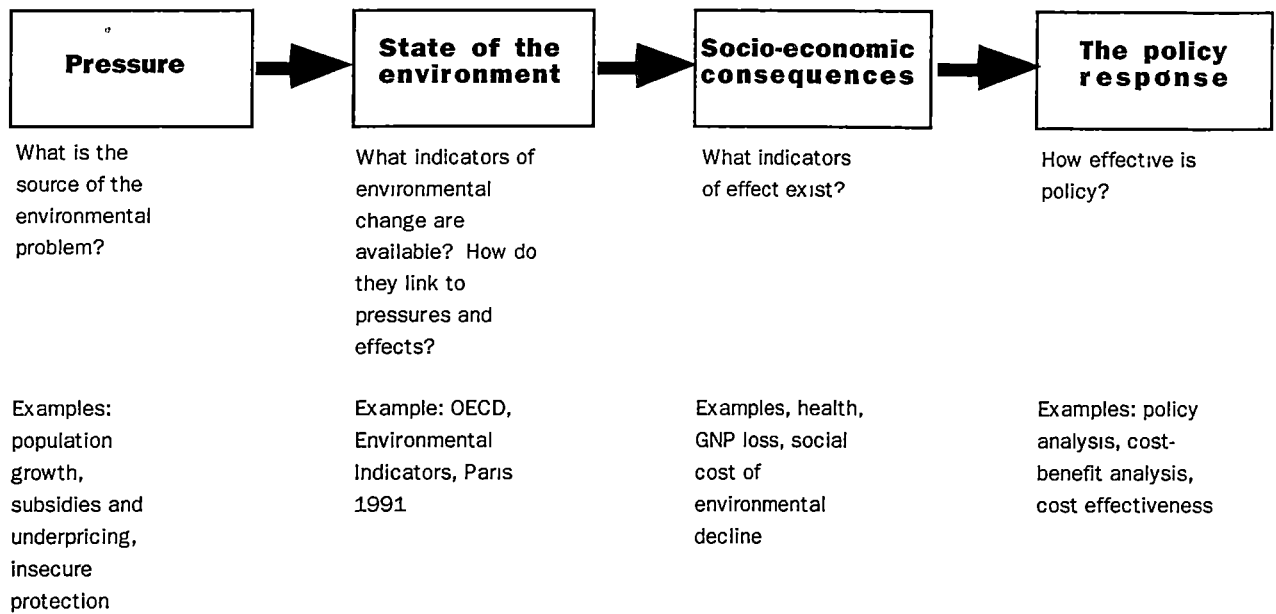
Figure 5.2: A basic model of environmental indicators



P=Pressure S=State of the Environment R=Response

Source: D. Pearce, et al. The Development of Environmental Indicators Report to the UK Department of the Environment, University College London, February 1991, reproduced in Pearce and Freeman 1991, p. 76

Figure 5.3: The analytic structure of policy-maker information



Source: Pearce and Freeman 1991, p. 63

The purpose of including components which are not strictly 'environmental', according to Statistics Canada (1991, p. 214), is to:

...show how traditional environmental data (emissions, loadings in media and biota, measures of physical and biotic state) can integrate with socio-economic data to provide a more complete picture of (i) how environmental quality may be related to socio-economic activities; and (ii) how socio-economic activities may be influenced by changing environmental quality.

5.1.1.1 Environmental efficiency indicators

There is a variety of indicator types which relate to this model. Environmental efficiency indicators, for example, represent a link between environmental impacts and state and economic activity. The energy intensity of economies, relating energy consumption to GDP, is an example of an environmental efficiency indicator.

A reduction in the amount of energy used per unit of GDP is a measure of improved environmental efficiency. It may also be an indicator of structural change from industrial to a more services oriented economy.

Other measures relevant to environmental efficiency include the cost of environmental decline and proposed indices of human welfare. Sample estimates of the cost of environmental decline are detailed in Table 5.1. Social cost estimates are an important indicator to include within SoE as corporate and government decision makers are typically unaware that environmental decline has both direct and indirect costs.

Table 5.1: Summary of some costs of environmental degradation in the industrialised and developing worlds

Country	Nature of damage	Year	% of GNP
Netherlands	Some pollution damage	1986	0.5-0.8
Germany	Most pollution damage	1983/85	4.6-4.9
USA	Avoided damage due to environmental legislation	1978	1.2
Mali	Soil erosion	1988	0.4
Ethiopia	Deforestation	1983	6.0-9.0
Indonesia	Deforestation	1984	3.6
Indonesia	Soil erosion	1984	0.4
Poland	Soil erosion	1987	4.7-7.7

Source: Pearce and Warford Environment and Development: Natural Resources in the Developing World in Pearce and Freeman 1991, p. 65

Daly and Cobb have extended the analysis of measures of social cost and human welfare through development of an 'index of sustainable welfare' (Daly and Cobb 1989, p. 401). In brief, the index commences from the standpoint of GNP and then factors in or excludes a range of other components. Examples of components which have been included in their calculations are income distribution, natural resources depletion, environmental damage and the value of unpaid household labor. Daly and Cobb have calculated that per capita sustainable welfare began to fall in the USA in the mid 1970s (1989, pp. 418-419). Pearce and Freeman (1991, p. 80) make the point about the Index of Sustainable Welfare that:

The essential point is that, if credible, such a measure could be more than an indicator of human welfare. If the adjustments made to GNP could be disaggregated to show which were due to environmental deterioration and which were not, then the indicator could also be used as a measure of environmental efficiency.

5.1.1.2 Policy efficiency indicators

Policy Efficiency Indicators refer to the linkage from response back to pressure. They have been described as a 'measure of how successful actual policy has been in its environmental aims...' (Pearce and Freeman 1991, p. 81). Policy efficiency indicators are a key to the auditing function which is frequently assigned to SoE. Examples of such measures may include indicators of the extent of compliance with regulation and changes in ambient concentrations of pollution. The list of ministerial exemptions from the requirements of the Environmental Protection Act 1973 has been applied, tacitly, as a policy efficiency indicator in Tasmania. However, as a possible measure of policy efficiency it is poor as it does not take into account the appropriateness of standards which determine the premises requiring exemptions from the requirements of the Environmental Protection Act 1973.

Policy efficiency indicators are equally appropriate at corporate, government agency, or at local, State and Commonwealth levels. In Norway, environmental responsibility has been introduced in response to the Bruntland report. In their annual statement every central government agency must discuss the environmental impacts of their policies, the environmental situation in their sector and the ameliorating measures they are taking (Ward 1990, p.34).

The development of meaningful policy efficiency indicators highlights the requirement for the identification of clear, precise objectives whether by the responsible agency, corporation or government. As stated previously, if goals are unclear then information requirements will also be unclear.

Policy efficiency indicators are also likely to become increasingly important in the evaluation of the relative merits of those market based measures for environmental protection that are gaining favour at the expense of more traditional command and control responses. Social cost benefit analyses are being viewed as part of the responsibilities of SoE. The New South Wales Protection of the Environment Administration Act 1991 requires that the SoE Report include a section on 'an examination of trends in economic analysis and of the costs and benefits (including economic evaluation) of environmental protection'(New South Wales Environmental Protection Authority 1992, p. 29).

Monitoring of policy is not an optional add-on to SoE; it is an imperative that is implicit in the 'stress-response' framework. While acknowledging its role, Dovers and Lewis (1993, p. 57) tend to view it as an alternative to environmental monitoring. Nevertheless, their point is an important one. It is explained in the following extract:

...the common notion of SER seems to be that we will monitor the environment for signs of degradation, and, if necessary and possible, implement some policy change to correct the situation if degradation is detected. It could be just as useful to consistently monitor the impact of current and future policy changes - are these working, how well, and why or why not? There is never certainty behind policy, and too often society loses interest in an issue, only to see the issue arise some years later after the policy initiative has proved inadequate. Strategies, reports and policies are means, the end is positive change in the environment or our use of it.

5.1.1.3 Sustainability indicators

Despite the latitude which exists in approaches and conceptions of the term 'sustainable development', there is perhaps consensus that it should encompass, as a minimum, the conservation of life support systems and biodiversity, the sustainable use of renewable resources and the minimisation of rates of depletion of non-renewable resources. It is language, style and emphasis which separate sustainability indicators from indicators for environmental reporting in general.

Concepts of sustainable development seek to highlight the interconnectedness between economy and environment and, as a consequence, the common language places an emphasis on terms such as natural and human capital, assets and wealth. The following extract illustrates the language of sustainable development and notes the importance of conveying the message of environmental assets as wealth (Pearce and Freeman 1991, p. 68):

The first (rule of sustainability) requires the maintenance of man-made and human capital through ongoing investment in areas that allow society to maintain a productive sector, both with respect to industrial infrastructure and work force. The second is found in the notion of environmental or natural capital (the stock of natural assets, such as tropical forests, freshwater, fisheries, and wildlife). To think of other environments as wealth, too, is not such a familiar notion. For example, the ozone layer is an environmental asset, as are the fundamental biogeochemical cycles that regulate the earth and life upon it.

The 'language of sustainability' may sometimes be clinical and devalue the importance of the environment, as in descriptions such as 'ecological infrastructure' or 'environmental capital'.

These descriptions may serve to entrench human centred conceptions of the environment. As a consequence, a downside of this is the credibility loss and cynicism it generates among community groups. On the other hand, there is also a case that, through using a language which may be familiar to some decision makers, ownership and responsibility may be encouraged.

Thus, in the case of analyses of stocks and rates of change of environmental assets, both natural and human, Pearce and Freeman comment that '..the result accords with the lay person's perception that a nation can ill afford to run down either its education, research and health sectors nor its technology and man made capital' (1991, p. 68).

Aside from language, however, dedicated indicators for ESD which have not already been included or considered for inclusion in SoE reports are not known to the author. School retention rates, for example, may be viewed as a key indicator of sustainability in reflecting both the capacity of the community to understand environmental change, to meet the challenges of environmental change and to train to realise opportunities beyond the traditional resource intensive industry base, particularly in Tasmania, but also in Australia generally. Indicators of education are included as part of a set of urban environmental indicators identified by the Department of Home Affairs and the Environment in 1983 and are also included in the CEPA Discussion Paper on the Development of a National SoER system (1992, p. 40).

In short, current processes for the recognition and development of separate indicators of sustainability as part of the conclusion to the Commonwealth's ESD program are unnecessary and represent a confusing duplication of effort. The value of such an exercise is further diminished as ESD was not developed as an implementable program of action by the Commonwealth Government. There are, therefore, significant problems in actually monitoring implementation as goals and priorities have never really been properly identified.

5.1.1.4 Impact indicators

Impact indicators provide an assessment of the social cost of environmental damage and, in this manner, Pearce and Freeman argue that they provide the basis for 'relating environmental statistics to socio-economic statistics' (1991, p. 67). Impact indicators should aim to promote an understanding of inter-relationships between the environment and other sectors of society. Previously mentioned CSIRO figures on the cost of land degradation are an impact indicator. Claims of the link between the increasing incidence of various forms of cancer and exposure to industrial carcinogens highlighted by Dr Samuel Epstein (*Mercury*, 25 March 1993, p.9) are another possible illustration.

Social cost estimates of policies and programs are important in that they serve to translate environmental degradation into terms that finance ministers, the business community and others can relate to. As with indicators of sustainability, it is a question of communication and a language which encourages attention.

5.1.1.5 Predictive indicators

Predictive environmental indicators may be applied to give an early warning of environmental damage. For example, indicator species near the top of the food chain such as trout may reveal deteriorating environmental conditions. Indicators at lower levels may be applied to anticipate what might happen at higher levels in the future if ameliorative steps are not taken.

5.1.1.6 Incidence indicators

Indicators of incidence or distributional effect (Pearce and Freeman 1991, p. 67) relate the cost of environmental decline or the cost of defensive expenditures or policy responses to their relative impact across the community. Lower income groups have a generally more limited capacity to escape from environmental decline or to take other response measures, whether that be at a local level, as in the case of specific industrial pollutants, or at an international level, as in the case of chronic environmental decline in Africa.

Incidence indicators would be applied to establish who gains and who loses from a policy response. The information would be relevant for decision makers and those who would be likely to gain or lose from a response.

Referring to Figure 5.2, 'A Basic Model of Environmental Indicators', incidence indicators may be applicable at any stage from underlying pressure to proximate pressure, impact/ state or response. Descriptive indicators may also relate to different stages of the indicator model.

5.1.1.7 Descriptive indicators

Descriptive indicators explain an environmental condition in a qualitative manner. Although 'description' is an important facet of any appraisal of the environment, descriptive indicators may be of particular relevance to a local community in expressing that community's relationship with their local environment. According to Ward (1990, pp. 38-40), valued environmental components (VECs) will serve to:

identify an aspect of the environment that is perceived as having value. Such an indicator may be based on public responses to stimuli such as photographs or the experiences of those who interact with certain features of the landscape.

Indicators may be applied to '...enhance appreciation of the social significance of a cleaner environment and express the benefits of the environment policy in socially acceptable terms' (Ward 1990, p.38). VECs could be derived from public response to expert opinion, oral histories from residents, responses to stimuli such as photographs, or the generation of a community vision for the future.

As well as being potentially useful indicators in their own right, VECs may also serve to target other indicators and reporting in general by directing the process towards issues that may be relevant to people's lives. VECs may therefore serve as useful planning tools for a system of environmental reporting. Serving a similar role is a further category of indicator which seeks to communicate to decision makers the community's views regarding their environment.

5.1.1.8 Importance indicators

Decision makers need access to information about the community's opinions on and rankings of environmental issues. Variations between expert opinion and wider community perceptions may suggest gaps in environmental education or may indicate that expert groups and decision

makers are isolated from community concern. Policy responses in isolation from an appreciation of community concern may well be poorly accepted and unsuccessful.

Information may be needed on the ranking of environmental issues by different professional groups within the community. The survey of Local Government Information Needs referred to in Chapter 3 is an example of a source of information on the relative importance of a range of issues to a particular level of government.

At an international level, a most significant statement of importance came from 1575 of the world's leading scientists, including 100 Nobel Prize winners. The Statement by the Union of Concerned Scientists (reprinted in *The Daily Planet*, July/ August 1993, pp.12-13) noted that:

...the environment is suffering critical stress in relation to the atmosphere, water resources, oceans, soil, forests and living species and that the earth will be unable to sustain plant and animal life unless humans end their threat to the environment.

In summary, SoE will need to be established through the development and application of indicators of environmental efficiency, policy efficiency, sustainability, impact and state, incidence, and importance. Within each class, indicators may be predictive, descriptive, show trends, show stocks and/or show rates of change.

5.2 Indicator classification

A sample indicator file for SoE is contained in Table 5.2. The classification attempts to integrate information on the priority issue, the proposed indicator, the position/ role of the indicator, and details of any available monitoring and research support.

The development of a compendium of indicators, following this or a similar format and compiled through wide community and government consultation is the recommended approach for developing a reporting program. It is also hoped that a list of sample indicators will prompt wider community and professional interest in contributing to the program.

The indicator could be presented in a range of formats whether using graphs, maps, tables or a combination of all three. An important associated feature is an audit trail to enable the source of the data, analysis and the tools employed to be recorded. The audit trail is a component of data quality control for SoE (see Table 5.3).

Table 5.2: Sample indicator file for SoE

Priority issue	Climate change
Indicator	Tasmanian emissions of CO ₂ , CH ₄ , N ₂ O and CFCs
Units	Total tonnages
Notes	Total tonnages may also be compared per unit of GDP and per capita. Greenhouse gas emissions may also be expressed by consumption sector.
Target or standard	To stabilise greenhouse gas emissions based on 1988 levels by year 2000 and to reduce these emissions by 20 % by the year 2005 (subject to Australia not implementing response measures that would have net adverse economic impacts nationally or on Australia's trade competitiveness....)
Indicator type	secondary and tertiary

Table 5.3: Sample audit trail for SoE

Priority issue	(e.g. climate change)
Data collection	(title)
Analysis by	(contact)
Analysis tools	(e.g. statistical and spatial analysis tools)
Reliability	(indexed reliability figure)

5.3 Data classification, access and quality

Once the range of indicators for SoE has been identified, the task then is to establish formal and informal data access arrangements which will allow summary data from existing statistical collections to be generated and then applied to support selected indicators. The availability of data to provide reliable statistical analyses of environmental trends and to support a core set of indicators is another issue and this will be discussed in more detail in chapter 7.

Standards and protocols are required to guarantee the comparability and transferability of information between data bases, ensuring that confidence limits are clearly stated on SoE products.

The process of selecting summary data and loading them into a data base for SoE will need to be subject to control. There are a number of concerns to be addressed and practical considerations regarding the data volume, timing and cost restraints, as well as the legitimate concerns of data holders about the use and interpretation of environmental and socio-economic data for which they are the custodians.

Control points within the SoE process, regardless of jurisdiction, must be created to review summary data sets proposed for inclusion in an SoE Report and to ensure conformity to standards and relevance to the SoE reporting process.

The SoE Community Advisory Group, as previously suggested, may offer an appropriate control point, allowing community review of the appropriateness of a data set to the SoE process. Other control points would be responsible for ensuring that the conversion to required format has been performed correctly, and that other technical standards have been achieved. The State SoE may adopt a similar audit trail to the national SoE.

Consideration will need to be given to incorporating a reliability index as one component of the audit trail for SoE indicators. The reliability index may be on a scale of 0-9 with an index of 0 indicating sampling and/ or analysis which is ad hoc or unreliable. A reliability of 9 would indicate sampling and analysis to high specifications. Without such an assessment of reliability, there is a danger that decisions will be made on the basis of collated data when those data have varying degrees of reliability.

Custodians of data sets would be responsible for ensuring data quality and the provision of information on the data services, potential errors and limitations upon its use and interpretation. The task for SoE is one of preserving the accuracy, precision and documentation of the source data set. In this regard the views of NRIC (Bradbury et al 1991, p.1) are notable:

The effect of combining datasets from disparate subject areas with different error characteristics and of varying spatial and attribute accuracy, does not as yet have a statistical basis for its prediction. The combination of datasets results in a derived dataset whose quality is no better, and may be much worse, than that of the poorest quality dataset.

SoE is an integrating exercise, however, the majority of the datasets it will be utilising were developed for specific sectoral needs and were not intended to be integrated. Data are generated using different sampling schemes, scales, recording methods, standards and classifications and, as a consequence, there will be difficulties associated with comparing and combining data. Much of the information needed to support SoE will be incompatible in form, incomplete and/or found in diffuse locations. Developing the co-operation and the systems to overcome these problems will be a major task for SoE.

The issues discussed in this chapter are over and above the quality assurance requirements for environmental monitoring programs. In brief, the sharing of environmental data and a compilation as a SoER requires knowledge of the reliability of the data submitted.

Further, if the involvement of the Australian Bureau of Statistics in the SoE exercise is to be supported and encouraged, these are the type of minimum standards which the ABS would expect. Its expectations of reporting (Oakley 1993, p. 49) include the following:

- time series of data
- data series to be similarly defined regardless of the source agency
- data to be consistent in definition, classifications used, and that methodological issues such as sampling frequency and accuracy of measurement, do not compromise the quality of the data.

The central issues of quality assurance for monitoring have been well identified by Croze and Vanderweerd (1991, p. 107):

Besides having a valid statistical basis and a proven data collection methodology, any viable monitoring activity must have a quality assurance program that measures and promotes the reliability of the data collected. QA is required to guarantee the generation of data of suitable quality to address the defined aims of the monitoring program. QA involves a set of activities that ensure the accuracy, representativeness and comparability of data: accurate analytical measurements; representative and meaningful sampling program; suitable storage and pre-treatment procedures for samples; accurate and meaningful data validation procedures.

Rather than being a task that SoE reporting authorities should undertake independently, the ABS has considerable expertise to contribute to the development of SoE reporting in the areas of data standards, frameworks for reporting, classification of geographic systems, classification of terms to be applied in reporting; and national and international consistency.

5.4 Research and monitoring

In order to support the development of and regular reporting of an agreed set of indicators, SoE is dependent on research and monitoring. Ideally this will need to be over a sufficient period to establish trends. Monitoring should cover key physical, chemical and biological features of the environment, major parameters of human development and the status of natural resources.

Environmental monitoring may have a range of objectives. Croze and Vanderweerd (1991, p. 106) have identified these as:

- establishment of baseline conditions
- determining the status and trends in environmental conditions and processes
- development of resource inventories
- collection of data for modelling and prediction purposes
- collection of data for guiding policy decisions and the development and management of resources
- collection of information to set policy and action priorities
- evaluation of project/ program performance and of the effect of management intervention
- evaluation of and adherence to and impact of international agreements
- advance warning of environmental threats

There are three principal monitoring objectives: short term monitoring intended to disclose cause and effect relationships, short and longer term performance monitoring required to support standards and enforcement and longer term monitoring for SoE intended primarily for management and decision making.

There is potential for some overlap between all three monitoring types and a key requirement for SoE is to maximise the use of all environmental research. Nevertheless, SoE has some particular needs which have prompted calls to purpose fit monitoring for SoE rather than adapting data designed for other purposes.

The extent to which SoE systems can rely on existing sources is questionable. Existing sources of environmental data are generally highly fragmented and intended for purposes other than realising a long term and systematic approach to assessing changes in the environment and human interaction with the environment.

The monitoring needs of SoE require a departure from traditional single discipline approaches which tend to focus on single parameters such as temperature, pH, rainfall, plant density, animal numbers, attitudes to recycling, occupancy rates per household, or educational attainment. As noted by Ward (1991, pp. 1-2):

A comprehensive understanding of the way in which elements of the environment interact requires an integrated approach to environmental monitoring rather than just physical, chemical, biological or socio-economic aspects...ideally, a system of indicators needs to be developed that reflects the state and management of resources in relation to the long-term goal of sustainability. In order to focus on sustainability there is a need to take a more holistic approach to environmental problems. Biophysical and socio-economic considerations must be integrated as closely as possible...

The range of issues which will need to be considered in an integrated approach to environmental monitoring will include:

- key physical, chemical and biological features of the environment
- major components of human development
- status of natural resources
- performance of policies, laws and other institutional arrangements

- progress of environmental protection measures
- land-use changes
- changes in public behaviour and attitudes
- inventories of natural and cultural assets.

Integrated monitoring for a national SoE system requires a coordinated system with comparable monitoring undertaken at state and local government levels. State level monitoring should be undertaken by appropriate State agencies sponsored by DEST, SoE Unit.

Monitoring for SoE will benefit from technological developments in a range of areas. The application of geographic information systems can be used to analyse more rapidly the temporal and spatial facets of environmental conditions showing the relationships between natural resources and economic activity. An example application is provided by Young (1993, p.12):

Recognising the progress being made with state of the environment reporting and anticipating the emergence of better data sets we, at the CSIRO Division of Wildlife and Ecology, are trying to develop regional and sector based accounting systems. The approach that we are developing builds upon available data and forces integration. To obtain spatial consistency through all our data sets, we have turned to geographic information systems. Temporal consistency is obtained by developing maps for each year and, where necessary, interpolating and modelling to fill in the gaps.

As illustrated in this example, the integration of resource and environmental information with geographic information systems holds the promise of improved appreciation of environmental change, the socio-economic consequences of that change and the policy options.

Biomonitoring is another example of a potentially valuable tool to support monitoring for SoE. Aquatic filter feeders, earthworms and honeybees have been investigated as replacements for expensive instrumentation to monitor water, soil, and air pollution respectively.

In summary, considerable uncertainty exists in relation to both the functioning of the environment, carrying capacity, assimilative capacity and the range of services provided by the environment. SoE will need to be open in communicating this uncertainty to decision makers and the wider community.

The two responses available are the development of appropriate monitoring programs at a national level supported by compatible State and regional programs and the 'do-nothing' option. As indicated by Pearce and Freeman, the latter has significant risks: '...in the face of such uncertainty, it seems dangerously risky to behave as if we know what we are surrendering by degrading our environment further' (1991, p. 69).

The Canadian national program is now proceeding towards the establishment of an ecological monitoring network (Rump 1993, p. 11) with ecological science centres to be located in each of Canada's 15 ecozones. Such an approach may be appropriate for Australia and would certainly be of assistance in improving the availability and comparability of information on ecosystem condition across Australia.

5.5 Review

The information system for SoE will comprise spatially referenced summary data selectively extracted and converted to a consistent format from data bases. Summary data would then be applied to support a series of agreed indicators. Indicators represent the building blocks for an SoE system. Indicators should be:

- transparent to the reader and reviewer
- reproducible to subsequent reporting efforts
- transferable to various jurisdictions
- cost effective.

This chapter has identified various classes of indicator and how these relate to the pressure-state-response framework for reporting. A data quality assurance program is required for SoE and it is proposed that SoE for Tasmania adopt the same 'audit trail' approach which has been advanced at a national level. This will help to ensure consistency, ease of data transfer across jurisdictions and add to community confidence in the output of reporting programs.

The general approach to indicators which has traditionally been adopted by SoE Reports may be described as 'scatter gun': compiling and reporting on any attribute which may provide some message of environmental pressures, condition or responses. This is an acknowledgement of the lack of monitoring available to identify and then support a series of core indicators. These would comprise a small number of key indicators which would be supported consistently over time with a level of commitment traditionally only assigned to economic indicators such as balance of trade and GDP or social indicators such as population, housing and employment.

Based on this assessment of the information collection and analysis task for SoE, the next chapter examines the output of an SoE system: format, timing, organising information and markets.

6. Reporting on the State of the Environment

The most critical question is what the purpose of an SER system is - that is, why do we want it, and who is to use it and how. This is, in Australia, not at all clear. This should be the starting point of discussion, before any operational system is thought of, or any indicators suggested. Given the statement in the CEPA discussion paper that decision makers and policy formulators will be the main users, another way of putting this is to ask the question: Do politicians and managers need more data of the kind suggested in the discussion paper, and would they do things differently if they got it?

We believe the answers are: probably no, and probably not. One of the reasons is that there is a great difference between data, information, knowledge and understanding. Or stated differently, between information, useful information and effective action (Dovers and Lewis 1993).

These are some of the questions which need to be asked 'up-front' of SoE. Dovers and Lewis take the view that the success of SoE will lie in the extent to which it will produce better environmental outcomes through establishing real links with the policy process. Central to this is an assessment of the range of products, the format, timing, language, style and distribution which could comprise the output of an SoE system. Regardless of the level at which it is undertaken, SoE requires a communications strategy.

6.1 Frameworks for reporting

Any statistical activity will require an explanatory framework for organising and presenting the component parts. The task of frameworks may be described in terms of making sense of the whole and communicating the interdependence between society, economy and environment. Their role may also be considered in terms of assisting client groups in understanding environmental processes and promoting an understanding of the linkages between the environment, economics and human health and well being.

An SoE consists of an organisational framework (such a framework may be key issue oriented-to land degradation, for instance), a spatial framework (for example, based on catchment, administrative units or ecological boundaries), indicators and a reporting format (whether this be pictorial, graphs of trends, fact sheets by issue, descriptions or interactive presentation using, for example, CD ROM).

The development of SoE has been characterised by a long standing search for organisational and spatial methodologies and indicators which reflect as closely as possible the dynamics of the environment and human interaction with the environment. This search continues; a single all encompassing framework for SoE has not emerged.

An SoE should include a statement as to current environmental objectives, as progress towards environmental objectives cannot be assessed if objectives are vague, unspecified or non-existent. The sample indicator included in Table 5.2 incorporates a statement of targets relevant to the indicator.

There are also fundamental values issues which need to be addressed in developing frameworks for SoE and some of these issues will be highly politically sensitive. Dovers and Lewis (1993, p. 57) give the following example:

Answers to the question of what is happening in the environment will be not particularly useful without knowing why and by whom. The causes of environmental issues, or at least those under our control to change, lie in human

action and consumption, not in the environment itself. A degraded environment is the symptom of these causes. The topic of the per capita rate of consumption is not politically palatable, and attention to this aspect is not noticeable at present. There is a considerable amount of consumption data extant for other purposes, and existing data procurement processes could be easily enough adapted to gather more useful information.

ABS consumption data will increasingly assume a dual purpose of, on the one hand, providing an indication of economic well-being and, on the other hand, serving as a measure of environmental impact arising from consumption. Residential housing commencements, particularly on the urban fringe, are an example. For Tasmania, consumption data may also be among the most readily available data for SoE. However, this will produce a report which may have an over-emphasis on the 'pressure' element of the 'pressure–state–response' model.

6.2 Organisational frameworks: thematic grouping of indicators

The role of an organisational framework may be summarised in the following terms, as described by Statistics Canada (1991, p. 213):

A framework must be sufficiently comprehensive to include human activities, natural resources and the natural environment. It must also provide links to existing statistical frameworks such as the National Accounts, Census and Business Surveys.

An organisational framework for SoE will be:

- consistent with national and relevant international frameworks;
- broadly based around the concept of ESD;
- sufficiently flexible to cater for regional differences in priority issues.

Reporting frameworks may be seen in terms of discrete (stand-alone) approaches to SoE, or as building blocks to the development of a picture of the environment. These building blocks may be combined in a single SoE or applied in consecutive years. For example, reporting on a set of issues followed by a five yearly comprehensive report may be one approach. This latter approach was taken by the Victorian Commissioner for the Environment, with reports prepared on various environmental components on a regular basis.

Approaches to transforming data into information were identified by Environment Canada (1990). With consideration to their general application for the local context, these approaches are briefly outlined.

6.2.1 Environmental media

This framework is common to all reports as all SoEs describe, to some degree, the characteristics of particular environmental media such as air, water and soil. These categories may be further defined spatially in terms of specific airsheds, water catchments or soil types. Air quality and noise are a major concern of urban dwellers so that an SoE for a specific urban area typically places some emphasis on this component. Water quality, potable water, irrigation and stockwater are often major concerns for rural dwellers.

6.2.2 Resource sector

A resource sector could include, for example, forestry, fisheries, agriculture or mining. Australia's own State of the Environment Source Book published in 1987 (DAHE 1987) included chapters on particular resource sectors. However, a resource sector approach is rarely, if at all, applied throughout an SoE on a stand alone basis.

A State of the Forests (SoF) report is a legislative requirement in Tasmania under Section 59D of the Forestry Act and a report is currently being prepared. The Tasmanian Rivers and Waters Supply Commission has also now proposed the publication of a five yearly State of the Rivers Report for the riverine environment (1993, pp.15-19).

Sectoral reports will need to be integrated with comprehensive SoE Reports. It is also notable that the OECD emphasises the importance of reports which focus on the entirety rather than specific issues. While there may be a role for reporting by sectors or issues, this information could appropriately be included as part of normal agency annual reporting. SoE should be generally directed at providing an integrated perspective across resource sectors.

6.2.3 Issues

Most SoEs focus on particular issues such as land degradation, urban amenity, pesticide and insecticide use, pollution and greenhouse gas emissions. At a global level, State of the World, produced annually by the Worldwatch Institute, considers global issues such as land degradation, the global carbon budget and the Earth's declining productivity. Issue chapters conclude with strategy statements such as a National and Global Policy Agenda, Strategies for the 90s, Planning Ahead, and Mobilising for Cleaner Air. Regularity of reporting provides a mechanism for evaluating progress and modifying policies and programs.

The identification of priority issues can be used to develop indicators for SoE. The following chapter considers priority environmental issues identified at local, state and national levels.

6.2.4 Pressure–state–response (Environmental Process Framework)

The environmental process or 'pressure–state–response' framework attempts to reflect the dynamics of the environment and human interaction with the environment. This approach was developed and has been most rigorously applied in Canada and has also been suggested as a possible approach to SoE in New Zealand, the Commonwealth of Australia and in those States and Territories of Australia which have developed or are proposing SoE programs. It combines well with an ecosystems based spatial framework. This framework is illustrated in Figure 5.2.

The specific approaches and models used vary considerably between countries. However, a general approach is common to most reports produced by OECD countries. This approach requires the assessment of contributing pressures or stresses on the environment by examining the influence of specific economic sectors. Reports provide an assessment of the impacts of these stresses on the state of the environment—the resulting environmental trends and conditions. They also indicate likely future impacts based on current trends through predictive modelling of current resource use and impact patterns. Finally they report on responses, in terms of policy and legislative changes, to identified problems and issues.

This pressure–state–response model underlies the framework proposed for the Australian report. The proposed Australian reporting framework has also been influenced by reporting programs developed in Canada, France, the Netherlands, Norway and the United States.

6.2.5 Combination

A combination approach samples from various reporting frameworks. In theory, by having more than one framework, combination approaches can serve different purposes and different readers in a single report. One approach might be to include an assessment of the condition of environmental media in Part 1 of a report using a ‘pressure–state–response’ model, followed by an assessment of sectors of the economy in Part 2. The Tasmanian legislation may necessitate this type of combination framework.

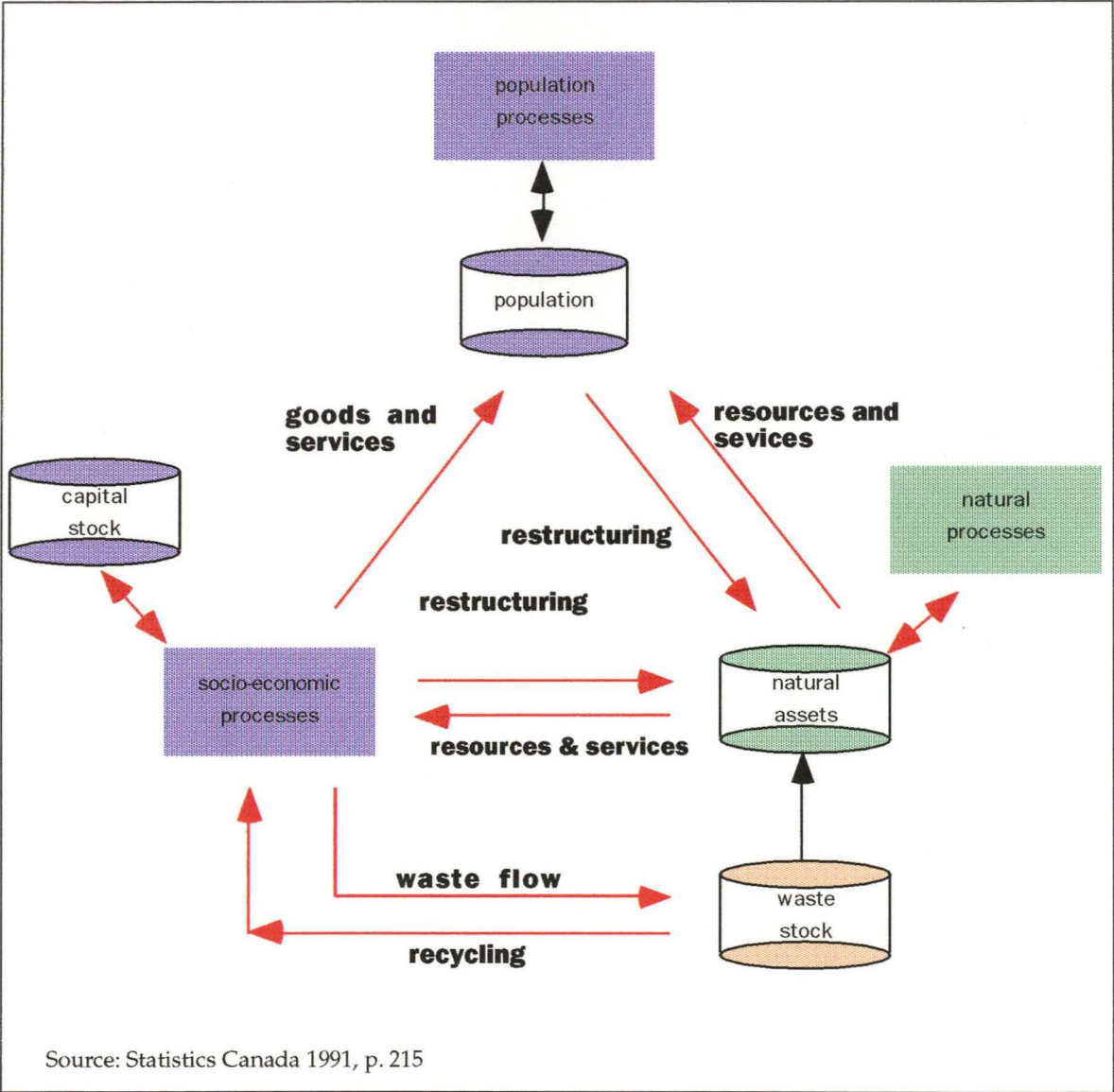
6.2.6 Population-Environment-Process

The Population-Environment-Process (PEP) is a systems based model, developed by Statistics Canada, which relates stocks (such as natural assets and population), with various processes (such as socio-economic processes), and shows flows between these, such as the flow of goods and services from the socio-economic process to the population.

This framework divides the world, or any system, into three major components: population, the socio-economic system and the natural environment. Each of these components consist of states, activities and interactions with other components.

The components of the PEP model (Figure 6.1) will include (Statistics Canada 1991, p. 215): stocks such as population, capital and natural assets and wastes. Capital stocks may include capital for pollution control (by sector and by material controlled), transportation infrastructure (including energy for transport) and natural assets (including quantity and quality of living resources, air and water quality and amount and quality of wilderness).

Figure 6.1 Population environment process model



The merits of the PEP approach, as noted by Statistics Canada, are outlined in the following extract (Statistics Canada 1991, p. 214):

There is a direct link between the framework and measures of socio-economic processes that are the subject matter of existing Statistics Canada surveys (e.g. agriculture, primary industries, manufacturing, services including transport). Similarly capital formation and capital stock are measured by existing surveys.

6.3 Spatial frameworks

A key difference between the Canadian and OECD approaches to SoE is the partitioning of the environment according to ecosystems (by Canada) as against the administrative approach by the OECD. OECD guidelines suggest that reports should be based on sectoral rather than ecosystem classifications to facilitate responses to emerging problems.

In part this could reflect the circumstances of many of the nations within the OECD where, in the comparatively more modified European context, ecosystems may, seemingly, have less relevance. The many shared ecosystems in European countries would further complicate an ecosystem model in European countries.

Environmental information will need to be based around some unit of space, whether a catchment of water, a 'catchment' of people, an administrative area such as a council or state, or an ecosystem area. Each region should be analysed and treated as an integrated system, taking account of the interactions among land, air, water, organisms and human activities.

The spatial framework should help to communicate the relationship between human activities and the environment. A spatial framework, such as a catchment, which enables the display of both environmental and human activity data can help enhance our understanding of linkages.

Geographical information systems combining overlays of environmental and socio-economic data would assist in the development and analysis of indicators and the identification of cause and effect. The International Forum on Environmental Information stressed the importance of the spatial nature of all environmental data and information and recommended developing improved methods for presenting the products of geographic information systems (Croze and Vandeweerd 1991, p.109).

To allow the effective application of GIS, it is essential that data for SoE be collected at the smallest available spatial scale in order to permit aggregation and integration to a range of different spatial levels.

As is the case with organisational approaches, spatial approaches will evolve over time and it is unavoidable that the next wave of SoE reports, including the national SoE, will be based around an amalgam of various spatial frameworks. No one framework can be assigned all the available information relating to the state of the environment, human impacts on the environment and government and community responses to these conditions and threats.

Accordingly, Maps 6.1 to 6.9 show various frameworks which may form the basis for SoE regionalisation in Tasmania. The regions comprise various environmental and botanical regions, catchments, local government areas, land use classes and census district boundaries. These boundaries, with modification, refinement, and where possible and desirable, integration, represent the key spatial building blocks for SoE. The regionalisations may be broadly classified in terms of environment or natural resource management space, decision

making space and information space (such as Census Collector District boundaries). Some may form multiple roles.

The environmental regions displayed in Map 6.1 were devised by the Tasmanian Herbarium in 1980/81 and have since been adopted by the Tasmanian Forestry Commission. The Forestry Commission scheme is based around eleven Nature Conservation Regions with criteria similar or identical to the Herbarium scheme. In a report on Environmental Regionalisations in Tasmania, Wells et al. (1992, p. 31) comment that:

...the scheme was biogeographically based and had well-defined unambiguous boundaries based largely on natural features. The scheme did, however, include two arbitrary regions, selected because of high levels of botanical collection and visitation.

ERIN has completed development of a 'family' of twenty, thirty and forty group environmental regionalisations for Australia. An approximation of the thirty group regionalisation for Tasmania is reproduced in Map 6.2. The limitations of these regionalisations should be noted (Thackway and Cresswell 1992, p. 2):

Environmental classification is defined as a procedure for grouping spatial units or objects into groups (ie. types) based on the association of environmental attributes recorded for these objects, that is objects that have similar environmental attributes are classed together. The output from the classification is a regionalisation, which comprises a mosaic of regions usually presented as a map, with a key to the types of ecosystems present.

Most regionalisations can provide only a generalised picture of the environment and do not account for the inherent fine scale spatial and temporal dynamics of habitat, flora and fauna. Recognising these limitations, all regionalisations need to be viewed as approximations of the heterogeneity of nature and exist only as surrogates for a true understanding of the complexity of the environment. Therefore, no single regionalisation should be regarded as sufficient to answer all questions regarding conservation assessment and planning.

The 1986 and 1992 Canadian SoE reports used ecozones to spatially report environmental data and some difficulties were experienced. In particular some reviewers highlighted the difficulty to relate the data reported by ecozones and watersheds to socio-administrative boundaries. It was found that it was not possible to cross reference data to the more commonly used socio-administrative boundaries (Gleason and Hanna 1988, p. 1), which restricted the general public's understanding of the approach.

Though the Canadian Ecozone approach is one of the most accurate representations of the dynamics of the environment, the natural process space, it was less successful from the perspective of the dynamics of decision making.

It is also the case that in Australia, delineating ecozones is, in comparison to Canada, a less certain process and concerns have been expressed at the National SoE workshop about the process of 'partitioning' the environment for SoE. Thackway and Cresswell (1992, p.1) also note that:

Achieving a national consensus on the classification of ecosystems appears to be an unresolvable problem. Many and varied definitions of ecosystems have been used by researchers and managers, depending on their own perspective and needs. In part this is because areas differ widely not only in climate, topography, soils, flora and fauna, but also in terms of human modification, and in responses to these impacts. That is, the processes that determine ecosystem patterns at a variety of scales vary widely across Australia.

While contrary views were advanced, the generally expressed preference for the national reporting of SoE data was by environmental region. This was supported on the basis that reporting on the state of the environment requires an environmental framework. It is therefore likely that an agreed form of the ERIN environmental regionalisations will be applied for national SoE reporting, so it is important that the limitations as outlined be recognised.

The extent of the Canadian commitment to an ecozone (refer to Table 6.1) approach is highlighted in the following advice to participants at the National SoE workshop (Rump 1993, p. 16):

I would recommend that an ecosystem approach be used in all aspects of SoE reporting, from monitoring and data management to research, analysis, and reporting. I would even suggest that it should be a consideration in organisational structure. For successful SoE reporting, we need to understand ecosystem relationships, and that's why ecosystems provide the most appropriate spatial framework for what we do. However, much of our environmental thinking still follows sectoral lines—we look at agricultural, forestry or industrial problems without looking sufficiently at the broader ecosystem issues of which they are a part. A switch to systems thinking—an ecosystem perspective—would provide a balanced way of considering these important structural problems. And it would facilitate a more holistic view of environment-economy-health interactions.

Table 6.1 Canadian ecozone approach

Ecodistricts form an integral part of the ecological land classification process that delineates and classifies ecologically distinctive areas of the earth's surface. This hierarchical system includes ecozones, ecoprovinces, ecoregions, ecodistricts, ecosections, ecosites and ecoelements, all of which represent diminishing levels of generalisation. Ecodistricts are characterised by areas having distinctive combinations of landforms, geology, relief, soils, vegetation, water and wildlife. Within Canada, there are 15 broad ecozones, 170 ecoregions, and over 5400 ecodistricts, for which Environment Canada compiles descriptive information for land planning and analysis, modelling studies and state of the environment reporting. The ecodistrict can form the basic environmental unit for consistent spatial analysis to show state of the environment condition and trends.

Source: Environment Canada 1990, p.9

Despite the advice and the apparent emerging agreement to adopt an ecosystems approach, from the perspective of the dynamics of decision making, the catchment is emerging as an accepted unit for environmental management by agencies around Australia.

Catchment based reporting may also help to support the development of a basic understanding of the water cycle and improve awareness of the value of wetlands, peatlands and other aquatic ecosystems and the ways they can be used sustainably. The encouragement of this awareness of the water cycle among decision makers was advanced as a key principle in the IUCN, WWF, UNEP Strategy (1991, p. 140).

Map 6.3 depicts the 45 catchments of Tasmania. Map 6.4 shows current local government boundaries in Tasmania following a recent amalgamation program. Ideally, this amalgamation process would have served to establish some consistency between local government boundaries and catchments or portions of catchments. Map 6.5, providing an overlay of catchment and local government boundaries, indicates that this has failed to occur. For environmental and natural resource management and for SoE, this represents a lost opportunity to relate the natural process space more to the decision process space.

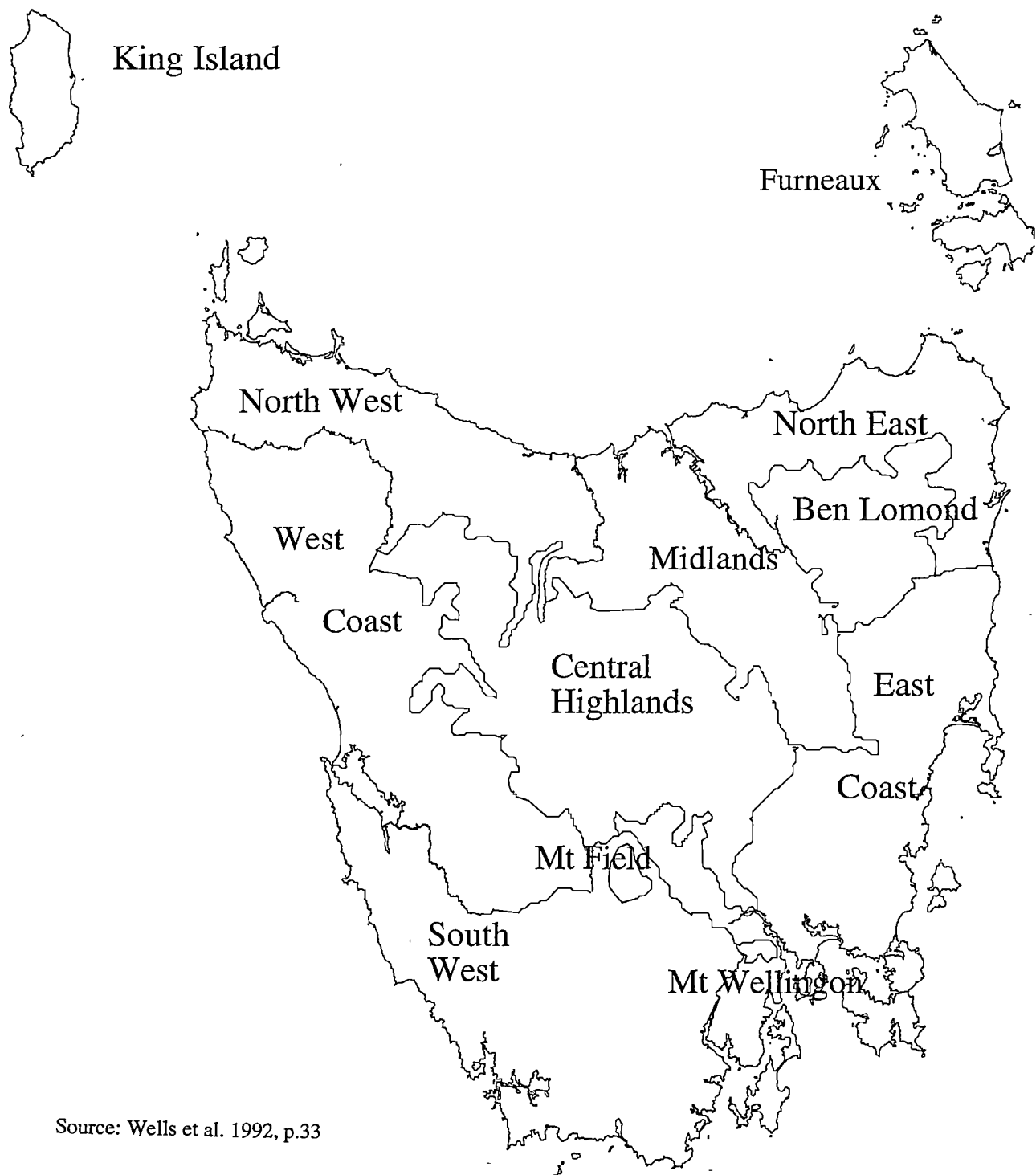
Other spatial boundaries for SoE may be based around priority issues. For example, Map 6.6 displays the botanical boundaries used to record the distribution of rare or threatened plant species. The numbers of rare or threatened species are shown in brackets. Other priority issue based boundaries for Tasmania could display, for example, locations of point source emissions from industrial premises, rates of change of the extent of urban areas and distribution of introduced terrestrial and marine species. Many indicators should be capable of being represented as a thematic map. Provided sufficient information is available, it may be possible to produce an atlas of SoE for Tasmania.

Map 6.7 displays census collector district boundaries. These are important spatial units for the social and economic components of a reporting program. These boundaries may be aggregated into a range of possible administrative and biophysical units.

Map 6.8 displays the geographic range of the Tasmanian SoE program. In principle, the geographic area proposed would include Tasmania, its islands (including Macquarie Island) and the marine environment to the State limit at 3 nautical miles. For national reporting, geographic coverage will extend to the limit of the Australian fishing zone at 200 nautical miles.

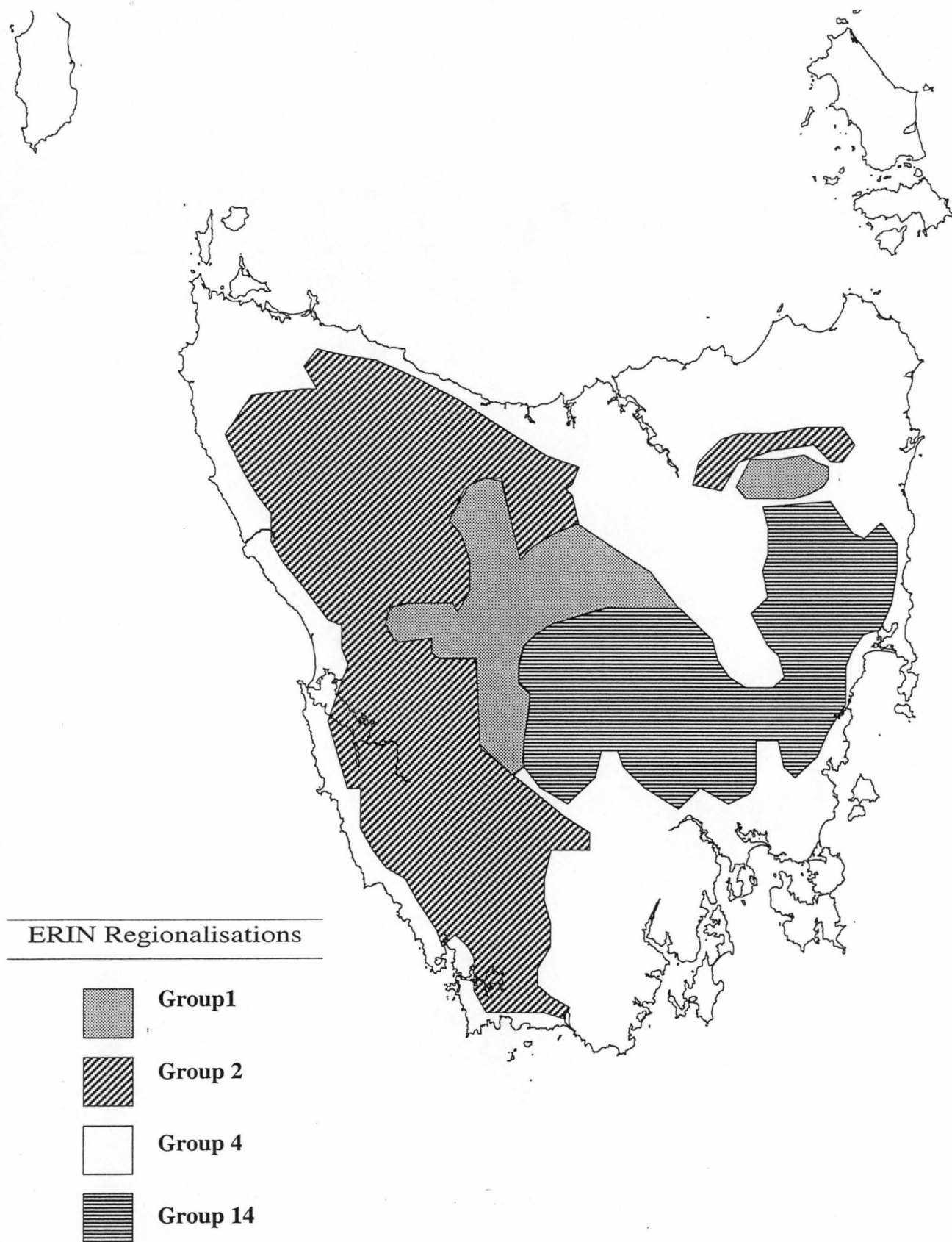
Map 6.9 shows one component or category of land use with special national and international significance and special needs under an SoE program, the Tasmanian World Heritage Area.

Map 6.1 Environmental regions developed by the Tasmanian Herbarium



Source: Wells et al. 1992, p.33

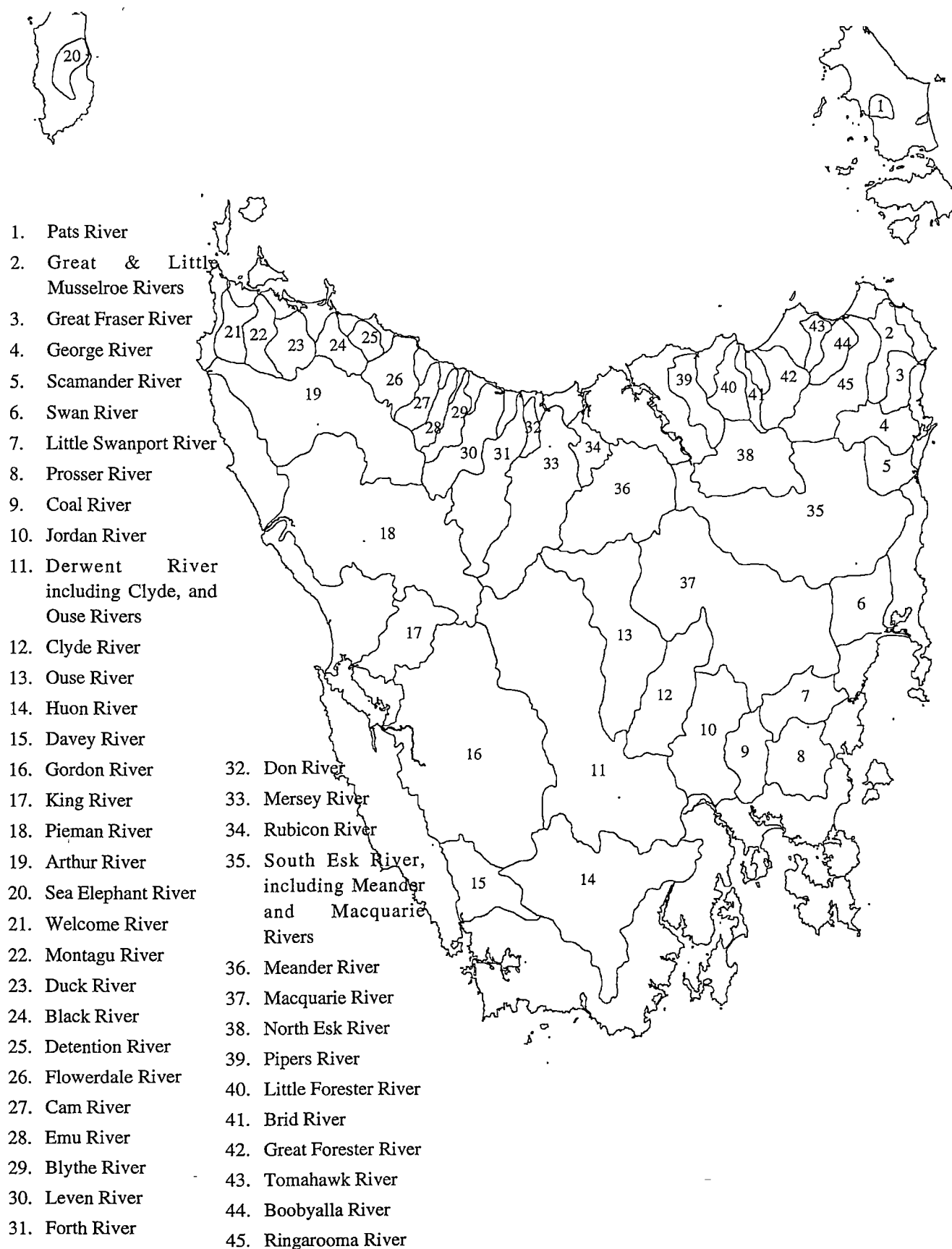
Map 6.2 Environmental regions developed by ERIN



Note: Map represents approximations of the 30 Group Environmental Regionalisations of Australia

Source: Thackway and Cresswell 1992, p.18

Map 6.3 Catchments of Tasmania

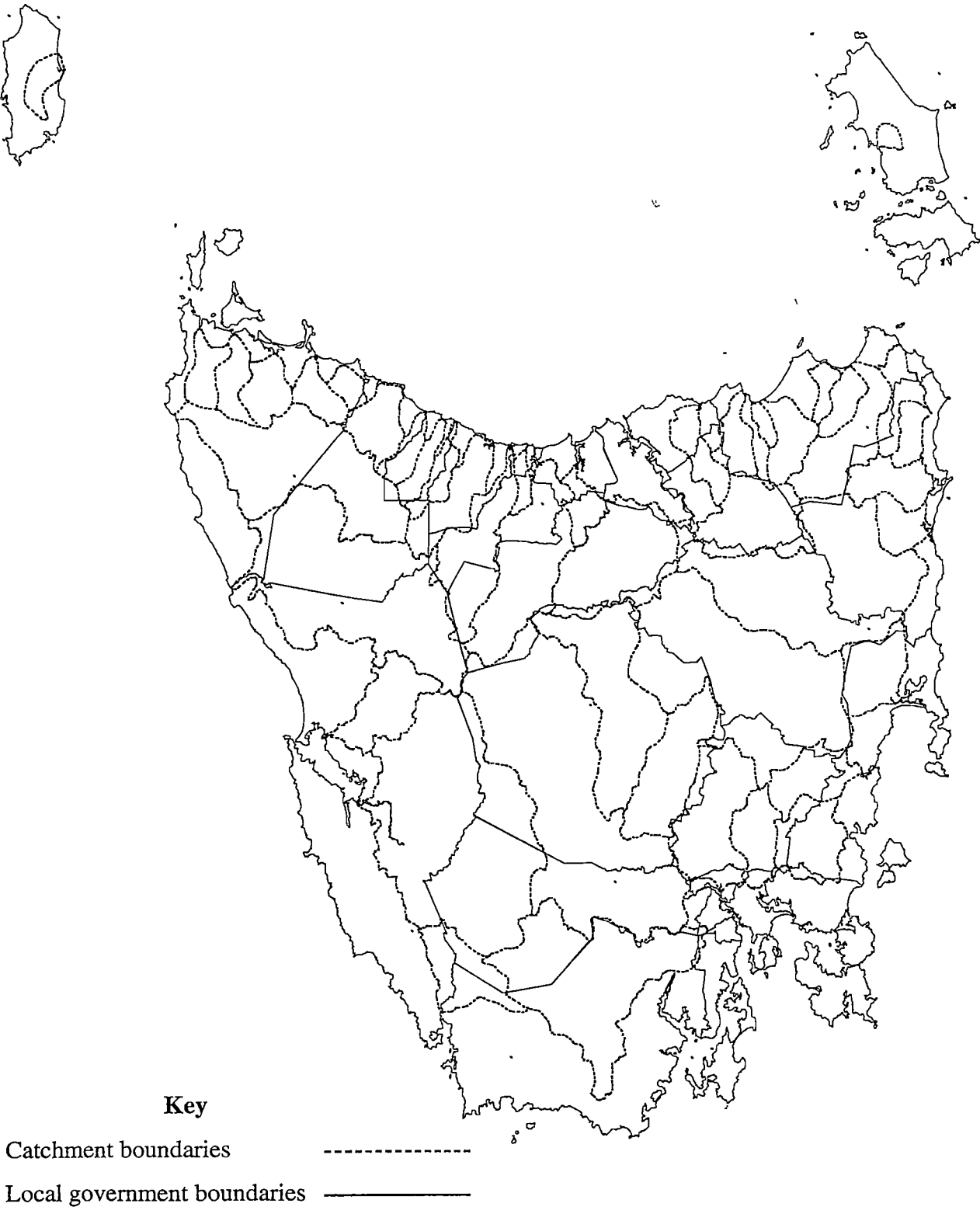


Map 6.4 Local Government boundaries



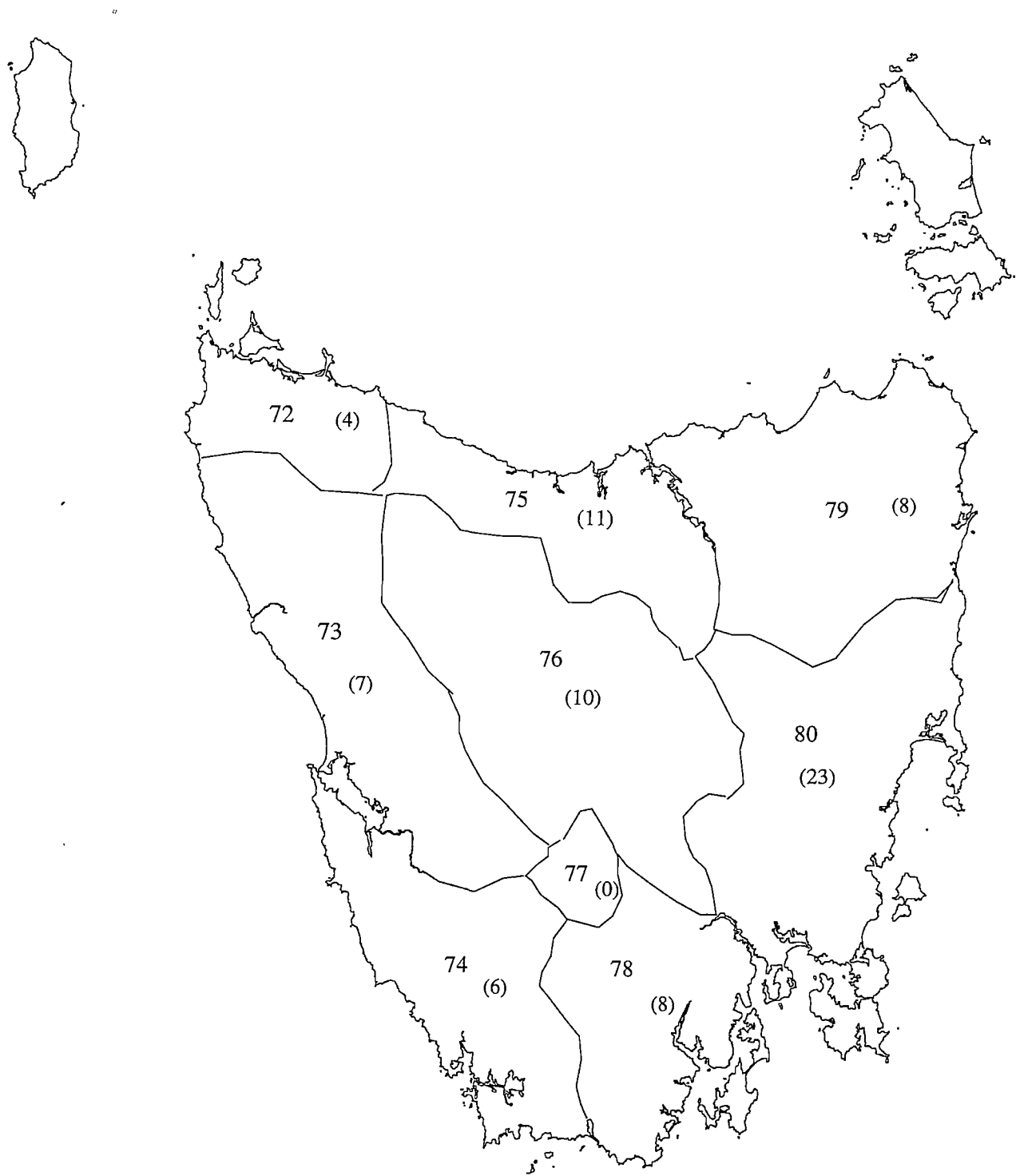
Source: Digitised by the Land Information Bureau, Department of Environment and Land Management

Map 6.5 Combined catchment and Local Government boundaries



Source: Digitised by the Land Information Bureau, Department of Environment and Land Management

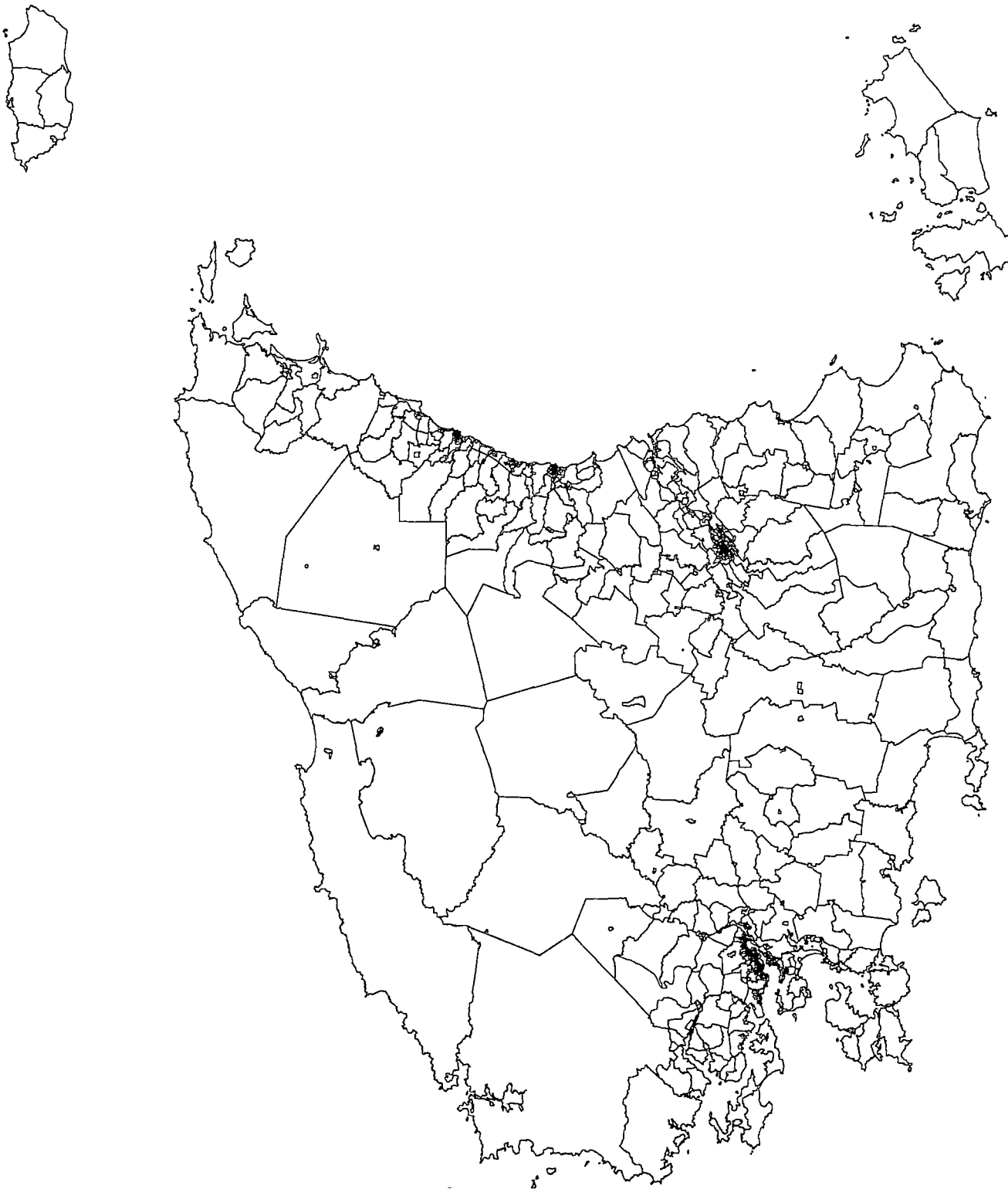
Map 6.6 Botanical boundaries



Note: Number refers to the national region of occurrence and bracketed number refers to the number of threatened plant species

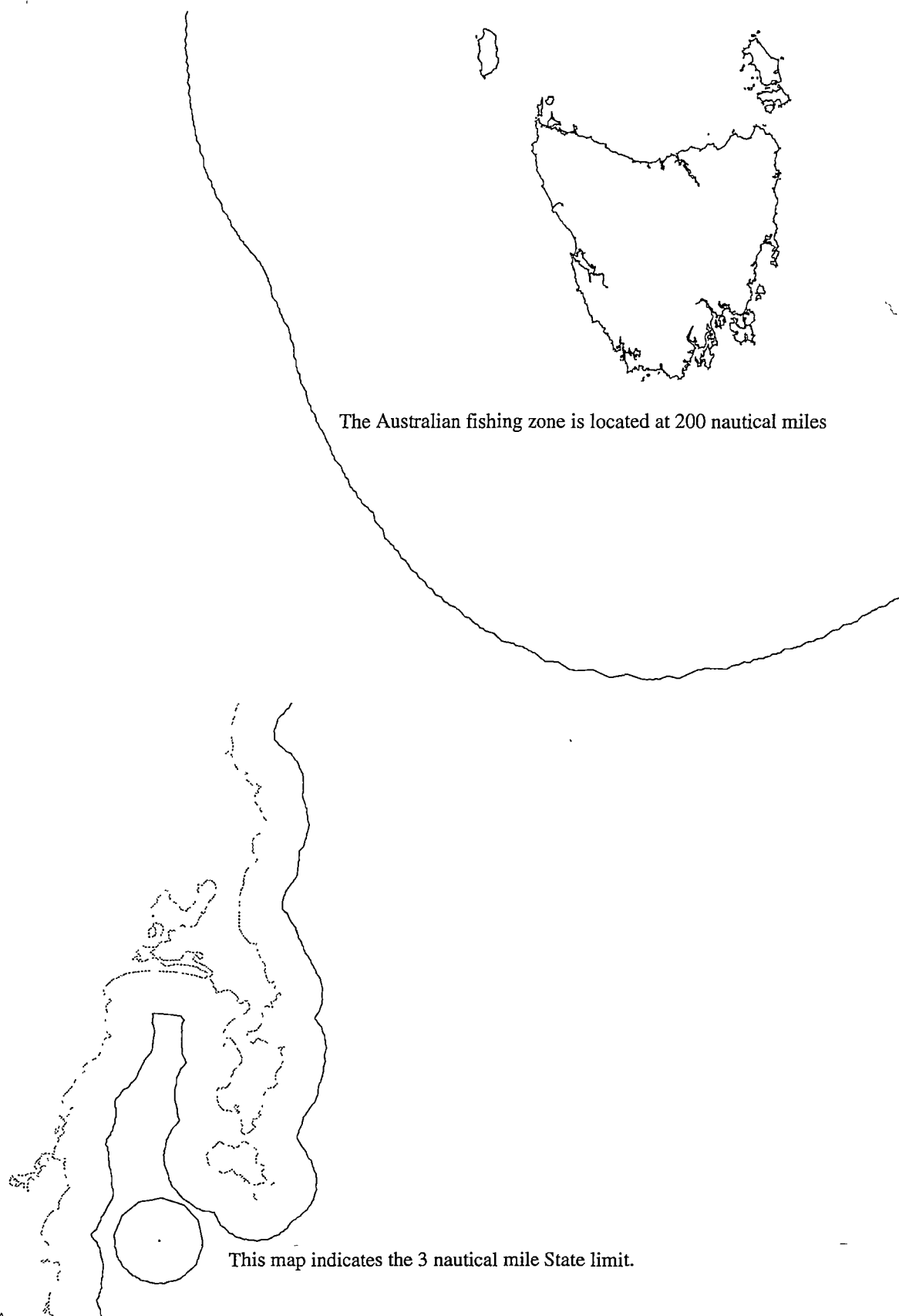
Source: Leigh and Briggs 1992, p.4

Map 6.7 Census collector district boundaries



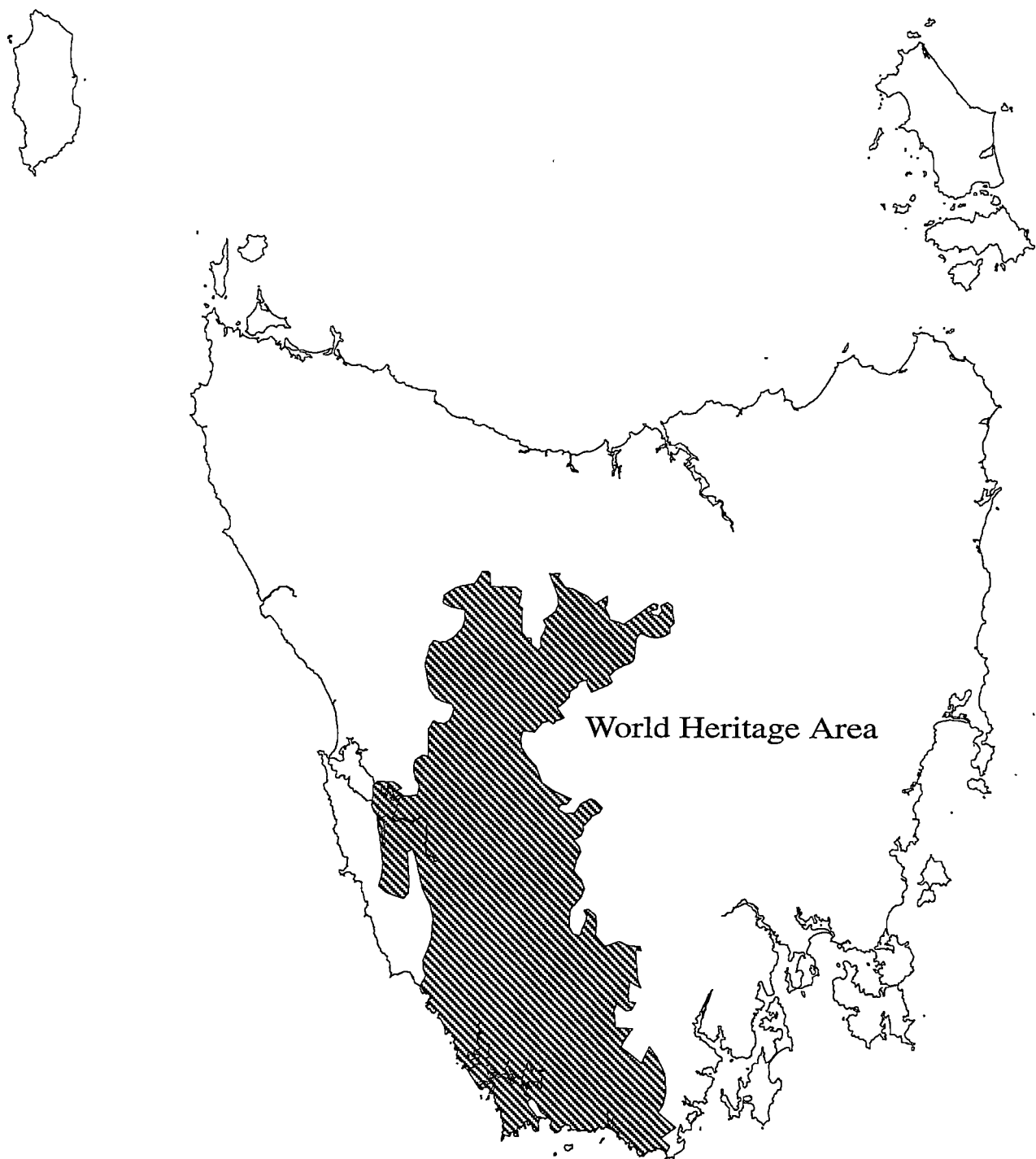
Source: Australian Bureau of Statistics

Map 6.8 Geographic boundaries



Source: Compiled from 1:500 000 digitised map data

Map 6.9 Tasmanian World Heritage Area



Source: Compiled from 1:500 000 digitised map data

In summary, for the first Tasmanian SoE Report, spatial scales may include any of the following:

- the global (e.g. for reporting on global issues such as climate change);
- Tasmania wide (e.g. for changes in forest cover);
- environmental regions, based on broad climatic, soil, topographic and vegetational characteristics;
- major catchment areas (e.g. for reporting on water quality); and
- specific ecosystems, such as alpine or temperate rainforest types
- point locations for case studies or issues

Other environmental reporting units will include major groundwater basins and major airsheds, and the distribution of specific native plant and animal communities.

The reports will also analyse environmental conditions in the context of administrative boundaries of the three spheres of government.

6.4 Information products

Once spatial and organisational frameworks are established, indicators selected, existing data sets identified and new monitoring undertaken as required, the output of an SoE system may be directed or applied in a variety of possible forms other than simply an SoE Report. This view is outlined in the International Forum on Environmental Information (Croze and Vanderweerd 1991, p. 111):

There is increasing pressure on environmental assessors to take the process as far as possible, working with sectoral experts to develop packages of management options for the decision makers, who will have the ultimate responsibility for drafting legislation, altering policy and deploying management troops in the field.

Some of the options and directions for these value added pathways are explored, briefly, in this section. The analysis is intended to highlight the linkages with SoE rather than provide a more detailed analysis of the tools.

A range of products is proposed for the national SoE program. These may include: regular SoE reports, public summaries, education and public awareness kits, ad hoc detailed analytical reports for policy purposes, datasets for use in models and maps and, eventually, on-line access to scientific data.

Similarly the Canadian SoE program produces such products as newsletters, overview reports, on-line information and fact sheets. An example of the latter is the Ground-level Ozone State of the Environment Fact Sheet (Environment Canada 1992-1).

The Canadian program involves six fact sheet bulletins per year. The marketing list for SoE products in Canada (Rump 1993) includes:

governments	32%
schools/ universities	25%
NGOs	14%
industry groups	12%
libraries	8%

On the basis of popularity, the Canadian program has been successful. Its success in these terms is illustrated in part by the 1992 Canadian SoE Report being prescribed as a text for some university and high school courses.

Information products may include newsletters, atlases, electronic data bases delivered as 'run-time' versions for use on personal computers, fact sheets on specific issues, comprehensive SoE reports, catchment reports, video cassettes, graphics and multimedia presentations. All are becoming increasingly available and cost effective as desktop productions. However, in the early stages of development, presentation media may most appropriately be based around simple and accessible formats such as newsletters and fact sheets.

6.5 Other products: decision support tools

An occasional criticism of SoE is that the process is reactive. That is, it reports on the state of the environment that is a consequence of past pressures. The response to this criticism may be threefold. Firstly, it is possible and desirable to identify and apply predictive indicators for SoE (refer to *Predictive Indicators* on page 49). Secondly, there is scope for forecasting impacts within the SoER based on, for example, current patterns of resource use and population forecasts. Thirdly, information from an SoE system may be applied as input for decision support tools.

Decision support tools may lie outside the immediate responsibility of all but the most well resourced SoE units (and DEST may or may not fit into this category). These functions are an accepted part of the SoE task in, for example, the Netherlands (see chapter 2).

It may take the form of modelling and scenario development, 'back casting', 'what-if' analysis or simply the development of a shared community vision. These tools represent an important opportunity to add value and improve the relevance of information to decision makers.

Until recently, the forecasting role of SoE has not been widely acknowledged as a legitimate part of any SoE program. Part III of the New South Wales SoER includes a section entitled, *Towards Sustainability*. A key element of this section is the instruments of environmental policy: economic, regulatory and public and private sector action plans. This section would also provide an opportunity to introduce the use and application of modelling and decision support tools.

Implicitly, a *Towards Sustainability* section requires some definite time frame as to when sustainability may be realised. This is precisely the approach taken in the SoE program undertaken in Norway where the goal is sustainability by 2005 and an SoE is given relevance

by reporting on the progress towards a State or national goal. Without a time frame for realisation the concept will remain nebulous and irrelevant.

The forecasting role of SoE is also being recognised at a national level in proposals for the National SoE system (DEST 1993, p.15). In the Tasmanian case, predictive indicators, forecasting and 'back-casting' should be part of the legitimate role of SoE. The development of decision support tools could proceed through co-operative arrangements with national organisations such as ERIN and the Australian Bureau of Statistics.

6.6 Other products: environmental valuation and resource accounting

Environmental valuation and resource accounting are the subjects of major investigations nationally and internationally and it is beyond the scope of this thesis to examine these issues in any detail other than to highlight the importance of the potential relationship with SoE.

To support the development of satellite natural resource accounts by the Australian Bureau of Statistics, as a supplement to the traditional national accounts, information is needed on defensive expenditures associated with pollution abatement, soil conservation, air and water quality monitoring, water and sewerage treatment and cleaning up of pollution following oil spills. Information is required on resource stocks and flows at local, catchment and state levels in both physical and economic terms.

It has been widely recognised by governments that it is no longer enough to rely on conventional measures of income and wealth to indicate state, national or international well being. The Environment and Natural Resource Unit of the Australian Bureau of Statistics is working to develop the capacity to report on the opening and closing stock of natural resource assets. These would be reported through a satellite system to the core national accounting framework.

In Statistics Canada, SoE activities are concentrated in the National Accounts and Environment Division. In addition to the production of a national statistical compendium on human activities and the environment, it has initiated research to integrate economic and environmental accounting through the development of satellite accounts linked to the existing System of National Accounts. Pilot natural resource accounts are presently underway for forestry and oil and gas (Rump 1993, p. 10). Other accounts will comprise waste and pollution accounts and environmental expenditure accounts.

Environmental valuation will also be required at a project or resource specific level. For example, the ESD Forest Use Working Group (Commonwealth of Australia 1991b, p. 131) concluded that:

Forests provide a range of material and non-material benefits to society which appropriately should be fully valued and taken into account in determining the most beneficial use. Valuing the commercial and non-commercial, environmental and natural resources of forests is an integral part of ensuring that the community benefit from forests is optimised across all values. Under-valuing, or not placing a measurable value on environmental assets of forests, including biodiversity and wilderness, can skew decisions and result in sub-optimal benefits.

Valuations at a catchment level may also be undertaken and this has been suggested by the IUCN and WWF (1990, p. 139). In the future, SoE may be in a position to provide information to support these forms of valuation. This will be dependent on the development of

co-operative arrangements with the Australian Bureau of Statistics. Other State Government environment agencies such as the New South Wales Environmental Protection Authority have engaged environmental economists able to develop methodologies for environment and natural resource valuation. The New South Wales SoE Report, in particular, includes some of the case work undertaken by the agency's environmental economists.

At this point it is appropriate to revisit the opening paragraph of this thesis (Mathews 1991, p. 23) as it is as relevant to the specifics of environmental valuation and resource accounting as it is to the whole theme of SoE:

...as long as nature was treated as a free resource and an open pit for wastes, the key indicator of successful development was production, with productivity measured in terms of output per unit of land, capital and labour.

It is clear that once we acknowledge the inadequacy of this 'free resource view of the world' then the magnitude of the task to account for our impacts becomes quite apparent. Changing the paradigm requires more than information and valuation; it is fundamentally a task of community wide education. SoE has much to offer to environmental education.

6.7 Environmental education

In relation to school based environmental education the Victorian Environmental Education Council concluded that (1991, p.18):

by the standards needed to effectively address the serious and urgent environmental problems we face, students in many schools receive only fragmented and superficial learning experiences. A major hindrance to the implementation of environmental education, especially in secondary schools, is that environmental education is not suited to traditional structures and processes in the school system.

An adequately resourced and well implemented SoE system could support and, in turn, be supported through an environmental education strategy in Tasmania. Community based sampling, in particular, represents an opportunity to break the shackles of traditional educational structures as identified by the Victorian Environmental Education Council. However, the links and shared objectives between environmental education and SoE need to be established in the early planning stages.

The Victorian Environmental Education Council noted the importance of developing a new approach to build understanding human relations with the natural world into formal education. The Council also stressed the importance of non formal education and communication. SoE has the potential to contribute to both formal and non formal aspects of environmental education through providing a coherent, integrated and credible local information base from which courses and syllabi can be developed. Perhaps the clearest example of the potential link is illustrated by the Canadian SoE which has been adopted as a course text for environment studies by at least five universities in Canada (Rump 1993, p.14).

As SoE becomes integrated into the operations of all environment and natural resource agencies in Tasmania, then this process of integration will also help to support environmental education by opening channels of communication and through the sharing of information. In effect, support for environmental education represents one of the value added outcomes of an SoE system.

It is important that all people have access to environmental education opportunities that will enable them to effectively take part in the policy and decision-making processes that affect their quality of life. Education and information are clearly inextricably linked.

Industry and business stand to benefit considerably from becoming environmentally educated. Benefits may arise in terms of anticipating and preventing problems, in avoiding costly problems, in improving industry and corporate images and in the development of marketable products and processes. SoE could support industry and corporate education through a range of possible products and processes. SoE would assist in-house trainers appreciate the wider context in which their enterprise operates.

Trade Unions are an important client group for SoE because of the environmental consequences of workplace practices. For trade unions and industries, industry based information may well be the most valid, although, arguably it is perhaps more important for industry and unions to be aware of cross-sectoral and inter-sectoral issues.

Environmental education is particularly well-suited for helping to meet general requirements like experience in problem solving, critical thinking, decision making, creative activities, conflict resolution, teamworking, relating learning to action, relating education to society's needs and many other requirements which are not easy to meet through traditional educational approaches.

Environmental themes, especially involvement in action to address environmental problems, can be very effective contexts for learning, in particular in curriculum areas such as literacy, numeracy and artistic skills, understanding scientific and geographic concepts, and so on (Victorian Environmental Education Council 1991, p 11).

Table 6.2: Aims of environmental education

To encourage:
<ul style="list-style-type: none">• a greater awareness of the environment and the consequences of human interactions with it;• an understanding of how life is sustained and supported on earth both locally and globally;• a wide range of knowledge and skills from different fields to assist in investigating environmental issues and choosing appropriate courses of action;• an appreciation of the range of perspectives that impinge upon environmental issues - for example, the biological, the economic and the technological aspects;• an environmental ethic which clarifies and enhances environmental values, leading to the appreciation of natural and human-made beauty, valuing a healthy environment, concern for the welfare of people and other living things, and belief in the wise use of resources;• a commitment to work, personally and co-operatively, for a better physical and social environment, and a willingness to apply the knowledge and skills acquired in action programs to improve or protect students' own environments;• an understanding of the need to balance development and conservation to meet the needs of society

Source: Victorian Environmental Education Council 1991, p. 47

6.8 Review

This chapter commenced from the standpoint of the question and response: 'Do politicians and managers need more data...and would they do things differently if they got it? We believe the answers are: probably no, and probably not' (Dovers and Lewis 1993, p. 59). However, this critique ignores the potential contribution of SoE in influencing the values which underpin the decisions which are made by politicians and managers and the decisions which are made by the wider community that influence politicians and decision makers. In short, SoE may not necessarily need to have direct bearing on a particular decision situation to influence the outcome.

Each of the thematic approaches to reporting on the state of the environment has a valuable role, however, a trend towards resource sector based approaches is considered to simply duplicate the role which should be taken by normal agency annual reporting.

Environmental information will need to be based around some unit of space, whether a catchment of water, a 'catchment' of people, an administrative area such as a council or State or an ecosystem area. Various frameworks which may form the basis for SoE regions in Tasmania are presented. These comprise various environmental and botanical regions, catchments, local government areas and census district boundaries.

Catchments or groupings of catchments are considered to be the most valid regions for Tasmania. Catchment based reporting will help to support the development of a basic understanding of the water cycle and improve awareness of the value of wetlands, peatlands and other aquatic ecosystems and the ways they can be used sustainably. There is likely to be disagreement as to the preferred regions at State and national levels.

Limitations with environmental regions have been highlighted, noting that delineating ecozones is, in comparison to Canada, a less certain process. Concerns have been expressed at the National SoE workshop about the process of 'partitioning' the environment for SoE.

7. Information Sources

SoE will rely on the development of co-operative arrangements, whether formal or informal, between the reporting authority and State Government agencies, local government, community groups, industry and educational institutions.

The information situation faced by all SoE systems to varying degrees is highlighted in the following extract (Rump 1993, p. 9) from the relatively well resourced and experienced Canadian program:

...an imperfect knowledge of environment-economy-health interactions, and cause and effect relationships in particular. In addition, we have not yet perfected the art of targeting information to meet user demands. Often, we suffer from an overload of data and a dearth of information. But, in addition, there are times when we suffer from a genuine lack of data

This chapter reviews sources of information for SoE and where possible, example applications are provided. However, it is intended only to provide a general indication rather than a comprehensive review.

A directory of environment and natural resource datasets is presently under development as a national project by all States and Territories. The State of the Environment Data Inventory (SOEDI) is funded by the Department of Environment, Sport and Territories and coordinated through the ANZECC SoE Taskforce. The Data Inventory project is intended to support the development of national indicators.

The structure of SOEDI reflects the structure of the national SoE Report, namely, pressure-state-response. The structure of the SOEDI program is complex, however, some of its features are summarised in Figure 7.1, Figure 7.2 and Figure 7.3.

Figure 7.1 Sample extract from SOEDI—custodian details

Custodians

Organisation Name:

Edit

New

Custodian Position:

Contact.Title/Name:

Surname:

Postal Address

Street Address

Phone:

Fax:

e-mail address:

New

Delete

Save

Goto...

Ok

Cancel

Source: Department of Environment, Sport and Territories

Figure 7.2 Sample extract from SOEDI—data form details

Datasets

Full Name:

Date of Visit
14/12/1994

Short Name:

Data Form

Details

☐ GIS.....

☒ Database.....

☐ Spreadsheet...

☐ Text.....

☐ Photos.....

☐ Maps.....

☐ Images.....

☐ Paper Based..

☐ Other.....

Lineage

☒ Raw ☐ Derived

Lineage Description

Comments

X Ref.

Data Form

Admin.

Spatial

Temporal

Regions

Categories

Biblio.

Keywords

New

Delete

Save

Goto...

Ok

Cancel

Source: Department of Environment, Sport and Territories

Figure 7.3 Sample extract from SOEDI—dataset themes

Datasets

Full Name:

Date of Visit
14/12/1994

Short Name:

Themes

Human Settlements

Inland Aquatic

Marine and Estuarine

Human Activity

Primary Animal Production

Primary Plant Production

Reporting Focus

Pressure

Response

State

Ecosystem

Rural

Comments

X Ref.

Data Form

Admin.

Spatial

Temporal

Regions

Categories

Biblio.

Keywords

New

Delete

Save

Goto...

Ok

Cancel

Source: Department of Environment, Sport and Territories

Figure 7.2 Sample extract from SOEDI —data form details

Datasets

Full Name .

Date of Visit

14/12/1994

Short Name:

Data Form

Details

☐ GIS.....

☒ Database.....

☐ Spreadsheet...

☐ Text.....

☐ Photos.....

☐ Maps.....

☐ Images.....

☐ Paper Based..

☐ Other.....

Lineage

☒ Raw ☐ Derived

Lineage Description

Comments

X Ref.

Data Form

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Spatial

Temporal

Regions

Categories

Biblio.

Keywords

New

Delete

Save

Goto...

Ok

Cancel

Source: Department of Environment, Sport and Territories

Figure 7.3 Sample extract from SOEDI—dataset themes

Datasets

Full Name .

Date of Visit

14/12/1994

Short Name:

Themes

Human Activity

Human Settlements

Inland Aquatic

Marine and Estuarine

↑

≡

↓

Edit

Primary Animal Production

Primary Plant Production

↑

↓

Edit

Reporting Focus

Ecosystem

Pressure

Response

State

↑

↓

Edit

Rural

↑

↓

Edit

Comments

X Ref.

Data Form

Admin.

Spatial

Temporal

Regions

Categories

Biblio.

Keywords

New

Delete

Save

Goto...

Ok

Cancel

Source: Department of Environment, Sport and Territories

7.1 Australian Bureau of Statistics (ABS)

The ABS is the primary source for statistics in the social and economic arenas. As noted in this strategy this information is important for linking socio-economic pressures with environmental condition and linking environmental condition with socio-economic consequences.

In relation to the issue of the socio-economic consequences of the condition of the environment, the ABS may have an increasingly important role to fulfill in relation to issues of 'socio-environmental' equity.

A recent report to the Commonwealth Environment Protection Agency (Falk et al 1993, p.4) emphasised that:

...issues of environment and social equity are profoundly and inextricably interrelated. Thus, for example, a sub group of the population may be economically deprived, financially locked into living near a pollutant source, poorly nourished, physically exhausted and particularly vulnerable to chemical stress. So profound is the interrelationship of economic, social and environmental equity factors that in this study we will refer frequently to their combined effect as an indicator of 'socio-environmental equity'.

Socio-environmental equity is defined in the report as:

...the gap in environmental quality and quality of life between generations millennia apart and to the long-term survival of the biosphere (intergenerational equity). However, it also refers to the much more microscopic patterns of equity in a suburb. These might include, for example, the different impacts of occupational health hazards, noise, and availability of transport facilities on different members of a suburban family.

While the ABS is not involved directly in the collection of scientifically-based environmental data, the issues of socio-environmental equity suggest that it may become an increasing focus of ABS statistical activities.

In addition, many of the ABS statistical collections include questions of an environmental nature. Some examples are listed in a recent unpublished report on sources of Tasmanian environmental information (Mills 1993, p.2):

Manufacturing and Mining Censuses added questions regarding expenditure on efforts to control pollution levels. Agriculture collections had questions dealing with water resources and inputs such as fertilisers, pesticides, land degradation and money spent on environmental protection or rehabilitation practices. The 1992 household survey included looking at household practices in relation to recycling and packaging and how people ranked environmental concerns.

Recently the ABS has begun to address environment and natural resource issues through a specialist statistical unit at the national level. Recent and planned activities in this field are (Oakley pers. comm. 19 October, 1993):

- inclusion of questions on pollution abatement and control expenditures in recent Manufacturing and Mining Censuses;
- inclusion of questions in the Agriculture program collections;
- conduct of a national household survey on household practices and attitudes in relation to issues such as recycling, packaging and ranking of environmental concerns;
- initiation of work on natural resource accounts, in physical terms, commencing with energy resources; and

- production in June 1992 of a compendium publication.

ABS census data can reveal an important message, for example, in relation to the pressures which are being placed on our environment and natural resources. Combined with a range of other data a picture can be established of our relative efficiency in using land.

The ABS is also currently finalising an environmental review of the transport sector and this is expected to be released in the first half of 1994. Work is also progressing on an assessment of the costs of environmental protection measures.

7.2 Local government

Issues of availability and access to local government data are intended to be clarified both through consultations with the Municipal Association of Tasmania and through the proposed Directory of Biophysical Data Collections.

Some of the following general information categories may be available through local government in Tasmania (Sanders 1993, p. 53):

- Environmental data from development applications
- Monitoring of development conditions
- Infrastructure provision and performance (e.g. transport, water, sewerage)
- Maintenance costs (e.g. weed invasion, sediment)
- Complaints register
- Community and health surveys
- Licences, permits etc. (e.g. chemicals, noise)
- Waste and recycling streams
- Spatial planning information (e.g. conservation areas - flood prone land, waterways, topography)
- Open space networks and uses
- Audits of council work

7.3 Educational institutions

At the tertiary level, inputs could include:

- comment on the proposed program and the conceptual issues as outlined in this strategy document
- advising on the selection of specific indicators relevant to their area of expertise
- review of SoE data collections and the review of draft reports
- supplying actual data sets
- development of modelling methods for various environmental, social and economic issues important for SoE

At the secondary school level, input to SoE may take the following forms:

- review of the SoE Report with comments and criticisms in relation to suitability to environmental education at a secondary level
- input of environmental information through, for example, identification of factors and features of environmental change in the local environment
- input of environmental monitoring data

There are many examples of community based monitoring which could be adapted to support SoE in Tasmania. These include the distribution of streamwatch kits to schools and community groups.

7.4 Community based input

As previously mentioned it is proposed that a discussion paper or papers be released to generate community interest and contributions to the Tasmanian SoE. This would provide the opportunity for input from community based organisations. Contributors may include:

- landcare and coastcare groups
- walking clubs and other recreational users
- Tasmanian Field Naturalists
- conservation organisations
- consumer associations
- industry organisations

In addition, it is also proposed that a community based advisory committee be established to provide a more formal opportunity for review of SoE reports. SoE is an iterative process and the means for ensuring its evolution lie in maximising the opportunity for community review.

7.5 State government agencies

Table 7.1 lists principal environment and natural resource related data collections from the Tasmanian Statistical Advisory Committee (TSAC) Register of Tasmanian Government Data Collections.

Table 7.1: Selected State Government data sources

Collection Title	Purpose
Taspaws	Recording fauna and flora observations
Water quality	Monitoring of State-wide water quality
Water uses database	Licensing, collating water use data, statistical analysis
Water quality data	Assessment of water quality
Marine farm returns	Marine farm production statistics
Australian fire incident	Statistical purposes

Planning schemes	safety & prevention, annual report Recording the active and draft planning documents in the state, identifying documents nearing expiry and progress towards replacement
------------------	--

In addition to the longer term data collections outlined in Table 7.1, detailed monitoring programs are currently in progress at various locations around the State. These include:

- a major study of Launceston's airshed
- a baseline study of air quality at Bell Bay intended to provide future industries at the Bell Bay heavy industrial site with information on the dispersion of pollutants in the Tamar Valley and a computer-based model specifically designed for air quality management
- a nutrient study of the lower Derwent River

7.6 Review

A comprehensive review of datasets which may be available for SoE remains a priority task for any SoE program. Informal advice is that there is a dearth of air quality data for the State of Tasmania. Some monitoring is in progress in Launceston, associated with the particular problems of wood smoke and temperature inversion. Data strengths in Tasmania would relate more to land and habitat and forestry, although gaps in knowledge between the agency jurisdictions of the Forestry Commission and the Parks and Wildlife Service of the Department of Environment and Land Management will emerge.

The almost complete absence of long term environmental monitoring raises doubt about the capacity, under current circumstances, to report on the majority of indicators which were outlined in chapter 5. Environmental monitoring is predominantly short term and problem oriented. On the positive side, one of the aims of SoE is to raise awareness of the importance of long term environmental monitoring and it an essential task of SoE Reports to comment on the adequacy of information available on the condition of the environment.

The contribution of research staff and students at the University of Tasmania, including the Centre for Environmental Studies, will be central to the development of a credible SoE program. A recent example of the type of contribution which would be of major benefit to SoE is the study of the decline of sea-grass beds in Tasmania (Rees 1993). SoE, however, would also require that such studies be updated on a periodic basis.

8. Conclusions

The objective of this thesis were to examine the current status of SoE in Australia, focussing particularly on Tasmania, and review the legislative basis for SoE in Tasmania and consider possible directions for the Tasmanian program including the foundation SoE Report.

The extent to which SoE will be given latitude to fully discuss the pressures and responses aspects of the reporting process is unknown, however, many topics may be politically unpalatable. For example, population carrying capacity is a key issue that is typically absent in SoE Reports. There is a considerable amount of consumption data extant for other purposes, and existing data procurement processes could be easily adapted to gather more useful information. Again, the ABS would have to take a lead role.

Lack of data on environmental conditions will force a greater relative weighting to pressures (reflecting the availability of social and economic data) and responses. However, the political unpalatability of pressures and responses may present problems. If these aspects are suppressed due to political sensitivities then the possibility of a white-wash publication would loom. This would marginalise SoE in Tasmania. An open and forthright approach in acknowledging ignorance and uncertainty is a key to the development of SoE Reporting.

The five yearly reporting program will not be sufficient and a range of other products will be required. These could include, for example, an SoE newsletter, fact sheets on environmental issues to support State Policies, or catchment based reports.

A primary task for any SoE system is the development of co-operative arrangements and organisational structures aimed at securing a level of agency, industry and community commitment to participation. This is an evolutionary process and is dependent on the establishment of the credentials and credibility of SoE as a basic community, government and corporate resource. The establishment of a community based/ scientific advisory and review process is considered to be important as a means to establish community ownership of the reporting program.

This thesis has reviewed developments in one of the most dynamic areas of environmental policy and has witnessed the institutionalisation of SoE programs in Australia. SoE has reached a threshold at which it is unlikely to be removed from the agenda of the three spheres of government.

The promise of SoE Reporting is to improve decision making through better information, however, it has also been recognised that the relationship between information and decision making has yet to be clearly defined for SoE. McRae (1989, pp. 33-45) has viewed output benefits in terms of the following:

- assess the condition of the natural environment
- monitor pressures on the environment
- monitor the degree of success of management policies
- raise the standard of public debate
- accelerate the understanding and approval of environmental policies

Process benefits relate to co-operative arrangements between spheres of government, disciplines and public and private sectors. SoE is viewed as a case study in the application of principles of SoE including the precautionary principle and community participation.

SoE also faces various predicaments and dilemmas. Briefly, these include the following:

- The relevance dilemma: ensuring relevance for specific groups with specific needs, such as indicated in chapter 7, while maintaining interest for the wider community.
- The client audience dilemma: is there a core decision making group at which SoE should be targeting its limited reporting resources? If so, what information does this group need and how does this vary at different stages of the decision making process?
- If the wider community, rather than a core group of decision makers, is determined to be the client group, then is it possible to maintain credibility and integrity in reporting on the complex interactions between environment, economics and society while ensuring ease of understanding and accessibility?
- The length dilemma: overcoming the problem of inaccessibility due to the length of reports (the average length of reports is more than 100 pages and the recent New South Wales Report is more than 200 pages in length).
- The independence dilemma: being at arms length from industry and environment and natural resource agencies while maintaining a reliance on their data and maximising the use of existing sources of information while ensuring that SoE is not simply and inevitably a literature search.
- The 'Alice dilemma': "Would you tell me, please, which way I ought to go from here?" "That depends a good deal on where you want to get to" said the Cat' (Carroll 1939, pp. 64-65). SoE is given the responsibility for the review of policies and programs in circumstances where there is a general lack of vision concerning environmental objectives. SoE would have the most to contribute in circumstances where a society has a clear environmental objective in mind (such as sustainability by the year 2005) and the role of SoE would be to monitor progress in meeting that goal. SoE is given its meaning from the community's vision for the future and if that vision is unknown then the role of SoE is problematic.
- The spatial framework dilemma: environmental regions appear to have been accepted as the most appropriate national spatial approach. However, there is doubt that the Canadian ecozone approach would be transferable to the Australian situation. The dilemma of environmental space, decision making space and information space was identified as a particular issue for Tasmania. As the only island State, Tasmania has the comparative advantage that, at least at a State level, environmental space, information space and decision making space may coincide.

However, in many ways these dilemmas reflect the fledgling status of SoE and the wider struggle for the community to recognise and respond to the challenges of ESD. The institutionalisation of SoE will, hopefully, witness a rapid evolution in the national and international consistency of reports and an emerging status for SoE relative to other social and economic 'road signs'. Dedicated long term monitoring program for SoE will also emerge as the inadequacies of current monitoring, which is short term, ad hoc, single discipline and 'problem oriented', are revealed. SoE has particular information requirements, however, in the

current budgetary situations reporting authorities are reluctant to stress these information requirements.

There is no doubt that SoE can be an important tool for establishing the progress that has been made towards protecting the environment. It may also introduce greater levels of accountability in environmental and natural resource management provided the process is open, credible and relevant for decision makers and the general community. SoE represents an information package which will assist in filling the information void which decision makers and the wider community face in making sense of ESD.

For these and the other reasons raised in this thesis, SoE is an activity which is deserving of a level of commitment which should be at least on par with social, economic and financial data gathering and reporting. There is little doubt that the pursuit of environmental accountability warrants a similar level of backing, encouragement and status.

It is clear that an attempt should be made at a comprehensive SoE report for Tasmania. There is also merit in the approach put forward by Dovers and Lewis (1993, p. 57) which suggests a greater emphasis on the management response aspects of SoE:

...the common notion of SER seems to be that we will monitor the environment for signs of degradation, and, if necessary and possible, implement some policy change to correct the situation if degradation is detected. It could be just as useful to consistently monitor the impact of current and future policy changes - are these working, how well, and why or why not? There is never certainty behind policy, and too often society loses interest in an issue, only to see the issue arise some years later after the policy initiative has proved inadequate. Strategies, reports and policies are means, the end is positive change in the environment or our use of it.

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