

How to evaluate the effectiveness of an environmental legal system

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Abstract

The principal research question addressed in this thesis is how the effectiveness of an environmental legal system can best be evaluated. A legal system is effective if it is achieving or likely to achieve its objectives. For an environmental legal system this means achieving sustainable development. The hypothesis tested in relation to this research question is that the pressure-state-response (“PSR”) method of State of the Environment (“SoE”) Reporting provides the best available framework for evaluating the effectiveness of an environmental legal system.

A subsidiary research question addressed in this thesis is whether the environmental legal system protecting the Great Barrier Reef (“GBR”) in north-eastern Australia is likely to achieve sustainable development of it. The hypothesis tested in relation to this research question is that the environmental legal system protecting the GBR is likely to achieve sustainable development of the GBR.

The principal method used to address these research questions and test the hypotheses is a case study of the effectiveness of the laws protecting the GBR. Particular emphasis is given in the case study to climate change both because it is now recognised as the major threat to the GBR and is a topic of significant international and national interest. This thesis is intended to contribute, in particular, to the current public and policy debate on responding effectively to climate change by using the GBR as a yardstick against which to measure “dangerous climate change” and, conversely, acceptable climate change.

There are five major findings of the research. First, most of the legal writing regarding environmental legal systems is descriptive, explanatory and interpretative rather than evaluative. Second, most legal writers who attempt to evaluate the effectiveness of part or the whole of an environmental legal system implicitly use the PSR method and refer to pressures, conditions, and responses but do not acknowledge this conceptual framework. Third, the best available conceptual and analytical framework for evaluating the effectiveness of an environmental legal system is the PSR method. It is the simplest, most systematic, comprehensive and meaningful framework with the greatest predictive power for evaluating the effectiveness of the total social and legal response to human-induced environmental degradation currently available. Fourth, current practice in SoE reporting, at least in relation to the GBR, is largely descriptive and rarely evaluates the effectiveness of the response.

The fifth major finding of this research is that, while there are many effective parts of the response to pressures on the GBR, the current environmental legal system is not likely to be effective in preventing climate change from causing very serious damage to the GBR. Based on what we know at this point in time, particularly the technology that is currently available and current greenhouse gas emissions, the impacts of climate change appear likely to swamp the many good aspects of the legal system protecting the GBR. Atmospheric concentrations of carbon dioxide in 2005 were approximately 379 parts per million (“ppm”) and rising by 2 ppm per year. Including the effect of other greenhouse gases such as methane, the total concentration of atmospheric greenhouse gases was around 455 ppm carbon dioxide equivalents (“CO₂-eq”) in 2005, although the cooling effect of aerosols and landuse changes reduced the net effect to around 375 ppm CO₂-eq. Limiting the total increase in mean global temperature to approximately 1°C requires stabilization of atmospheric greenhouse gases and aerosols around 350 ppm CO₂-eq. Increasing the net effect of greenhouse gases and aerosols to 450-550 ppm CO₂-eq is

expected to result in a 2-3°C rise in mean surface temperatures. There are currently no international or national legal constraints to hold greenhouse gas concentrations beneath these levels and they appear likely to be exceeded. These increases in mean global temperatures are expected to severely degrade the GBR by 2030-2040. Even the targets being set by the new Australian Government of reducing Australia's greenhouse gas emissions by 60% by 2050 appear insufficient to protect the GBR. If a 60% reduction in emissions can be achieved globally by 2050 a rise in mean global temperature of around 2.4°C is expected. This indicates the environmental legal system protecting the GBR is not likely to be effective in relation to climate change and, therefore, is failing to reach its objective of sustainable development.

Three major recommendations arise from the research. First, legal writers attempting to evaluate the effectiveness of the whole or part of an environmental legal system should use and acknowledge the PSR method. Second, SoE reports should include a stand-alone chapter evaluating the effectiveness of the response. Third, the environmental legal system protecting the GBR should take strong and comprehensive measures to reduce greenhouse gas emissions if the objective of sustainable development is to be achieved. Such measures should include setting policy targets for stabilizing atmospheric greenhouse gas and aerosol concentrations around 350 ppm CO₂-eq to limit increases in mean global temperature to 1°C. Policy targets of stabilizing atmospheric greenhouse gases and aerosols at 450-550 ppm CO₂-eq to limit increases in mean global temperatures to 2-3°C are likely to be too high to avoid severe impacts of coral bleaching to the GBR.

KEYWORDS: environmental law – environmental legal system – natural resources law – law and legislation – effectiveness – evaluation theory – policy analysis – environmental policy – climate change – ecologically sustainable development – state of the environment reporting – Great Barrier Reef – Queensland – Australia.

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CURRENCY: Unless otherwise stated the law and facts stated in this thesis are current at 20 December 2007.

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Acronyms

ANAO	Australian National Audit Office
ANZECC	Australian and New Zealand Environment and Conservation Council
AP6	Asia-Pacific Partnership on Clean Development and Climate
ASEC	Australian State of the Environment Committee
CO ₂ -eq	Carbon dioxide equivalents
CSIRO	Commonwealth Scientific and Industrial Research Organization
DEWHA / DEH	Australian Government Department of the Environment, Water, Heritage and the Arts (formerly the Department of Environment and Heritage)
DPI&F	Department of Primary Industries & Fisheries (Qld)
DPSIR	Driving force–Pressure–State–Impact–Response
DSR	Driving force–State–Response
EIA / EIS	Environmental Impact Assessment / Environmental Impact Statement
EPA	Environmental Protection Agency
EP Act	Environmental Protection Act 1994 (Qld)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
EPLJ	Environmental and Planning Law Journal
ESCAP	Economic and Social Commission for Asia and the Pacific
ESD	Ecologically sustainable development
GBR / GBRWHA	Great Barrier Reef / Great Barrier Reef World Heritage Area
GBRMPA	Great Barrier Reef Marine Park Authority
GBRMP Act	Great Barrier Reef Marine Park Act 1975 (Cth)
GEO-3 / GEO-4	Global Environment Outlook 3 / Global Environment Outlook 4
ICM	Integrated Catchment Management
IDAS	Integrated Development Assessment System
IPA	Integrated Planning Act 1997 (Qld)
MA	Millennium Ecosystem Assessment
NEPA	National Environmental Policy Act of 1969 (US)
NRM	Natural resource management
NRW	Department of Natural Resources and Water (Qld)
OECD	Organisation for Economic Co-operation and Development
PSIR	Pressure–State–Impact–Response
PSR	Pressure–State–Response
QPWS	Queensland Parks & Wildlife Service
RCMP	Regional Coastal Management Plan
RE	Regional Ecosystem
RWQPP	Reef Water Quality Protection Plan
RFA	Regional Forestry Agreement
SEAC	State of the Environment Advisory Council
SEQFA	South East Queensland Forests Agreement
SoE	State of the Environment
SoE Method	State of the Environment Reporting Method
UN / UNEP	United Nations / United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
USL	Unallocated State Land
VMA	Vegetation Management Act 1999 (Qld)
WHA	World Heritage Area

Statement of original authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature:

A handwritten signature in black ink, appearing to read 'Chris McDonald'.

Date: 20 December 2007

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Chapter 1 – Introduction

Many laws exist to protect our environment but research into the effectiveness of these laws is rare. The complexity of the environment and the laws themselves makes evaluating the effectiveness of an environmental legal system a Herculean, multi-disciplinary task requiring the integration of environmental science and law. Without a clear conceptual and analytical framework this task is practically impossible and the communication of any results of such research for policy improvement is severely hampered. This thesis aims to address these issues with particular emphasis to evaluating the effectiveness of the response to climate change, the most complex and difficult environmental issue currently faced by society.

TOPIC

This thesis examines how the effectiveness of an environmental legal system can best be evaluated. While considering the literature and practice generally on evaluating the effectiveness of legal systems and policy, it focuses on evaluating the effectiveness of the environmental legal system providing for the protection and management of the Great Barrier Reef, Australia (“GBR”), and the response to climate change. This thesis is intended to contribute, in particular, to the current public and policy debate on responding effectively to climate change by using the GBR as a yardstick against which to measure “dangerous climate change” and, conversely, acceptable climate change.

The principal hypothesis tested is that the pressure-state-response (“PSR”) method of State of the Environment (“SoE”) Reporting provides the best available framework for evaluating the effectiveness of an environmental legal system. The PSR method provides a framework that has been widely adopted internationally and nationally for reporting on the current and likely future health of the environment with reference to what society is doing to regulate human impacts.¹

Several terms used frequently in this thesis need to be defined and clearly understood from the outset. The meanings of “the environment”, “environmental law” and “environmental legal system” have been extensively considered and are well enough understood to need little elaboration here.² The short definitions and explanations of these terms provided in the following paragraphs suffice for the purposes of this thesis.

The “environment” is a protean term as it readily assumes different forms and characters but it is defined for the purposes of this thesis to mean the natural and human-

¹ See, for example, State of the Environment Advisory Council (“SEAC”), *State of the Environment Australia 1996* (CSIRO Publishing, Melbourne, 1996); Australian State of the Environment Committee (“ASEC”), *Australia State of the Environment 2001* (CSIRO Publishing, Melbourne, 2001); Beeton RJS, Buckley KI, Jones GJ, Morgan D, Reichelt RE, and Trewin D, *Australia State of the Environment 2006* (DEH, Canberra, 2006). Available at <http://www.environment.gov.au/soe/> (viewed 17 December 2007). The Australian Government now uses the terms “Condition-Pressure-Response” to connote the PSR method.

² For Australian, United States, English/European, and international approaches, see, Bates G, *Environmental Law in Australia* (6th ed, LexisNexis Butterworths, Sydney, 2006); Fisher D, *Australian Environmental Law* (Lawbook Co, Sydney, 2003), Ch 1; Ferrey S, *Environmental Law* (3rd ed, Aspen Publishers, New York, 2004); Bell S and McGillivray D, *Environmental Law* (6th ed, Oxford University Press, Oxford, 2006), pp 4-10; Birnie P and Boyle A, *International Law & the Environment* (2nd ed, Oxford University Press, Oxford, 2002), pp 1-10; Hunter D, Salzman J and Zaelke D, *International Environmental Law and Policy* (2nd ed, Foundation Press, New York, 2002); and Sands P, *Principles of International Environmental Law* (2nd ed, Cambridge University Press, Cambridge, 2003), Ch 1.

made world, excluding economic and social matters. This includes: the ecosystem (including biodiversity and natural resources); all areas and structures modified or built by humans; and all factors affecting human health and the quality of human life (including cultural heritage and amenity). Economic and social matters are excluded to confine the concept of the environment to its common-usage in this context.

Tim Low recasts perceptions of “nature” and “wilderness” for the purpose of explaining the relationship between the natural and human-made world and, thereby, understanding the meaning of the term, “the environment”. He argues convincingly that:³

nature is more opportunistic than we think ... animals aren't fixed in their ways [and] they will exploit the opportunities that we provide. ... Nature is not a separate domain hiding away in the wilderness. Animals and plants live all around us and exploit us when they can.

The environment, then, is all around us and humanity is part of it. If we consider how human impacts on the environment are regulated we should not lose sight of the fact that human impacts are themselves part of the environment. However, discussion of regulating human impacts on the environment is not circular because it simply focuses on regulating that part of the environment that can be controlled by humans.

For the purposes of this thesis, “environmental law” is the body of law that regulates human impacts on the environment.⁴ These laws comprise legal rights, duties, powers and liabilities⁵ contained in international treaties, customary international law, domestic legislation, and the Common Law. The extent and exercise of these laws can depend on legislative and administrative objects, policies and principles.⁶ Environmental law includes, but is not limited to, traditional categories such as environmental protection, conservation, pollution, mining, fisheries, cultural heritage, environmental impact assessment, and planning and development laws. It is a very wide area of law without precise boundaries. As John Cole and David Grinlinton suggested over a decade ago, the boundaries of environmental law remain indistinct and it is a functional classification that defies ordered “pigeon holing”.⁷

An “environmental legal system” is the combination of environmental law with the courts, government departments and other bodies that administer it within a particular jurisdiction or geographic area. It includes the decision-making processes, policies, practices and constitutional constraints that affect the administration of the law. Many authors do not distinguish between “environmental law” and “an environmental legal system”,⁸ or use the terms interchangeably. There is no great harm in this but these terms are distinguished here for clarity and precision in terminology. There are also some

³ Low T, *The New Nature* (Viking, Camberwell, 2002), pp 11 and 21.

⁴ The term is now widely used, as shown by the texts listed in footnote 2. The first text on this topic in Australia was Fisher DE, *Environmental Law in Australia* (UQ Press, Brisbane, 1980).

⁵ Robert Goodin's notion of “shared responsibilities” is not included because it does not warrant separate recognition from a legal duty to protect the environment, conserve biodiversity and to achieve sustainable development. See Goodin R, *Utilitarianism as a Public Philosophy* (Cambridge University Press, Cambridge, 1995) and Fisher, n 2, Ch 2.

⁶ See Fisher DE, “Legal and paralegal rules for biodiversity conservation: a sequence of conceptual, linguistic and legal challenges” (2005) 17 ELM 243; and (2005) 18 ELM 35; De Sadeleer N, *Environmental Principles: From Political Slogans to Legal Rules* (Oxford University Press, Oxford, 2002), Ch 5 and 6.

⁷ Cole J, “Environmental Law and Politics” (1981) 4 UNSWLJ 55 at 58; and Grinlinton D, “The ‘Environmental Era’ and the Emergence of ‘Environmental Law’ in Australia – A Survey of Environmental Legislation and Litigation 1967-1987” (1990) 7 EPLJ 74 at 75-76.

⁸ See, generally, the texts cited in footnote n 2.

variations in terminology. Some authors, particularly Oran Young, refer to environmental legal systems as “environmental regimes”.⁹ Similarly, Farhana Yamin and Joanna Depledge refer to the “climate regime” to identify the international rules, regulations and institutions responding to climate change.¹⁰ Richard Brooks, Ross Jones, and Ross Virginia propose the terms “ecosystem regime” and “ecosystemic legal regimes” to emphasise the need to incorporate ecological principles into environmental law.¹¹ These variations are intriguing and interesting but “environmental legal system” is adopted here as the most precise and widely used label for this area of law and public policy.

It is worth recognising explicitly that politics¹² and values play an inherent role in any system of government and, therefore, in an environmental legal system.¹³ Traditional political cultures and values such as “the sanctity of private property and the widely held view that a landholder is free to do whatever he or she wishes with their land” have only relatively recently begun to yield to concerns for a wider public interest in the environment.¹⁴

There are normally multiple layers of law and administration within any environmental legal system. These layers typically include international, national, regional/state and local laws depending on the governance and constitutional arrangements of the particular jurisdiction. Individual layers are often referred to as “systems” in their own right, such as “the international legal system”. This can be useful to focus a discussion on a particular layer, but in reality each of the layers is inter-dependent not independent. For this reason an environmental legal system is best considered as a vertical hierarchy of different administrative levels.

An example of the vertical hierarchy and multiple layers in an environmental legal system is the “Australian environmental legal system”. Australia has a federal system of government in which the power to make law is divided in a written constitution between the national government (known as the Australian, Commonwealth or Federal Government), six States, and two mainland Territories. There are no regional governments beneath the level of States or Territories, but around 700 local governments play an important role in the environmental legal system, particularly through the creation of planning schemes that guide development in their areas.¹⁵ Australia follows the English legal tradition where the principles and rules developed by the higher courts create binding precedents to form a body of law known as “the Common Law”. While Acts of Parliament or statutes create the bulk of modern environmental laws, the Common Law continues to provide important rights and principles unless over-ridden by statute. The “Australian

⁹ See Young OR (ed), *The Effectiveness of International Environmental Regimes: Causal Connections and Behavioural Mechanisms* (The MIT Press, Cambridge Ma, 1999) and the work cited at footnote 36.

¹⁰ Yamin F and Depledge J, *The International Climate Change Regime: A Guide to Rules, Institutions and Procedures* (Cambridge University Press, London, 2004), p 6.

¹¹ Brooks RO, Jones R, and Virginia RA, *Law and Ecology: The rise of the ecosystem regime* (Ashgate, Aldershot, 2002), pp 2-6.

¹² In the sense used here, “politics” and “political” mean “relating to or affecting interests of status or authority in an organisation rather than matters of principle (*a political decision*)”: Moore B (ed), *The Australian Oxford Dictionary* (Oxford University Press, Melbourne, 1999), p 1046. In particular, “politics” refers to anything done to obtain or hold power in government.

¹³ See Cole, n 7, pp 67-68.

¹⁴ Gunningham N and Grabosky P, *Smart Regulation: Designing Environmental Policy* (Oxford University Press, Melbourne, 1998), pp 278-279.

¹⁵ See generally, Wild River S, “The role of local government in environmental and heritage management” (DEH, Canberra, 2006), available at <http://www.environment.gov.au/soe/> (viewed 17 December 2007).

environmental legal system”, therefore, includes international law, Commonwealth law, State and Territory laws, local government laws, and the Common Law.

A number of other terms are critical to this thesis. These require a brief explanation now and detailed explanation later. To “evaluate” is to ascertain the value of something or to appraise it carefully.¹⁶ “Effective” means that something serves its purpose or produces the intended result.¹⁷ In a legal context, “effectiveness” can be seen as a measure of how successful law is in solving the problem it was designed to address.¹⁸ Evaluating the effectiveness of an environmental legal system considers whether it is likely to achieve its goal of sustainable development. In the context of this thesis, “best available” means the method that provides the simplest, most systematic, comprehensive and meaningful framework with the greatest predictive power currently available to evaluate the effectiveness of an environmental legal system.

Given the scale and complexity of the task of sustainable development, an environmental legal system is unlikely to be effective in the long-term unless it is generally efficient, cost-effective, equitable, politically acceptable, and “optimal”.¹⁹ Short term success at a cost that leads to long-term failure is not truly *effective*.²⁰ Evaluating true effectiveness of a legal system is, therefore, intertwined with evaluating whether it is efficient, cost-effective, equitable, politically acceptable, and optimal. However, the primary concern here is effectiveness and issues such as efficiency are only considered to the extent that they impact on effectiveness.

SIGNIFICANCE

How to evaluate the effectiveness of an environmental legal system is a significant research question for five main reasons. First, the importance of properly protecting the environment for the survival and quality of life of humans and life on earth makes the effectiveness of environmental legal systems a vital issue. Second, the effectiveness of environmental legal systems is important for social and economic reasons because they are often an arena for intense political and social conflict, and a significant constraint on business activity. Third, the effectiveness of an environmental legal system is difficult to evaluate because of the maze of legal and scientific complexity (including large gaps in information and scientific uncertainty). Fourth, evaluation of the effectiveness of an environmental legal system is relatively rarely attempted. A good example of the first three of these points is the current debate over greenhouse gas emissions and human-induced climate change or global warming.²¹

¹⁶ Delbridge A, Bernard JRL, Blair D, Butler S, Peters P and Yallop C, *The Macquarie Dictionary* (Revised 3rd ed, The Macquarie Library Pty Ltd, Macquarie University, 2001), pp 649 and

¹⁷ *The Macquarie Dictionary*, n 16, p 603.

¹⁸ Zaelke D, Kaniaru D, and Kružiková E (eds), *Making Law Work - Environmental Compliance & Sustainable Development* (Cameron May Ltd International Law Publishers, London, 2005), p 22.

¹⁹ These terms are explained by Gunningham and Grabosky, n 14, pp 26-27, and will be discussed below. See also, Jacobs M, *The Green Economy: environment, sustainable development and the politics of the future* (Pluto Press, Concord, 1991), p 152.

²⁰ Stephen Covey makes this point in defining “effectiveness” in the field of human behaviour. See Covey S, *The 7 Habits of Highly Effective People* (Simon & Schuster, New York, 1989), p 54.

²¹ See generally, Houghton J, *Global Warming: The Complete Briefing* (3rd ed, Cambridge University Press, Cambridge, 2004); Pittock AB, *Climate Change: Turning Up the Heat* (CSIRO Publishing, Melbourne, 2005); and Schellnhuber HJ, Cramer W, Nakicenovic N, Wigley T and Yohe G, *Avoiding Dangerous Climate Change* (Cambridge University Press, Cambridge, 2006).

A fifth reason for the significance of this topic is that evaluating the effectiveness of the whole, or selected parts of, environmental legal systems is an integral component of wider government policy cycles and planning processes. In this context, a “policy” is a position taken and communicated by government that recognises a problem and states in general what will be done about it.²² Stephen Dovers argues convincingly that good environmental policy processes must be based on a cyclical process with four major stages: problem-framing, policy-framing, policy implementation, and policy monitoring and *evaluation*.²³ As an integral part of the wider policy process and planning cycle, evaluating the effectiveness of environmental legal systems makes an essential contribution to the system constantly evolving and changing in response to new information. Just as the environment, society and life are continuous and constantly changing, this is an ongoing and difficult task with no endpoint or final solution.

“Modern” environmental laws have developed around the world over the past 30 years and particularly in Australia since the early 1990s. Environmental legal systems continue to evolve rapidly. The question can now be meaningfully asked: why are environmental legal systems constantly evolving? The major reason environmental legal systems continue to evolve and should be expected to continue to do so in the future is that they deal with complex, difficult policy problems that are themselves changing in nature and scale and for which there are often large gaps in knowledge and information. Again, the current debate over the policy response to climate change is a pertinent example. As our understanding of the problems changes so too must our response to them change and evolve. Robert Bartlett colourfully described these issues as “patently tangled, wicked environmental policy problems.”²⁴ His 1994 comments about the need for improving environmental policy evaluation remain apt:²⁵

Programs, policies, processes, and institutions, particularly environmental ones, are messy things, and environmental policy evaluation must develop richer theories, concepts, and methodologies to provide useful information for further policymaking in spite of that messiness.

While the effectiveness of environmental legal systems is a difficult and vital issue, only rarely are attempts made to address it. Most of the literature on environmental legal systems merely describes, explains or interprets individual laws within the different systems. Attempts are seldom made to describe or to evaluate the effectiveness of an entire environmental legal system.

In addition to the significance of the general question of how to evaluate the effectiveness of an environmental legal system, this research is also significant for evaluating the effectiveness of the environmental legal system protecting the GBR with particular analysis of the response to climate change. The GBR has immense environmental, social and economic value at international and national levels. Climate change is the most complex and difficult environmental challenge currently faced by society. The research is intended to make a significant contribution to the current public and policy debate on responding effectively to climate change and protecting the GBR.

²² Dovers S, *Environment and Sustainability Policy: Creation, Implementation, Evaluation* (The Federation Press, Sydney, 2005), p 12.

²³ Dovers, n 22, pp 59-65 and Ch 8 (Policy monitoring and evaluation).

²⁴ Bartlett R, “Evaluating Environmental Policy Success and Failure” in Vig N and Kraft M (eds), *Environmental Policy in the 1990s - Towards a New Agenda* (2nd ed, CQ Press, Washington, 1994).

²⁵ Bartlett, n 24, p 183.

These points highlight the significance of this research and lead to the questions of how the thesis is structured and how the research was conducted.

STRUCTURE

The thesis is structured in eight chapters. There are four main functional parts: preliminary; how to describe an environmental legal system; how to evaluate an environmental legal system; and conclusions.

The first and second chapters deal with preliminary issues. The first chapter introduces the thesis topic, its significance and the conceptual framework for the thesis. The second chapter explains the theoretical context of the research within the fields of Policy Analysis and Evaluation Theory.

The third and fourth chapters deal with how to *describe* an environmental legal system. This is an essential step before attempting to evaluate the effectiveness of an environmental legal system. The third chapter explains the objective of the environmental legal system and methods for describing it. The fourth chapter provides a case study of how to describe an environmental legal system by describing the Queensland environmental legal system. This not only provides an example of the complexity and wide ambit of an environmental legal system, but also sets the scene for a later case study of the effectiveness of an environmental legal system.

The fifth, sixth and seventh chapters are concerned with how to *evaluate* an environmental legal system and the current manner in which this task is performed. The fifth chapter discusses the variety of methods that are used for evaluating the effectiveness of environmental legal systems both internationally and in Australia. The sixth chapter builds upon this discussion through a case study of evaluating the effectiveness of the environmental legal system protecting the GBR. Again, the analysis includes both international and Australian legal systems. The seventh chapter compares the results of the case study of the laws protecting the GBR with published SoE reports relevant to it. The purpose of making this comparison is to ask whether published SoE reports are evaluating the effectiveness of environmental laws and policies, or merely describing pressures, conditions and responses without evaluating the responses.

Finally, the eighth chapter concludes the thesis and summarises the lessons that may be drawn from the research. All of these chapters are built around a research design.

RESEARCH DESIGN, METHODOLOGY AND METHODS

Research philosophy

While the term, “research”, is sometimes confined to the natural sciences and laboratory studies, here it is used to mean a careful and systematic process of inquiry to find answers to problems of interest. To do “research” is to investigate a problem systematically, carefully and thoroughly.²⁶

A “scientific attitude” is adopted in that the research is carried out systematically, sceptically and ethically for the purpose of seeking the “truth” about the subject of the

²⁶ Tan W, *Practical Research Methods* (2nd ed, Prentice Hall, Singapore, 2004), p 3.

research.²⁷ “Scientific” modes of knowledge are characterised by rigorous procedures and empirical testing. They can be contrasted with “non-scientific” modes of understanding such as faith, personal belief, intuition, practice, deferring to authority, unrepresentative observation, rationalism, and empiricism.²⁸

The research philosophy adopted in this thesis is consistent with a “real world enquiry” advocated by Colin Robson.²⁹ It involves applied research because the interest here is on solving problems rather than just gaining knowledge. Flexible methods are used looking for large effects and actionable factors where changes are feasible.

Research design

The research design may be defined as the plan for getting from the research question to the conclusion.³⁰ Robson suggests that the research design has five components.³¹ The first component is the *purpose* of the research: what is it trying to achieve? The second component is the *theory* that will guide or inform the research: what conceptual framework links the phenomena being studied and allows the findings to be understood? The third component is the *research question(s)*: what question or questions is the research geared to providing answers to in the time and resources available? The fourth component is the *methods*: what specific techniques (for example, case studies) will be used to collect data to answer the research question; how will that data be analysed; how will that data be shown to be trustworthy? The fifth component is *sampling strategy*: where, when and how will the data be located?

The principal *purpose* of the research undertaken in this thesis is to determine the best available method for evaluating the effectiveness of an environmental legal system and, ultimately, to improve the system. A subsidiary purpose of the research is to evaluate the effectiveness of the environmental legal system protecting the GBR with particular focus on climate change. The significance of these topics was discussed earlier.

The broad *theoretical frameworks* within which the research is undertaken are Policy Analysis and Evaluation Theory.³² Policy Analysis is a field of applied research concerned with the study of government policy. Evaluation Theory is concerned with the process of formal evaluation in any discipline or organisation. Other theories and assumptions underpinning the thesis are explained later in this chapter. Collectively, these theories provide a conceptual framework to link the phenomena being studied and allow the findings to be understood in a wider context of human knowledge.

The primary *research question* asked in this thesis is what is the best available method for evaluating the effectiveness of an environmental legal system? Within this research question, the *hypothesis* tested is that the PSR method of SoE reporting provides the best available framework for evaluating the effectiveness of an environmental legal system.

A subsidiary research question asked is whether the environmental legal system protecting the GBR is likely to achieve sustainable development of it? The hypothesis

²⁷ Robson C, *Real World Research: A Resource for Social Scientists and Practitioner - Researchers* (2nd ed, Blackwell Publishers, Oxford, 2002), p 18.

²⁸ Tan, n 26, p 14.

²⁹ Robson, n 27.

³⁰ Tan, n 26, p 76.

³¹ Robson, n 27, p 81.

³² These broad theoretical fields will be discussed in Chapter 2.

tested in relation to this research question is that the environmental legal system protecting the GBR is likely to achieve sustainable development of it.

The *methods* used to collect data to answer the research questions are a literature review, a literature survey and case studies. The literature review and literature survey provide data on the variety of methods used to evaluate the effectiveness of environmental legal systems. The case studies provide factual information and examples to allow the hypothesis to be tested in the real world. The purpose of case studies is, “to tell a big story through the lens of a small case.”³³ Case studies are frequently used in research of policy and regulatory design. For example, Neil Gunningham and Darren Sinclair used case studies of environmental regulatory design to identify regulatory best practice internationally in a number of specific contexts to evaluate through fieldwork the effectiveness of regulation.³⁴

The *sampling strategies* used are discussed further below. It is particularly important to justify the scope of the sampling strategies, including in this the scope of the case studies, to explain how representative and trustworthy the data is.

Methodology

Methodology is closely related to, and overlaps with, the research design and methods. It may be defined as the ways of producing and analysing data to test hypotheses.³⁵ That is, it broadly deals with the latter components of the research design, such as methods, once the purpose and research question have been decided. Said another way, it deals with how the research question is answered rather than determining the research question itself or its significance. It is impossible to determine a suitable methodology until the research question and hypothesis to be tested are known.

The methodology adopted in this thesis is a qualitative and flexible design strategy using a literature review of methods for evaluating the effectiveness of environmental legal systems and a case study of the environmental legal system protecting the GBR. This case study is used to answer both the research questions.

A quantitative and inflexible design strategy is not appropriate for this research given the nature of the problem addressed, which is a “real world” problem that cannot be addressed by fixed designs such as manipulative experiments in a scientific laboratory. There are, of course, many aspects of the environment that can be tested quantitatively, such as the level of pollution in a river. However, evaluating the effectiveness of an environmental legal system draws in many qualitative issues, such as whether a particular law is likely to deter pollution of a river in the future. A qualitative approach is required, coupled with quantitative data where possible.

Arild Underdal explains the methodology required to assess the effectiveness of a legal regime in a recent, major international study of the effectiveness of environmental regimes:³⁶

³³ Tan, n 26, p 77.

³⁴ Gunningham N and Sinclair D, *Leaders & Laggards: Next Generation Environmental Regulation* (Greenleaf Publishing, Sheffield, 2002).

³⁵ Tan, n 26, p 14.

³⁶ Underdal A, “One question, two answers” in Miles E, Underdal A, Andresen S, Wetterstad J, Skjærseth JB, and Carlin EM, *Environmental Regime Effectiveness: Confronting Theory with Evidence* (The MIT Press, Cambridge Ma, 2002), pp 4-5. This work built upon Underdal A, “The concept of regime

From a methodological perspective, evaluating the effectiveness of a cooperative arrangement means *comparing* something – let us provisionally refer to this object simply as *the regime* – against some standard of success or accomplishment. Any attempt at designing a conceptual framework for the study of regime effectiveness must, then, cope with at least three (sets of) questions: (1) what precisely constitutes *the object* to be evaluated? (2) against which *standard* is this object to be evaluated? and (3) *how* do we go about comparing the object to this standard – in other words, what kind of measurement operations do we have to perform to attribute a certain score of effectiveness to a certain regime?

For this thesis the *object* to be evaluated is an environmental legal system, particularly the environmental legal system protecting the GBR, and the environmental outcomes achieved by it. The *standard* against which this object is to be evaluated is the objective of sustainable development. The PSR method of SoE reporting is used to compare the outcomes achieved under an environmental legal system with the objective of sustainable development (i.e. *how*).

Methods

As noted in the previous section, three methods are used to collect data to answer the research questions in this thesis: a literature review; a literature survey; and case studies. Each of these is guided by a sampling strategy linked to the research question. A literature review is made of the theory and practice of evaluating the effectiveness of environmental legal systems using standard research techniques such as searches of library catalogues and online databases of journals. A literature survey, or content analysis, is conducted to quantify the percentage of published work that evaluates environmental legal systems. The scope of this survey is limited to all articles in the *Environmental and Planning Law Journal* (“EPLJ”). A case study is made of describing an environmental legal system and the subject of this case study is the Queensland environmental legal system. This establishes the basis for a further case study of the effectiveness of the environmental legal system protecting the GBR using the PSR method of SoE reporting as a conceptual framework for the evaluation.

While the justification for much of the research design is self-evident in light of the research question, the rationale for the scope of the literature survey and case study is not self-evident and requires justification. The criteria that are used to determine the “best” available method for evaluating the effectiveness of an environmental legal system also require clarification and justification.

Justification for the scope of the literature survey

The literature survey is limited to every article in the EPLJ to balance the need to obtain a representative sample of the literature with the need to avoid an unnecessary or excessive sample size. The EPLJ is Australia’s leading environmental law journal and has been published since 1984. Most articles published in the journal deal with Australian domestic laws, although many consider international law as part of their analysis. Comparative studies of other legal systems are relatively infrequent. There are over 900 articles in the journal covering a wide variety of topics relevant to environmental law in

‘effectiveness’” (1992) 27(3) *Cooperation and Conflict* 227 at 228-229. See also Helm C and Sprinz D, “Measuring the effectiveness of international environmental regimes” (2000) 44(5) *Journal of Conflict Resolution* 630.

Australia and globally. The sample size is, therefore, large enough to be representative at least of Australian literature. Cataloguing even this number of articles took several hundred hours of research time.

Justification for the choice and scope of the case study

The protection of the GBR is used as the case study for the primary research question in this thesis because it provides the best available example of applying the PSR method of SoE reporting to evaluate the effectiveness of an environmental legal system within the feasible constraints of the research for this thesis. This topic and geographic location also provide a sufficiently large and complex enough example to be representative of the practical benefits of, and the practical problems associated with, using of the PSR method to evaluate the effectiveness of an environmental legal system.

The GBR is a natural icon of national and international status, and therefore the results of the research can be expected to be of interest in their own right, in addition to being a case study of applying the PSR method to evaluate the effectiveness of an environmental legal system. The planning and management of the GBR World Heritage Area and Marine Park under the GBR Marine Park Authority is widely viewed as an international best practice.³⁷ However, the GBR World Heritage Area and Marine Park are almost exclusively marine and do not include the adjacent coastline (with the exception of some coastal islands such as Hinchinbrook Island). It would be wrong to focus solely on the marine park in isolation from the planning and management of the coastline because of the influence of coastal development on the marine ecosystem.

The Cardwell-Hinchinbrook region was selected as a representative coastal region adjacent to the GBR for more detailed study of the laws protecting the GBR through regulation of land-based activities that may impact on the reef. International, national, State and local government controls have been extensively developed in this region due to a combination of the very high conservation values and heavy development pressure there. It is a region with complex legal and factual issues that provide a very real challenge to the environmental legal system. Heated debate over the development of a tourist resort, Port Hinchinbrook, in the mid-1990s led to a strong focus on improving planning and management in the region. The planning and management framework for the region is now amongst the most highly developed on the Queensland coast adjacent to the GBR. For these reasons the Cardwell-Hinchinbrook region provides a sufficiently large and complex example to be representative of the environmental legal system protecting the GBR.

There are three further, practical matters that justify the scope of the case study. First, there is extensive published literature concerning the GBR and Cardwell-Hinchinbrook region, including several SoE reports, which provides an excellent information base for the case study. Second, the scope of the case study was the largest feasible within the constraints of a PhD thesis and the technical abilities of the researcher. Third, the researcher was born and grew up close to the study area and has worked on many issues relevant to it, giving a broad background of knowledge about the case study.

For these reasons the use of the case study and the conclusions that are drawn from it are considered justifiable in terms of their nature and scope to answer the primary research

³⁷ See Wilkinson C (ed), *Status of the Coral Reefs of the World* (Australian Institute of Marine Science, Townsville, 2004), Vol 1, p 8, 9 and 13, and Vol 2, p 303.

question. The process of how the effectiveness of an environmental legal system is evaluated using the SoE method is applicable to other areas and for both international and national environmental legal systems. In addition, the outcomes of the case study are significant in their own right for improving the protection of the GBR.

Criteria to determine the “best available” method

It is important to clarify and justify the criteria used to determine the “best available” method for evaluating the effectiveness of an environmental legal system. These criteria reflect a theory of what constitutes a good method for evaluating the effectiveness of an environmental legal system. Willie Tan suggests that there is no universal agreement on what makes a good theory or hypothesis but the following criteria are often used:³⁸

- simplicity;
- elegance (such as $E = mc^2$);
- scope (that is, range of application);
- internal or logical consistency;
- usefulness;
- predictive power (that is, the theory can be used to make predictions);
- realism of assumptions; and
- adequacy of concepts (that is, testability).

How these criteria can be applied to test a theory or hypothesis can be explained with reference to the hypothesis tested in this thesis. The SoE method provides a simple and elegant method for evaluating the effectiveness of environmental legal systems. The SoE method has a very wide scope because it can be applied to evaluate the effectiveness of any environmental legal system, irrespective of national borders, governance arrangements, or legal tradition. It has internal and logical consistency. As the issues involved are universal and because the SoE method is widely adopted internationally and nationally, the theory or hypothesis is highly useful. The theory has predictive power, makes realistic assumptions, and is testable. For these reasons the theory and hypothesis, that the SoE method provides the best available method for evaluating the effectiveness of an environmental legal system, can be said to be a good one.

Robson also suggests four general criteria that should be satisfied before carrying out any *evaluation*:³⁹

- *Utility*: there should be a point or reason for doing an evaluation and a prospect of its being useful to some audience;
- *Feasibility*: an evaluation should only be done if it is feasible to conduct in political, practical and cost-effectiveness terms;
- *Propriety*: an evaluation should only be done if it will be carried out fairly and ethically; and
- *Technical adequacy*: given reassurance about utility, feasibility and proper conduct, the evaluation must then be carried out with technical skill and sensitivity.

³⁸ Tan, n 26, p 60.

³⁹ Robson, n 27, p 209.

The criteria suggested by Tan and Robson form a springboard from which to develop criteria for comparing different methods for evaluating the effectiveness of an environmental legal system. In particular, Tan's first criterion of simplicity is attractive for comparing different methods of evaluating an environmental legal system. The principle of Occam's Razor that is widely applied in scientific research suggests that, all things being otherwise equal, the simplest method or solution is preferable. A simple method is more likely to be widely adopted than a more complex one.

While simplicity is important, to arrive at objectively sound and verifiable conclusions, a method for evaluating the effectiveness of an environmental legal system must be *systematic* and *comprehensive*. This is because evaluating the effectiveness of an environmental legal system involves very complex environmental issues at global, regional and local scales, very complex laws and policies, and enormous amounts of information (as well as many large gaps in information) about the environment. The criterion that the method must be *systematic* reflects Tan's criteria for internal or logical consistency, and testability. The criterion that the method must be *comprehensive* reflects Tan's criteria for scope and realism of assumptions, and Robson's criterion of technical adequacy.

Tan's sixth criterion, *predictive power*, is an important criterion for comparing different methods of evaluating an environmental legal system. One of the most important objectives of evaluating the effectiveness of an environmental legal system is to allow predictions of the likely outcomes that will be achieved by the system. In particular, an evaluator wants the method to be able to answer the question: is an environmental legal system likely to achieve sustainable development or, if not, why not? This criterion subsumes two of Tan's other criteria: realism of assumptions; and testability. Unless a method for evaluating an environmental legal system has realistic assumptions and is testable it cannot have predictive power.

In addition to these criteria, there is little practical use in arriving at objectively sound and verifiable conclusions if users cannot understand what the results mean, so the evaluation and its results must be comprehensible or "meaningful" to them. The "users" of such evaluations logically include politicians, government policy advisors, scientists and members of the community who have widely varying knowledge, skills and abilities to understand the results. The best term for this criterion is that the results of the evaluation must be "meaningful" to a wide cross-section of society and policy-makers. This criterion reflects Tan's criteria for simplicity and usefulness, and Robson's criterion of utility.

To summarise, the following criteria will be used to compare different methods for evaluating the effectiveness of an environmental legal system:

- *Simplicity*: All other things being equal, the simplest method will be considered the best.
- *Systematic*: The method must follow a logical, step-by-step approach that sets the problems and potential solutions in context.
- *Comprehensive*: The method must allow scope for all aspects of environmental problems and potential solutions to be considered in an integrated and holistic way.
- *Predictive power*: The method must allow the effectiveness of an environmental legal system to be evaluated and, as far as possible given natural uncertainty and gaps in information, allow predictions of the likely outcomes that will be achieved by the system. In particular, the method must be able to answer the question: is an

environmental legal system likely to achieve sustainable development or, if not, why not? To have predictive power a method must have realistic assumptions and be testable.

- *Meaningful*: The method must be capable of identifying problems and potential solutions in a manner that is easily understood by the general community and politicians, not merely specialist researchers in a narrow field.

Turning from the justification of the research design, the next topic for consideration is the relationship between the research and previous literature.

LITERATURE REVIEW

Literature review

The results of the literature review conducted for this thesis are presented throughout the thesis by citation of relevant work in appropriate places. There is a rich tapestry of academic and professional writing relevant to the topic of evaluating the effectiveness of environmental legal systems. In particular, there is a considerable body of academic writing concentrated on evaluating the effectiveness of international environmental legal regimes. Oran Young and Arun Underdal are two notable authors in this field. Relatively little published work evaluates the effectiveness of domestic environmental legal systems.

Distinguishing evaluative writing

While recognising that there is a rich tapestry of academic and professional writing relevant to evaluating the effectiveness of environmental legal systems, it is significant in the context of this thesis to note that most published legal writing *describes*, *explains* or *interprets* the law and its administration but does not *evaluate* its effectiveness. This is the case for most articles, books and government reports on the law. Attempting to evaluate the effectiveness of laws and legal systems is relatively rare in the legal profession and government because this is not what concerns most lawyers and government officers. Judges, lawyers and others working within an environmental legal system generally *interpret* and *apply* the law but do not evaluate it. Judges and members of parliament also *create* and *amend* the law. These different approaches reflect the different purposes of the writers and roles of the participants in the legal system: describing; explaining; interpreting; applying; evaluating; creating; and amending. The following table provides examples of these different approaches and functions of legal writing and research.

Examples of description, explanation, interpretation, application and evaluation of part of an environmental legal system

Description	The <i>Environmental Protection Act</i> 1994 (Qld) is comprised of 12 chapters and 3 schedules. Chapter 1 sets out preliminary matters, such as the objects of the Act ...
Explanation	The <i>Environmental Protection Act</i> 1994 (Qld) repealed the <i>Clean Air Act</i> 1963 (Qld) and <i>Clean Waters Act</i> 1971 (Qld). It was intended to provide an integrated approach and general principles for environmental protection. ...

Interpretation	Is the concept of “environmental harm” in the <i>Environmental Protection Act 1994</i> (Qld) wider than the traditional concept of “pollution”? In <i>Maroochy Shire Council v Barnes</i> [2001] QPELR 475; [2002] QPELR 6, it was determined that it is wider and includes harm caused by tree clearing.
Application	When constructing a road the Department of Main Roads is required to take all reasonable and practicable measures to prevent or minimise environmental harm consistent with the general environmental duty stated in section 319 of the <i>Environmental Protection Act 1994</i> (Qld). This includes stormwater management ...
Evaluation	How effective has the <i>Environmental Protection Act 1994</i> (Qld) been in reducing environmental harm in Queensland? There is no doubt that the Act has reduced pollution by urban development and heavy industry. However, other sources of environmental harm, particularly from rural activities, have not been regulated under the Act ...
Creation	Passage of the <i>Environmental Protection Bill 1993</i> through the Queensland Parliament and proclamation of the law.
Amendment	Passage of the <i>Environmental Protection and Other Legislation Amendment Act 2003</i> through the Queensland Parliament enacting changes to the <i>Environmental Protection Act 1994</i> (Qld).

The fact that evaluations of the effectiveness of environmental legal systems are relatively rare is a logical conclusion simply from considering the normal purpose of lawyers, judges, legal writers and others concerned with the legal system. However, to test how rare evaluations of the effectiveness of environmental legal systems are in the academic literature, a literature survey was undertaken.

Literature survey

The literature survey to test the proposition that evaluation of the effectiveness of environmental legal systems is relatively rare surveyed articles published in the EPLJ from 1982 to 2006.⁴⁰ The articles were divided into two categories. The first category contained descriptive, explanatory or interpretative articles. The second category contained evaluative articles. “Descriptive, explanatory or interpretative” legal writing was defined as describing, explaining or interpreting the content, context or application of the legal system, including clarifying ambiguity or inconsistency in the law and applying the law in case studies or examples. “Evaluative” legal writing was defined as containing significant evaluation of the merit or worth of the legal system (in terms of fairness, efficiency, or effectiveness in achieving its objective, or some other criteria⁴¹) either alone or in combination with description, explanation or interpretation. Evaluation of “effectiveness” was defined as considering whether the law or its administration is likely to achieve its objective.

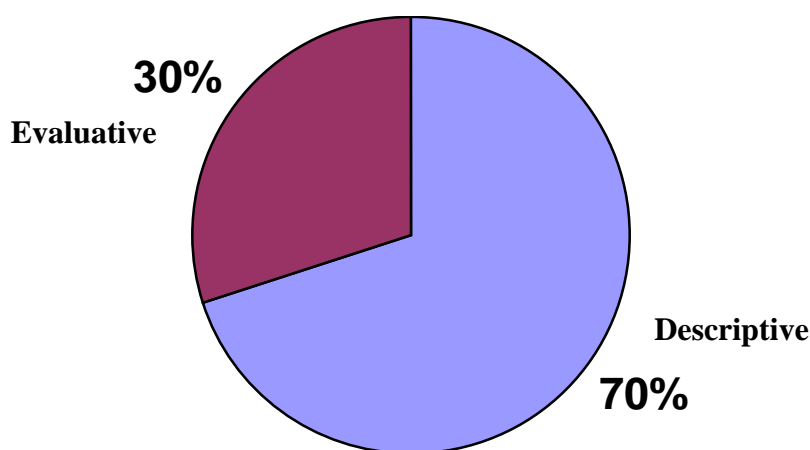
⁴⁰ Volumes 1(1) to 23(3). Kieran Tranter conducted a literature survey, or content analysis, of the EPLJ in Tranter K, “Return to green foundations: liberation and survival” (1999) 8(2) *Griffith Law Review* 280.

⁴¹ An example of “other criteria” is provided by Homel B, “Just a process change? The impact of IDAS on environmental protection in Queensland” (1999) 16 EPLJ 75. Homel evaluated major legislative amendments in Queensland and found they had resulted in increased fragmentation, complexity and uncertainty for both industry and administrators.

It was necessary to read each article in the literature survey rather than rely on the journal index or an electronic search for several reasons. The principal reason is that evaluation is very much a process of thinking or analysis and is not necessarily identified as “an evaluation”. Many articles containing some sort of evaluation do not use this term in their title or abstract and, therefore, may not be located in an electronic search. In addition, some authors refer in passing to evaluation of the effectiveness of the laws but their analysis remains largely descriptive. For example, Freya Dawson compared the definitions of biodiversity conservation in scientific publications with the definitions in key Australian Government policy documents and laws.⁴² While stating in the abstract that, “this article argues that the goals of biodiversity conservation are not clear and that this may frustrate and undermine conservation efforts”, which suggests an evaluation of effectiveness of the laws, she then provided an extensive description of various definitions of biodiversity before returning to evaluating the policies and laws in two sentences in the conclusion. Such articles were classified as descriptive.

The results of the literature survey are shown on the following graph. In total the literature survey analysed 896 articles. 626 articles (70%) were categorised as descriptive, explanatory or interpretative. 269 articles (30%) were categorised as evaluative. The vast majority of articles categorised as evaluative focused on the effectiveness or efficiency of a selected part of an environmental legal system. Only one article attempted to evaluate the effectiveness of an environmental legal system in total.⁴³ As the evaluative category included not only evaluation of effectiveness, but also evaluation of fairness, efficiency, or some other criteria, the percentage of articles evaluating the effectiveness of parts of an environmental legal system was less than 30%.

Figure 1: Results of literature survey



The literature survey supports a general conclusion that most legal writing is descriptive, explanatory or interpretative. The fact that only one article in the literature survey attempted to evaluate the effectiveness of an environmental legal system in total suggests that such research is very rare.

⁴² Dawson F, “Analysing the goals of biodiversity conservation: scientific, policy and legal perspectives” (2004) 21 EPLJ 6.

⁴³ Gardner A, “The administrative framework of land and water management in Australia” (1999) 16 EPLJ 212.

Why is most legal writing descriptive, explanatory or interpretive?

The logical reason for why most legal writing is descriptive, explanatory or interpretive is that the principal purpose of most legal writing is to teach or explain the law. Textbooks aim to teach and explain the law to students and other readers.⁴⁴ Journals articles mostly aim to explain developments in the law and policy to practising lawyers, legal academics, and policy-makers.⁴⁵ Professional publications such as loose-leaf services annotating legislation with relevant case law and commentary aim to explain the current law to practising lawyers.⁴⁶

To say that most legal writing describes, explains or interprets the legal system is not, in itself, a criticism of such legal writing. If the main purpose is to teach or explain the law then describing, explaining or interpreting the law is perfectly appropriate. The importance of teaching and professional publications is obvious in this context. However, this sets the background to understanding why evaluating the effectiveness of environmental legal systems is relatively rare.

A second reason why most legal writing is descriptive, explanatory or interpretive may be that traditional, mainstream legal thinking revolves around Legal Positivism. This school of legal thinking teaches its students to distinguish between what the law “is” and what it “ought” to be, particularly in the context of moral or ethical considerations. Law students, lawyers and academics are therefore trained to apply the law as they find it and not to critically evaluate it, other than to interpret and resolve ambiguity in the law. Practising lawyers invariably also seek to find and apply the law to solve their client’s problems rather than critiquing the law. Courts are bound to apply the law. Thus, telling a judge that the law is wrong and should be changed will rarely assist a litigant. Understandably, legal textbooks and law journal articles generally adopt this mainstream philosophy.

In contrast, evaluation of the effectiveness of the law goes beyond teaching or explaining the law. It asks questions such as, “is this good enough”, “is this achieving what it was intended to achieve”, and “are there any gaps here”? Most legal writing is not asking such questions and therefore does not *evaluate* the legal system. These points emphasise the importance of examining underlying the theories, assumptions and beliefs upon which the research is based.

UNDERLYING THEORIES, ASSUMPTIONS & BELIEFS

Context

The theoretical context in which the thesis is framed, Policy Analysis and Evaluation Theory, is dealt with in detail in the next chapter and will not be addressed at this point. The discussion here addresses conceptual matters that underlie the thesis.

⁴⁴ For example, see the texts listed in footnote 2.

⁴⁵ There are many such professional journals, including the EPLJ (Australia), *Environmental Law* (US), and *Journal of Environmental Law* (Europe and UK).

⁴⁶ For example, Stein P, “Volume 12 - 180 (Environment)” in Gibbs H (ed), *Halsbury’s Laws of Australia* (Butterworths, Sydney, 1995-); Fowler R and Bates G (ed), *Title 14 - Environment & Natural Resources*, The Laws of Australia (Lawbook Co, Sydney, 1996-); Fogg A, Meurling R and Hodgetts I, *Planning and Development Queensland* (LBC, Sydney, 2003).

The underlying theories, assumptions and beliefs upon which this thesis is built need to be examined to decide whether there is a solid basis to them and to expose any bias or pre-conceptions that may mistakenly skew the results of the research. This is an important part of a sound research process. It is also consistent with recognised evaluation ethics. In stating five guiding principles for ethical evaluation,⁴⁷ the American Evaluation Association states that “evaluators should discuss in a contextually appropriate way those values, assumptions, theories, methods, results, and analyses significantly affecting the interpretation of the evaluative findings.”⁴⁸

Robert Bartlett highlights the need to sift through underlying assumptions and beliefs when evaluating the effectiveness of environmental policy. He accepts that we can and should evaluate environmental policy in meaningful ways but he warns that the task is a difficult one that needs to be undertaken without bias or a pre-determined position. He cautions us to be very careful of the questions that we ask:⁴⁹

Both success and failure [of environmental policy] are variably defined, often implicitly. Claims are often consciously crafted to be consistent with some ideological standpoint and perspective or to support or attack some *a priori* political position. Such claims, forcefully advanced, may be persuasive in environmental policy debates if definitions of failure are not questioned, criteria for success are not articulated, and the process of evaluation is conceived as a narrow technical one reserved for experts of one particular type.

The need to examine theoretical perspectives and subconscious biases in research is paradoxically illustrated by Bjørn Lomborg – a principal proponent of the view that there is no environmental crisis at hand.⁵⁰ His fundamental proposition is a call for scientific rigour in decision-making about environmental issues. He states that, “we need to get the facts and the best possible information to make the best possible decisions”.⁵¹ He heavily criticises the environmental movement for misrepresenting a looming environmental catastrophe where none exists (which he terms, “the Litany”). He argues that one reason for the Litany is “our Calvinistic sense of guilt. We have done so well that some actually feel rather ashamed.”⁵² The question of whether a “Calvinistic sense of guilt” explains views that modern society is irreparably damaging the environment is a useful illustration of the need to identify and eliminate any subconscious biases in the research methodology to promote intellectual rigour.⁵³ Addressing these subconscious biases is a first step to critical thinking about the issues to be addressed in this research.

⁴⁷ Summarised as: systematic inquiry; competence; integrity/honesty; respect for people; and responsibilities for general and public welfare.

⁴⁸ American Evaluation Association, *Guiding Principles for Evaluators* (AEA, Fairhaven, MA, USA, 2004), available at <http://www.eval.org/> (viewed 23 March 2005).

⁴⁹ Bartlett, n 24, p 183.

⁵⁰ Lomborg B, *The Skeptical Environmentalist: Measuring the Real State of the World* (Cambridge University Press, Cambridge, 2001).

⁵¹ Lomborg, n 50, p 5.

⁵² Lomborg, n 50, p 330.

⁵³ There have been many, scathing critiques of Lomborg’s work, particularly his selective use of evidence. For a succinct and telling critique of his analysis of climate change, see Pittock, n 21, p 80.

Critical thinking

The touchstone of the reasoning process in this thesis is critical thinking. This means that deliberate consideration is given to the merits or validity of claims or arguments.⁵⁴ It is inherent in this approach that careful consideration must be given to the premises, reasoning and evidence supporting or refuting claims or arguments. There are two main reasons for doing this. The first reason for considering these issues is to establish the intellectual landscape within which the thesis is situated. The second reason for considering them is to attempt to identify and eliminate any subconscious bias in the research methodology, thereby promoting intellectual rigour. Though the discussion here is brief, the influence of these concepts on the thesis is pervasive and fundamental.

Critical thinking is essential to successfully address difficult social problems such as environmental policy. As much as is humanly possible, personal biases must be set aside and evidence examined carefully to attempt to arrive at the objectively “best” solution possible. Careful consideration must be given to the premises, reasoning and evidence supporting or refuting claims or arguments. It is surprising how rarely this is explicitly done. An excellent, if rare, example in which this is done in the context of environmental issues is given by William Cunningham and Barbara Saigo who provide the following summary of steps in critical thinking:⁵⁵

- Identify and evaluate premises and conclusions in an argument.
- Acknowledge and clarify uncertainties, vagueness, equivocation and contradictions.
- Distinguish between facts and values.
- Recognize and interpret assumptions.
- Distinguish the reliability or unreliability of a source.
- Recognize and understand conceptual frameworks.

Critical thinking and explaining underlying assumptions are the basic building blocks of a “scientific attitude” to the research conducted here. In other words, critical thinking is fundamental to proceeding systematically, sceptically and ethically for the purpose of seeking the “truth” about the subject of the research.⁵⁶

Ontology: Naturalism

The ontological⁵⁷ theory or premise assumed by this thesis is Naturalism.⁵⁸ This theory accepts that the world can be fully explained by natural elements and forces without reference to supernatural or spiritual forces. It assumes all phenomena are covered by laws of science and that all teleological⁵⁹ explanations are, therefore, without value for understanding or explaining existence and reality. Consequently, the world is viewed as a

⁵⁴ See generally Moore B and Parker R, *Critical Thinking* (Mayfield Publishing Company, Mountain View CA, 1992).

⁵⁵ Cunningham W and Saigo B, *Environmental Science: A Global Concern* (5th ed, McGraw-Hill, New York, 1999), pp 40-41.

⁵⁶ Robson, n 27, p 18.

⁵⁷ Ontology is the study of the nature of existence, being and reality: see generally, Crotty M, *The Foundations of Social Research* (Sage, London, 1998), pp 10-12.

⁵⁸ See generally, Rachels J, “Naturalism”, Ch 4 in La Follette H, *The Blackwell Guide to Ethical Theory*, (Blackwell Publishers, Malden, Mass, 2000).

⁵⁹ Explanations that order in the universe implies the existence of god(s) and cannot be explained by purely natural forces: *The Macquarie Dictionary*, n 16, p 1275.

physical entity that is capable of being understood and explained without reference to any god(s) or supernatural forces. Environmental issues are considered in terms of cause-and-effect relationships that science is capable of discerning and predicting. Religion is, therefore, irrelevant here.⁶⁰

James Lovelock's concept of Gaia is also accepted. He has developed this concept since the 1970s within a field of learning he refers to as "geophysiology", the systems science of the Earth.⁶¹ He explains the concept of Gaia as follows:⁶²

Gaia is the Earth seen as a single physiological system, an entity that is alive at least to the extent that, like other living organisms, its chemistry and temperature are self-regulated at a state favourable to life.

I describe Gaia as a control system for the Earth ... a system made up of all living things and their surface environment, the oceans, atmosphere, and crustal rocks, the two parts tightly coupled and indivisible. It is an "emergent domain" – a system that has emerged from the reciprocal evolution of organisms and their environment over the eons of life on Earth. In this system, the self-regulation emerges as the system evolves. No foresight, planning, or teleology (suggestion of design or purpose in nature) are involved.

The idea that the Earth has an automatic control system to maintain conditions favourable to life is not necessarily any more teleological than recognising an individual organism, such as a human, has automatic control systems to keep it alive. The human body automatically controls its heartbeat, breathing and digestion without conscious thought or design. The idea that the Earth has similar systems seems logical and likely based on the evidence Lovelock presents, particularly in relation to climate regulation. This does not mean, however, that the Earth can respond and control all forces that might disturb its life support systems. Just as a human can be killed by an external force his or her body is unable to control – such as a major wound causing extensive bleeding – so too might the Earth's automatic control systems be unable to cope with major, novel disturbances such as global thermonuclear war.

The widespread criticism of Lovelock's concept of Gaia as teleological is perhaps understandable in light of the choice of the word "Gaia". In pre-classical Greek mythology, Gaia was the Earth goddess, so the choice of this term itself implies a god or supernatural force is involved.⁶³ Perhaps if a more technical term, such as "geophysiological force", had been used instead of Gaia the concept would have received less resistance and criticism from mainstream scientists who adopt an ontological view of Naturalism. However, accepting that the concept does not imply a god, supernatural force, purpose or design in nature beyond self-regulation, it is useful for understanding how the Earth's major systems and physical qualities, particularly climate, have evolved and are maintained through time.

⁶⁰ If it were considered relevant, an agnostic view is adopted in any event. The existence of a god(s) is not accepted or denied.

⁶¹ Lovelock J, *Gaia: The practical science of planetary medicine* (Gaia Books Ltd, London, 1991), p 10.

⁶² Lovelock, n 61, p 11.

⁶³ The choice of the term is explained in Lovelock, n 61, p 24.

Epistemology: Critical Realism

The epistemological⁶⁴ theory or premise underpinning this thesis is Critical Realism, which is a variation on Constructionism.⁶⁵ This accepts that there is a pre-existing, objective reality in the universe but meaning is constructed, not created, and transmitted by social interaction. Postmodernist thought, that there is no objective meaning and a general distrust of ideologies, broad theories and “grand narratives”, is not accepted although it is recognised as contributing to the rich tapestry of intellectual debate.⁶⁶

Jurisprudence: Legal Positivism

The legal or jurisprudential theory underpinning this thesis is a mild form of Legal Positivism.⁶⁷ Consequently an analytical separation is maintained between law and morals – what the law *is* and what the law *ought* to be. “What is law” is defined as the rights, duties, liabilities and powers established under international treaties, customary international law, domestic legislation and subordinate legislation, and the precedents established by decisions of judges. In this context, note that that Legal Positivism has a different meaning from Religious Positivism where divine truth is revealed in texts or teachings. It also has a different meaning to Scientific Positivism where scientific knowledge is obtained through strict scientific observation and is objective, empirically verifiable and value-neutral.⁶⁸

A strict view that there is no connection between law and morals is overly simplistic because the law is a normative system constructed by society to control human behaviour. The law is a “normative system” because it concerns rules or norms that prescribe a course of conduct (what “ought” to happen) as opposed to statements or propositions of fact or physical laws that state causal connections that can be proven to be true or false. Normative usages include not only laws, but also commands, exhortations, and moral, ethical, or religious codes or rules of conduct. The normative nature of the law contrasts to the physical reality of environmental issues such as the level of pollution in the atmosphere.

As a normative system, what the law *ought* to be undoubtedly influences what the law *is* because society generally constructs the law to reflect its morals, ethics and values. For this reason, strict Formalism (colloquially known as “Black-Letter Law”) is not adopted because morals, values and politics are inherent in the creation and operation of the law. Indeed, the over-arching objective of the international and Australian environmental legal system, sustainable development, which guides the content and operation of the system is a broad social and political policy objective not merely a legal one. Similarly, fundamental and pervasive concepts such as personal property inherently imply certain cultural and political views.

⁶⁴ Epistemology is the study of the origin, nature, methods and limits of human knowledge: *The Macquarie Dictionary*, n 16, p 634. See generally, Crotty, n 45, pp 8-9.

⁶⁵ It is commonly associated with the work of Bhaskar R, *A Realist Theory of Science* (Harvester Press, Brighton, 1978).

⁶⁶ See generally, Crotty, n 57, pp 183-195.

⁶⁷ See generally Freeman M, *Lloyd's Introduction to Jurisprudence* (6th ed, Sweet & Maxwell, London, 1994); Wacks R, *Jurisprudence* (4th ed, Blackstone Press Limited, London, 1995), Ch 4.

⁶⁸ See Crotty, n 57, pp 19, 20 and 27.

An environmental legal system, what the law is and how it operates, cannot be fully understood without understanding its social and political context. While these points tip-toe towards an understanding of the law consistent with Critical Legal Studies (the basic concept of which is that the law is politics and it is not neutral or value free), this theoretical framework is not accepted. Nor are other branches of Postmodernism accepted that reject objective meaning and the acceptance of broad social objectives. Contrary to Critical Legal Theory and Postmodernism, in this thesis the over-arching objective of the international and Australian environmental legal system, sustainable development, is accepted and used as the objective against which the effectiveness of the system is made.

Ethical and political theories: Utilitarianism and Liberal Democracy

The ethical and political theories underpinning this thesis are Utilitarianism⁶⁹ and Liberal Democracy.⁷⁰ The overall objective of law, society and politics is seen as to achieve public good and happiness. Liberal democratic government, where elected representatives are subject to the Rule of Law and constitutional constraints that protect minority rights, is accepted. The Rule of Law is viewed as of fundamental importance to achieving public good and happiness.

When considering the political context of this research, one constraint to an environmental legal system that it is almost trite to recognise is that, in a democratic and pluralistic society such as Australia, laws must be socially acceptable (that is, politically acceptable). The yardstick of social acceptability therefore ultimately limits what the law can achieve in relation to the environment. For example, while a law that prescribes vegetarianism (by prohibiting the consumption of meat or seafood) may have significant benefits for the Australian environment, such a law would not be acceptable to the Australian people. Such a law is, therefore, not available to improve the protection of the environment. In contrast, a ban on the killing of whales by Australians anywhere in the world, while breathtaking in its width and extra-territorial operation is a reality in Australian law.⁷¹ The fundamental difference between these laws being socially acceptable or not socially acceptable is the cultural values associated with different animals or parts of the environment. As Douglas Fisher recognises:⁷²

the value that a people or a community place upon the environment or upon nature is a reflection of their fundamental cultural values.

Cultural values are recognised as an inherent part of political debate and any environmental legal system. They are the result of many factors, including education, history, religion and, indeed, the environment in which society exists. Cultural values are also a collective representation of individual values, needs and desires, such as for food, water, survival, health, security, family, friendship, money, leisure and self-fulfilment. This leads to a consideration of environmental ethics as a sub-set of cultural values.

⁶⁹ See generally, Mill JS, *Utilitarianism*, (Fount Paperbacks, London, 1979); Van DeVeer D and Pierce C, *The Environmental Ethics and Policy Book: Philosophy, Ecology, Economics* (3rd ed, Thomson/Wadsworth, Belmont CA, 2003), pp 24-27.

⁷⁰ See generally, Carter A and Stokes G (eds), *Liberal Democracy and its Critics: Perspectives in Contemporary Political Thought* (Polity Press, Cambridge, 1998).

⁷¹ See sections 224 and 229-230 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

⁷² Fisher, n 2, p 27. Ch 2 of this text provides an overview of the ethical dilemmas of environmental law.

Environmental ethic: stewardship / sustainable development

The environmental ethic underpinning this thesis is human stewardship for the natural world.⁷³ Stewardship implies a responsibility to care for the natural world and manage it sustainably for future generations due to humanity's special ability to alter the natural environment and knowledge of the consequences of such actions. This concept implies a notion that humanity's power to alter the environment itself creates an obligation to exercise that power wisely for the benefit of future generations and nature itself. This ethic forms the basis for the concept of sustainable development – widely accepted as the objective of environmental legal systems at least since the release of the Bruntland Report in 1987.⁷⁴ While it is fundamentally an anthropocentric philosophy, it recognises that humanity occupies a special role by virtue of our ability to plan and manage our impacts on the environment and because of that we have the responsibility to maintain the environment. Stewardship is fundamentally different from the traditional, Western (Judeo-Christian) philosophy of dominion summarised by Ian McHarg as the view that:⁷⁵

Man [sic] is exclusively divine, all other creatures and things occupy lower and generally inconsequential status; man is given dominion over all creatures and things; he is enjoined to subdue the earth.

Andrew Brennan and Yeuk-Sze Lo explain the traditional view of human dominion over the Earth as follows (emphasis in underlining added):⁷⁶

Many traditional western ethical perspectives ... are *anthropocentric* or human-centered in that either they assign intrinsic value to human beings alone (i.e., what we might call anthropocentric in an *absolute* sense) or they assign a significantly greater amount of intrinsic value to human beings than to any nonhuman things such that the protection or promotion of human interests or well-being at the expense of nonhuman things turns out to be nearly always justified (i.e., what we might call anthropocentric in a *relative* sense). Aristotle (*Politics*, Bk. 1, Ch. 8) maintains that 'nature has made all things specifically for the sake of man' and that the value of nonhuman things in nature is merely instrumental. The Bible (*Genesis* 1:27-8) says: "God created man in his own image, in the image of God created he him; male and female created he them. And God blessed them, and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over fish of the sea, and over fowl of the air, and over every living thing that moveth upon the earth." Thomas Aquinas (*Summa Contra Gentiles*, Bk. 3, Pt 2, Ch 112) argues that because nonhuman animals are 'ordered to man's use', he can kill them or use them in any way he wishes without any injustice.

While dominion has historically been the dominant philosophy, at least in Western society over the past 2,000 years, stewardship has emerged and continues to emerge as the

⁷³ In relation to environmental ethics generally, see Brennan A and Lo Y, "Environmental Ethics" in Zalta EN (ed), *The Stanford Encyclopedia of Philosophy (Fall 2007 Edition)* (Stanford University, Stanford, 2007), available at <http://plato.stanford.edu/archives/fall2007/entries/ethics-environmental/> (viewed 18 December 2007); Stenmark M, *Environmental Ethics and Policy Making* (Ashgate Publishing Co, Aldershot UK, 2002); Schmidtz D and Willott E, *Environmental Ethics: What really matters, What really works* (Oxford Uni Press, New York, 2002); Malden M, Light A and Rolston H, *Environmental Ethics: An Anthology* (Blackwell, Oxford, 2003).

⁷⁴ World Commission on Environment and Development, *Our Common Future* (Oxford University Press, Oxford, 1987). The concept of sustainable development will be discussed further in Chapter 3.

⁷⁵ McHarg I, "Values, Process and Form" in *The Fitness of Man's Environment* (Smithsonian Institution Press, Washington, 1968), p 213. See also White L, "The Historical Roots of Our Ecological Crisis" (1967) 55 *Science* 1203; Passmore J, *Man's Responsibility for Nature* (2nd ed, Duckworth, London, 1974).

⁷⁶ Brennan and Lo, n 73.

mainstream view of humanity's relationship with the environment. The overarching paradigm of environmental legal systems, sustainable development, is fundamentally based upon this philosophy.

Juxtaposed to the philosophy of humanity's dominion over nature is the philosophy of deep ecology. Brennan and Lo explain deep ecology as follows:⁷⁷

The 'deep ecology movement' ... endorses 'biospheric egalitarianism', the view that all living things are alike in having value in their own right, independent of their usefulness to human purposes. The deep ecologist respects this intrinsic value, taking care, for example, when walking on the mountainside not to cause unnecessary damage to the plants.

Both dominion (the extreme of anthropocentric views) and deep ecology (the extreme of ecocentric views) are not accepted here because neither is consistent with the concept of sustainable development. Sustainable development will be considered in more detail in chapter 3. For present purposes the Brundtland Report defined it in 1987 as "development which meets the needs of present generations while not compromising the ability of future generations to also meet their needs."⁷⁸ As such the concept is anthropocentric (hence contrary to deep ecology) but also the inconsistent with pursuit of subduing the natural world (hence contrary to the philosophy of dominion).

This discussion of the underlying concepts, assumptions and beliefs underlying the thesis leads to a more detailed consideration of the broad theories upon which it is built.

⁷⁷ Brennan and Lo, n 73.

⁷⁸ World Commission on Environment and Development, n 74, p 9.

Chapter 2

A broad theoretical context: Policy Analysis and Evaluation Theory

This chapter explains the broad theoretical context of the thesis within the fields of learning known as “Policy Analysis” and “Evaluation Theory”. There is a great deal of overlap between these two fields, particularly in an area known as “Program Evaluation”. Later chapters will build on this theoretical context to explain how to evaluate the effectiveness of an environmental legal system. Charlie Zammit, Geoff Cockfield and Sue Funnell have taken a similar theoretical approach to develop a framework for evaluating natural resources management policies and programs.⁷⁹ Their work provides a useful, general reference and summary of these topics, although their framework differs from the SoE method adopted in this thesis.⁸⁰ Paul Rump also introduces SoE reporting by reference to, amongst other matters, the policy cycle and program evaluation.⁸¹

POLICY ANALYSIS

General concepts

Stephen Dovers recently provided an excellent overview and discussion of the process of creating, implementing and *evaluating* environmental policy.⁸² He makes a good point by saying that, “a tendency to ignore basic policy knowledge from other areas is a weakness of much environment and sustainability policy thinking.”⁸³ Legal writers, in particular, rarely acknowledge the wider policy literature in analysing laws and legal systems. That error will not be made here.

Dovers acknowledges that his book is inspired by the work of Peter Bridgman and Glyn Davis, who have written the main text on the theory and practice of policy-making in Australia.⁸⁴ While the work of Bridgman and Davis is excellent and a useful background text, Dovers’ work is specifically focused on environmental policy. Dovers’ text is used here as the principal point of reference to set the theoretical context of this thesis within the field of Policy Analysis.

⁷⁹ Zammit C, Cockfield G and Funnell S, *An outcomes-based framework for evaluating natural resources management policies and programs* (Land and Water Resources Research and Development Corporation, Canberra, June 2000). Available at http://www.usq.edu.au/lurc/R_LWRRDC/1LWRRDCfull.pdf (viewed 12 March 2007).

⁸⁰ Their work will be critically discussed further in Chapter 5.

⁸¹ Rump P, *State of the Environment Reporting: Source Book of Methods and Approaches* (UNEP/DEIA, Nairobi, 1996). A similar approach is taken by Helm and Sprinz, n 36.

⁸² Dovers, n 22. See also, Dovers S, “Adaptive policy, institutions and management: challenges for lawyers and others” (1999) 8(2) *Griffith Law Review* 374.

⁸³ Dovers, n 22, p 18.

⁸⁴ Bridgman P and Davis G, *The Australian Policy Handbook* (3rd ed, Allen & Unwin, Sydney, 2004). Another important text in this field is Howlett M and Ramesh M, *Studying Public Policy: Policy Cycles and Policy Subsystems* (Oxford University Press, Ontario, 2003).

Dovers notes the somewhat loose separation between the fields of Policy Studies and Policy Analysis, and it is the latter term that is of interest here.⁸⁵ Policy Studies are generally *descriptive* of policies and policy processes, although evaluation of policy may occur within this field. Policy Analysis is more purposeful and involves evaluation, information for policy-making, process advocacy and policy advocacy.

Dovers introduces the lexicon of Policy Analysis by defining many of the important terms used in the field:⁸⁶

- *Policies* are positions taken and communicated by government that recognise a problem and in general what will be done about it. For example, a widely accepted environmental policy is a commitment to ecologically sustainable development through integrating environmental considerations into decision-making.
- *Policy programs* (or, simply, *programs*) are specific and substantial manifestations of a policy, comprising elements of implementation as well as of intent. Beneath this level, for an applied policy, there will be a variable number of on-ground *projects* in particular places. For example, a policy for protecting water catchments may be implemented in part through a program for restoring riparian vegetation within catchments and projects for re-planting particular stretches of degraded waterways.
- *Policy instruments* are the ‘tools’ or means used by governments in partnership with other players to implement policies and achieve policy goals. Laws, regulations, education campaigns, and taxes are all examples of policy instruments.
- *Policy sub-systems* are discernable structures and processes that exist for specific sectors or issues, although there will always be overlap between these sub-systems. Environmental, taxation and industrial relations policies are all examples of policy sub-systems.
- *Policy-makers* or decision-makers have the legal competence and responsibility to make formal policy decisions. Examples include government Ministers and departments responsible for particular portfolios.
- *Institutions* are persistent, predictable arrangements, laws, processes or customs serving to structure political, social, cultural or economic transactions and relationships in society. Institutions are embedded in complex, interactive systems with many organisations and actors.
- *Organisations* are specific manifestations of institutions, such as specific departments, associations, agencies, and so on.
- *Policy actors* are individuals and groups who participate in policy creation, implementation and/or evaluation. Collectively, policy actors form a *policy community*.

Policy instruments

Dovers builds on the work of Gunningham, Grabosky, Sinclair and others by recognising a variety of instruments for environmental policy.⁸⁷ Many of the terms and concepts used to describe policy instruments are drawn from the field of Regulatory

⁸⁵ Dovers, n 22, pp 20-21 citing Hogwood BW and Gunn LA, *Policy Analysis for the Real World* (Oxford University Press, Oxford, 1984), p 29.

⁸⁶ Dovers, n 22, pp 12-15.

⁸⁷ Gunningham and Grabosky, n 14; Gunningham N and Sinclair D, “Regulatory pluralism: designing policy mixes for environmental protection” (1999) 21(1) *Law & Policy* 49.

Theory,⁸⁸ which deals with government regulation of human behaviour. It can be viewed as a subset or close companion of Policy Studies and Policy Analysis for present purposes. Another related field is Compliance Theory, which considers why legal obligations are met and recognises that deterrence through the imposition of sanctions is not the only reason why laws and policies are complied with, particularly at an international level.⁸⁹ Understanding such related fields and concepts is important for good policy design and choice of policy instruments.

Gunningham and Grabosky suggest six functional categories of instruments for environmental policy in their text, *Smart Regulation: Designing Environmental Policy*.⁹⁰ While they state this categorization is not intended to be exhaustive and merely provides a relatively comprehensive summary of the range of environmental policy instruments available,⁹¹ it is worthwhile setting out their six categories here:

- *Command and control regulation* (or *direct regulation*) involves laws backed by sanctions to prohibit or restrict harmful activities. Imposing environmental standards is the commonest form of command and control regulation for environmental policy. Standards involve the establishment of uniform requirements on broad categories of activities to achieve specific environmental goals.⁹²
- *Self-regulation* involves industry or professional associations controlling the conduct of their members without direct government control.
- *Voluntarism* involves individuals undertaking to do the right thing without any basis in coercion from government, industry or professional bodies.
- *Education and information instruments* include such things as education and training, corporate environmental reporting, and pollution inventories.
- *Economic instruments* are primarily based on using positive and negative financial incentives rather than direct government control, including enforceable property rights, a trading market, or taxation.
- *Free market environmentalism* relies on property rights and the free market alone to control environmental impacts unrestricted by government intervention.

Ideology and politics influence choice of policy instruments

Like Gunningham, Grabosky, and Sinclair, Dovers advocates a mixture of these instruments in environmental policy but he also recognises the influence that ideology and politics have on the choice of policy instruments. His critique of the recurrent debate about regulation versus market mechanisms for environmental policy is particularly insightful. He argues:⁹³

Debates about policy instruments commonly recognise just a few general categories, notably regulation, education, and market-based approaches, but also increasingly self-

⁸⁸ There are many texts on regulatory theory and design. Two useful ones for environmental regulation are Gunningham and Grabosky, n 14; and Sparrow MK, *The Regulatory Craft: Controlling Risks, Solving Problems, and Managing Compliance* (Brookings Institution Press, Washington, 2000).

⁸⁹ See generally, Mitchell RB, "Compliance Theory: an Overview" in Cameron J, Werksman J and Roderick P (eds), *Improving Compliance with International Environmental Law* (Earthscan Publications Ltd, London, 1996); and Doelle M, *From Hot Air to Action? Climate Change, Compliance and the Future of International Environmental Law* (Thomson Canada Ltd, Toronto, 2005), Ch 3.

⁹⁰ Gunningham and Grabosky, n 14, Ch 2.

⁹¹ Gunningham and Grabosky, n 14, p 38.

⁹² Gunningham and Grabosky, n 14, pp 39-40.

⁹³ Dovers, n 22, pp 106-107. See also Gunningham and Grabosky, n 14; and Gunningham and Sinclair, n 87.

regulation and community-based programs. Just as commonly, the general superiority of one or other category is advocated over others by different policy actors, with the classic argument being between the merits of regulation versus market mechanisms. Some policy actors advocate one kind of instrument as suitable for many or even all problems. This puts the means before the ends and narrows the scope of policy options. This is, however, to be expected, remembering that political ideology or disciplinary leaning play a strong role in determining what policy options will be favoured.

There are three crucial problems with such simplistic debates. First, it is foolish to imagine that one kind of policy instrument will always or even usually be superior to others, given the diversity of problems and contexts in environment and sustainability. ... Second, categories such as “regulatory” or “market-based” are general classes of instrument, not meaningful and precise descriptions or choices. ... Third, it is rare that a policy intervention utilises only one instrument, even when a specific one represents a major feature.

Dovers’ criticism that advocates of market-based mechanisms in environmental policy are often ideologically-driven is telling. He recommends a wider, richer approach to environmental policy-making:⁹⁴

It is common now to hear the statement that “regulation doesn’t work”. ... Opponents of regulation see an unwieldy administrative rationality and a wrongful belief that people only respond to imposed rules. These opponents include “woolly social scientists” who hold a communicative rationality that instructs cooperative and educational instruments, and “hard-nosed economists” who champion price signals in a free market as the prime way to influence rational, utility-maximising individuals. The position taken in this book is that these positions are all both partially true and singularly inadequate, as all instruments are available [and necessary].

Rory Sullivan also notes the ideologically-driven basis of much of the debate about environmental policy:⁹⁵

While it may be overly harsh to stereotype economists as favouring economic instruments, lawyers as preferring traditional regulatory approaches, scientists as preferring research, and business people as preferring voluntary approaches or self-regulation, such an assessment is probably not too far from the truth.

Yet Dovers does not advocate an idealistic approach to environmental policy that eschews value-judgments and politics. He points out that policy-making is inherently a political process involving value-based judgments and many policy actors, organisations and institutions. He suggests that:⁹⁶

... policy can never be so rational as to delete the political and value-based contests and choices that some view as ‘irrational’. Poor knowledge, moral biases, conflicting interests, hidden agendas and the allure of convenient quick answers will always exist. Beyond that, *all policy is political*, and so it should be. ... Qualitative judgment, whether political in the first instance or eventually legal in assessing the fairness and validity of a decision in a court of law, is the way in which all systems of government and other social institutions make important decisions.

It is important, therefore, to recognise the influence of ideology and politics in environmental policy.

⁹⁴ Dovers, n 22, pp 124-125. See also Gunningham and Grabosky, n 14; and Gunningham and Sinclair, n 87.

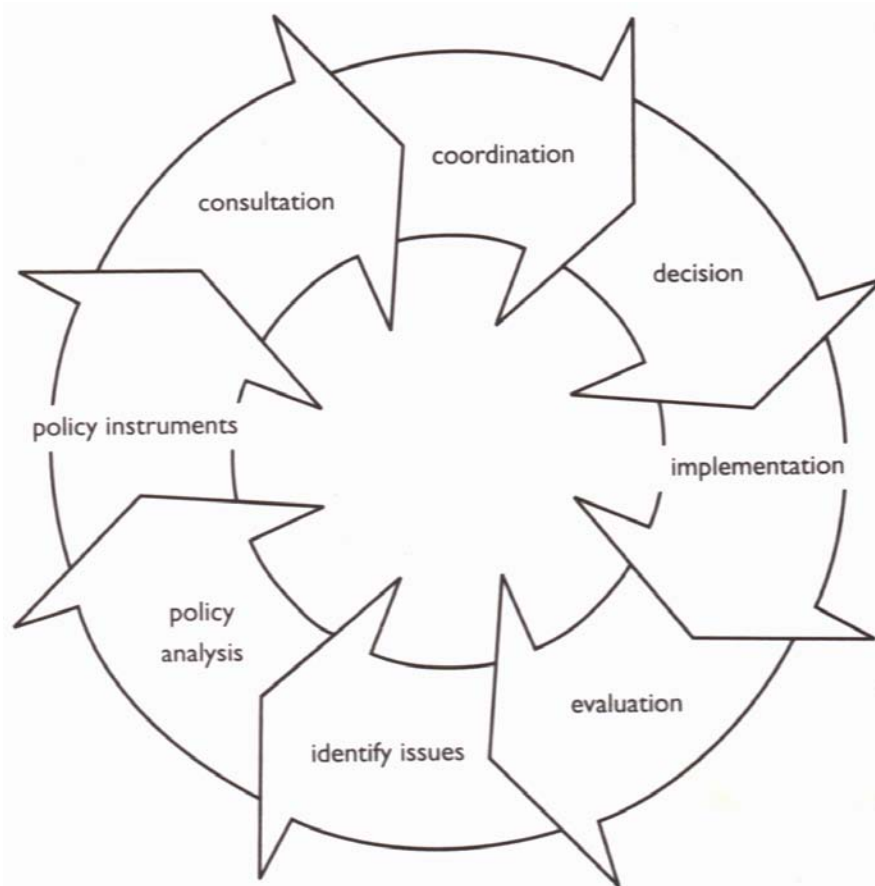
⁹⁵ Sullivan R, *Rethinking voluntary approaches in environmental policy* (Edward Elgar, Cheltenham, 2005), p 6, citing Gunningham and Sinclair, n 87, p 50, who in turn cite earlier work of Dovers.

⁹⁶ Dovers, n 22, p 33.

The Policy Cycle

Recognising the influence of ideology and politics, Dovers emphasises that policies are produced through often complex and variable *policy processes*, which are often “messy” and have little linear logic. Despite the messiness he uses the term “the Policy Cycle” synonymously with policy process to emphasise the cyclic and reiterative nature of policy-making. In doing so, Dovers follows the approach of Bridgman and Davis and other writers.⁹⁷ The stages in the Policy Cycle are shown in the following diagram.

Figure 2: The Policy Cycle⁹⁸



Dovers suggests that the policy cycle for environmental policy is complicated by risk, uncertainty and ignorance, and that these complicating factors should be explicitly recognised.⁹⁹ *Risk* is the relevant concept where the probability of an event occurring is known with reasonable accuracy (that is, we know the odds). For example, the probability of flooding in an area during a certain timeframe based on rainfall records and the history of flooding in the area. *Uncertainty* occurs where the direction of change is known but precision in predicting the scale of probability of impacts is not possible. For example, the current scientific consensus on climate change involves uncertainty in predicting the likely

⁹⁷ For example, Bridgman and Davis, n 84, Ch 3. See also in relation to the complementary concept of the “cyclic planning process”, Hall P, *Urban and Regional Planning* (4th ed, Routledge Press, London, 2002).

⁹⁸ Bridgman and Davis, n 84, p 26; Dovers, n 22, p 57.

⁹⁹ Dovers, n 22, p 81-83.

magnitude of change.¹⁰⁰ *Ignorance* exists when not even the broad directions of change are known, and where the thresholds and surprises are understood as likely. For example, there is considerable ignorance of the likely local impacts of climate change in the future.

Dovers argues that because uncertainty, complexity and long time horizons are inherent in formulating and implementing environmental policies, we should see these policies as *experiments* that must evolve and change so this reality should be built into policy processes and institutions.¹⁰¹ This is an important point and one that deserves careful consideration. It recognises that environmental policies have no end-point but are an ongoing challenge that we must attempt to meet always with imperfect knowledge. The Policy Cycle provides a conceptual model for policy-making that incorporates such considerations well.

Policy evaluation

Dovers argues convincingly that, within the context of the risk, uncertainty and ignorance that is inherent within environmental policy, good environmental policy processes are based on a policy cycle with four major stages: problem-framing, policy-framing, policy implementation, and policy monitoring and *evaluation*.¹⁰² In Stage 1, problem-framing, discussion occurs, goals are set and risks are assessed. In Stage 2, policy-framing, guiding policy principles, policy statements and measurable policy goals are developed. In Stage 3, policy implementation, the means of implementing the policy are planned, communicated and implemented. In Stage 4, policy monitoring and evaluation, the effectiveness of the policy is monitored and, if necessary, modified or stopped. The general elements of the policy process include: coordination and integration (across and within policy fields), public participation, transparency, accountability and openness.

Dovers' recognition of the importance of evaluating policy outcomes in the policy cycle reflects other writers in the field of Policy Analysis. Bridgman and Davis put it in this way:¹⁰³

since policies in practice often drift from the objective of the original submission or are imperfect in realising their goals, *evaluation* is essential so government can gauge the effects of a policy and adjust or rethink policy design as appropriate. Such evaluation, of course, starts the cycle afresh, with a new look at the problem, and a reconsideration of the recommended instruments. Policy is a wheel continually turning, a task never completed.

... evaluation serves three purposes:

- It asks how well a policy, once implemented, meets its objectives.
- It holds officials accountable for the implementation of a policy.
- It provides important clues of future policy making.

¹⁰⁰ Limpert PB, "Beyond the Rule in Mohan: A New Model for Assessing the Reliability of Scientific Evidence" (1998) 54 *Univ Toronto L Rev*, suggests that there are seven types of uncertainty likely to be found in any scientific assessment or opinion: (1) conceptual uncertainty; (2) measurement uncertainty; (3) sampling uncertainty; (4) mathematical modelling uncertainty; (5) causal uncertainty; (6) testing uncertainty; and (7) communicative and cognitive uncertainty.

¹⁰¹ Dovers, n 22, p 32.

¹⁰² Dovers, n 22, p 59-65 and Ch 8 (Policy monitoring and evaluation).

¹⁰³ Bridgman and Davis, n 84, pp 28 and 130-131.

... A commitment to evaluation carries analytical rigour through the cycle, and emphasises that policy is iterative – an endless chain of experiments and rethinking, as policies and programs adjust to their changing circumstances.

Michael Howlett and M Ramesh also emphasise the importance of policy evaluation through administrative, judicial and political mechanisms.¹⁰⁴ They trace the history of ideas on policy evaluation and conclude that it is far from a scientific exercise that is completely objective, systematic and empirical. Rather, like all elements of the policy cycle, it has political influences that should be recognised and accounted for. Despite the difficulty in policy evaluation, they recognise it as an important tool for policy learning.

Howlett and Ramesh define five strands of policy evaluation at an administrative level, which are also adopted by Dovers.¹⁰⁵ The first strand is *effort evaluation*, which is driven by efficiency concerns and examines the quantity of inputs (time, finance and so on) that have been used. The second strand is *performance evaluation*, which examines the outputs and outcomes of a policy in whatever form these have manifested (independent of whether the policy goals are being achieved). The third strand is *adequacy of performance (effectiveness) evaluation*, which considers whether the stated policy goals are being achieved. The fourth strand is *efficiency evaluation*, which asks whether the outcomes of a policy program could have been achieved at a lower cost. The fifth strand is *process evaluation*, which seeks lessons about process and organisational design from individual programs. Howlett and Ramesh summarise the third strand, *effectiveness evaluation*, in the following way:¹⁰⁶

Adequacy of performance evaluation (also known as *effectiveness evaluation*) involves more complexity than simply adding up program inputs or outputs; it is intended to find out if the program is doing what it is supposed to be doing. In this type of evaluation, the performance of a given program is compared to its intended goals and/or whether the goals need to be adjusted in the light of the program's accomplishments. On the basis of the findings, recommendations for altering or changing programs or policies may be made. While this type of evaluation is most useful to policy-makers, it is also the most difficult to undertake. The information needs are immense and the level of sophistication required to carry out the process is higher than is generally available to government.

The most common form of policy evaluation, including of effectiveness, is often referred to as “Program Evaluation.”

Program Evaluation

In addition to being the most common form of policy evaluation, Program Evaluation is the area in which Policy Analysis and Evaluation Theory most clearly overlap. In this sense, a *program* is normally distinguished from (higher-level) *policies* and (lower-level) *projects*, as explained by Dovers above, but the distinction is not clear-cut. There are numerous published texts and journal articles on the topic of Program Evaluation,¹⁰⁷ but a

¹⁰⁴ Howlett and Ramesh, n 84, Ch 9.

¹⁰⁵ Howlett and Ramesh, n 84, Ch 9; Dovers, n 22, pp 136-137.

¹⁰⁶ Howlett and Ramesh, n 84, p 211.

¹⁰⁷ See generally, McDavid JC and Hawthorn LRL, *Program Evaluation & Performance Measurement: An Introduction to Practice* (Sage Publications, Thousand Oaks CA, 2006); and Huey-Tsyh C, *Practical Program Evaluation: Assessing and Improving Planning, Implementation, and Effectiveness* (Sage Publications, Thousand Oaks CA, 2005). See also Curtis A, Robertson A and Digby R, “Lessons from recent

good starting point is a summary provided by the Australian National Audit Office (“ANAO”):¹⁰⁸

Program Evaluation (commonly referred to simply as ‘evaluation’) can be defined as the systematic and objective assessment of a government program, or parts of a program, to assist the Government and other decision-makers to:

- assess the continued relevance and priority of program objectives in the light of current circumstances, including government policy changes (that is, appropriateness of the program);
- test whether the program outcomes achieve stated objectives (that is, its effectiveness); and
- ascertain whether there are better ways of achieving these objectives (that is, its efficiency).

The objectives of program evaluation are to:

- provide a better information base to assist managers in improving program performance;
- assist government decision making and setting priorities, particularly in the Budget process; and
- contribute to improved accountability to the Parliament and the public.

Evaluation is of considerable value to agency managers, external decision-makers and other stakeholders. It is also a critical tool in assessing performance and in this way contributes to sound management practice.

The Australian Government Department of Finance defines four types of Program Evaluation.¹⁰⁹ The first type is *appropriateness evaluation*, which helps decision-makers determine whether a program is needed and aligns with government priorities, and whether an existing program should be maintained. The second type is *efficiency evaluation*, which examines how well inputs are used to obtain a given output (for example, whether the program is efficient in the way it uses public money for policy purposes). The third type is *effectiveness evaluation*, which asks whether the program is achieving its objectives. The fourth type is *meta-evaluation*, which assesses the evaluation process itself (for example, whether evaluation practices are professional and producing reports which influence management choices). While not recognised as a separate type of evaluation in this categorisation, *cost-effectiveness evaluation* is a hybrid of efficiency and effectiveness evaluation that assesses the relationship between inputs and outcomes in dollar terms. This may also be termed *cost-benefit analysis*.¹¹⁰ The ANAO provides a useful diagram of the distinction between the different types of evaluation as shown in the following diagram.

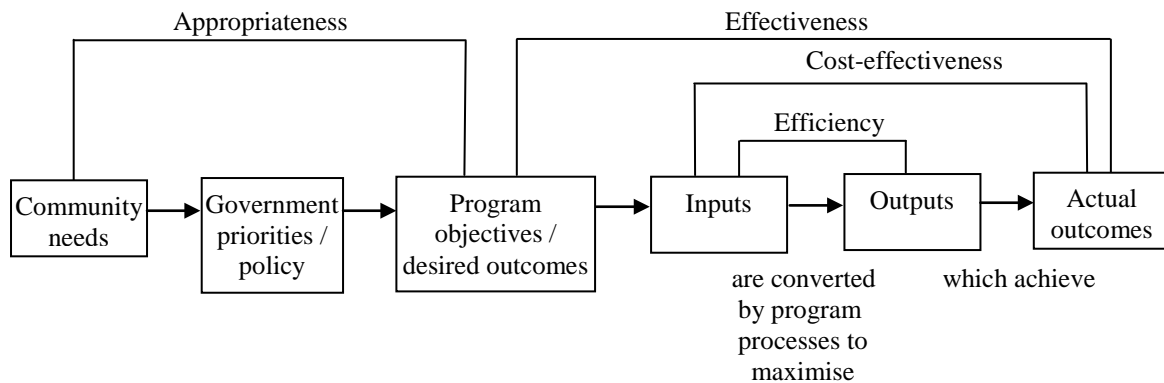
evaluations of natural resource management programs in Australia” (1998) 5 (2) AJEM 109, who found there “has been very little published about evaluations of NRM programs in Australia.”

¹⁰⁸ Australian National Audit Office, *Program Evaluation in the Australian Public Service* (ANAO, Canberra, 1996). Available at <http://www.anao.gov.au> by searching publications (viewed 1 July 2006).

¹⁰⁹ Department of Finance (DoF), *Doing Evaluations: A Practical Guide* (DoF, Canberra, 1994), p 4. A similar approach is taken by McDavid and Hawthorn, n 107, pp 15-21.

¹¹⁰ Sunstein CR, “Cost-Benefit Analysis and the Environment” (2005) 115 (2) *Ethics* 351 reviews some recent examples of cost-benefit analysis for environmental issues.

Figure 3: Types of program evaluation¹¹¹



The broad distinction between the effectiveness and efficiency of a policy, program or project is very common but the criteria used to evaluate these factors obviously vary widely depending on the circumstances of individual evaluations. For example, the Canadian Environmental Assessment Research Council recognised three broad themes of evaluation in suggesting criteria for evaluating environmental impact assessment (“EIA”): effectiveness, efficiency and fairness.¹¹² Its criteria can be used to evaluate an individual EIA or, by assessing a sample of individual EIAs, an EIA program:

An EIA may be considered *effective* if, for example:

- information generated in the EIA contributed to decision making
- predictions of the effectiveness of impact management measures were accurate, and
- proposed mitigatory and compensatory measures achieved approved management objectives.

Efficiency criteria are satisfied if, for example:

- EIA decisions are timely relative to economic and other factors that determine project decisions, and
- costs of conducting EIA and managing inputs during project implementation can be determined and are reasonable.

Fairness criteria are satisfied if, for example:

- all interested parties (stakeholders) have equal opportunity to influence the decision before it is made, and
- people directly affected by projects have equal access to compensation.

A recent text edited by David Ervin, James Kahn and Marie Livingston, although concentrating largely on economic analysis, emphasises the importance of using a wide set of criteria to evaluate environmental policy.¹¹³ They suggest the following decision-making criteria for this task:¹¹⁴

- *Economic efficiency*: maximization of the difference between the social benefit and social cost of an economic activity.
- *Equity*: a fair or even distribution of costs and benefits among members of society, including future generations.

¹¹¹ ANAO, n 108, p 8.

¹¹² Canadian Environmental Assessment Research Council, *Evaluating Environmental Impact Assessment: An Action Prospectus* (CEARC, Hull, Quebec, 1988).

¹¹³ Ervin DE, Kahn JR and Livingston ML, *Does Environmental Policy Work? The Theory and Practice of Outcomes Assessment* (Edward Elgar Publishing Ltd, Northampton, USA, 2004).

¹¹⁴ Ervin, Kahn and Livingston, n 113, pp 5-16. However, note that the editors later regard this list as “just a preliminary attempt” (p 190).

- *Sustainability*: in an economic sense, maintenance of artificial and natural capital.
- *Ecological impact / environmental stewardship*: maintaining a desirable state of an ecosystem as measured through operational indicators of environmental quality. Two primary concepts are advanced: ecosystem health and ecosystem integrity.
- *Environmental justice*: a fair distribution of exposure to environmental risk within a community.
- *Public participation*: fairness and appropriateness of the process in arriving at decisions through active involvement of the public.
- *Ethics*: while not capable of quantitative assessment, ethical constraints form qualitative criteria for decision-making.
- *Advancement of knowledge*.

Of the list of criteria for evaluating environmental policy that are suggested by Ervin, Kahn and Livingston, only sustainability and ecological impact are relevant for evaluating the *effectiveness* of environmental policy. Their work provides little information on how the effectiveness of environmental policy may be evaluated but does illustrate the variety of perspectives or “outcomes” against which environmental policy may be evaluated other than merely its effectiveness.

Neil Gunningham, Peter Grabosky, and Darren Sinclair add a criterion of “political acceptability” to the normal criteria of effectiveness, efficiency and cost-effectiveness in the context of environmental regulation. They also refer to the criterion of a policy instrument being “optimal”. Their rationale for including these criteria is insightful:¹¹⁵

In the absence of any consensus on precisely what criteria a successful regulatory strategy should satisfy, and with no value-free way of establishing any, it falls upon us to identify our own preferred criteria and our reasons for choosing them. ... We begin with the three that find their way into almost all lists: effectiveness (contributing to improving the environment); efficiency (improving the environment at minimum cost within which we include administrative simplicity); and equity (showing fairness in the burden-sharing among players) to which we add political acceptability (which includes factors such as liberty, transparency, and accountability).

Of these, we choose to make effectiveness and efficiency the pre-eminent criteria, because we believe that, in the majority of cases, the effectiveness of regulatory policy in reaching an environmental target and its efficiency in doing so at least cost, will be the primary concerns of policymakers. ...

... we consider effectiveness and efficiency to be the two criteria most likely to yield substantial results in terms of improved environmental performance. These criteria are the essence of the term ‘optimality’, which is concerned with whether instruments will do the desired task and at an acceptable performance level. ...

The term ‘optimal’ is, therefore, a convenient shorthand to encapsulate our core goals in designing systems of regulation.

Malcolm Hollick took a similar approach in 1984 by suggesting that environmental management policies should be evaluated against criteria of effectiveness, efficiency, providing incentives, equity, individual freedom, and political attractiveness. He suggested

¹¹⁵ Gunningham and Grabosky, n 14, p 26 (footnotes omitted). This quote is repeated, almost verbatim, by Gunningham N and Sinclair D, “Curbing non-point pollution: lessons from the Swan-Canning” (2004) 21 EPLJ 181 at 184. These criteria are adopted by Curnow P, “Designing optimal environmental policy for SME’s – the new Australian ozone and synthetic greenhouse gas framework and its application to the refrigeration and air conditioning industry” (2004) 21 EPLJ 391 at 392.

that “any policy can only be successful to the extent that it attracts support from politicians and the general public, and avoids causing opposition from powerful lobby groups.”¹¹⁶ That overstates the point but the underlying importance of the political acceptability should be noted.

Bearing in mind that the criteria used for individual evaluations will vary, the explanations of Program Evaluation provided by the ANAO and the Department of Finance are useful for understanding the types of program evaluations. These approaches obviously fit within the wider learning on Policy Analysis. These areas also overlap and blend¹¹⁷ with the field of Evaluation Theory, which is the next topic for discussion.

EVALUATION THEORY

Evaluation Theory is concerned with the process of formal evaluation in any discipline or organisation.¹¹⁸ As noted earlier, the ordinary meaning of “evaluate” is to ascertain the value of something or to appraise it carefully and “effective” means that something serves its purpose or produces the intended result.¹¹⁹ The essence of evaluation is to compare something with criteria. Formal evaluation merely recognises this function in a systematic way. Evaluation, whether formal or informal, is an integral component of improvement in any field of human endeavour and, understandably, evaluation theory and practice are wide-ranging and well developed.¹²⁰ The Australasian Evaluation Society¹²¹ defines formal evaluation as “the systematic collection and analysis of information to make judgements, usually about the effectiveness, efficiency and/or appropriateness of an activity.”¹²² Similarly, Colin Robson defines evaluation in the context of scientific and social research as “an attempt to assess the worth or value of some innovation, intervention, service or approach.”¹²³ He states, “the purpose of evaluation is to assess the effects and effectiveness of something, typically some innovation, intervention, policy, practice or service” and considers “effectiveness” in terms of reaching planned goals.¹²⁴

Evaluation Theory distinguishes between “formative” and “summative” evaluation, primarily in terms of the purpose of an evaluation.¹²⁵ *Formative evaluation* is intended to help in the development or improvement of a program, innovation or whatever is the focus of the evaluation. *Summative evaluation* concentrates on judging the effects and effectiveness of the program. Formative evaluation tends to occur during the development

¹¹⁶ Hollick M, “The design of environmental management policies” (1984) 1 EPLJ 58 at 59.

¹¹⁷ Entire texts are devoted to “policy evaluation”, for instance, Rist RC (ed), *Policy Evaluation: Linking Theory to Practice* (International Library of Comparative Public Policy, Aldershot, UK, 1995), contains a collection of international articles on the topic.

¹¹⁸ Useful, general textbooks on this topic include: Rossi PH, Lipsey MW, Freeman HE, *Evaluation : A Systematic Approach* (7th ed, Sage Publications, Thousand Oaks, 2004); and Alkin MA (ed), *Evaluation Roots: Tracing Theorists’ Views and Influences* (Sage Publications, Thousand Oaks, 2004).

¹¹⁹ *The Macquarie Dictionary*, n 16, pp 649 and 603.

¹²⁰ See generally, Robson, n 27, Ch 7.

¹²¹ Similar organisations are found around the world, including the UK Evaluation Society (<http://evaluation.org.uk>); American Evaluation Association (<http://www.eval.org/>); and the Canadian Evaluation Society (<http://www.evaluationcanada.ca/>), viewed 23 March 2005.

¹²² Australasian Evaluation Society, *Guidelines for the Ethical Conduct of Evaluations* (AES, Canberra, 2002), p 3. Available at <http://www.aes.asn.au> (viewed 23 March 2005).

¹²³ Robson, n 27, p 202.

¹²⁴ Robson, n 27, pp 202-207.

¹²⁵ Robson, n 27, p 208; McDavid and Hawthorn, n 107, p 21.

phase of a program while summative evaluation occurs at the end of a program or in a review phase after implementation of the program.

Evaluation Theory also distinguishes between “process” and “outcome” evaluation.¹²⁶ *Process evaluation* is concerned with the systematic observation and study of what actually occurs in the program, intervention, or whatever is being evaluated. *Outcome evaluation* is concerned with measuring how far a program, practice, innovation, intervention or policy met its stated objectives or goals.¹²⁷

Michael Patton adds to the general theories of evaluation by advocating “utilization-focused evaluations”. These begin “with the premise that evaluations should be judged by their utility and actual use; therefore, evaluators should facilitate the evaluation process and design any evaluation with careful consideration of how everything that is done, *from beginning to end*, will affect the use.”¹²⁸ Use is not an abstract concept in this approach. The focus is on the intended use by intended users from beginning to end of the evaluation.

Clearly based upon these general approaches to evaluation in other fields, Robert Bartlett explained the approaches that are generally used to evaluate environmental policy.¹²⁹ He identified three general categories of systematic environmental policy evaluation, which he described as:

- *Outcomes Evaluation*: An evaluation carried out of the results or effects of a project, program, or policy. A “project” is a time-bound effort (such as the clean up of a hazardous waste site). Environmental impact assessment is the general tool used to perform an outcomes evaluation of a specific project. A “program” is a class of projects that collectively constitute a government program (such as the *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (US) known as CERCLA or Superfund). A “policy” is a strategy in response to a broad issue or problem.
- *Process Evaluation*: Assessments of the merit of policy processes themselves judged against various criteria, such as responsiveness, coordination, legitimacy, leadership, participation, efficiency, representation, fairness, integration, practicality and pluralism.
- *Institutional Evaluation*: Assessments of how processes work and outcomes are produced within a larger institutional framework created in part by policies and within which policies are made and remade. In short, what is evaluated is “political architecture” that influences outcomes, structure, processes, and constructs and elaborates meaning.

Bartlett’s approach to evaluation of environmental policy does little more than replicate the general approaches to evaluation in other fields. This suggests that that evaluation of environmental policy can validly draw upon the theoretical underpinnings of general evaluation theory. Of the three general categories of evaluation identified by Bartlett, an evaluation of the effectiveness of an environmental legal system most closely

¹²⁶ Robson, n 27, p 208.

¹²⁷ The recent text edited by Ervin, Kahn and Livingston, n 113, is an example of the use of this term in evaluating environmental policy.

¹²⁸ Patton MQ, *Utilization-Focused Evaluation: The New Century Text* (3rd ed, Sage Publications, USA, 1997), p 20.

¹²⁹ Bartlett, n 24, p 170.

fits within an Outcomes Evaluation at a policy level. The evaluation in this case addresses the effectiveness of the environmental legal system achieving the policy of sustainable development.

A wide range of methodologies and methods is used in formal evaluations, particularly program evaluations, and there is a great deal published on these topics.¹³⁰ Program evaluations often use surveys, questionnaires, interviews with stakeholders, case studies, and observational methods. Evaluation methodologies for program evaluations have shifted from a pre-occupation with experimental designs based on randomized experiments producing statistically significant differences during the 1960s and 1970s, to a diversity of more variable, qualitative evaluations.¹³¹ The methodology and methods used in this thesis are consistent with the latter approach.

Logic modelling

One conceptual and analytical tool for evaluations of particular note for this thesis is *program logic modelling*, also referred to as *logic modelling* or *theories-in-action*, which is often used as a method for undertaking program evaluations. The heart of such a model is a diagram depicting a chain of cause-and-effect relationships, which together explain the core rationale behind a public policy or program.¹³² That is, they are *causal models* that make explicit connections between activities, outputs and outcomes.¹³³ These models / diagrams provide visual representations of programs that show how a program is intended to work, that is, how resources that are available to deliver the program are converted into program activities, and how these activities in turn produce intended results.¹³⁴ These provide sets of assumptions and inferences about cause and effect that add up to a theory of how to produce a desired result.¹³⁵ These models are widely applicable because virtually every policy or program contains at least a latent theory of how certain actions will produce desired results. Once articulated these theories can be tested against evidence and, therefore, provide a basis for systematically evaluating policies and programs.¹³⁶

Logic models typically consist of several functional parts and linkages, which are identified by specific terms in the literature of program evaluation.¹³⁷ *Program inputs* are the resources that are required to operate the program, such as money, people, equipment, facilities and knowledge. *Program components* are major clusters of activities in a program that are intended to drive the process of producing outcomes. *Program processes* are the activities in a program that produce outputs. *Program constructs* are the words or phrases in logic models that are used to describe the key features of a program, including the cause-and-effect linkages in the program (that is, *causal linkages*). *Implementation objectives* are statements of what needs to happen to get a program producing outputs (they focus on program implementation and not on program outcomes). *Program objectives* are statements of the intended outcomes of a program that ideally: specify the

¹³⁰ See generally: McDavid and Hawthorn, n 107; Huey-Tsyh, n 107; and Rossi, Lipsey and Freeman, n 118.

¹³¹ See generally, McDavid and Hawthorn, n 107, pp 82-83.

¹³² Baehler K, "Managing for outcomes: accountability and thrust" (2003) 62(4) *Australian Journal of Public Administration* 23 at 27.

¹³³ McDavid and Hawthorn, n 107, p 43.

¹³⁴ See generally, McDavid and Hawthorn, n 107, Ch 2, p 41.

¹³⁵ Patton, n 128, p 221.

¹³⁶ Baehler, n 132, p 27.

¹³⁷ See McDavid and Hawthorn, n 107, pp 46-49 and the glossary to their text.

target population, group or domain over which outcomes should occur; specify the magnitude and the direction of expected change; specify the time frame for achieving the result; and specify outcomes that are measurable. *Program outputs* are the work or things produced by program activities. *Program outcomes (intended)* are the results occurring in the environment of a program that it is intended to achieve. *Program outcomes (observed)* are what the program appears, through a process of measurement, to have achieved.

This thesis uses the logic model provided by the SoE method as the conceptual framework within which to evaluate the effectiveness of an environmental legal system. The condition-pressure-response model used in the SoE method is a very basic, high-level logic model that illustrates causal relationships between human pressures on the environment with changes in the condition of the environment, and responses to those pressures and changes.

The politics of evaluations

A final point to note in relation to Evaluation Theory is to recognise the influence of politics in formal evaluations. Ian Shaw recognises that evaluation, at least of government policy, is an inherently political process.¹³⁸ This is despite the fact that traditional academic values held by many evaluators encourage a non-political approach to their research. His comments reflect those of Dovers, Howlett and Ramesh, that were discussed above in relation to the influence of politics in policy. Shaw comments:¹³⁹

In my view there is no real solution to the political issues, including hidden agendas and other pressures which exist within and around evaluation. Evaluators should be clear about the theoretical line they are applying to evaluations and to be honest about the limitations of their work. Seeking out hidden agendas and addressing them is important, though this can be difficult when government set the parameters for the evaluation, which often happens. Even stakeholders who are left on the 'short end' of an evaluation and who may contest the findings, could accept that the evaluation team strived to be as fair, open and equitable as possible. In many circumstances this is the best that can be achieved.

Political criteria also affect the way in which the effectiveness of a policy or program is evaluated but the definition of effectiveness itself is reasonably universal and constant. This is the next topic for discussion.

MEANING OF "EFFECTIVENESS"

Scrutinizing doubtful meanings

Patricia Birnie and Alan Boyle consider that any evaluation of the effectiveness of environmental laws or an environmental legal system is inherently based upon a value judgment and that there are multiple meanings of effectiveness.¹⁴⁰ Their text on the international environmental legal system is largely descriptive and they question the ability to evaluate the effectiveness of the system:

Does existing international law adequately protect the environment? This is an important question to which there is no easy or single answer. ... Ultimately, whether

¹³⁸ Shaw I, *Evaluating Public Programmes: Contexts and Issues* (Ashgate Publishing, Aldershot UK, 2000), Ch 5, pp 84-85.

¹³⁹ Shaw, n 138, p 91. Similar comments are made by McDavid and Hawthorn, n 107, p 27.

¹⁴⁰ Birnie and Boyle, n 2, p 9.

the protection offered to the environment by international law is 'adequate' in scope and stringency is of course a value judgment, which will depend on the weight given to the whole range of competing social, economic and political considerations. All this book can do is try to help the reader to understand what the existing international legal system does provide.

As far as measuring the effectiveness of international environmental law is concerned, much depends on the criteria used. Effectiveness has multiple meanings: it may mean solving the problem for which the regime was established (for example, avoiding further depletion of the ozone layer); achievement of goals set out in the constitutive instrument (for example, attaining a set percentage of sulphur emissions); altering behaviour patterns (for example, moving from use of fossil fuels to solar or wind energy production); enhancing national compliance with rules in international agreements, such as those restricting trade in endangered species. ... the effectiveness of different regulatory and enforcement techniques is largely determined by the nature of the problem. What works in one case may not work in others. ...¹⁴¹

Birnie and Boyle's views on evaluating the effectiveness of the system are doubtful. Value judgments play an important role in deciding the appropriate objective of a law or legal system, but that decision has largely been made in relation to environmental legal systems. The objective is sustainable development or one of its variants such as ESD. That decision largely resolves the value judgments involved in evaluating the effectiveness of an environmental legal system. Once this policy decision is made, the subjective or political element of the evaluation can give way to objective evidence of whether the objective is achieved or not. It is true that subjective elements still play a role in balancing out competing social, economic and social goals in the many planning and management decisions that litter environmental legal systems, but objective criteria can be used for evaluating whether sustainable development is being achieved. For example, evidence of a serious deterioration in the environmental quality of a river can be used as an objective measure of the inadequacy or ineffectiveness of a legal system seeking to achieve sustainable development or sustainable use of the river. Birnie and Boyle even contradict their own reticence about making such evaluations later in their text, for example by noting that "management of high seas fisheries had been inadequate" and that "relying solely on flag state enforcement, or mutual observer schemes, has not been effective at controlling illegal and unregulated fishing."¹⁴²

Birnie and Boyle's suggestion that there are "multiple meanings" of effectiveness is logically flawed on the face of their own reasoning. Their alternative meanings can all be resolved to a single meaning, namely: whether the objective of the law or legal system being evaluated is achieved. That is the fundamental meaning of an evaluation of effectiveness in a legal context. Birnie and Boyle confuse with this the fact that criteria for the achievement of the objective may be stated or measured in many different ways.

Oran Young and Marc Levy also suggest that effectiveness in the context of international environmental regimes can have multiple meanings. Their comments also require further critical appraisal. They suggest:¹⁴³

Effectiveness is a matter of the contributions that institutions make to solving the problems that motivate actors to invest the time and energy needed to create them. On

¹⁴¹ Birnie and Boyle, n 2, pp 9-10.

¹⁴² Birnie and Boyle, n 2, pp 671 and 677.

¹⁴³ Young O and Levy MA, "The effectiveness of international environmental regimes" in Young O (ed), *The effectiveness of international environmental regimes: causal connections and behaviour mechanisms* (The MIT Press, Cambridge Mass, 1999), pp 3-5.

closer examination, however, effectiveness emerges as an elusive concept. It can mean a number of different things, and some of its meanings require difficult normative, scientific, and historical judgments.

Problem Solving Approach

International regimes commonly emerge in response to particular problems – environmental deterioration, escalating tariffs, border conflicts. The most intuitively appealing sense of effectiveness centers on the degree to which a regime eliminates or alleviates the problem that prompts its creation. Yet this definition presents practical problems that are sometimes severe [due to the complexity of the problem and measuring effectiveness in this way]. ...

Legal Approach

A legal definition of effectiveness might hold that the measure of a regime's effectiveness is the degree to which contractual obligations are met – rules are complied with, policies changed, programs initiated, and so forth. ...

Economic Approach

An economic definition of effectiveness would incorporate the legal definition and add an efficiency criterion. Economists want to know not only whether a regime generates the right outcome but also whether it does so at the least cost. ...

Normative Approach

It is also possible to think about effectiveness in terms of normative principles, such as fairness or justice, stewardship, participation, and so forth. ...

Political Approach

[Using a political definition] Effective regimes cause changes in the behaviour of actors, in the interests of actors, or in the policies and performance of institutions in ways that contribute to positive management of the targeted problem. ... Because international regimes are political institutions, we regard some variant of the political definition as a necessary component of the study of institutional effectiveness. In the absence of perverse exogenous effects, regimes that are effective in the political sense will also be effective in the problem-solving sense.

Despite their views to the contrary, only Young and Levy's problem solving approach is consistent with the normal meaning of "effectiveness". Their ostensible reason for not choosing this definition is that it is difficult to assess. Difficulty is not a reason to re-define a term in an artificial way so that you can claim to have solved the problem.

All of alternative definitions of Young and Levy do not bear scrutiny. Their "Legal Approach" confuses compliance with effectiveness, without linking it to whether this achieves the objective of the law or solves the problem the law was intended to address. The "Economic Approach" is simply cost-effectiveness, which is readily accepted by other writers on program evaluation to be a different criterion to effectiveness. The "Normative Approach" also conflates other criteria, such as fairness, which are not normally equated with effectiveness (except to the extent that those matters were part of the objective of the law to begin with). The "Political Approach" uses political outcomes as a substitute or surrogate for environmental outcomes. It assumes a positive political change will lead to a positive environmental change. In doing so it adds an unnecessary and unusual factor into the evaluation of effectiveness.

A plain meaning of effectiveness

Despite the doubts of Birnie, Boyle, Young, and Levy it is evident from the discussion in this chapter that "effectiveness" has a clear and consistent meaning. The ordinary and plain meaning of "effective" is "serving to effect the purpose; producing the

intended or expected results.”¹⁴⁴ The authors noted above when discussing Policy Analysis and Evaluation Theory all used the word in this sense. Howlett and Ramesh refer to *effectiveness evaluation* (which they term *adequacy of performance evaluation*) as assessing whether the stated policy goals are being achieved. This approach is used by Dovers. The Australian Government Department of Finance and the ANAO define *effectiveness evaluation* as asking whether the program is achieving its objectives. Robson considers effectiveness in terms of reaching planned goals. Gunningham, Grabosky, and Sinclair define “effectiveness” as “contributing to improving the environment”¹⁴⁵ but, as the context in which they give this definition is designing environmental policy and regulation, it is apparent that they also use effectiveness in the sense of achieving the intended policy objective.¹⁴⁶

The plain and ordinary meaning of “effective” was also used in the Millennium Ecosystem Assessment (“MA”), a major international assessment of the consequences of ecosystem change for human well-being which considered the effectiveness of various types of policy responses. The MA considered the goal of environmental policy was to protect and enhance ecosystem services (i.e. the benefits that humans obtain from ecosystems such as fresh water). It categorized responses as effective, promising or problematic according to whether the response was expected to achieve the goal of protecting and enhancing ecosystem services as follows:¹⁴⁷

A response is considered to be *effective* when its assessment indicates that it has enhanced the particular ecosystem service (or, in the case of biodiversity, its conservation and sustainable use) and contributed to human well-being without significant harm to other ecosystem services or harmful impacts to other groups of people. A response is considered *promising* either if it does not have a long track record to assess but appears likely to succeed or if there are known means of modifying the response so that it can become effective. A response is considered *problematic* if its historical use indicates either that it has not met the goals related to service enhancement (or conservation and sustainable use of biodiversity) or that it has caused significant harm to other ecosystem services.

The plain and ordinary meaning should be used to define “effectiveness” in a legal context. Zaelke, Kaniaru and Kružíková do so by defining “effectiveness” of laws as a measure of how successful law is in solving the problem it was designed to address.¹⁴⁸ This definition of legal effectiveness is adopted here as an appropriate test of effectiveness. As Robyn Bartel notes:¹⁴⁹

There are a number of methods of assessing whether a law has been successful. Traditionally, the success of law has been measured according to arrests or convictions, i.e. the processing rates of criminals. A law also needs to be assessed in terms of its

¹⁴⁴ *The Macquarie Dictionary*, n 16, p 603.

¹⁴⁵ Gunningham and Grabosky, n 14, p 26; Gunningham and Sinclair, n 34, p 10; Gunningham and Sinclair, n 115, p 184.

¹⁴⁶ As the objective of environmental policy is to improve the environment.

¹⁴⁷ Millennium Ecosystem Assessment Board, *Millennium Ecosystem Assessment Synthesis Report* (Island Press, Washington DC, 2005), p 199. Available at <http://www.maweb.org/en/Products.aspx?> (viewed 1 July 2006).

¹⁴⁸ Zaelke, Kaniaru and Kružíková (eds), n 18, p 22.

¹⁴⁹ Bartel RL, “Compliance and complicity: an assessment of the success of land clearance legislation in New South Wales” (2003) 20 EPLJ 116 at 121-122 citing Hawkins K, *Environment and Enforcement: Regulation and the Social Definition of Pollution* (Clarendon Press, Oxford, 1984). Read in context, Bartel considers “effectiveness” to mean the law achieves its substantive legislative aims or policy objectives.

effectiveness, and may also be assessed in terms of its achievement of legislative aims in the sense of it being equitable, transparent and certain in application.

Similarly, in considering the issue of regulatory effectiveness, the Australian Law Reform Commission commented:¹⁵⁰

Modern regulation occurs against a backdrop of 'outcomes-focused' government, with results shown (or styled) to justify funding dollars. Successful regulation encompasses compliance by the target population with regulatory rules and the achievement of the regulatory objective, whether this be clean water, safe airways, or a competitive marketplace. But the proper measure of these outcomes is elusive. ... Traditional measures of enforcement success – including number of proceedings commenced, quantum of penalties imposed, and litigation success rates – give some indication of the outcomes of conventional enforcement, but are not particularly helpful in identifying whether regulation is achieving its objectives.

In the context of environmental law it would be largely meaningless to judge the success of the law according to arrests or convictions.¹⁵¹ The only logical criterion that can be used to evaluate effectiveness of environmental law is how it achieves its objects, which normally will relate to achieving some form of substantive environmental outcome. Lawrence Susskind suggests in writing about negotiating more effective global environmental agreements that, "it would be a mistake to measure success in terms of anything less than tangible environmental improvements."¹⁵² Michael Zürn comments in response to this suggestion that, "from a normative point of view, this seems to be an almost uncontestable assertion."¹⁵³ Many other authors judge effectiveness of environmental regimes based on tangible environmental results, for example: "The ozone regime has produced a measurable effect on the problem, whereas greenhouse gas emissions and concentrations in the atmosphere continue to increase at alarming rates".¹⁵⁴ Malcolm Sparrow, writing about reforming regulatory practice, inherently adopted this view and identified three core elements of emerging strategies for improving regulatory effectiveness: a focus on real results (i.e. not just productivity measures); a problem-solving approach; and investment in collaborative partnerships.¹⁵⁵ Arild Underdal also notes this approach in writing the introduction to a recent, major study of environmental regime effectiveness.¹⁵⁶

[A] common-sense notion of effectiveness [is] simply that a regime is effective to the extent that it successfully performs some generic function or solves the problem that motivated its establishment. For most *environmental* regimes the ultimate test will be to what extent they improve the state of the environment itself. Environmental

¹⁵⁰ Australian Law Reform Commission, *Principled Regulation: Civil and Administrative Penalties in Australian Federal Regulation* (ALRC, Canberra, 2002), paras 3.124 and 3.129, available at <http://www.austlii.edu.au/au/other/alrc/publications/reports/95/> (viewed 14 November 2006).

¹⁵¹ But see Hain M and Cocklin C, "The effectiveness of the courts in achieving the goals of environmental protection legislation" (2001) 18 EPLJ 319 at 322, where conviction rates, etc were used in an attempt to evaluate the effectiveness of the courts in achieving the objectives of environmental legislation.

¹⁵² Susskind LE, *Environmental Diplomacy: Negotiating More Effective Global Agreements* (Oxford University Press, Oxford, 1994), p 40.

¹⁵³ Zürn M, "The rise of international environmental politics: a review of current research" (1998) 50 *World Politics* 617 at 637.

¹⁵⁴ Brooks, Jones and Virginia, n 11, p 360.

¹⁵⁵ Sparrow, n 88, p 100.

¹⁵⁶ Underdal, n 36, p 11. Similarly, see VanDeveer SD, "Effectiveness, capacity development and international environmental cooperation" Ch 7 in Dauvergne P (ed), *Handbook of Global Environmental Politics* (Edward Elgar, Cheltenham, UK, 2005), p 97.

objectives are to be achieved through changes in the human behaviour that causes environmental damage (such as pollution and unsustainable harvesting).

Underdal and some other authors suggest that the difficulties in assessing the actual effects of an environmental legal system are so great it may be preferable to focus on observable political effects of institutions rather than directly on environmental impacts.¹⁵⁷ Using a surrogate variable such as observable political effects is, however, problematic and should generally be avoided. It is problematic because it introduces another layer of complexity into the evaluation process. It is also wrong to assume that direct testing for improvements in the environment is impossible or even difficult. The great improvements in the quality of environmental data collection and development of comprehensive sets of environmental indicators¹⁵⁸ mean that researchers are increasingly able to test for direct improvements in the environment. This information is now often readily available in published SoE reports and in reports published on the internet by government agencies responsible for environmental protection. Consequently, rather than rely on surrogate indicators of effects of policy regimes such as observable political effects, researchers should begin the task of evaluating the effectiveness of environmental legal systems and environmental regimes¹⁵⁹ by looking for direct improvements in environmental pressures and conditions. That approach is taken here.

Directly measuring any reduction in pressures and improvements in environment conditions is crucial to evaluating effectiveness but, as was noted in the introduction, an environmental legal system is unlikely to be effective in the long-term unless it is generally efficient, cost-effective, equitable, politically acceptable, and “optimal”.¹⁶⁰ Short term success at a cost that leads to long-term failure is not truly *effective*.¹⁶¹ Evaluating true effectiveness of a legal system is, therefore, intertwined with evaluating whether it is efficient, cost-effective, equitable, politically acceptable, and optimal. However, the primary concern here is effectiveness and issues such as efficiency are only considered to the extent that they impact on effectiveness. This is not, therefore, to accept Young and Levy’s “Political Approach” to defining effectiveness, as discussed above, by substituting political outcomes as a surrogate of real environmental benefits.

There must be a causal relationship

James McDavid and Laura Hawthorn point to another important issue for evaluating the effectiveness of public policies and programs: the need to determine whether an observed outcome is the result of the policy or program, or, something that occurred for some other reason or by chance.¹⁶² They note that, therefore, evaluating the effectiveness

¹⁵⁷ See Underdal, n 36; Helm and Sprinz, n 36; Keohane RO, Haas PM, and Levy MA, “The effectiveness of international environmental institutions” in Haas PM, Keohane RO and Levy MA, *Institutions for the Earth: Sources of effective environmental protection* (MIT Press, Cambridge Mass, 1993), p 7.

¹⁵⁸ This topic will be discussed further in Chapter 5.

¹⁵⁹ Zürn, n 153, p 624, explains the use of the term “regime” in the literature. International regimes are social institutions consisting of agree-upon principles, norms, rules, and programs that govern the interactions of actors in specific issue-areas. In this context, a legal system is a part of a regime but regimes are more rooted in social practice and rely upon a broader set of obligations for rule compliance than legal systems.

¹⁶⁰ These terms are explained by Gunningham and Grabosky, n 14, pp 26-27, and Jacobs, n 19, p 152.

¹⁶¹ Covey, n 20, p 54, makes this point in defining “effectiveness” in the field of human behaviour.

¹⁶² Young and Levy, n 143, discuss this issue in detail at pp 4, and 10-22, as does Underdal, n 36, pp 4-15. Mitchell, n 89, p 24, and Doelle, n 89, p 73, make a similar point about assessing the effectiveness of international environmental regimes.

of a policy or program involves not only evaluating whether the objects of the policy or program are being achieved, but also whether the policy or program is *the cause of* the observed outcomes. They summarise this point as follows:¹⁶³

Although there are many different reasons for conducting evaluations, a principal one is to learn whether the program achieved its intended outcomes. ... the question of program effectiveness really is two separate questions:

- [1] Was the program responsible for (or the cause of) the observed outcomes?
- [2] Were the observed outcomes consistent with the [intended] outcomes?

To evaluate the effectiveness of a policy or program it is, therefore, not only necessary to determine whether the intended results are being achieved but also whether the policy or program is a cause of those results (either directly or indirectly). The difficulty in attributing a causal link between a policy or program and evidence of the intended outcomes actually occurring is a key difficulty of much evaluation research. A commonsense and logical approach should be taken to determining causation in the complexity of program evaluation in the real world. It may be difficult to attribute and measure a direct causal relationship between a policy or program and an observed change.

Zürn traces three basic strategies for establishing causal links: using counterfactuals; tracing causal mechanisms; and using comparisons.¹⁶⁴ Counterfactuals measure a regime's effectiveness by comparing what has happened with what would have happened had the regime not existed. The causal mechanisms approach involves identifying the mechanisms through which a regime is expected to be effective and observing whether or not they are working. The causal mechanisms approach can also be used to test the likely effectiveness of policies in the future by comparing various plausible future scenarios based on different assumptions of human behaviour and environmental processes.¹⁶⁵ Using comparisons is a research strategy in which the outcomes of a number of case studies are tested for a correlation that can be attributed to an identified cause or factor.¹⁶⁶

One method of counter-factual reasoning that has generated considerable academic debate recently is the so-called "Oslo-Potsdam Solution".¹⁶⁷ Sprinz explains this approach and reproduces a diagram of the conceptual framework for it as follows:¹⁶⁸

¹⁶³ McDavid and Hawthorn, n 107, p 82.

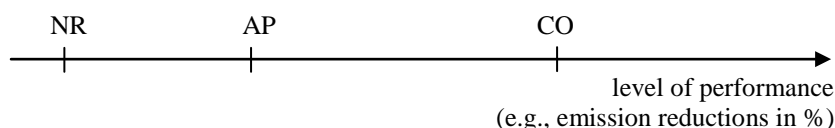
¹⁶⁴ Zürn, n 153, p 637. Underdal, n 36; and Helm and Sprinz, n 36, recommend the counterfactual approach.

¹⁶⁵ See, for example, UNEP, *Global Environment Outlook 3 (GEO-3): Past, present and future perspectives* (Earthscan Publications Ltd, London, 2002), p 30. Available at <http://www.unep.org/geo/> (viewed 5 July 2006), Ch 4.

¹⁶⁶ This approach uses the experimental design language of dependent and independent variables. "The dependent variable" (or outcome or response variable) is a factor whose values are tested in various treatment conditions. The treatment conditions are known as "the independent variable" (or explanatory variable). Researchers using a classic experimental design test whether a change in the dependent variable is observed when the independent variable is varied. If a change is observed then, in the absence of another plausible explanation, the independent variable is the "presumed cause" of the change and the dependent variable is the "presumed effect" of the independent variable.

¹⁶⁷ The name of this method appears to be based on the cities in which its proponents live. Detlef Sprinz holds a position at the Potsdam Institute for Climate Impact Research, Germany, and Jon Hovi holds a position at the Centre for International Climate and Environmental Research, University of Oslo. For the debate on this method, see: Hovi and Sprinz, n 36; Young OR, "Inferences and indices: evaluating the effectiveness of international regimes" (2001) 1(1) *Global Environmental Politics* 99; Hovi J, Sprinz DF, and Underdal A, "The Oslo-Potsdam Solution to measuring regime effectiveness: critique, response, and the road ahead" (2003) 3(3) *Global Environmental Politics* 74; Young OR, "Determining regime effectiveness: a commentary on the Oslo-Potsdam Solution" (2003) 3(3) *Global Environmental Politics* 97; Hovi J, Sprinz DF, and Underdal A, "Regime effectiveness and the Oslo-Potsdam Solution: A rejoinder to Oran Young"

In essence, the Oslo-Potsdam solution (OPS) defines a policy space for international regimes with two reference points. The policy space is essentially a unidimensional (or aggregated multidimensional) scale that is causally related to the degree of (e.g., environmental) problem-solving. The two reference points are a lower and an upper bound which define the policy space that could be covered by the international regime. Whereas the lower bound (or nonregime counterfactual NR) defines the performance on the policy space in the absence of a regime, the upper bound (or collective optimum CO) represents the policy performance of a perfect regime. The distance (CO-AP) outlines the potential for improvement by way of an ideal regime. The degree to which regime-induced policy performance improved beyond the lower bound (AP-NR) in relation to the potential for improvement (CO-NR) is a simple measure of the relative effectiveness of an international regime.



Notes: NR = nonregime counterfactual
 CO = collective optimum
 AP = actual performance

The Oslo-Potsdam Solution uses counter-factual reasoning in which “no regime” (NR) represents the counter-factual situation if no regime existed, “actual performance” (AP) represents what is actually achieved, and the “collective optimum” (CO) equates to the objects of the regime. There seems to be no real advance in using this approach over simply conceptualising effectiveness as a measure of how successful law is in solving the problem it was designed to address, particularly if counter-factual reasoning is not the chosen method of analysing effectiveness. Another criticism of this approach is that Hovi and Sprinz unnecessarily substitute the objective of the regime with the term, “collective optimum”. The basic problem remains measuring whether the objective of the regime is achieved or is likely to be achieved in the future. The Oslo-Potsdam Solution does little to assist in answering this basic question. In fact it makes a rather contrived and convoluted approach to answer this basic question. For these reasons it will not be used further here.

While Zürn identified three basic strategies for establishing causal links, the logic upon which all three are based depends on attributing a reasonable and plausible causal relationship between a policy or program and any observed changes. The technique of “tracing causal mechanisms” emphasises this conceptual process for establishing the causal relationship but the other two strategies also involve it.

A *causal relationship* is considered to exist between a policy or program and an observed change where three things exist.¹⁶⁹ First, a change is observed as a policy or program is implemented. Second, it is reasonable and logical to attribute the change to the policy or program. Third, there are no other causes that could plausibly account for the change.

(2003) 3(3) *Global Environmental Politics* 105; Mitchell RB, “Problem structure, institutional design, and the relative effectiveness of international environmental agreements” (2006) 6(3) *Global Environmental Politics* 72.

¹⁶⁸ Sprinz D, “Regime effectiveness: the next wave of research”, paper presented to the 2005 Berlin Conference on Human Dimensions of Global Environmental Change, pp 2-3, after Hovi and Sprinz, n 36, p 637.

¹⁶⁹ Adapted from McDavid and Hawthorn, n 107, p 436.

Frequently, however, gaps in information, the complexity of the environment, and the existence of many, overlapping policies and programs with similar intended outcomes make it difficult to satisfy the third element of the causal relationship to attribute the cause of an observed change to a specific policy or program in more than a general way. This means that evaluating the effectiveness of environmental policies and programs may rely on observing positive or negative changes in key indicators of environmental health, but attributing measurable amounts of those changes to individual policies or programs may be practically impossible. In answer to this dilemma, McDavid and Hawthorn emphasise the role of an evaluator's professional judgment and:

maintain that the way to answer causal questions without research designs that can convincingly rule out rival hypotheses [that is, causes for an observed change other than the policy or program being evaluated] is to acknowledge that in addressing issues like program effectiveness (which we take to be the central question in most evaluations), we cannot offer definitive findings. Instead, our findings, conclusions, and our recommendations, supported by the evidence at hand and by our *professional judgment*, will reduce the uncertainty associated with the question.¹⁷⁰

Establishing a causal relationship between an environmental legal system and achieving sustainable development / ESD is a central issue for this thesis. It is also a complex issue because an environmental legal system is a broad, functional group of policy instruments forming a policy sub-system within the overarching policy of ESD and involves many policy programs. This makes the task of attributing a causal relationship between any component of the system and an observed change difficult even without considering the difficulties that arise because of uncertainty, gaps in knowledge and lag-times. It may be simpler to attribute a causal relationship between an observed change and an entire environmental legal system (rather than a component of it), but this too may be complicated by other factors such as changes in technology and changes in public awareness over time. This complication is not critical in the PSR method of SoE reporting, however, because all changes in human behaviour (including those caused by an environmental legal system) form part of the response to environmental pressures and conditions. It is the effectiveness of the entire response that is the critical question in this model, not merely the effectiveness of the relevant environmental legal system.

However, because an environmental legal system sets the boundaries of acceptable and desirable human behaviour and impacts on the environment, and because responsibility for achieving ESD ultimately rests with the legal system,¹⁷¹ a failure to achieve it can be viewed as a failure of the legal system. For this reason, while it may be difficult to attribute a causal relationship between an environmental legal system and the achievement of some aspect of ESD, the failure to achieve some aspect of ESD is a failure of the relevant environmental legal system. It is, therefore, more difficult to conclude an environmental legal system is effective in achieving some aspect of ESD than it is to conclude the system is ineffective for failing to achieve ESD. This distinction rests on the difficulty in determining the factual causation of an observed change and the relative simplicity of attributing the legal and administrative responsibility for an observed change.

¹⁷⁰ McDavid and Hawthorn, n 107, p 409. These authors provide a useful discussion, and acknowledgment, of the nature and practice of professional judgment in program evaluation in Chapter 12, pp 401-430.

¹⁷¹ As defined in Chapter 1, "the legal system" is understood to include both the content of the law (which is the responsibility of the Legislature) and its administration (which is the dual responsibility of the Executive and the Judiciary).

In summary, while proving an environmental legal system is effective in causing its objective to be achieved is a complex and difficult task, it can be answered in two main ways. First, it can be answered through professional judgment based on systematic and thorough research of the problem and solution. Second, it can be answered by accepting that, while positive proof an environmental legal system is achieving its objective may be difficult or impossible to obtain, negative proof that the objectives of the system are not being, or are unlikely to be, obtained can be attributed to a failure of the system. A failure to achieve the objectives of an environmental legal system is unambiguous proof that the system is failing. It is necessary when using either of these methods for proving an environmental legal system is effective to bear in mind Bartlett's caution about oversimplifying the nature of the problem and the solution. Rarely will an environmental legal system be totally effective or ineffective.

However, before even approaching the question of the effectiveness of an environmental legal system, we must first begin with an understanding of what is the system that is sought to be evaluated. The next chapter, therefore, addresses how an environmental legal system can be described.

Chapter 3

Describing an environmental legal system

This chapter explains the objective of sustainable development and the general methods for describing an environmental legal system. It is necessary to understand these topics before considering how to evaluate the effectiveness of an environmental legal system. By definition, effectiveness depends on how well something achieves its objective. The objective of an environmental legal system must, therefore, be understood before its effectiveness can be evaluated. Similarly, the first step to evaluating the effectiveness of anything is first to describe the subject of the evaluation.¹⁷² The detail and precision of the description will vary with the complexity of the thing being evaluated and the purpose of the evaluation. Unless an environmental legal system is described with sufficient detail and precision to understand its scope and general operation it will not be possible to understand exactly what is being evaluated.

THE OBJECTIVE OF SUSTAINABLE DEVELOPMENT

Definition

Over the past 30 years the central paradigm of the international environmental legal system has become “sustainable development” and this is, therefore, clearly the objective against which the effectiveness of the international and national environmental legal systems must be judged.¹⁷³ It is unnecessary here to enter into a debate over whether this objective is the right one or ethically correct. Sustainable development is simply accepted here as the objective of environmental law and environmental legal systems because as Fisher points out:¹⁷⁴

The principle lending potential coherence and unity to the system [of environmental law] is sustainability: sometimes called sustainable development or ecologically sustainable development. This is not to suggest that the principle of sustainability is universally accepted, clear in concept or enforceable in practice. Yet sustainability in one form or another is the fulcrum around which environmental law is evolving and it is the nature of sustainability that is forcing environmental law to adopt new approaches and new mechanisms.

The concept of sustainable development was brought to the forefront of international policy-making in 1987 by the Brundtland Report. It defined sustainable development and stated its minimum criteria as follows:¹⁷⁵

Development which meets the needs of present generations while not compromising the ability of future generations to also meet their needs. ... in the end, sustainable development is not a fixed state of harmony, but rather *a process of change* ... At a minimum, sustainable development must not endanger the natural systems that support life on Earth; the atmosphere, the waters, the soils and the living resources.

¹⁷² Noting Underdal’s explanation of the methodology for evaluating the effectiveness of legal regimes, n 36.

¹⁷³ See generally, Segger MC and Khalfan A, *Sustainable development law: principles, practices and prospects* (Oxford University Press, Oxford, 2004).

¹⁷⁴ Fisher, n 2, p 6. See also the texts cited at n

¹⁷⁵ World Commission on Environment and Development, n 74, p 9.

There are a variety of other definitions of sustainable development and related concepts such as sustainable use. In Australia it has been re-labelled as “ecologically sustainable development” (“ESD”). This concept was defined in the *National Strategy for Ecologically Sustainable Development* as:¹⁷⁶

Using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

The question of what is meant by “the ecological processes on which life depends” and “the total quality of life” are considered further below.

One objective or many?

Some writers argue that sustainable development is not the over-arching objective of environmental law and environmental legal systems, but merely one of multiple objectives. For instance, Patricia Birnie and Alan Boyle suggest that:

... not all environmental questions necessarily involve sustainable development, or vice versa. We may wish to preserve Antarctica, or endangered species such as the great whales or the giant panda, for reasons that have little or nothing to do with sustainable development, or put another way, we may wish to preserve them *from* sustainable development.¹⁷⁷

To suggest that sustainable development is but one of multiple objectives of an environmental legal system is a fundamental misconception of the concept. Gerry Bates and Zada Lipman have rebutted such views in criticising domestic Australian legislation listing ESD / sustainable development as one of a number of objectives to be achieved, as follows:

... it is difficult to resist the criticism of the legislation that, by including ESD as one of a number of features to which regard should be had, it has missed the point that ESD is not a factor to be balanced against other considerations; ESD *is* the balance.¹⁷⁸

Sustainable development is the over-arching objective and paradigm of the international and national environmental legal systems, not merely a factor to be balanced against other considerations such as environmental protection and conservation. To use the example given by Birnie and Boyle, preservation of protected areas such as the Antarctic and endangered species such as the great whales or the giant panda, has everything to do with, and is an integral part of, sustainable development. Planning processes – the principal practical mechanism through which sustainable development is achieved – have everything to do with balancing competing uses such as exploitation and conservation.

Sustainable development does not imply that all parts of the environment are physically developed or exploited by humans. In fact, the opposite is true. Amongst other things, sustainable development involves reducing human impacts and repairing parts of the environment that have been used unsustainably in the past. For example, retrofitting a house with a solar hotwater system to reduce greenhouse gas emissions is an example of development to reduce human impacts. Other examples in fisheries management include

¹⁷⁶ Commonwealth of Australia, *National Strategy for Ecologically Sustainable Development* (AGPS, Canberra, 1992). Available at <http://www.environment.gov.au/esd/national/nsesd/> (viewed 19 Dec 2007).

¹⁷⁷ Birnie and Boyle, n 2, p 3.

¹⁷⁸ Bates G and Lipman Z, *Corporate Liability for Pollution* (LBC, Sydney, 1998), p 47.

excluding trawlers from protected areas and mandating the use of turtle excluder devices to reduce by-catch and mortality of turtles due to trawling.

Sustainable development must be considered on the scale of the ecosystem, which may be regional or global. Some parts of the ecosystem can be used while others conserved giving, together, sustainable development. More specifically, a threshold question and a balance are inherent in the concept of sustainable development.

A threshold question

Sustainable development involves two aspects: a threshold test and a balancing exercise. The threshold test is that “the ecological processes on which life depends” must be protected. The balancing exercise occurs in assessing whether development improves the “total quality of life”. Yet there is no definitive statement of the content of these concepts in the *National Strategy for ESD* or any related publication and, therefore, it is necessary to consider these concepts further.

In stating the legal principles for environmental protection and sustainable development, the Experts Group on Environmental Law of the World Commission on Environment and Development explained the related concept of “life-support systems” of the biosphere and stated that, “the most important of those life-support systems are agricultural systems, forests and coastal and fresh water systems.”¹⁷⁹ This focuses more on ecosystems than the processes in the statement in the Bruntland Report, quoted above, that “the natural systems that support life on Earth [are the] the atmosphere, the waters, the soils and the living resources.” More precise explanation of these concepts is found in the natural sciences, particularly the science of ecology.

Robert Ricklefs, an eminent ecologist, Zev Naveh and Robert Turner have provided a useful summary of the concepts involved in the conservation of ecological processes. They begin with the following definition and caution:¹⁸⁰

Ecological processes include all the physical processes and the plant and animal activities which influence the state of ecosystems and contribute to the maintenance of their integrity and genetic diversity, and thereby their evolutionary potential. The particular processes that make up the dynamics of an individual ecosystem are so numerous and their expressions so diverse that they defy simple characterization. They must be defined individually in each situation.

Reflecting Ricklefs, Naveh and Turner’s caution, the science of ecology is replete with analysis of life-support systems and essential ecological processes. A glance at any standard ecological or environmental science text¹⁸¹ reveals consideration of many systems and processes. Energy processes such as photosynthesis and food webs figure prominently as do material cycles such as the Carbon Cycle (incorporating both photosynthesis and respiration), the Nitrogen Cycle, the Phosphorus Cycle, the Sulphur Cycle and the Water/Hydrologic Cycle. In discussing biological systems, consideration must be given not just to places and things such as habitats and species, but to many

¹⁷⁹ Experts Group on Environmental Law of the WCED, *Environmental Protection and Sustainable Development* (Graham & Trotman, London, 1986), p 46.

¹⁸⁰ Ricklefs RE, Naveh Z and Turner RE, *Conservation of Ecological Processes: Commission on Ecology Papers Number 8* (IUCN, Gland, 1984), p 6.

¹⁸¹ For example, see Ricklefs R and Miller G, *Ecology* (4th ed, Freeman & Co, New York, 2000); and Cunningham and Saigo, n 55; Begon M, Townsend CR and Harper JL, *Ecology: From Individuals to Ecosystems* (4th ed, Blackwell Publishing, Malden MA, 2006).

processes, including reproduction, ecological succession, natural selection, adaptation, and evolution. There are also ecological processes that damage life such as bioaccumulation, biomagnification, eutrophication, salinization, deforestation, desertification, erosion of soils, land degradation, global warming, and extinction.

The following list provides a summary of the ecological processes on which life depends, as understood in this thesis.

The ecological processes on which life depends

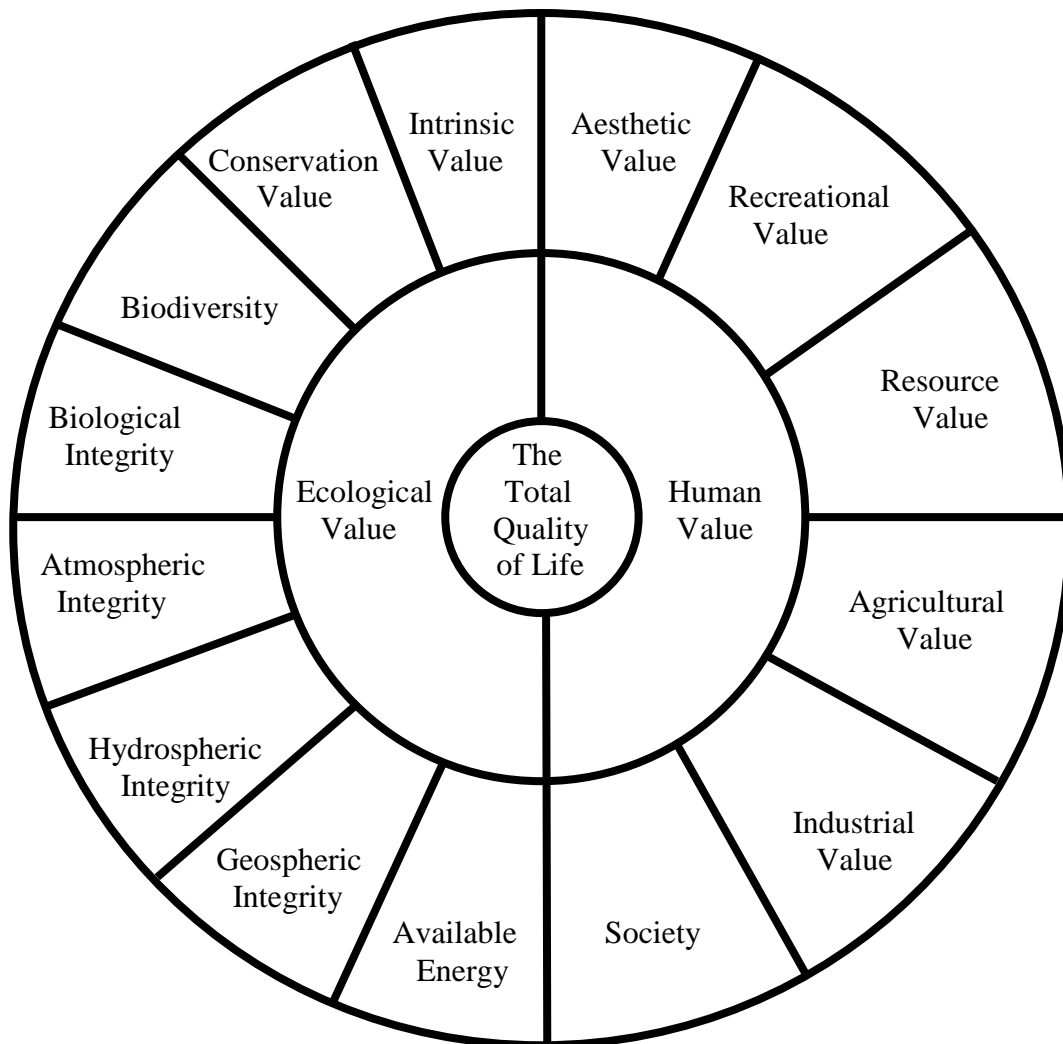
1. The Water Cycle (including biological components);
2. Atmospheric homeostasis processes:
 - (i) Photosynthesis (oxygen production) and respiration;
 - (ii) Removal of contaminants;
 - (iii) Climate control processes;
3. Photosynthesis (energy production) and energy flow;
4. Nutrient cycling, soil fertility and water nutrient processes;
5. Reproduction; and
6. Evolution.

The “ecological processes on which life depends” shown in the list above involve a threshold question for what constitutes “sustainable development”, but because the processes generally occur on regional and global scales it is a question that generally can only be resolved at a regional or global scale. If considered in isolation virtually any development will not cause a break-down in the “ecological processes on which life depends”. It is therefore largely meaningless to ask, for example, whether logging ten hectares of forest is sustainable development, without placing the development in a regional and global context. Similarly, where a development breaks a regional process, such as a dam construction that does not provide for ecological flows to maintain the Water Cycle and downstream communities, it is largely meaningless to consider the development in isolation of other regions or global impacts. Consideration of the regional and global context is generally essential to addressing whether a particular development is sustainable.

A question of balance

Following the threshold question, to constitute “sustainable development” a development must improve the “total quality of life”, which is a question of balance. What constitutes the “total quality of life” can be described in many ways but at the very least recognition must be given to a wide variety of qualities. In the traditional, Western view of the environment founded on Descartes’s *dualism*, human beings are separate from the environment and values associated with human society are similarly separate. At least for present purposes this separation is worth maintaining because it reflects a normal view of the world. Based on this fundamental separation and accepting that any attempt to list the “total qualities of life” is fraught with difficulty, the following diagram summarises the content of this concept that is accepted for the purposes of this thesis.

Figure 4: The “total quality of life”



The “ecological processes on which life depends” and the “total quality of life”, are understood in these terms in this thesis. Sustainable development therefore means more than simply development that can be continued indefinitely and it is more than balancing economic, social and environmental concerns (often termed, “the Triple Bottom Line”). There are thresholds of environmental protection that must be reached before development can be said to be sustainable, either individually or cumulatively with other development.

How then can progress towards sustainable development be evaluated? This is the question addressed in the following chapters. As a necessary preliminary step, however, the issue of how an environmental legal system is described must be addressed. This is the topic of the next chapter.

Principles of sustainable development

The difficulties of incorporating the consideration of sustainable development into day-to-day decision-making are obvious. How does one properly consider the protection of large-scale ecological processes and balance a range of values in, for example, deciding

whether to grant a development approval for a small amount of vegetation clearing or issuing a licence for the emission of some pollutant? One of the most practical ways in which this has been sought to be done is through the adoption of decision-making principles.¹⁸²

Several principles are commonly recognised as a basis for integrating the concept of sustainable development or ESD into day-to-day decision-making. In Australia, these principles were set out in the *National Strategy for ESD* and have been subsequently been adopted in numerous laws and policies.¹⁸³ One of the most significant statements of these principles is section 3A of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (“EPBC Act”):

3A Principles of ecologically sustainable development

The following principles are *principles of ecologically sustainable development*:

- (a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;
- (b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
- (c) the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
- (d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;
- (e) improved valuation, pricing and incentive mechanisms should be promoted.

These principles offer working tools for integrating sustainability into day-to-day decision-making within an environmental legal system. What exactly then is, “an environmental legal system” within which these principles operate? Said another way, how do we describe an environmental legal system?

METHODS FOR DESCRIBING AN ENVIRONMENTAL LEGAL SYSTEM

Overview

Four different approaches to describing environmental legal systems can be broadly identified for the purposes of the discussion here:

- Descriptive categories;
- Purposive categories;
- Functional categories; and
- An alternative to categories: structural hierarchy.

¹⁸² McDonald GT, “Planning as sustainable development” (1996) 15 *Journal of Planning Education and Research* 225 provided useful criteria and recommendations for integrating sustainable development into planning processes.

¹⁸³ These principles rarely receive judicial consideration but recent exceptions are *BGP Properties Pty Ltd v Lake Macquarie City Council* [2004] NSWLEC 399; (2004) 138 LGERA 237 at [82]-[114] per McClellan CJ (discussion of the principles of ESD in the context of refusing a development application for a 48 lot industrial subdivision because of impacts of traffic noise and impacts on a freshwater wetland and the threatened species); *Bentley v BGP Properties Pty Ltd* [2006] NSWLEC 34 at [58]-[62] per Preston CJ (discussion of ESD in imposing a fine of \$40,000 for illegal clearing of a threatened plant species); and *Telstra Corporation Ltd v Hornsby Shire Council* [2006] NSWLEC 133 at [107]-[208] per Preston CJ (discussion of the precautionary principle in allowing construction of a telephone tower in a residential area).

The first three of these approaches use different categories to describe the parts or elements that, collectively, form an environmental legal system. The fourth approach avoids the use of categories and describes environmental legal systems simply around the structural hierarchy that is inherent in the systems themselves.

All methods for describing environmental legal systems reflect the structural hierarchy that is inherent in the different scales and levels of governance in the systems. International law, national laws, regional laws and local laws operate at increasingly smaller scales. Within the inherent structural hierarchy of environmental legal systems, virtually all of the methods of describing these systems use some sort of descriptive category to identify different parts of the systems. These categories describe the activity or purpose with which the law was concerned, for example, “pollution law”.

Descriptive categories such as “pollution law”

The traditional and still most common method of describing and explaining an environmental legal system is to discuss the system in descriptive categories or fields. These categories use common, descriptive terms to identify:

- a particular human activity or an impact on the environment that is regulated (for example: pollution; mining; farming; forestry; energy; greenhouse gas emissions; hazardous waste disposal; contaminated land; international trade; nature conservation);
- a particular part of the environment of concern (for example: natural resources; fisheries; water; biodiversity; threatened species; cultural heritage);
- a particular mechanism through which the system operates (for example: town planning; development control; environmental impact assessment; enforcement).

For ease of reference here, these can all be labelled “the descriptive categories approach”, although this is not a label that other authors have used.

There are many variations of this approach. For example, Gerry Bates has structured each of the six editions of his text, *Environmental Law in Australia*, around these traditional categories.¹⁸⁴ The parts and chapter headings of the 6th edition of this text illustrate the terminology and approach used:

- Part 1: Fundamental Concepts in Environmental Law
 - Chapter 1: The growth of environmental law
 - Chapter 2: The development of environmental law and policy
 - Chapter 3: Federal Government and environment protection
 - Chapter 4: Environmental legislation: purpose, structure and content
 - Chapter 5: Ecologically Sustainable Development
- Part 2: Resolving Environmental Disputes
 - Chapter 6: Standing
 - Chapter 7: Civil Remedies
 - Chapter 8: Challenging environmental decision-making
 - Chapter 9: Criminal enforcement
- Part 3: Environmental planning and assessment
 - Chapter 10: Strategic environmental planning
 - Chapter 11: Environmental assessment of projects and activities

¹⁸⁴ Bates, n 2. Other examples abound, for instance, see Fisher, n 4; McGrath C, “Laws affecting the environment”, Ch 24 in Trevino J (ed), *The Queensland Law Handbook* (9th ed, Caxton Legal Centre, Brisbane, 2007).

- Chapter 12: Environmental impact assessment
- Part 4: Pollution control
 - Chapter 13: Managing pollution and waste
- Part 5: Protection of Biodiversity
 - Chapter 14: Managing biodiversity: habitats and species

There are also many examples of specialty texts and journal articles from Australia and around the world dealing with discrete parts of environmental legal systems using traditional, descriptive categories. Good examples where the title of the text illustrates the traditional, environmental field covered are Douglas Fisher's, *Natural Resources Law in Australia*¹⁸⁵ and *Water Law*,¹⁸⁶ as well as Zada Lipman and Gerry Bates', *Pollution Law in Australia*.¹⁸⁷ Similarly, Ben Boer and Graeme Wiffen, in their recent text, *Heritage Law in Australia*, consider both natural and cultural heritage protection in Australia at international, national, State and Territory, and indigenous levels.¹⁸⁸ Michael White considers *Australasian Marine Pollution Laws*.¹⁸⁹ Tim Bonyhady and Peter Christoff use a descriptive category of "climate law" for the emerging legal response to climate change and greenhouse gas regulation.¹⁹⁰ United Kingdom and European texts such as Stuart Bell and Donald McGillivray's *Environmental Law* considers sectoral coverage in topics such as "town and country planning", "waste management", "air pollution and air quality", "contaminated land", and "conservation of nature".¹⁹¹ United States' texts such as Steven Ferrey's *Environmental Law* adopt a similar approach.¹⁹² Ferry's chapter headings explain the descriptive categories used to describe and explain the United States' environmental legal system:

- Chapter 1: Environmental ethics, standards, markets and the common law
- Chapter 2: Administrative procedure for environmental regulation
- Chapter 3: The National Environmental Policy Act
- Chapter 4: Constitutional issues: The commerce clause and environmental preemption
- Chapter 5: Air quality regulation
- Chapter 6: Water pollution
- Chapter 7: Rights to use water
- Chapter 8: The management of hazardous and solid wastes: RCRA
- Chapter 9: The Superfund: Hazardous substance remediation
- Chapter 10: Local environmental controls
- Chapter 11: Preservation of natural areas: wetlands and open space
- Chapter 12: Energy and the environment
- Chapter 13: The Endangered Species Act
- Chapter 14: TSCA and FIFRA: Regulating chemical manufacture and distribution
- Chapter 15: International environmental law

¹⁸⁵ Fisher D, *Natural Resources Law in Australia* (The Law Book Co, Sydney, 1987).

¹⁸⁶ Fisher D, *Water Law* (LBC Information Services, Sydney, 2000).

¹⁸⁷ Other specialty texts which illustrate this approach in their titles include: England P, *Integrated Planning in Queensland* (2nd ed, The Federation Press, Leichhardt, 2004); Fogg, Meurling and Hodgetts, n 45; Thomas I and Elliot M, *Environmental Impact Assessment in Australia: Theory and Practice* (4th ed, Federation Press, Leichhardt, NSW, 2005).

¹⁸⁸ Boer B and Wiffen G, *Heritage Law in Australia* (Oxford University Press, Melbourne, 2006).

¹⁸⁹ White M, *Australasian Marine Pollution Laws* (The Federation Press, Sydney, 2007).

¹⁹⁰ Bonyhady T and Christoff P (eds), *Climate Law in Australia* (The Federation Press, Sydney, 2007).

¹⁹¹ Bell and McGillivray, n 2, Part III (Sectoral Coverage).

¹⁹² Ferrey, n 2.

The same approach is widely used at an international level. For example, the structure of Birnie and Boyle's text, *International Law & the Environment*, is clear from their chapter headings:¹⁹³

1. International Law and the Environment
2. International Governance and the Formulation of Environmental Law & Policy
3. The Structure of International Law I: Rights and Obligations of States
4. The Structure of International Law II: Regulation, Compliance, Enforcement and Dispute Settlement
5. The Structure of International Law III: Environmental Rights and Crimes
6. Environmental Protection and the Sustainable Use of International Watercourses
7. The Law of the Sea and the Protection of the Marine Environment
8. The International Control of Hazardous Waste
9. Nuclear Energy and the Environment
10. Protecting the Atmosphere and Outer Space
11. Conservation of Nature, Ecosystems, and Biodiversity: Principles & Problems
12. Conservation of Migratory and Land-Based Species and Biodiversity
13. Conservation of Marine Living Resources and Biodiversity
14. International Trade and Environmental Protection

Similarly, Alexandre Kiss and Dinah Shelton use traditional categories such as "soil", "fresh waters", "marine environment" and "atmosphere" in their text, *International Environmental Law*.¹⁹⁴ However, these authors also attempt to integrate their analysis by considering the "Regulation of Trans-sectoral Problems". A similar approach is taken by Sands in his text, *Principles of International Environmental Law*, and by Hunter, Salzman and Zaelke in their text, *International Environmental Law and Policy*.¹⁹⁵

The traditional approach is still widely used and clearly has a number of advantages, such as the fact that it uses widely known and understood terms to describe the categories that it adopts. While there is considerable variation in the use of terms between authors and in different jurisdictions, there is at least a basic level of common understanding if, for instance, an author says that they are considering, "pollution laws". There are also advantages where a common terminology is applied to specific mechanisms and tools within an environmental legal system, such as "environmental impact assessment". While the approaches taken for such mechanisms vary widely, the use of a common terminology to identify these mechanisms can greatly assist understanding and explaining the system.

The problems with descriptive categories such as "pollution"

The main problem with the descriptive categories approach is that many modern environmental laws and modern environmental problems do not fit into neat categories. Modern environmental laws have increasingly reflected the inter-relatedness of the environment by creating rights and duties that are general in nature and thereby apply to all activities and impacts. The traditional categories or any simple categorisation is, therefore, apt to mislead our thinking about the law.

¹⁹³ Birnie and Boyle, n 2.

¹⁹⁴ Kiss A and Shelton D, *International Environmental Law* (3rd ed, Transnational Publishers, New York, 2004).

¹⁹⁵ Sands, n 2, and Hunter, Salzman and Zaelke, n 2.

The EPBC Act provides a good example of how modern environmental laws do not fit the traditional, descriptive categories and defy any simple categorisation. Section 12 of the Act is sufficient for present purposes.¹⁹⁶ It provides:

12 Requirement for approval of activities with a significant impact on a declared World Heritage property

- (1) A person must not take an action that:
- (a) has or will have a significant impact on the world heritage values of a declared World Heritage property; or
 - (b) is likely to have a significant impact on the world heritage values of a declared World Heritage property.

Section 12 of the EPBC Act may be breached in any of a multitude of ways. It may be breached by the release of a contaminant into a World Heritage property: that is, traditional “pollution”. It might be breached by building a dam to supply water for cotton growing: what might be called traditional “water law”.¹⁹⁷ It may be breached by clearing of vegetation and ploughing in preparation for a wheat crop: that is, traditional “farming” or agricultural land use.¹⁹⁸ It may be breached by electrocuting flying foxes to protect a fruit crop on private land outside a World Heritage property: that is, traditional “nature conservation”.¹⁹⁹

The fact that the use of traditional categories such as “pollution” is apt to mislead our thinking about an environmental legal system is illustrated by the practice of the Queensland Environmental Protection Agency (“EPA”) in administering the *Environmental Protection Act* 1994 (Qld) (“EP Act”). This Act replaced earlier traditional, pollution control legislation, the *Clean Air Act* 1963 (Qld) and the *Clean Waters Act* 1971 (Qld). Although the EP Act does not use the term “pollution” but the wider term “environmental harm”, the EPA continues to administer the Act with the limited focus on pollution control and noxious industry. Even though a local government has successfully used the Act to regulate vegetation clearing,²⁰⁰ in practice the EPA does not use the Act beyond the scope of pollution control legislation. This is an example of modern, integrated environmental legislation being administered narrowly within traditional categories.

Many modern environmental problems also do not fit within discrete traditional categories. For example, the emission of greenhouse gases contributing to global warming can be caused by burning of fossil fuels in anything from a power station to a private vehicle as well as by land clearing. The impacts of global warming are equally all-pervasive and affect human health, amenity, biodiversity, raising surface and sea temperatures and atmospheric stability. These issues cannot be simply categorised using a traditional approach without including virtually every law and human activity.

A related problem for describing an environmental legal system using descriptive categories is repetition. Because many modern environmental laws do not fit neatly within discrete categories, a description of an environmental legal system using such categories must repeat references to individual laws in multiple categories. Unless this is done the description will be incomplete or misleading. Such descriptions tend to become repetitive.

¹⁹⁶ See generally, McGrath C, “Key concepts of the EPBC Act” (2005) 22 EPLJ 20.

¹⁹⁷ See *Minister for the Environment & Heritage v Queensland Conservation Council* (2004) 139 FCR 24, where the downstream impacts of a dam through indirect impacts of farm chemicals pollution waters flowing to the Great Barrier Reef World Heritage Area were in issue.

¹⁹⁸ See *Minister for the Environment & Heritage v Greentree (No 2)* (2004) 138 FCR 198.

¹⁹⁹ See *Booth v Bosworth* (2001) 114 FCR 39; McGrath C, “The Flying Fox Case” (2001) 18 EPLJ 540.

²⁰⁰ *Maroochy Shire Council v Barnes* [2001] QPELR 475; [2002] QPELR 6.

The lines between different categories are also blurred by this repetition and cross-referencing, thereby eroding the utility of the categorisation itself.

Yet despite these problems, the descriptive categories approach is still a useful method for providing simple explanations of an environmental legal system, particularly for lay-people. Lawyers and professionals working or researching in the field, however, require a more integrated knowledge and understanding.

Purposive categories

A variation of the traditional, descriptive categories approach for describing an environmental legal system is to use categories defined by the purpose of the laws. Douglas Fisher has sought to develop a theoretical description and analysis of environmental legal systems based upon different purposes or objectives of the law. The chapter headings of his 2003 text, *Australian Environmental Law*,²⁰¹ show many of the traditional categories being used but Chapters 7-9 introduce a more systematic approach to defining categories based on the purpose of the law:

- Chapter 1: The nature of environmental law
- Chapter 2: The ethical dilemmas of environmental law
- Chapter 3: The international framework for environmental law
- Chapter 4: The constitutional foundations of environmental law
- Chapter 5: The fundamental directions of environmental law
- Chapter 6: The instruments of environmental law
- Chapter 7: The objective of resource development
- Chapter 8: The objective of environmental protection
- Chapter 9: The objective of environmental conservation
- Chapter 10: Ecologically sustainable development
- Chapter 11: Environmental planning
- Chapter 12: Enforcement

Fisher's approach is still based on the structural hierarchy imposed by international and national legal systems and still uses categories to describe different parts of the system, but he varies the traditional descriptive categories by focusing on the purposes of the laws. A theoretical framework is constructed around the objectives of resource development, environmental protection and environmental conservation in Chapters 7-9. In this analysis, "resource development" focuses on the use and development of the resources of the environment. One example of such legislation is the *Mineral Resources Act* 1989 (Qld). "Environmental protection" laws regulate activities (such as pollution) that harm the environment. An example of such legislation is the *Environmental Protection Act* 1994 (Qld). "Environmental conservation" laws protect things (such as threatened species and protected areas) for their intrinsic values. An example of such legislation is the *Nature Conservation Act* 1992 (Qld).

This ambitious approach seeks to establish a theoretical framework for an environmental legal system; however, the distinctions between the categories encounter similar problems as the traditional descriptive categories approach as modern environmental laws do not fit neatly within them. The distinction between protection and conservation is very blurry indeed. Modern laws defy these categories and do not distinguish the words consistently. For example, Chapter 2 (Protecting the environment) of the EPBC Act regulates actions that have, will have or are likely to have a significant

²⁰¹ Fisher, n 2.

impact on matters of national environmental significance. This is the “environmental protection” part of the Act but the main focus is on protecting identified things which in Fisher’s analysis should come within “environmental conservation”.

The purposive approach is a useful conceptual analysis but, ultimately, it suffers from the difficulty of neatly categorising modern environmental laws. An alternative method is to look at the broad functions within environmental legal systems.

Functional categories

Another variation of the traditional, descriptive categories approach for describing environmental legal systems is to use categories defined by the functions of the different parts of the systems. A “functional categories approach”, therefore, defines categories within an environmental legal system based on the functions or roles that are performed by different parts of the system. Only two functional approaches will be considered here.

Grinlington’s IRM approach

David Grinlington described an environmental legal system in three functional levels: normative, strategic and operational.²⁰² His purpose in proposing this approach was to develop a model for integrated resource management and he recognised that there is considerable overlap between these levels. His main concern in proposing this approach was integrated and coherent policy development but in doing so a side-effect was that he described environmental legal systems in a functional way. It is this side-effect that is the interest in his approach here.

According to Grinlington’s approach, the normative level concerns the consideration of the value premises and priorities underlying resource management systems and decision-making processes; the definition of desired goals and ideals; and the setting of higher level objectives and policies for natural resource use and management.²⁰³ He gave as examples of such normative objective setting and implementation “the assimilation of international resource management ‘grundnorms’ such as ‘sustainable development’ into national legislation.”²⁰⁴

Grinlington defined the strategic or “tactical” level of resource management as the detailed analysis and evaluation of alternative goals and objectives, and the selection and design of means to achieve these desired goals and objectives. Strategic implementation includes the provision of legal and administrative frameworks, plans, and management structures capable of implementing those structures.²⁰⁵ “Macro-planning” is important at this level.

Grinlington defined the operational level of an integrated resource management system as concerned with “the nuts and bolts of implementing normative and strategic policies, objectives and plans.”²⁰⁶ This includes the allocation of specific responsibility for various elements of resource management; the implementation of detailed planning, permit and consent structures; and enforcement.

²⁰² Grinlington D, “Integrated Resource Management – A model for the future” (1992) 9 EPLJ 4.

²⁰³ Grinlington, n 202, p 5.

²⁰⁴ Grinlington, n 202, p 5.

²⁰⁵ Grinlington, n 202, p 8.

²⁰⁶ Grinlington, n 202, p 11.

Grinlinton's approach has not been widely adopted but it does provide an example of a functional approach for describing environmental legal systems.

Planning and management functions

A second functional approach for describing an environmental legal system is to distinguish between the two major functions of laws and policies in an environmental legal system: planning and management.²⁰⁷ In this context "planning" means all of the laws, regulations, policies and administrative practices that determine what goes where and resource allocation. It also includes such things as population controls (if any), controls on consumption, and the listing of threatened species. In this context, "management" means how something is done, such as generating electricity from solar power to avoid greenhouse gas emissions.

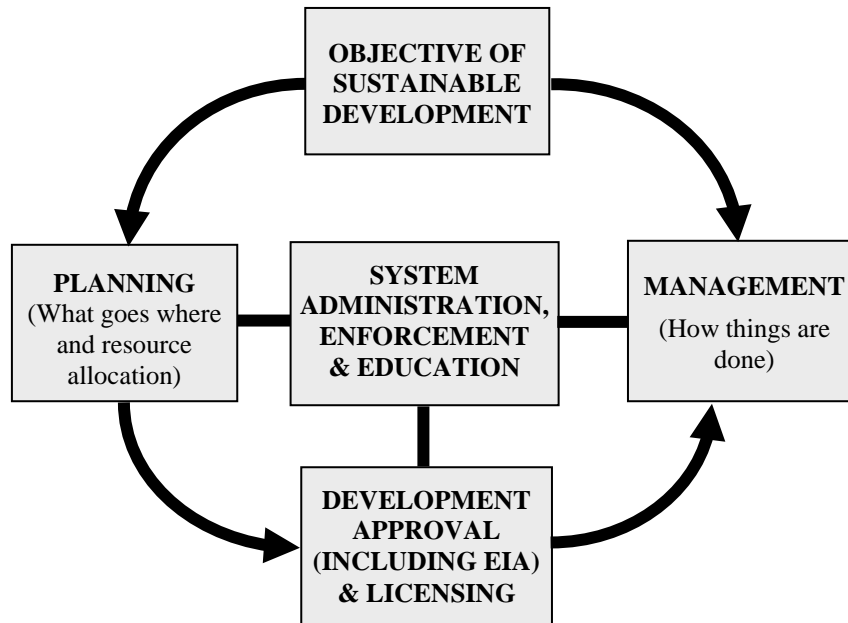
The two function limbs of an environmental legal system are normally intertwined within the system in development assessment, environmental impact assessment ("EIA"),²⁰⁸ and licensing mechanisms. For example, a government approval for a marina may attach conditions on the marina's construction and operation such as a condition controlling sewage disposal. The decision to approve the marina is, functionally, a *planning decision* while the decision to attach conditions are *management decisions* yet both are normally contained in a single decision and document (the government approval or licence). A second example is a decision to grant a commercial fishing licence. The licence might be limited to a particular species or area and attach conditions such as the use of by-catch reduction devices to limit the amount of non-target species that are killed by the fishing. The decision to grant the fishing licence is, functionally, a *planning decision* while the decision to attach a condition that a by-catch reduction device is used is a *management decision*. These planning and management decisions are typically contained within a single document – the fishing licence.

All of the functional parts of an environmental legal system – planning, management, development approval and licensing – are joined by administration, enforcement and education of the system. These are a further functional part of an environmental legal system. The following diagram shows the inter-relationship between these functional parts.

²⁰⁷ This reflects the difference between leadership and management: "Management is doing things right; leadership is doing the right things" notes Covey, n 20, p 101 quoting Peter Drucker and Warren Bennis.

²⁰⁸ Environmental impact assessment is widely used within environmental legal systems to assess the likely impacts of proposed developments and the ways of mitigating those impacts. See generally, Raff M, "Ten Principles of Quality in Environmental Impact Assessment" (1997) 14 EPLJ 207; Petts J (ed), *Handbook of Environmental Impact Assessment* (Blackwell Science, London, 1999); and Thomas and Elliot, n 187.

Figure 5: Functional structure of an environmental legal system



While this functional method of describing an environmental legal system holds some attractions at a theoretical level, its limitations are obvious. The terms “planning” and “management” are widely used in different contexts and likely to cause confusion when used strictly in this functional sense. The distinction between planning and management is also likely to confuse people working within and studying environmental legal systems because most approval processes combine the two functions in one process, one decision and one document. This approach also suffers from the same problem as other approaches for describing an environmental legal system based on categories: that modern environmental laws defy any neat categorisation.

An alternative to categories: The structural hierarchy / jigsaw approach

Because of the difficulties of categorising modern environmental laws, a method for describing an environmental legal system that does not rely on categorising the laws may be the best method for describing it in certain circumstances. Structure is still needed, however, or the description will end in confusion.

A universal way to initially structure a description of an environmental legal system is the various levels of governance that regulate the system: the structural hierarchy of the system. All environmental legal systems have at least two levels of governance: international and national. However, normally there are more levels, such as regional, provincial and local governments (for instance in New Zealand). Countries with federal systems of government, such as Australia and the United States, also have state levels. Regional groups, such as the European Union, can provide an additional level of regulation between national and international levels.

Within the various levels it will normally be useful to first explain the constitutional or other constraints on the laws at that level so that their possible scope and basis can be understood. For example, international law can be explained by reference to the nature of

international treaties and customary international law. National and state laws of federations such as Australia and the United States can be explained by reference to a national constitution. In Common Law countries legislation over-rides the Common Law, therefore any Common Law rules protecting the environment can form the final or bottom layer of the description of the system. This will be unnecessary in Civil Law countries where no similar body of judge-made law exists. Other systems, such as Islamic law countries and China, can adopt variations on these approaches as appropriate.

Once the constitutional basis of the laws is explained, to avoid categories but to provide a logical structure, laws might be listed alphabetically and briefly explained in that order. This allows readers/students to move through the explanation in a logical order but without placing the various laws in “boxes” or categories to which they do not properly fit. The relevant government regulator for the law can be mentioned at this point also so as to assist the reader/student to understand who is responsible for administering the law.

This approach, which is simply a method for orderly description of any environmental legal system, treats an environmental legal system like a jigsaw within a structural hierarchy by placing all of the “pieces” of the system before the reader/student for them to “build up the picture” of the total system. An appropriate label for this method to describing the law is “the structural hierarchy approach”, “the components approach” or, more colloquially, “the jigsaw approach”. Its advantage to the traditional descriptive category approach is that it avoids artificial and illusory categories. Its disadvantage is that a reader/student may find it easier to understand and learn if laws are placed into tangible and commonly understood categories such as “pollution”. This approach might, therefore, not be preferable for teaching lay-people (such as farmers) about an environmental legal system; however, for more advanced students and professionals working in the field of environmental law, this method is likely to be the most useful for problem solving within the system.

The next chapter provides a case study of using the structural hierarchy / jigsaw approach to describe an environmental legal system.

Chapter 4

A case study of describing the Queensland environmental legal system

This chapter provides a case study of describing an environmental legal system using the structural hierarchy or jigsaw method explained in the previous chapter.²⁰⁹ The structure of this chapter makes it difficult to read from beginning to end because within the major layers of the structural hierarchy the individual parts of the system are described more as a “patchwork quilt” than in a logical, flowing analysis. Readers need not labour too long on the details of this chapter, and may simply read any parts that are of particular interest rather than trying to read the whole chapter comprehensively. The main point to understand is that the chapter is describing the main parts of an environmental legal system in its entirety, while acknowledging that there are no precise boundaries to this system and it is a functional body of law. The main lesson to take from this chapter is that an environmental legal system is a complex patchwork of many different laws that are administered by many different government bodies. The detail of the individual laws described here is not necessary to understand before moving to later chapters.

GENERAL CONCEPTS

The “Queensland environmental legal system” is the system of laws and administrative structures that regulate the impact of humans on the natural environment and quality of life in the State of Queensland.²¹⁰ It is a subset of the Australian legal system and inherently linked to the international legal system.

Queensland is one State in a constitutional monarchy in which the legislative power is divided between the Commonwealth (i.e. Australian or Federal), six States, and two mainland Territory governments in a written constitution. Hundreds of local governments have also been created under State and Territory legislation. Unlike some jurisdictions, such as India, there is no constitutional protection of the environment or Bill of Rights in Australia.²¹¹

The central concept or paradigm through which the environmental legal system in Australia is now operating is ESD, which was described and explained in the previous chapter. The concept of ESD in Australia is drawn from the concept of “sustainable development” in international law and policy.

A second central concept of the environmental legal system in Australia is “Cooperative Federalism”. This means that, at least in theory, within the federal system of government in Australia all levels of government will work together to achieve desired outcomes. In the context of the environment, the seminal statement of this policy is the

²⁰⁹ An expanded version of this chapter has been published as McGrath C, *Synopsis of the Queensland Environmental Legal System* (4th ed, Environmental Law Publishing, Brisbane, 2006). Available at <http://www.envlaw.com.au/sqels4.pdf> (viewed 30 June 2006). Note that the research for the 1st – 4th editions of this book was undertaken as part of the research for this thesis.

²¹⁰ See generally Fisher, n 2; Bates, n 2.

²¹¹ See Fisher, n 2, Ch 4; and Hayward T, *Constitutional Environmental Rights* (Oxford University Press, Oxford, 2005).

*Intergovernmental Agreement on the Environment*²¹² and the outcome sought to be achieved is ESD. The idea of Cooperative Federalism is, of course, aspirational and in the real world different levels of government do not cooperate all of the time.

Consistent with the principle of Cooperative Federalism, the environmental legal system in Queensland is administered by Commonwealth and State Government departments as well as local governments. Government departments administering specific pieces of legislation are listed in the text below. State and Federal courts also perform a vital judicial role.

As a very broad summary, the environmental legal system in Queensland requires all people (including corporations and governments) conducting activities that affect the Queensland environment to do three things:

- Obtain and comply with any necessary licence or government approval.²¹³
- Comply with any relevant standard imposed by the law, including taking all reasonable and practicable measures to prevent or minimise environmental harm (the general environmental duty).
- If unlawful material or serious environmental harm occurs or may occur, notify the Environmental Protection Agency.²¹⁴

Within this framework of basic concepts, institutions and obligations it is possible to analyse the Queensland environmental legal system. As a subset of the Australian legal system it also has four distinct layers: international law; Commonwealth law; Queensland law; and the Common Law. “Queensland law” is taken here to include planning schemes and local laws made by local governments. Each of these levels will be analysed in turn.

INTERNATIONAL LAW

International law is the law between nations. That is to say, its content is the rules that are recognised as forming binding rights and obligations between nations.²¹⁵ Australia’s international legal obligations are enforceable only by other nations and are not enforceable by members of the public unless incorporated into domestic law.

The fundamental basis or justification for international law rests on sovereignty and comity. Sovereignty is the independence of a state, that is, freedom from external interference in the conduct of a state’s affairs. A “state” or “statehood” in international terms means a recognised and effective system of government exercising control of a defined territory and permanent population with the ability to enter into international relations.²¹⁶ Comity means the mutual respect and recognition of national interests, laws and customs by states.

²¹² Council of Australian Governments, *Intergovernmental Agreement on the Environment* (AGPS, Canberra, 1992). Available at <http://www.deh.gov.au/esd/national/igae/> (viewed 5 July 2006).

²¹³ See generally the Queensland *SmartLicence* website at <http://www.sd.qld.gov.au/dsdweb/htdocs/slol> (viewed 5 July 2006).

²¹⁴ See section 320 of the *Environmental Protection Act* 1994 (Qld).

²¹⁵ See generally Triggs G, *International Law: Contemporary Principles and Practices* (LexisNexis, Sydney, 2006).

²¹⁶ In international law the term, “state” is used as a synonym for “nation”. It is important not to confuse the use of this term as referring to the States and Territories of the Australian federal system of government. The Commonwealth is the only level of government in Australia recognised in the international arena.

However, there is a constant tension between the sovereignty of individual nations and international obligations. Recognition of the “Realpolitik” of international law, that national self-interest is paramount and that enforcement is difficult against recalcitrant nations, is central to understanding and operating within the international legal system. On this basis it is clear that international law, including the rapidly developing area of international environmental law,²¹⁷ is an advanced study in legal and political debate.

Fisher suggests that there have been four recognisable stages in the ongoing development of international environmental obligations to the present position where the obligations of states to protect the environment are becoming in practice more important than the rights of states to independence within their territory (that is, sovereignty):²¹⁸

1. Permissive Stage: No restrictions on states based upon the doctrine of the permanent sovereignty of states over their natural resources and their environment;
2. Restrictions on activities outside the territory of states harming the marine environment (eg. ocean dumping of wastes);
3. Restrictions on activities within states which have a detrimental environmental effect beyond their boundaries (eg. ozone depleting substances);
4. Restrictions on activities within states which have a detrimental environmental effect within their boundaries (eg. the protection of World Heritage).

These might alternatively be referred to as “themes” as there is considerable overlap and no clear transition between them. What is clear is the general trend toward imposing stronger obligations on states and thereby restricting the doctrine of absolute state sovereignty.

In relation to the sources of international law giving rise to these obligations, Article 38 of the *Statute of the International Court of Justice* recognises four sources of international law²¹⁹ of which the two principal sources are custom (the general practice of nations based on a belief of being legally bound) and treaties / conventions (formal agreements between nations).

Customary international law, while limited in terms of the environment, does impose important environmental obligations such as the *Trail Smelter* principle imposing liability for cross-border pollution.²²⁰ The extensive recognition of, and action on, environmental issues by nations over the past three decades and in the future will cause customary international law to continue to develop.

However, by far the greater source of international legal obligations is treaty law. The areas of international environmental law within which Australia has treaty obligations include World Heritage protection, biodiversity conservation, atmospheric protection, marine pollution, uranium use and Antarctica.²²¹ The following are the major environmental treaties relevant to Queensland.

²¹⁷ See Birnie and Boyle, n 2; Sands, n 2; and the environmental law database at <http://www.ecolex.org/> (viewed 5 July 2006).

²¹⁸ Fisher D, “The Impacts of International Law Upon the Australian Environmental Legal System” (1999) 16 EPLJ 372 at pp 373-374.

²¹⁹ Article 38 provides that the Court is to apply: (a) international conventions; (b) international custom, as evidence of general practise accepted as law; (c) the general principles of law recognised by civilised nations and; (d) judicial decisions and the teaching of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law.

²²⁰ *United States of America v Canada* (1941) 9 Annual Digest and Reports of Public International Law Cases 315 (“the Trail Smelter arbitration”).

²²¹ See generally <http://www.austlii.edu.au/dfat/> (viewed 5 July 2006).

Biodiversity Convention 1992

The *Convention on Biological Diversity* 1992 (“the Biodiversity Convention”)²²² imposes extremely wide and important obligations on Australia. Article 8 imposes a general obligation on Australia to conserve biodiversity in both terrestrial and marine ecosystems:

Article 8

In-situ conservation

Each Contracting Party shall, as far as possible and as appropriate:

- (a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity; ...
- (c) Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas with a view to ensuring their conservation and sustainable use;
- (d) Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings;
- (e) Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas; ...
- (k) Develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations; ...

The Biodiversity *Convention* is administered by a secretariat located in Montreal, Canada.²²³

CITES 1973

As its name suggests, the *Convention on the International Trade in Endangered Species* 1973 (“CITES”)²²⁴ provides a framework for controlling international trade in endangered species. It accords varying degrees of protection to more than 30,000 species of animals and plants, whether they are traded as live specimens, fur coats or dried herbs. It is administered by a secretariat within the United Nations Environment Program (“UNEP”) located at Geneva, Switzerland.²²⁵

International Whaling Convention 1946

The *International Convention for the Regulation of Whaling* 1946 (“ICRW” or “International Whaling Convention”)²²⁶ provides a loose framework for the regulation of whaling. A moratorium on all commercial whaling was declared in 1982. Japan continues to conduct whaling for “scientific purposes”, part of which is conducted in Australia’s Antarctic waters.²²⁷ The Convention is administered by the International Whaling Commission.²²⁸

²²² Entry in to force generally 29 December 1993. ATS 1993 No 32.

²²³ See <http://www.biodiv.org/> (viewed 5 July 2006).

²²⁴ Entry into force 27 November 1976. ATS 1976 No 29.

²²⁵ See the CITES website at <http://www.cites.org/> (viewed 5 July 2006).

²²⁶ Entry into force 10 November 1948. ATS 1948 No 18.

²²⁷ See McGrath C, “The Japanese Whaling Case” (2005) 22 EPLJ 250.

²²⁸ See the IWC website at <http://www.iwcoffice.org/> (viewed 5 July 2006).

MARPOL 73/78

The *International Convention for the Prevention of Pollution from Ships* 1973, as modified by the Protocol of 1978 (“MARPOL 73/78”)²²⁹ is the main international convention regulating pollution of the marine environment by ships from operational or accidental causes. It is administered by the International Maritime Organisation.²³⁰

A related treaty is the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* 1972 and 1996 Protocol (“London Convention”) which limits the discharge of wastes that are generated on land and disposed of at sea. The London Convention is also administered by the International Maritime Organisation.²³¹

Ramsar Convention 1971

The *Convention on Wetlands of International Importance especially as Waterfowl Habitat* 1971²³² provides an international framework for the protection of wetlands. It was signed in the Iranian city of Ramsar in 1971 and is commonly referred to as “the Ramsar Convention.” It provides for listing of wetlands, particularly large wetlands of critical importance for migratory birds. There are 64 Ramsar wetlands in Australia and 5 in Queensland, including Moreton Bay adjacent to Brisbane.²³³ The Convention is administered by a secretariat located in Gland, Switzerland.²³⁴

UNCLOS 1982

The *United Nations Convention on the Law of the Sea* 1982 (“UNCLOS”)²³⁵ provides a major framework controlling shipping and the use of resources in the world’s oceans. It places important obligations on Australia to protect the marine environment, such as:

Article 192

States have the obligation to protect the marine environment.

Article 194

States shall take ... all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable measures at their disposal ...

UNCLOS established a major reform of maritime jurisdictions. Jurisdictional limits over the sea are measured from a standard reference point known as the “baseline”. This is generally the lowest astronomical tide or a straight line drawn across bays. Under UNCLOS the principal territorial limits extend, depending on the subject matter in question, to territorial waters (12 nautical miles from the baseline), the exclusive economic zone (200 nautical miles from the baseline) and the continental shelf. Outside of these limits, what are known as “the high seas” or international waters, ships and people are generally regulated by the country in which they are registered or their nationality.

The UNCLOS secretariat is part of the United Nations.²³⁶

²²⁹ ATS 1988 No 29; 1990 No 34; 1995 No 4. Entry into force for Australia completed 1 July 1992.

²³⁰ See IMO website <http://www.imo.org> (viewed 5 July 2006) and White, n 189.

²³¹ See <http://www.londonconvention.org/> (viewed 5 July 2006).

²³² Entry into force 21 December 1975. ATS 1975 No 48.

²³³ See generally <http://www.deh.gov.au/water/wetlands/> (viewed 5 July 2006).

²³⁴ See the Secretariat website at <http://www.ramsar.org> (viewed 5 July 2006).

²³⁵ Entry into force generally 16 November 1994. ATS 1994 No 31.

UN Framework Convention on Climate Change 1992

As its name suggests, the *United Nations Framework Convention on Climate Change* 1992 (“UNFCCC”)²³⁷ provides an international framework for regulating human-induced climate change / global warming. As a contracting party, Australia is obliged to take climate change into account in its decision-making and cooperate in avoiding dangerous climate change. The objective of the Convention, stated in Article 2, is:

to achieve ... stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

After a decade of debate Australia recently ratified the *Kyoto Protocol to the United Nations Framework Convention on Climate Change* 1997 (“the Kyoto Protocol”).²³⁸ The Kyoto Protocol sets binding targets for developed countries and establishes a framework for an international trading scheme for greenhouse gas emissions. Australia is required to limit its emissions to 108% of 1990 levels during 2008-2012. The contracting parties are currently negotiating their commitments after 2012.²³⁹

Vienna Convention for the Protection of the Ozone Layer 1985

The *Vienna Convention for the Protection of the Ozone Layer* 1985²⁴⁰ is a major international treaty for reducing and eliminating ozone-depleting substances such as chlorofluoro-carbons (CFCs). The *Montreal Protocol on Substances that Deplete the Ozone Layer* 1987²⁴¹ was negotiated under the convention and stipulates that the production and consumption of specified ozone-depleting substances are to be phased out by 2000-2005.

The loss of ozone and the “hole in the ozone layer” are often confused with climate change. Ozone is an atmospheric gas that is critical in reducing ultra-violet light reaching the Earth. Anthropogenic climate change involves the build-up of greenhouse gases such as carbon dioxide in the atmosphere from human activities causing increased surface temperatures and other changes to the Earth’s climate. Some greenhouse gases are also ozone-depleting substances but the phenomena are different.

The Vienna Convention and Montreal Protocol are administered by the Ozone Secretariat in Nairobi, Kenya.²⁴²

World Heritage Convention 1972

The *Convention concerning the Protection of the World Cultural and Natural Heritage* 1972 (“World Heritage Convention”)²⁴³ is a pillar of the international

²³⁶ See <http://www.un.org/Depts/los/index.htm> (viewed 5 July 2006).

²³⁷ Entry into force generally 21 March 1994. ATS 1994 No 2. For a detailed review of the negotiation and implementation of the UNFCCC, see Doelle, n 89.

²³⁸ Done at Kyoto on 11 December 1997. Signed for Australia at New York, 24 April 1998. Entry into force generally on 16 February 2005. Not yet in force for Australia. Reported in [2005] ATNIF 1.

²³⁹ See <http://unfccc.int/> (viewed 20 December 2007).

²⁴⁰ Entry into force 22 September 1988. ATS 1988 No 26.

²⁴¹ Entry into force 1 January 1989. ATS 1989 No 18.

²⁴² See <http://www.unep.org/ozone/index.asp> (viewed 5 July 2006).

environmental legal system. It is concerned with the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity. A World Heritage List is established under the Convention. Australia currently has 16 World Heritage sites including the Great Barrier Reef.²⁴⁴ The Convention is administered by the United Nations Educational, Scientific and Cultural Organization.²⁴⁵

Relationship between international law and Australian domestic law

The existence of international legal obligations to protect the environment has important constitutional ramifications for the Australian federal system of government where the legislative competence is divided between the Commonwealth (or Federal) and State/Territory governments. A series of High Court decisions, most prominently in the Tasmanian Dam Case, established the existence of international legal obligations for Australia provides the Commonwealth Government with the constitutional competence under section 51(xxix) (External Affairs) of the *Constitution of the Commonwealth of Australia* (“*Commonwealth Constitution*”) to enact legislation that is reasonably capable of being considered appropriate and adapted to implementing those obligations.²⁴⁶ Within the Australian federal system of government international obligations may be met by the combined efforts of both levels of government.

International law may also be relevant in interpreting Australian domestic law. Where a statute or subordinate legislation is ambiguous, the courts should favour that construction which accords with Australia’s obligations under a treaty or international convention.²⁴⁷ This is limited to treaties to which Australia is a party, at least in those cases in which the legislation is enacted after, or in contemplation of, entry into, or ratification of, the relevant international instrument.²⁴⁸

International considerations may also impact upon the Australian legal system through international debate and policy documents (sometimes called “soft-law”) forming the basis for government policy. International policy documents and debate such as the Bruntland Report in 1987²⁴⁹ and *Agenda 21*²⁵⁰ in 1992 contributed significantly to the massive expansion of environmental law in Australia in the 1990s. This period led to a major expansion of environmental law in Queensland through enactment of legislation such as the *Environmental Protection Act 1994* (Qld) and entrenched sustainable

²⁴³ Entry into force 17 December 1975. ATS 1975 No 47.

²⁴⁴ See <http://www.deh.gov.au/heritage/worldheritage/> (viewed 5 July 2006).

²⁴⁵ See <http://whc.unesco.org> (viewed 5 July 2006).

²⁴⁶ *R v Burgess; Ex parte Henry* (1936) 55 CLR 608; *Koowarta v Bjelke-Peterson* (1982) 153 CLR 168; *The Commonwealth v Tasmania* (1983) 158 CLR 1 (the Tasmanian Dam Case); *Richardson v Forestry Commission* (1988) 164 CLR 261; *Queensland v Commonwealth* (1989) 167 CLR 232 (the Wet Tropics Case); *Victoria v Commonwealth* (1996) 187 CLR 416 (the Industrial Relations Act Case) at 487-488.

²⁴⁷ *Chu Kheng Lim v Minister for Immigration* (1992) 176 CLR 1 at 38; *Minister for Immigration and Ethnic Affairs v Teoh* (1995) 183 CLR 273 at 287. See also section 15AB(2)(d) of the *Acts Interpretation Act 1901* (Cth).

²⁴⁸ In *Minister of State for Immigration and Ethnic Affairs v Teoh* (1995) 183 CLR 273 a majority of the High Court held that a convention ratified by Australia, but not incorporated into Australian municipal law, could, absent statutory or executive indications to the contrary, found a legitimate expectation that administrative decision-makers would act in conformity with it. However, this doctrine has been rejected by Federal and State Governments.

²⁴⁹ World Commission on Environment and Development, n 74.

²⁵⁰ See <http://www.un.org/esa/sustdev/documents/agenda21/> (viewed 5 July 2006).

development as the overarching objective of the environmental legal system. The objective of sustainable development, in a variety of forms, is now the stated objective of modern environmental laws in Australia. International concern and debate about climate change is currently driving a new round of law-making and policy-development in Australia.

The protection of matters recognised as being of international importance may also be a weighty consideration in decision-making under Australian domestic laws. Places included on the World Heritage list receive the highest level of protection under Australian domestic laws. The protection of the Franklin River in Tasmania is the most prominent example of the special protection afforded to World Heritage properties.²⁵¹ International considerations now infuse a wide range of judicial and administrative decisions under Australian domestic laws. For example, *Booth v Bosworth* (2001) 114 FCR 39 (the Flying Fox Case) a conservationist sought an injunction under the *Environment Protection and Biodiversity Conservation Act* 1999 (Cth) to restrain the mass killing of flying-foxes by fruit farmers using an electric grid in North Queensland. The killing occurred on private property but the flying-foxes came from the nearby Wet Tropics World Heritage Area and were an integral part of the ecology of that area. The farmers claimed they would suffer financial hardship if an injunction were granted to restrain the operation of the electric grid. Branson J found that the operation of the grids was having a significant impact on the world heritage values of the Wet Tropics World Heritage Area and granted the injunction. Her Honour found in relation to the financial hardship argument raised by the farmers:²⁵²

In weighing the factors which support an exercise of the Court's discretion in favour of the grant of an injunction under subs 475(2) of the Act against those factors which tell against the grant of such an injunction, it seems to me that it would be a rare case in which a Court could be satisfied that the financial interests of private individuals, or even the interests of a local community, should prevail over interests recognised by the international community and the Parliament of Australia as being of international importance.

In summary, international law impacts upon the Queensland environmental legal system in five main ways. First, it places legal obligations on Australia to protect the environment. Second, it creates legislative power for the Commonwealth Government to fulfil Australia's international legal obligations. Third, it can assist in the interpretation of ambiguity in domestic legislation. Fourth, international debate and policy documents may form the basis for domestic policies. Fifth, international considerations may be a weighty consideration in decision-making under Australian domestic laws.

The next layer in the Queensland environmental legal system to consider is Commonwealth law.

COMMONWEALTH LAW

Commonwealth law is the legislation enacted and administered by the Australian Government.²⁵³ The central piece of Commonwealth environmental law is the EPBC Act. The Commonwealth also plays a particularly important role in customs and export controls for international trade in endangered species as well as for fisheries, ozone and greenhouse issues. The Great Barrier Reef Marine Park Authority ("GBRMPA") is also a

²⁵¹ See *The Commonwealth v Tasmania* (1983) 158 CLR 1 (the Tasmanian Dam Case).

²⁵² *Booth v Bosworth* (2001) 114 FCR 39 (the Flying Fox Case) at 67-68 [115]. See McGrath, n 199.

²⁵³ Available at <http://www.comlaw.gov.au/> (viewed 5 July 2006).

Commonwealth agency and is responsible for the protection and management of the GBR under the *Great Barrier Reef Marine Park Act 1975* (Cth). The limits of the Commonwealth Government's law making power are set out in the *Commonwealth Constitution*.

Commonwealth Constitution

While there is little reference to “the environment” or “natural resources” in the *Commonwealth Constitution*, interpretation of it by the High Court of Australia has led to recognition that the Commonwealth has extensive legislative powers with respect to the environment. The primary rule of Australian constitutional law is that, to be valid, Commonwealth legislation must be based on a head of legislative power contained in the *Commonwealth Constitution*.²⁵⁴ Section 51 of the *Commonwealth Constitution* is the principal statement of these heads of power. James Crawford summarised other basic rules for determining Commonwealth legislative powers as follows:²⁵⁵

1. Subject to certain exceptions, the heads of power in section 51 of the Constitution are to be interpreted separately and disjunctively, without any particular attempt being made to avoid overlap between them.
2. The powers conferred by section 51 are to be construed liberally in accordance with their terms, and without any assumption that particular matters were intended to be excluded from federal authority or “reserved” to the States.
3. There is no requirement that Commonwealth legislation be exclusively about one of the granted heads of power. The purpose of the law and its practical effect are irrelevant provided its legal operation is with respect to a head of power.

It was noted above that section 51(xxix) (External Affairs) provides an important link between international law and Australian domestic law by providing the Commonwealth with legislative power to enact laws that are reasonably capable of being considered appropriate and adapted to fulfil Australia's international legal obligations. This is a very wide head of legislative power for the Commonwealth given the enormous width of the Australia's international legal obligations. The obligations imposed by Article 8 of the *Biodiversity Convention*, in particular, provide the Commonwealth with a very wide scope for enacting laws to address environmental issues. Similarly, the obligations under the UNFCCC and the Kyoto Protocol to avoid dangerous climate change provide an enormous scope for Commonwealth legislation to regulate activities generating greenhouse gases either directly or indirectly. This covers virtually every aspect of economic and social activity from coal mining to energy efficient lighting standards.

In addition, section 51(xxix) also allows the Commonwealth to regulate places physically external to Australia, such as the marine environment seaward of the low water mark.²⁵⁶ However, in 1979 the Commonwealth gave proprietary rights and legislative jurisdiction to the States and Northern Territory for coastal waters (3 nautical miles from the low water mark) under the “Offshore Constitutional Settlement”.²⁵⁷ Subsequent

²⁵⁴ *Amalgamated Society of Engineers v Adelaide Steamship* (1920) 28 CLR 129 (the Engineers' Case).

²⁵⁵ Crawford J, “The Constitution and the Environment” (1991) 13 *Sydney Law Review* 11 at pp 14-16.

²⁵⁶ *New South Wales v Commonwealth* (1975) 135 CLR 337 (the Seas and Submerged Lands Act Case).

²⁵⁷ *Coastal Waters (State Powers) Act 1980* (Cth); *Coastal Waters (State Title) Act 1980* (Cth). See generally section 3 *Offshore Minerals Act 1998* (Qld); Fowler R, “Environmental Law and Its Administration in Australia” (1984) 1 *EPLJ* 10 at 13. This arrangement was upheld in *Port MacDonnell Professional Fishermen's Association Inc v South Australia* (1989) 88 ALR 12.

cooperative arrangements also provide for State fisheries legislation to extend beyond coastal waters as summarised in a table at the end of this chapter (Figure 7).

The following Commonwealth laws are based on these constitutional constraints.

Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) provides for the protection of significant Aboriginal areas and objects, as declared under the Act by the Minister, an authorised officer or inspector. The Act is administered by the Australian Government Department of the Environment, Water, Heritage and the Arts (“DEWHA”).²⁵⁸

Airports Act 1996 (Cth)

The *Airports Act 1996* (Cth) regulates major airports located on Commonwealth land. In Queensland these are Brisbane, Coolangatta, Archerfield, Townsville and Mt Isa airports. At these airports the *Airports (Environment Protection) Regulations 1997* (Cth) regulate noise pollution and impose a general environmental duty on operators to take all reasonable and practicable measures to prevent pollution, adverse impacts to ecosystems and cultural heritage and to prevent offensive noise. For other airports, development approval and environmental management is regulated under Queensland legislation. The Act is administered by the Airports Division of the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government.²⁵⁹

Australian Heritage Council Act 2003 (Cth)

The *Australian Heritage Council Act 2003* (Cth) established the Australian Heritage Council after the repeal of the earlier *Australian Heritage Commission Act 1975* (Cth). The new Act integrates national heritage assessment into the EPBC Act. The Register of the National Estate is established under section 21. The Act is administered by DEWHA.

Energy Efficiency Opportunities Act 2006 (Cth)

The *Energy Efficiency Opportunities Act 2006* (Cth) requires large energy using businesses to undertake and report publicly an assessment of their energy efficiency opportunities. The threshold for reporting is use of more than 0.5 petajoules in a financial year. One of the objects of the Act is to reduce greenhouse emissions. It is administered by the Department of Resources, Energy and Tourism.²⁶⁰

Environment Protection and Biodiversity Conservation Act 1999 (Cth)

The EPBC Act is the centrepiece of Commonwealth environmental laws.²⁶¹ Broadly speaking, it regulates impacts on matters of national environmental significance and impacts on the environment involving the Commonwealth or Commonwealth land. It also

²⁵⁸ See DEWHA homepage at <http://www.environment.gov.au/> (viewed 20 December 2007).

²⁵⁹ See DITRD LG homepage at <http://www.infrastructure.gov.au/> (viewed 20 December 2007).

²⁶⁰ See <http://www.energyefficiencyopportunities.gov.au/> (viewed 18 December 2007).

²⁶¹ See EPBC Act website at <http://www.environment.gov.au/epbc> (viewed 2 March 2007); and McGrath, n 196.

regulates killing or interfering with listed marine species and cetaceans (e.g. whales); and international trade in wildlife.

The current list of *matters of national environmental significance* is:

- The world heritage values of a declared World Heritage property;
- The National Heritage values of a declared National Heritage place;
- The ecological character of a declared Ramsar wetland;
- Listed threatened species and ecological communities;
- Listed migratory species;
- Nuclear actions; and
- Commonwealth marine areas.

By far the most important regulatory mechanism created by the Act is the approval system for actions with a significant impact on matters of national environmental significance. Together with actions by the Commonwealth or involving Commonwealth land with a significant impact on the environment, these are termed “controlled actions”.

The process of assessing and approving a controlled action under the Act potentially involves 3 stages: referral, assessment and approval. At the first stage a person (or a State or Federal government body) refers a proposed action to the Federal Environment Minister for determination whether the proposal involves a controlled action. If the proposed action is determined to involve a controlled action it is then assessed in accordance with the EPBC Act before the final stage where the Minister determines whether or not the action should proceed and any conditions that should apply.

A crucial term for the application of the EPBC Act is “action” which can be summarised to mean a physical activity or series of physical activities not being a government decision or grant of funding. Sections 43A and 43B exempt, from the operation of the EPBC Act, actions that were existing lawful uses or fully approved under State and Commonwealth laws at the commencement of the Act on 16 July 2000.

Justice Branson held the threshold test of “significant impact” to mean an impact that is important, notable or of consequence having regard to its context or intensity in the *Flying Fox Case*.²⁶² In that case the Federal Court granted an injunction to restrain the mass electrocution of flying foxes on a fruit farm adjacent to the Wet Tropics World Heritage Area. In the *Greentree Case*,²⁶³ Sackville J followed the definition of significant impact used by Branson J but noted that, “in the end, however, it is a question of fact as to whether any particular action or actions has had or will have a significant impact.” On appeal the Full Court implicitly confirmed this approach and held that a significant impact can occur to a site that is already degraded and is not natural or pristine.²⁶⁴

A wide approach must be taken when assessing the scope of impacts of actions under the EPBC Act.²⁶⁵ All likely impacts must be considered, including direct and indirect impacts. Impacts of an action may include the impacts of acts done by persons other than the proponent of the proposed action (third party impacts) and activities that are not proposed as part of the action. Impacts of an action include each consequence that is

²⁶² *Booth v Bosworth* (2001) 114 FCR 39. See McGrath C, “Casenote: Booth v Bosworth” (2001) 18 EPLJ 23; McGrath, n 199.

²⁶³ *Minister for Environment & Heritage v Greentree (No 2)* (2004) 138 FCR 198 at 244, [191]-[201].

²⁶⁴ *Greentree v Minister for the Environment and Heritage* [2005] FCAFC 128 at [45]-[50].

²⁶⁵ See *Minister for the Environment and Heritage v Queensland Conservation Council Inc* (2004) 139 FCR 24 at [53]-[57].

reasonably within the contemplation of the proponent, whether those consequences are within the control of the proponent or not. The width of the enquiry in each case will depend on the facts and on what may be inferred from the description of the “action” which the Minister is required to consider.

In addition to the wide jurisdiction and strong regulatory mechanisms, another important legal aspect of the EPBC Act is the very strong deliberative obligation created by the Act and the *Environment Protection and Biodiversity Conservation Regulations* 2000 (Cth) for environmental impact assessment (“EIA”) and approval of controlled actions.²⁶⁶ The Act and Regulations impose minimum standards of information as well as offences for providing false or misleading information during the assessment process.²⁶⁷ Australia’s international legal obligations, such as to protect World Heritage, are principal considerations when deciding whether to approve a proposed action.

Bilateral agreements are important variations to the normal assessment or approval stages of the EPBC Act. These are a relatively novel arrangement allowing State and Territory assessment and approval processes to be accredited to fulfil similar processes under the EPBC Act, thereby avoiding duplication. There are two types: *assessment bilaterals* in which State EIA processes are accredited but the Commonwealth makes the final decision; and *approval bilaterals* in which both assessment and approval are devolved to the State. An assessment bilateral has been signed for Queensland involving EIA processes in the *State Development and Public Works Organisation Act* 1971 (Qld) for “significant projects”, the *Environmental Protection Act* 1994 (Qld) for mining, and the *Integrated Planning Act* 1994 (Qld) for other assessable development.²⁶⁸

The EPBC Act also contains a wide range of mechanisms for protecting biodiversity, for example by establishing an Australian Whale Sanctuary in the Australian exclusive economic zone.²⁶⁹ However, generally these are limited to Commonwealth areas or attach no penalty for non-compliance, which limits their practical importance and effect. Exceptions to this general rule include international trade in wildlife and the protection of heritage places listed on the National Heritage List.

The administrative provisions of the EPBC Act in Chapter 6 contain widened standing for public interest litigants, executive officer liability and offences for providing false or misleading information under the Act. The Act is administered by DEWHA.

Environment Protection (Sea Dumping) Act 1981 (Cth)

The *Environment Protection (Sea Dumping) Act* 1981 (Cth) prohibits the dumping or incineration at sea of radioactive material, wastes and other material without a permit. Section 15 provides a defence for dumping conducted to save human life or a vessel in distress. The Act was made pursuant to the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* 1972 (the London Convention).²⁷⁰ The

²⁶⁶ See McGrath C, “Applying the EPBC Act: A case study of the Naturelink Cableway” (2001/2002) 7 (33) QEPR 123.

²⁶⁷ See *Mees v Roads Corporation* (2003) 128 FCR 418.

²⁶⁸ See McGrath C, “The Queensland Assessment Bilateral Agreement under the EPBC Act” (2002/2003) 8 (38) QEPR 145.

²⁶⁹ See Chapter 5 of the EPBC Act.

²⁷⁰ ATS 1985 No 16. Entry into force for Australia 20 September 2000.

Act applies to all Australian waters including the coastal waters of the States and Northern Territory. The Act is administered by the Australian Maritime Safety Authority.²⁷¹

Fisheries Management Act 1991 (Cth)

The *Fisheries Management Act* 1991 (Cth) operates together with the *Fisheries Act* 1994 (Qld) to regulate fisheries within the Australian fishing zone (other than in Torres Strait) under complex arrangements made following the Offshore Constitutional Settlement. A table at the end of this chapter (Figure 7) summarises legislative and administrative arrangements for Queensland fisheries planning and management. The legislation is administered by the Australian Fisheries Management Authority.²⁷²

Gene Technology Act 2000 (Cth)

The *Gene Technology Act* 2000 (Cth) provides a framework for regulating research, production and release of genetically modified organisms and genetically modified crops and products. The *Gene Technology Act* 2001 (Qld) provides complimentary State legislation. The Act is administered by the Office of the Gene Technology Regulator.²⁷³

Great Barrier Reef Marine Park Act 1975 (Cth)

The *Great Barrier Reef Marine Park Act* 1975 (Cth) establishes a framework for the protection and management of the Great Barrier Reef (“GBR”) Marine Park. The *Great Barrier Reef Marine Park Regulations* 1975 (Cth) establish a zoning plan for the GBR based on the concept of multiple-use management. In 2004, fully protected areas in the GBR were increased from 4% to 33%. The Act and Regulations also provide a range of specific management tools such as plans of management and compulsory pilotage areas for shipping. The *Great Barrier Reef Marine Park (Aquaculture) Regulations* 2000 (Cth) prescribe a licensing system to regulate aquaculture discharges into the GBR. The Act and Regulations are administered by the GBRMPA,²⁷⁴ although day-to-day management is conducted largely in conjunction with the Queensland Parks and Wildlife Service.

Hazardous Waste (Regulation of Exports and Imports) Act 1989 (Cth)

The *Hazardous Waste (Regulation of Exports and Imports) Act* 1989 (Cth) regulates the export and import of hazardous waste from or into Australia. Hazardous waste is defined with reference to a schedule of categories and characteristics of hazardous waste and includes, for example, wastes containing arsenic, mercury or lead at sufficient concentrations to be acutely poisonous or chronically toxic (including carcinogenic). The Act implements the *Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal*²⁷⁵ and is administered by DEWHA.

²⁷¹ See AMSA homepage <http://www.amsa.gov.au/> (viewed 5 July 2006).

²⁷² See AFMA homepage <http://www.afma.gov.au/> (viewed 5 July 2006).

²⁷³ See OGTR at <http://www.health.gov.au/ogtr/> (viewed 5 July 2006).

²⁷⁴ See GBRMPA at <http://www.gbrmpa.gov.au/> (viewed 5 July 2006).

²⁷⁵ ATS 1992 No 7. In force generally 5 May 1992.

Historic Shipwrecks Act 1976 (Cth)

The *Historic Shipwrecks Act* 1976 (Cth) provides a regime for protecting historic shipwrecks and relics that are at least 75 years old in Australian waters. The regime is based upon a declaration being made by the Commonwealth Environment Minister and prohibits access to declared areas or sites and the removal of relics without authority under the Act. There are 18 declared historic shipwrecks and 5 protected zones from 200 located shipwrecks in waters adjacent to Queensland, such as the *SS Yongala* located 50km off Townsville. The Act is administered by DEWHA.

National Environment Protection Council Act 1994 (Cth)

The *National Environment Protection Council Act* 1994 (Cth) forms the Commonwealth's part of reciprocal legislation with all States and Territories to establish the National Environment Protection Council which now operates under the umbrella of the Environment Protection and Heritage Council. National Environment Protection Measures set national objectives for protecting or managing particular aspects of the environment. There are currently six NEPMs: Ambient Air Quality, Assessment of Site Contamination, Diesel Vehicle Emissions, Movement of Controlled Wastes Between States and Territories, National Pollutant Inventory and Used Packaging Materials. The Act is administered by DEWHA.²⁷⁶

National Greenhouse and Energy Reporting Act 2007 (Cth)

The *National Greenhouse and Energy Reporting Act* 2007 (Cth) recently established a single, national system for reporting large greenhouse gas emissions, abatement actions, and energy consumption and production by corporations from 1 July 2008.²⁷⁷ It was intended as a preliminary step towards a national greenhouse gas emissions trading scheme proposed by the previous Australian Government. The future of the Act is uncertain following the election of a new federal government in November 2007 on the basis of a much stronger greenhouse policy platform. It is likely to be superseded in the near future by new legislation.

In its current form the Act provides thresholds for reporting to be phased in over three years for companies to greenhouse gas emissions or use of energy. Companies with emissions or energy use greater than the thresholds are obliged to be registered and report their emissions and energy use. The details of the reporting system have yet to be determined. It is administered by the Department of Climate Change.

Native Title Act 1993 (Cth)

The *Native Title Act* 1993 (Cth) is the Commonwealth Government's legislative response to the recognition of native title by the Common Law in *Mabo v Queensland (No 2)* (1992) 175 CLR 1. Broadly the Act does three things: it validates past acts of governments that affected native title; it provides statutory recognition of native title and a system for registering native title rights; and it establishes a Future Acts Regime to allow native title to be incorporated into government decision-making. The National Native Title

²⁷⁶ See EPHC at <http://www.ephc.gov.au/> (viewed 5 July 2006).

²⁷⁷ See <http://www.greenhouse.gov.au/reporting/index.html> (viewed 20 December 2007).

Tribunal administers the native title register;²⁷⁸ however, determinations of native title interests are made by the Federal Court.

Natural Heritage Trust of Australia Act 1997 (Cth)

The *Natural Heritage Trust of Australia Act 1997* (Cth) provides a framework for the establishment and administration of the Natural Heritage Trust (“NHT”), which is a large fund of federal money administered to provide for environmental protection and conservation at local, regional, State and national levels. The Act is administered by DEWHA.²⁷⁹

In conjunction with NHT, a *National Action Plan for Salinity and Water Quality* (“NAP”) provides a federal program for improved land and water management. Under the NAP, Natural Resource Management (“NRM”) plans are being developed to attempt to provide a framework of regional planning across Australia. The NAP is administered by DEWHA in conjunction with State and Territory Governments.²⁸⁰

Offshore Minerals Act 1994 (Cth)

The *Offshore Minerals Act 1994* (Cth) provides a framework for the regulation of mining of the seabed within Australian waters but excluding State and Northern Territory coastal waters. The Act adopts a traditional exploration and licensing regime. It is administered by the Department of Resources, Energy and Tourism.²⁸¹

Ozone Protection Act 1989 (Cth)

The *Ozone Protection Act 1989* (Cth) provides a system of licences and staged quotas to control the manufacture, use, import, export, recycling and disposal of ozone depleting substances such as chlorofluorocarbons (“CFCs”). The Act implements the *Vienna Convention for the Protection of the Ozone Layer*²⁸² and *Montreal Protocol on Substances that Deplete the Ozone Layer*.²⁸³ The Act is administered by the Department of Climate Change.²⁸⁴

Petroleum (Submerged Lands) Act 1967 (Cth)

The *Petroleum (Submerged Lands) Act 1967* (Cth) establishes a framework for the regulation of petroleum extraction in Australian waters through a traditional system of exploration permits and licensing. Section 9 of the Act allows State legislation to replace the operation of the Act within State coastal waters. The Act is administered by the Australian Government Department of Resources, Energy and Tourism.²⁸⁵

²⁷⁸ See NNTT homepage at <http://www.nntt.gov.au/> (viewed 5 July 2006).

²⁷⁹ See <http://www.nht.gov.au/index.html> (viewed 5 July 2006).

²⁸⁰ See <http://www.napsqwq.gov.au/index.html> (viewed 5 July 2006).

²⁸¹ See DRET homepage at <http://www.industry.gov.au> (viewed 18 December 2007).

²⁸² ATS 1988 No 26. In force generally 22 Sept 1988.

²⁸³ ATS 1989 No 18. In force generally 1 January 1989.

²⁸⁴ See <http://www.climatechange.gov.au/> (viewed 20 December 2007).

²⁸⁵ See <http://www.industry.gov.au/> (viewed 20 December 2007).

Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cth)

The *Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cth)* prohibits the discharge of oil, noxious substances, packaged harmful substances, sewage and garbage from ships (including aircraft) into the ocean. The Act implements MARPOL 73/78.²⁸⁶ The Act allows State and Northern Territory legislation to be accredited for coastal waters. In Queensland the relevant legislation is the *Transport Operations (Marine Pollution) Act 1995 (Qld)*. The Commonwealth Act is administered by the Australian Maritime Safety Authority.²⁸⁷

Quarantine Act 1908 (Cth)

The *Quarantine Act 1908 (Cth)* provides a framework to regulate the entry of infectious diseases and exotic plants and animals into Australia. Ballast water from ships, an important source of marine pests, is regulated under the *Quarantine Regulations 2000 (Cth)*. The Act is administered by the Australian Quarantine and Inspection Service, part of the Australian Government Department of Agriculture, Fisheries and Forestry.²⁸⁸

Renewable Energy (Electricity) Act 2000 (Cth)

The *Renewable Energy (Electricity) Act 2000 (Cth)* aims to reduce greenhouse gas emissions by encouraging electricity providers to source a small percentage of their energy from renewable sources. A tax penalty is imposed for failing to achieve this target by the *Renewable Energy (Electricity) (Charge) Act 2000 (Cth)*. The Act is administered by the Department of Climate Change.

Sea Installations Act 1987 (Cth)

The *Sea Installations Act 1987 (Cth)* provides a regulatory regime for the construction, operation and de-commissioning of offshore installations in Australian waters outside of State coastal waters. The Act applies to any man-made structure, including ships, attached to the sea-bed, in the case of Australian vessels, for 14 days or greater and for foreign vessels, for 30 days or greater, used for any environment related activity including tourism, recreation or fishing. However the Act does not apply to structures used for exploring for or exploiting natural mineral resources (including petroleum). The Act is administered by DEWHA.

Torres Strait Fisheries Act 1984 (Cth)

The *Torres Strait Fisheries Act 1984 (Cth)* and the *Torres Strait Fisheries Act 1984 (Qld)* regulate fishing within the Australian section of the Torres Strait Protected Zone, which is located north of Cape York between Australia and Papua New Guinea. The Acts are based upon the *Treaty Between Australia and the Independent State of Papua New Guinea Concerning Sovereignty and Maritime Boundaries in the Area Between the Two Countries, Including the Area Known as Torres Strait, and Related Matters*.²⁸⁹ The regime

²⁸⁶ ATS 1988 No 29; 1990 No 34; 1995 No 4. Entry into force for Australia completed 1 July 1992.

²⁸⁷ See AMSA homepage at <http://www.amsa.gov.au/> (viewed 20 December 2007) and White, n 189.

²⁸⁸ See AFFA homepage at <http://www.daff.gov.au/> (viewed 20 December 2007).

²⁸⁹ ATS 1985 No 4.

is administered jointly by the Australian Fisheries Management Authority and the Queensland Department of Primary Industries (Fisheries).²⁹⁰ The complex situation for fisheries jurisdiction is summarised in a table at the end of this chapter.

QUEENSLAND LAW

Queensland law is the legislation and/or subordinate legislation enacted and administered by the Queensland Government and local governments.²⁹¹ The 125 local governments in Queensland perform a central role in the environmental legal system by preparing and administering planning schemes to control land development within their local government areas. While a number of courts exercise jurisdiction under Queensland law, the Planning and Environment Court has a central role in hearing planning appeals.

Constitution Act 1867 (Qld)

The *Constitution Act 1867* (Qld) provides the basis for the Queensland Parliament to make laws, including laws regulating human impacts on the environment. Section 2 provides power for the Parliament “to make laws for the peace welfare and good government of the [State] in all cases whatsoever.” This is a plenary law-making power, subject only to the constraints of the Commonwealth Constitution.²⁹² Sections 30 and 40 of the Act provide the Parliament with power to make laws regulating the sale, letting, disposal, occupation and management of land in Queensland. The Executive Government, the Crown, may only sell, lease or otherwise dispose of land and other property of the State in accordance with a law of the Parliament.²⁹³ The *Constitution of Queensland Act 2001* (Qld) consolidates the constitution of the State, but the origin of the power to do this is based on the 1867 Act. The *Constitutional Powers (State Waters) Act 1980* (Qld) provides additional powers of the State over coastal waters. This legislation reflects the Offshore Constitutional Settlement in 1979, referred to above.

The Queensland Government (the Executive Government or “the Crown”), is now generally required to comply with laws protecting the environment. Historically the Crown was not bound by legislation unless expressly stated to be or by necessary implication.²⁹⁴ This principle was known as “Crown immunity”.

Aboriginal Cultural Heritage Act 2003 (Qld)

The *Aboriginal Cultural Heritage Act 2003* (Qld) and the *Torres Strait Islander Cultural Heritage Act 2003* (Qld) provide a framework for the protection of aboriginal and Torres Strait Islander cultural heritage. The *Queensland Heritage Act 1992* (Qld) protects non-indigenous heritage. The main mechanism through which each Act operates is a list of places and artefacts of heritage significance. The Acts are administered by the Cultural

²⁹⁰ See AFMA homepage at <http://www.afma.gov.au/> (viewed 20 December 2007).

²⁹¹ Queensland legislation is available on the internet at <http://www.legislation.qld.gov.au/OQPChome.htm> (viewed 20 December 2007).

²⁹² For example, section 109 of the *Commonwealth Constitution* provides that when a law of a State is inconsistent with a law of the Commonwealth, the latter shall prevail, and the former shall, to the extent of the inconsistency, be invalid.

²⁹³ *O’Keef v Williams* (1907) 5 CLR 217 at 225; *Cudgen Rutile (No 2) Ltd v Chalk* [1975] AC 520 at 533.

²⁹⁴ *Bropho v Western Australia* (1990) 171 CLR 1.

Heritage Coordination Unit of the Department of Natural Resources and Water (“NRW”).²⁹⁵

Biodiscovery Act 2003 (Qld)

The *Biodiscovery Act* 2003 (Qld) provides a framework for licensing and payment of royalties for the investigation of biological resources of Queensland. Permits issued under the Act over-ride the *Nature Conservation Act* 1992 (Qld) and allow investigation in National Parks. The Department of State Development administers the Act.

Biological Control Act 1987 (Qld)

The *Biological Control Act* 1987 (Qld) regulates the testing and release of biological agents to control pest infestations in Queensland. The most infamous failure of a biological control agent in Queensland history was the release of the cane toad. This species was released in the 1960s to control cane beetles in northern Queensland. The toad’s voracious appetite, poisonous skin glands and massive reproductive ability have caused a catastrophe for Queensland wildlife. The toads have now spread into the Kakadu National Park and World Heritage Area of the Northern Territory. The Act is administered by the Department of Primary Industries & Fisheries (“DPI&F”).

Coastal Protection and Management Act 1995 (Qld)

The *Coastal Protection and Management Act* 1995 (Qld) provides for the development of State and regional planning and integrated approval processes in relation to coast development. The *State Coastal Management Plan – Queensland’s Coastal Policy*, prepared under the Act, provides a Statewide vision, principles and policies for coastal development. Regional Coastal Management Plans (“RCMPs”) have been and are being developed to provide regional planning for coastal development. The Cardwell-Hinchinbrook RCMP will be discussed in more detail later in this thesis, when discussing the response to pressures on the GBR. The Act also provides for the regulation of dredging, quarrying, canal construction, tidal works and other activities in the coastal zone, in particular in coastal management districts and erosion prone areas. The EPA administers the Act and intends to have RCMPs in place for the whole east coast of Queensland by 2010.²⁹⁶

Electricity Act 1994 (Qld)

The *Electricity Act* 1994 (Qld) regulates the generation, transmission and supply of electricity in Queensland. Power generation in Queensland is overwhelmingly provided by coal-fired power stations. These are a major source of greenhouse gas emissions contributing to climate change. Under a series of policies, the *Queensland Energy Policy: A Cleaner Energy Policy* 2000, *Queensland Greenhouse Policy Framework: A Climate of Change* 2001, and *Queensland Greenhouse Strategy* 2004, and *ClimateSmart 2050* policy 2007, the use of gas, renewable energy (wind, solar and biomass), and energy efficiency

²⁹⁵ See http://www.nrm.gov.au/cultural_heritage (viewed 5 July 2006).

²⁹⁶ See http://www.epa.qld.gov.au/environmental_management/coast_and_oceans/coastal_management/ (viewed 5 July 2006).

measures are increasing in an effort to reduce emissions.²⁹⁷ The Act also regulates the construction and maintenance of power lines, which are a significant source of vegetation clearing and habitat fragmentation. The Act is administered by the Department of Mines and Energy.²⁹⁸

Environmental Protection Act 1994 (Qld)

The *Environmental Protection Act* 1994 (Qld) (“EP Act”) is a central component of the Queensland environmental legal system.²⁹⁹ The object of the Act is environmental protection within the context of ecologically sustainable development. To achieve this object the Act provides the following wide range of tools:

- Environmental Protection Policies;
- An environmental impact statement process for mining activities;
- A licensing system for “environmentally relevant activities”, including mining;
- A general environmental duty and duty to notify of environmental harm (sections 319-320);
- A system for environmental evaluations and audits;
- Environmental Management Programs;
- Environmental Protection Orders;
- Financial Assurances;
- A system for the management of “contaminated land”; and
- Environmental Offences and executive officer liability;
- Investigative powers of authorised officers including power to give an emergency direction;
- Civil enforcement provisions to restrain breaches of the Act with widened standing for public interest litigants; and
- Public reporting of information on the environment.

Four Environmental Protection Policies have been gazetted: the *Environmental Protection (Water) Policy* 1997; *Environmental Protection (Air) Policy* 1997; *Environmental Protection (Noise) Policy* 1997 and *Environmental Protection (Waste Management) Policy* 2000.

In addition, the *Environmental Protection Regulation* 1998 (Qld) lists 85 “environmentally relevant activities” in Schedule 1³⁰⁰ and provides a regulatory regime for minor issues involving environmental nuisance as well as implementing National Environment Protection Measures for the National Pollutant Inventory and Used Packaging Material.

The *Environmental Protection (Waste Management) Regulation* 2000 (Qld) provides offences for littering and waste dumping as well as for waste disposal. Special provisions

²⁹⁷ See http://www.epa.qld.gov.au/environmental_management/sustainability/climate_change_and_greenhouse/ (viewed 20 December 2007).

²⁹⁸ See <http://www.energy.qld.gov.au/> (viewed 5 July 2006).

²⁹⁹ See Fisher D and Walton M, *Environmental Law Queensland* (LBC, Sydney, 1996).

³⁰⁰ Including aquaculture, chemical manufacturing, chemical storage, petroleum product storage, oil refining, sewage treatment, power station, dredging, extractive industry, mining, concrete batching, marina operation and waste disposal.

are also provided for waste tracking, management of clinical and other wastes and materials containing PCBs.

While the EP Act is generally administered to regulate only contaminant release / pollution control rather than wider environmental harm issues such as land clearing, the decision in *Maroochy Shire Council v Barnes* [2001] QPELR 475; [2002] QPELR 6 puts beyond doubt that there is no basis for such a limitation to the Act. Within the wide jurisdiction created for the prevention of environmental harm, the conceptual fulcrum of the Act is the relationship between sections 319 and 436. Section 319 states the general environmental duty:

General environmental duty

319.(1) A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm (the “**general environmental duty**”).

(2) In deciding the measures required to be taken under subsection (1), regard must be had to, for example-

- (a) the nature of the harm or potential harm; and
- (b) the sensitivity of the receiving environment; and
- (c) the current state of technical knowledge for the activity; and
- (d) the likelihood of successful application of the different measures that might be taken; and
- (e) the financial implications of the different measures as they would relate to the type of activity.

The general environmental duty forms a central tenor for liability under the EP Act by forming the general defence to unlawful environmental harm contained in section 436, which is then used as an element in the offences of causing serious or material environmental harm contained in sections 437 and 438. The concept of “reasonable care”, drawn from the *Donoghue v Stevenson* principle³⁰¹ of negligence at Common Law, on which the general environmental duty is clearly based, is familiar both to lawyers and lay-people. This marks one of the most outstanding features of the Act and Queensland environmental legal system.

The lead agency for the administration of the EP Act is the EPA; however, minor environmentally relevant activities have been devolved to local governments.

Fisheries Act 1994 (Qld)

The *Fisheries Act* 1994 (Qld) provides the State’s legislative framework for the regulation of fisheries, coastal areas important as fisheries habitat, and marine plants. The complex situation for fisheries jurisdiction is summarised in Appendix 7. The Act provides a range of mechanisms aimed at the sustainable management of fisheries including management plans, quotas, offences, licences and declarations of closed seasons, closed waters and fisheries habitat areas. The *Fisheries Regulation* 1995 (Qld) provides technical and geographic detail for these mechanisms. Management plans are gazetted as subordinate legislation such as the *Fisheries (East Coast Trawl) Management Plan* 1999 (Qld). The Act is administered by DPI&F.

³⁰¹ *Donoghue v Stevenson* [1932] AC 562 at 580 per Lord Atkin. Conceptually and theoretically what the general environmental duty has done is to widen the Common Law concept of “neighbour” to include the environment. This marks a fundamental development in environmental jurisprudence.

Forestry Act 1959 (Qld)

The *Forestry Act 1959* (Qld) regulates the use of forest products such as timber on all State land including State forests, leasehold land and unallocated State land (in total approximately 80% of the State). A central definition of the Act is “forest products” which means all vegetable growth and material of vegetable origin (section 5). For designated timber producing areas such as State forests, “forest products” also include honey, native animals, fossils and quarry material. Section 45 vests the ownership of all forest products in the Crown. Sections 53-54 prohibit interference with forest products on State land other than under a permit granted under the Act or another Act. The Act was amended in 1999, pursuant to the *South East Queensland Forests Agreement* (“SEQFA”), to allow for 25 year agreements in relation to forest practices.³⁰² The SEQFA contemplates the phasing out of logging in native forests within 25 years. The Act is jointly administered by DPI&F, the NRW and the EPA.

Gene Technology Act 2001 (Qld)

The *Gene Technology Act 2001* (Qld) complements the *Gene Technology Act 2000* (Cth) to regulate research, production and release of GMOs and GM crops and products. The *Code of Ethical Practice for Biotechnology in Queensland* declares an ethical framework for the development of biotechnology in Queensland. The Act is administered by the Department of State Development.³⁰³

Health Act 1937 (Qld)

The *Health Act 1937* (Qld) provides a framework for the protection of public health. Of particular relevance to the environmental legal system is provision for the regulation of nuisances and offensive trades in sections 77-92. The Act also provides for licensing of pest control operators and inspection of agricultural and hazardous chemicals. The *Health Regulation 1996* (Qld) provide for the prevention and destruction of mosquitos and vermin control. The Act is administered by local government and Queensland Health.³⁰⁴

Integrated Planning Act 1997 (Qld)

The *Integrated Planning Act 1997* (Qld) (“IPA”) is Queensland’s principal planning legislation.³⁰⁵ However, it should be seen in the context of an environmental planning system that is comprised of many layers. International, national, State and regional planning is carried out under other pieces of legislation summarised in this Part as well as a range of non-legislative regional planning processes.³⁰⁶ The IPA is largely concerned with planning and regulating land-use at the local scale although regional, State and wider issues may also be incorporated.

³⁰² See Brown AJ, “Beyond Public Native Forest Logging: National Forest Policy and Regional Forest Agreements after South East Queensland” (2001) 18 (1) EPLJ 71; (2001) 18 (2) EPLJ 189.

³⁰³ See <http://www.sdi.qld.gov.au/innovation/biotechnology> (viewed 5 July 2006).

³⁰⁴ See QH homepage at <http://www.health.qld.gov.au/> (viewed 5 July 2006).

³⁰⁵ See generally Fogg, Meurling and Hodgetts, n 45; and the IPA website at <http://www.ipa.qld.gov.au/> (viewed 5 July 2006).

³⁰⁶ Information on a number of non-legislative regional planning projects, such as WHAM 2015, Wide Bay 2020 and SEQ 2021, is provided at <http://www.lgp.qld.gov.au/> (viewed 5 July 2006).

The IPA has two central components: planning schemes and the Integrated Development Assessment System (“IDAS”). Planning schemes are the *proactive* part of the system that look into the future and address where different types of development should occur (for example, agricultural, residential or industrial development) and how can infrastructure such as roads and sewerage be provided in a logical and efficient manner. The protection of land important for nature conservation is also an important consideration for modern planning schemes. In contrast the IDAS is the *reactive* part of the system that responds to individual development applications by assessing the applications on their merits against the relevant planning scheme and other planning instruments. Progressively planning and development legislation has and continues to come under the umbrella of the IDAS. The aim behind the “roll-in” of other legislation is to allow planning and development issues to be assessed in one process rather than through a series of separate legal frameworks.

What is a planning scheme?

Local government planning schemes are the heart and soul of planning and development approval under IPA. Planning schemes are documents prepared by local governments to plan for the future orderly development of its local government area, provide for infrastructure such as roads and sewerage and to protect the natural environment and quality of life in that area. It is also a legal instrument that restricts private rights to use land and it has the force of law.

An important new concept of IPA planning schemes is “desired environmental outcomes” (“DEOs”), which state objectives to be achieved under a planning scheme or within a particular area (for example, “to maintain and restore biodiversity”).³⁰⁷ This represents an important shift from the traditional approach to planning in Queensland based on separating incompatible activities such as heavy industry and residential areas by prescribing through zoning plans permitted, permissible and prohibited uses for particular zones (areas of land). Under the IPA local governments are not allowed to simply prohibit a development type or use of land. This aims to promote an outcome-orientated approach to planning and development by stating DEOs for areas against which development applications may be judged.

Although there is considerable variability between local government planning schemes, they are typically a physical document with maps and text divided into a number of sections such as:³⁰⁸

- A strategic plan which sets out the broad objectives, DEOs and future planning intent of the local government area;
- Area plans (previously called “zoning plans”) which set out the purpose, location, DEOs and other planning provisions for specific areas such as residential and industrial areas across the local government area;
- Local plans (previously called “development control plans”) which set out the purpose, location, DEOs and other planning provisions for areas such as the town center or a particular suburb where a special character or integrity is desired to be developed or maintained;

³⁰⁷ See Fisher D, “Planning for the Environment under the Integrated Planning Act” (1998) 4(19) QEPR 121.

³⁰⁸ There are many planning schemes now available online. For example see the Gold Coast City Planning Scheme at http://www.goldcoast.qld.gov.au/gcplanningscheme_new/start.htm and the Cardwell Shire Planning Scheme at http://www.csc.qld.gov.au/?page_id=59 (viewed 5 July 2006).

- Codes which set out requirements and planning provisions for particular planning issues (rather than geographic areas) such as landscaping, stormwater management or biodiversity; and
- Planning scheme policies which set out the policies that the local government will adopt in addressing particular issues such as the environmental impact assessment (“EIA”) of particular types of development (i.e. policies that guide the exercise of the local government’s discretion on particular issues).

An infrastructure charges schedule may also be prepared by a local government under Chapter 5 of IPA and set out charges and contributions to be imposed on new development towards public infrastructure such as sewerage, water supply and parklands.

What is IDAS?

An important process change envisaged by IPA is to “roll in” the majority of State planning and licensing approval processes into one process (a development application) and one document (a development approval) in the IDAS process. This integration is not yet complete. One major process integrated into IDAS at this stage is the licensing system for ERAs under the EP Act.³⁰⁹

The IDAS process is commonly described as involving four stages:

- *Application Stage*, in which the applicant applies to the relevant government entity (normally local government);
- *Information and Referral Stage*, in which the application is referred to any relevant government agency and an “information request” is made for further information necessary to assess it;
- *Notification Stage*, which applies only for “impact assessable” development (explained below) and in which public notification of the application is made;
- *Decision Stage*, in which the decision is made whether to approve, refuse or approve the application subject to reasonable and relevant conditions.

One of the major distinctions in the IDAS is between impact assessable development and code assessable development. Impact assessable development is assessed against the whole of the planning scheme, must be publicly notified and the public gains a right to make submissions and appeal a decision to approve the development. Code assessable is assessed only against any relevant technical code (e.g. a building code), is not publicly notified and no submission or appeal rights exist.

Characterisation as either impact assessable or code assessable development will depend upon any relevant planning scheme and Schedule 1 of the *Integrated Planning Regulation* 1998 (Qld). Large-scale development or development in sensitive areas will not necessarily be impact assessable.

Note that the term “impact assessable” does not connote a traditional environmental impact statement (“EIS”) document or process. IPA uses a system of “information requests” for both impact assessment and code assessment whereby government agencies assessing the application may request further information. This process has been

³⁰⁹ For strong criticism of the effect of the integration of the EP Act into IPA, see Homel, n 41.

criticised.³¹⁰ A formal EIS process has been inserted as Part 8 of Chapter 5 of IPA to fulfil the requirements of an assessment bilateral under the EPBC Act.

Should proposed development be approved?

The core question of substance for proposed development under the IDAS is whether the development should be approved or not. The two major questions that must be answered by a local government in determining whether or not to approve a development application are:³¹¹

- Is the proposed development consistent with the planning scheme?
- Are there sufficient planning reasons (for example, need, adverse impact on the environment, impacts on amenity) to justify any inconsistency with the planning scheme?

If the local government (or other assessment manager) decides to approve the development application, it may impose conditions that are relevant or reasonable.³¹² A “relevant” condition is one that properly relates to the legislation under which it is imposed (for example, to maintain standards in local development or in some other legitimate sense).³¹³ A “reasonable” condition is one that is a reasonable response to the changes that the development will cause (for example, increased traffic to a road or bridge).³¹⁴ For example, in response to a development application to build a marina in a coastal area subject to acid sulfate soils, a relevant and reasonable condition may be “to test for and manage acid sulphate soils in accordance with State Planning Policy 2/02 (Planning and Management Development Involving Acid Sulfate Soils).” Conditions are the basic mechanism for minimising adverse impacts and for providing public infrastructure such as parklands.

The Planning and Environment Court

While local governments are generally the assessment manager in the IDAS process and therefore make the final government decision, they are political bodies and often political reasons will be at the true heart of their decisions. To provide a check to this the Planning and Environment Court provides *de novo* (complete) merits review of the decisions of assessment managers for parties applying for development approval. A third party submitter may also appeal impact assessable development.³¹⁵

The primary role of the Planning and Environment Court is to decide any appeal that comes before it according to law and not political considerations. For this purpose the law is essentially contained in the IPA and the relevant planning scheme. The two major questions that must be answered by the Planning and Environment Court are the same as

³¹⁰ See Leong M, “Comparative Analysis of Environmental Impact Assessment under the Integrated Planning Act 1997 and the Local Government (Planning and Environment) Act 1990” (1998) 4(18) QEPR 74; Brown AL and Nitz T, “Where Have All the EIAs Gone?” (2000) 17 (2) EPLJ 89.

³¹¹ See sections 3.5.13 and 3.5.14 of IPA. Note that other planning instruments, such as State Planning Policies, may also be relevant and involve similar questions.

³¹² Section 3.5.30 IPA; *Maroochy Shire Council v Wise* (1998) 100 LGERA 311; *Proctor v BCC* (1993) 81 LGERA 398.

³¹³ *Lloyd v Robinson* (1962) 107 CLR 142.

³¹⁴ *Cardwell Shire Council v King Ranch Australia Pty Ltd* (1984) 54 LGRA 110 at 113.

³¹⁵ A case study of an appeal in the Planning and Environment Court by a third party submitter is available at <http://www.envlaw.com.au/cassowary.html> (viewed 5 July 2006).

for local governments.³¹⁶ Based upon these there are two fundamental principles for the assessment of environmental issues evident in decisions of the Planning and Environment Court.³¹⁷

The first fundamental principle for the assessment of environmental issues in the Planning and Environment Court is that environmental values not recognised in a planning scheme or other planning instrument will generally not be protected by the Court:

ordinarily an owner is entitled to use their land as they wish and is under no obligation to consider the desirability of conserving the existing environment.³¹⁸

[The Planning and Environment] Court has no plenary power to do whatever may be seen to be of environmental advantage to the community. It must exercise the jurisdiction which it is given pursuant to the relevant provisions of the Act. The subject land is privately owned. That its owners should expect to be able to develop it in accordance with the relevant instruments of statutory planning control is fundamental to proper and fair town planning.³¹⁹

The second fundamental principle for the assessment of environmental issues by the Planning and Environment Court is that the preparation of an Environmental Management Plan or similar plan is a powerful tool for persuading the Court that environmental issues have been adequately addressed:

the existence of potential problems, however serious, is not in itself sufficient to rule out a proposal provided that evidence is given to demonstrate, on the balance of probabilities, that there are ways and means (that can be adopted feasibly) of guarding against such problems.³²⁰

The Planning and Environment Court provides an important check to political decision-making; however, it is clear from the principles by which the Court operates that the protection that it can and will give to genuine environmental considerations is largely dependant on the relevant planning scheme.

The IPA is administered largely by local governments together with other State Government agencies responsible for the planning processes linked to the IPA. The Department of Local Government, Planning, Sport and Recreation is the lead agency for the Act.³²¹

Land Act 1994 (Qld)

The *Land Act* 1994 (Qld) provides a framework for the allocation of State land either as leasehold, freehold or other tenure. The importance of the allocation of land to the environmental legal system should not be underestimated. The decision to lease land, sell

³¹⁶ In relation the court's obligation to follow the planning scheme, see *Stradbroke Island Management Organisation Inc v Redland Shire Council* [2002] QCA 277.

³¹⁷ See generally Tranter M, "The Treatment of Environmental Issues in the Queensland Planning Courts" (1995) 1 (5) QEPR 152.

³¹⁸ *Indooroopilly Golf Club v Brisbane City Council & Ors* (1982) QPLR 13 at 32; *Sabdoen Pty Ltd v Redland Shire Council* (1989) QPLR 149 at 152.

³¹⁹ *Hollingsworth v Brisbane City Council* (1975) Planner LGC 92; *Sheeziel & White v Noosa Shire Council* (1980) Planner LGC 130; *Liongrain Pty Ltd v Council of Shire of Albert & Ors* (1995) QPLR 353 at 355.

³²⁰ *Davjan v Noosa Shire Council* (1981) QPLR 69; *Lane v Gatton Shire Council* (1988) QPLR 49; *Esteedog Pty Ltd v Maroochy Shire Council* (1991) QPLR 7 at 9; *GFW Gelatine International Limited v Beaudesert Shire Council & Ors* (1993) QPLR 342 at 352; *Pinjarra Hills & Ors v Brisbane City Council* (1995) QPLR 334 at 349.

³²¹ See <http://www.lgp.qld.gov.au/> (viewed 5 July 2006).

land as freehold, dedicate it as national park or other tenure will have an immense effect on the use of the land. This creates the fabric of tenures, which then in practice heavily constrains the environmental legal system, politically if not legally.³²² Previously, the Act also provided a regulatory regime for vegetation management on State lands; however, in early 2004 this was transferred into the *Vegetation Management Act* 1999 (Qld) and *Integrated Planning Act* 1997 (Qld) system. The Act is administered by NRW.

Land Protection (Pest & Stock Route Management) Act 2002 (Qld)

The *Land Protection (Pest & Stock Route Management) Act* 2002 (Qld) provides a framework for the control of declared pests such as foxes, feral pigs and groundsel. Schedule 2 of the *Land Protection (Pest & Stock Route Management) Regulations* 2003 (Qld) lists declared pests in 3 classes. In addition to pests, the Act also provides a framework for managing Queensland's 72,000km of stock routes, which remain of considerable importance in rural areas for the movement and agistment of cattle and sheep. The Act is administered by NRW.

The Act operates in conjunction with the *Plant Protection Act* 1989 (Qld), which provides for the control and eradication of pest plants, invertebrate animals, fungi, viruses and diseases that are harmful to crop plants in Queensland. However, the separation between these Acts is quite illogical.

Local Government Act 1993 (Qld)

The *Local Government Act* 1993 (Qld) is concerned primarily with the establishment and functioning of local governments (of which there are 125 in Queensland); however, it also contains power for local governments to pass local laws.³²³ Local laws apply within a local government area to a range of relatively minor environmental issues such as dog licences; however, due to the absence until recently of vegetation management laws at a State level, they have also been used to regulate vegetation clearing.³²⁴

Marine Parks Act 2004 (Qld)

The *Marine Parks Act* 2004 (Qld) is the marine equivalent of the *Nature Conservation Act* 1992 (Qld) and establishes a framework for the identification, gazettal and management of protected areas as Marine Parks and the protection of marine species. The Act recently replaced the *Marine Parks Act* 1981 (Qld). It adopts a planning and management approach of establishing zoning plans for multiple-use management and a permit system for activities within marine parks such as collecting marine products or commercial whale watching. This system is closely associated with the zoning scheme established under the *Great Barrier Reef Marine Park Act* 1975 (Cth). The Act is administered by the Queensland Parks and Wildlife Service ("QPWS"), part of the EPA.

³²² There is no right of compensation at Common Law for the acquisition of property by State governments: *Durham Holdings Pty Ltd v New South Wales* (2001) 205 CLR 399.

³²³ For information on local governments generally and links to numerous homepages of Queensland local governments see <http://www.lgaq.asn.au/> (viewed 5 July 2006).

³²⁴ In this regard note in particular *Bone v Mothershaw* [2002] QCA 120; (2002) 121 LGERA 75.

Mineral Resources Act 1989 (Qld)

The *Mineral Resources Act* 1989 (Qld) (“MRA”) provides a framework to regulate tenure and royalty issues associated with exploration and mining for minerals (defined not to include petroleum) on land in Queensland; however, the environmental impacts of mining are now regulated under the EP Act. Mining is exempt development under the IPA and it is not intended to integrate the approval processes for mining into the IDAS. Objections to mining leases under the MRA (and environmental authorities for mining under the EP Act) are heard by the Land and Resources Tribunal, which makes a “recommendation” to the Minister for Mines and Energy (and the Minister for Environment for the approval under the EP Act).³²⁵

The MRA vests property to minerals, with limited exceptions, in the Crown. This is possibly subject to native title interests in minerals but it appears unlikely that such interests will be established. Under the Act a royalty is payable to the Crown for the right to extract minerals. Exploration permits and mining leases may be granted over private land without the owner’s consent but are subject to compensation for the loss of the use of the land. In effect mining may occur at any location where sufficient mineral reserves are established and the public interest (including any deleterious environmental effects) warrants the grant of the mining lease. Section 27 of the *Nature Conservation Act* 1992 (Qld) provides the only exception to this rule by prohibiting the grant of a mining lease in a national park or conservation park.

Management of mining is divided between the Department of Mines and Energy and the EPA. The Department of Mines and Energy administers mining tenure issues under the MRA. The EPA regulates environmental aspects of mining under the EP Act. The reason for this division is to separate the administration of the economic benefits to the State Government obtained through promoting mining (principally the royalties paid to the State) from responsibility for environmental protection.

Native Title (Queensland) Act 1993 (Qld)

The *Native Title (Queensland) Act* 1993 (Qld) validates past acts attributable to the Queensland Government that may have affected native title and purports to confirm that certain acts have extinguished native title. Importantly for environmental law, section 17 purports to confirm the existing ownership of the State Government to all natural resources, the right to use, regulate and control the flow of waters and fishing access rights. Whether native title has been extinguished for these matters remains uncertain. The lead agency for native title issues is the NRW.

Nature Conservation Act 1992 (Qld)

The *Nature Conservation Act* 1992 (Qld) establishes a framework for the identification, gazettal and management of protected areas (such as national parks) and the protection of native flora and fauna (protected wildlife). Protected areas represent 4% of

³²⁵ See <http://www.lrt.qld.gov.au> (viewed 5 July 2006). For examples of judgments by the LRT for mining leases involving environmental issues, see *Salmon v Armstrong* [2001] QLRT 72; *Papillon Mining and Exploration Pty Ltd & Anor v Maddock & Ors* [2003] QLRT 62; and *Re Clark, Bexton, Lane & Ors, Environmental Protection Agency* [2005] QLRT 146.

the total area of the State.³²⁶ The Queensland Government has now adopted a systematic approach to conservation planning using bioregional ecosystems.³²⁷ The Act is administered by QPWS, part of the EPA.

Offshore Minerals Act 1998 (Qld)

The *Offshore Minerals Act* 1998 (Qld) establishes a framework for regulating the exploration and mining of minerals (defined not to include petroleum) in Queensland coastal waters. Section 3 of the Act refers to and explains the “Offshore Constitutional Settlement” of 1979. The Act mirrors the *Offshore Minerals Act* 1994 (Cth) in establishing a system for exploration permits, mining leases, other tenures and the payment of royalties. The Act is administered by the Department of Mines and Energy.

Petroleum and Gas (Production and Safety) Act 2004 (Qld)

The *Petroleum and Gas (Production and Safety) Act* 2004 (Qld) regulates petroleum exploration, extraction (including coal seam gas) and pipeline licensing for tenures granted after 2004. Due to native title complications, the *Petroleum Act* 1923 (Qld) continues to regulate the exploration and extraction of petroleum (including natural gas) for licences granted prior to 2004. The Acts are administered by the Department of Mines and Energy. As for mining, environmental protection aspects of petroleum extraction are regulated under the EP Act by the EPA.

Petroleum (Submerged Lands) Act 1982 (Qld)

The *Petroleum (Submerged Lands) Act* 1982 (Qld) establishes a framework for regulating the exploration and extraction of petroleum from Queensland waters. This Act operates, pursuant to the “Offshore Constitutional Settlement” of 1979, in conjunction with the *Petroleum (Submerged Lands) Act* 1967 (Cth). The Act is administered by the Department of Mines and Energy.

Plant Protection Act 1989 (Qld)

The *Plant Protection Act* 1989 (Qld) provides for the control and eradication of pest plants, invertebrate animals, fungi, viruses and diseases that are harmful to crop plants in Queensland. This includes the recent infestation of fire ants in Brisbane, for which a major eradication program is currently underway.³²⁸ The Act is administered by DPI&F.

The Act operates in a quite illogical union with the *Land Protection (Pest & Stock Route Management) Act* 2002 (Qld), which provides a framework for the control of declared pests such as foxes, feral pigs and groundsel.

Queensland Heritage Act 1992 (Qld)

The *Queensland Heritage Act* 1992 (Qld) operates in tandem with the *Aboriginal Cultural Heritage Act* 2003 (Qld) and the *Torres Strait Islander Cultural Heritage Act*

³²⁶ Environmental Protection Agency, *State of the Environment Queensland 1999* (EPA, Brisbane, 1999) Table 3-4 at p 3.10 and p 7.4. Available at <http://www.epa.qld.gov.au/> > link to SoE (viewed 5 July 2006).

³²⁷ See the discussion in the *Vegetation Management Act* 1999 (Qld) section of this Chapter.

³²⁸ See <http://www.dpi.qld.gov.au/fireants> (viewed 5 July 2006).

2003 (Qld) to protect Queensland's cultural heritage. The Act creates a framework to protect places or objects of cultural heritage significance for aesthetic, architectural, historic, scientific, social or technological reasons. The principal mechanism through which the Act operates is the Heritage Register. The Act is administered by the Queensland Heritage Council and the Cultural Heritage Unit of the EPA.

State Development and Public Works Organisation Act 1971 (Qld)

The *State Development and Public Works Organisation Act 1971* (Qld) is a nebulous Act drawing together a range of powers and functions which are used by the State Government to promote and facilitate large projects in Queensland. The Act provides a formal environmental impact statement process in sections 26-35 for significant projects. The Act provides a range of mechanisms to facilitate large development projects including declarations of prescribed development of State significance, State development areas and a power to compulsorily acquire land for large infrastructure facilities (section 125(1)(f)). The latter provision aims to facilitate large infrastructure projects such as dam construction by private companies. The Act is administered by the Coordinator-General and the Department of State Development.

Transport Infrastructure Act 1994 (Qld)

The *Transport Infrastructure Act 1994* (Qld) operates in conjunction with the *Transport Planning and Coordination Act 1994* (Qld) to facilitate the planning, construction and operation of State roads, railways and ports. The construction of these facilities has major direct and indirect effects on the environment due to physical destruction, disturbance and sub-sequent increased use. This Act therefore forms an important component of the environmental planning regime for Queensland. The Act is administered by the EPA, Queensland Transport, the Department of Main Roads and various port authorities.

Transport Operations (Marine Pollution) Act 1995 (Qld)

The *Transport Operations (Marine Pollution) Act 1995* (Qld) regulates marine pollution from ships in Queensland's coastal waters. It implements the MARPOL 73/78. The Act is made pursuant to the mechanism provided in the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cth) for the accreditation of State laws implementing the MARPOL 73/78.³²⁹ It is administered by the Maritime Division of Queensland Transport.

Vegetation Management Act 1999 (Qld)

The recent history of vegetation management in Queensland has been very controversial. Prior to the 1990s, there was little regulation of landholders clearing vegetation. In late 1997, a system to control vegetation clearing on the 70% of Queensland held as leasehold and other State lands commenced under the *Land Act 1994* (Qld). In late 2000, using a new mapping and classification system, a separate regime commenced in the *Vegetation Management Act 1999* (Qld) ("VMA") and IPA to regulate vegetation

³²⁹ See generally, White, n 189.

management on the 30% of Queensland held as freehold land and freeholding leases.³³⁰ During this period, many local governments also introduced bylaws or local laws under the *Local Government Act* 1993 (Qld) to protect significant local vegetation.

Faced with ongoing controversy and high levels of vegetation clearing across the State, in early 2004 major reforms to the vegetation management regime in Queensland were introduced.³³¹ A major part of the reform package was a policy commitment to phase out broadscale land clearing by 31 December 2006. The reforms have also removed the system of vegetation clearing laws for State lands in the *Lands Act* 1994 (Qld), and placed the control of vegetation management of most State lands in the VMA and IPA system. Vegetation management on approximately 95% of land in Queensland is now regulated under this system. Vegetation management on the 5% of Queensland in protected areas, such as National Parks, and State forests is regulated under the *Nature Conservation Act* 1992 (Qld) and *Forestry Act* 1959 (Qld), as well as some minor interests in State land still being regulated under the *Lands Act* 1994 (Qld).³³²

The VMA itself does not regulate vegetation management. Instead the trigger and process for assessment, together with the offence for clearing vegetation without approval, are contained in the IPA. Additional triggers for approval of material change of use or reconfiguration of a lot potentially leading to vegetation clearing are found in Schedule 2 of the *Integrated Planning Regulations* 1998 (Qld). However, the VMA provides for the preparation of mapping to identify areas of high conservation value, areas vulnerable to land degradation and remnant vegetation. The VMA also provides the power to create the policy under which applications for clearing vegetation are assessed.

A system of mapping and classifying vegetation known as “regional ecosystems” (“REs”) provides the basis of the vegetation management system in Queensland.³³³ Under this system, Queensland is divided into 13 bioregions based on broad landscape patterns that reflect the major underlying geology, climate patterns and broad groupings of plants and animals. REs, the vegetation communities in a bioregion, classify biodiversity at the landscape level. REs are each assigned a unique 3 digit code reflecting bioregion, land zone and dominant vegetation. For example, *Eucalyptus tereticornis* woodlands on coastal plains in southeast Queensland are classified as “RE 12.3.3”. The Queensland Herbarium has mapped REs for much of the State using a combination of satellite imagery, aerial photography and on-ground studies. RE maps show what remnant vegetation remains in REs throughout the State.

The conservation status of each RE is based on its current extent in a bioregion. REs are classified as under the *Vegetation Management Regulations* 2000 (Qld) as:

- *Endangered* if less than 10% of the preclearing extent remains, or 10-30% of the preclearing extent remains (if the area of remnant vegetation is less than 10 000 ha).
- *Of concern* if 10-30% of the preclearing extent remains, or more than 30% of the preclearing extent remains (if the area of remnant vegetation is less than 10 000 ha).

³³⁰ See McGrath C, “Summary and critical analysis of major vegetation management laws in Queensland” (2002/2003) 8 (37) QEPR 86.

³³¹ See generally McGrath C, “Queensland’s new vegetation management regime” (2004/2005) 10 (46) QEPR 26; McGrath C, “End of broadscale clearing in Queensland” (2007) 24 EPLJ 5.

³³² Appendix 7 of McGrath, n 209, provides a summary of vegetation management laws in Queensland.

³³³ See Sattler P and Williams R (eds), *The Conservation Status of Queensland’s Bioregional Ecosystems* (EPA, Brisbane, 1999).

- *Not of concern* if more than 30% of the preclearing extent remains, and the area of remnant vegetation is more than 10 000 ha.

The trigger for whether development approval is required for vegetation clearing is found in Schedule 8 of IPA. If development assessment is required, the *State Policy for Vegetation Management* (May 2004) provides the policy framework for the assessment of the application. The VMA is administered by NRW.

Water Act 2000 (Qld)

The *Water Act* 2000 (Qld) is a lengthy piece of legislation that provides a framework for the planning and regulation of the use and control of water in Queensland. This includes regulating both major water impoundments (dams, weirs, etc.) and extraction through pumping for irrigation and other uses. The Act provides a wide range of tools for the regulation of in-stream (that is, physically within a watercourse, lake or spring) and overland water flow and groundwater within the context of “sustainable management and efficient use” of water.

The most important planning instruments under the Act are Water Resource Plans, which are prepared through a consultative process generally on a catchment-by-catchment basis. An important aspect of the preparation of Water Resource Plans is balancing water allocations (that is, human use) with environmental flows (that is, leaving water in a watercourse to maintain natural processes). Water Resource Plans therefore form the “baseline” plan for what water can be taken out of catchments and represent a limit or “cap” to water use.

There are a number of other important planning tools in the Act. Water Use Plans may be prepared for areas at risk of land or water degradation due to such things as rising underground water levels, increasing salinisation, deteriorating water quality, water logging of soils, destabilization of bed and banks of watercourses, damage to the riverine environment or increasing soil erosion. Land and Water Management Plans may also be submitted by individual landowners applying to irrigate their land. Resource Operations Plans provide practical operational details of the implementation of a Water Resource Plan in an area under which Resource Operations Licences and Water Allocations, Water Licences and Water Permits may be granted.

As with other planning and development legislation, the *Water Act* is (at least partially) integrated into the Integrated Development Assessment System of the IPA. Two approvals are now required for extraction of water from a watercourse and other matters regulated under the *Water Act*:

- *Resource entitlement* or allocation (for water this may be referred to as a water entitlement, water allocation or water licence), which provides permission to extract or use a water resource. Applications for resource entitlements are assessed against relevant criteria in the Act and relevant Water Resource Plan and Resource Operations Plan (if any).
- *Development permit* provides permission for development associated with the use of water that is assessable development under Sch 8 of IPA. Sch 8 defines a number of types of water related development as assessable or self-assessable development. Assessable development includes all work in a watercourse, lake or spring that involves taking or interfering with water (e.g. a pump, stream re-direction, weir or dam); and all artesian bores anywhere in the State, no matter what their use.

In addition to these planning controls, the destruction of vegetation, excavation or placing fill in a watercourse, lake or spring is regulated under section 814. The Act also makes provision for trade waste agreements (i.e. release of industrial waste into local government sewerage systems), although water pollution is regulated under the *Environmental Protection Act 1994* (Qld). The Act is administered by NRW.

Wet Tropics World Heritage Protection and Management Act 1993 (Qld)

The *Wet Tropics World Heritage Protection and Management Act 1993* (Qld) establishes a framework for regulating land-use development and management within the Wet Tropics World Heritage Area of North Queensland through a regional plan for the area. The *Wet Tropics Management Plan 1998* (Qld) is the regional plan created under the Act. It provides a zoning plan to control development and activities within the Wet Tropics. The Act and Plan are administered by the Wet Tropics Management Authority³³⁴ in conjunction with the QPWS and NRW.

Wild Rivers Act 2005 (Qld)

The *Wild Rivers Act 2005* (Qld) provides an additional layer of protection to undeveloped river systems in Queensland. Wild River Declarations made under the Act restrict further water extraction within the declared area. 19 declarations have been proposed under the Act, but are mostly limited to rivers in Cape York and adjacent to the Gulf of Carpentaria. Declarations for Fraser Island and Hinchinbrook Island are also proposed. The Act is administered by NRW.

THE COMMON LAW

The Common Law (or “judge-made law”) is the law developed by judges in courts.³³⁵ Although now largely superseded by legislation at Commonwealth and State levels, the Common Law continues to provide an important background of principles that directly impact upon and shape the Queensland environmental legal system. The Common Law has traditionally placed a strong emphasis on the protection of private property and people, with little recognition or protection of public rights in the environment.³³⁶

Reflecting the traditional focus on protecting private property and people, the main causes of action at Common Law relevant for environmental issues are:³³⁷

- *Private nuisance*: unreasonable interference with the use of property, including due to smoke, noise or vibration arising from a neighbour’s property;
- *Public nuisance*: unreasonable interference with a public right, including by pollution;
- *Riparian user rights*: rights of a person owning property adjoining a watercourse to use water and to prevent other users from unreasonably interfering with the quantity or quality of the water;³³⁸

³³⁴ See WTMA homepage <http://www.wettropics.gov.au/> (viewed 5 July 2006).

³³⁵ See generally Bates, n 2, pp 19-33 and 171-187.

³³⁶ See Bates, n 2, Ch 2; Bonyhady T (ed), *Environmental Protection and Legal Change* (Federation Press, Sydney, 1994), Ch 4; Coyle S and Morrow K, *The Philosophical Foundations of Environmental Law: Property, Rights and Nature* (Oxford and Portland, Oregon, 2004), Ch 3.

³³⁷ See generally Bates, n 2, pp 171-187.

³³⁸ See Fisher D, *Water Law* (LBC, Sydney, 2000).

- *Negligence*: a duty to take reasonable care to avoid damage to a people or property, including, for example, manufacturing goods that cause cancer;³³⁹
- *Trespass*: a direct interference or invasion of private land, including by pollution.

Other general principles of the Common Law permeate the environmental legal system. For example the concept of standing has been a major constraint on public interest litigation to protect the environment;³⁴⁰ however, this obstacle has been largely overcome in many jurisdictions through widening standing provided under statute.³⁴¹

Native title, recognised as part of the Common Law in *Mabo v Queensland (No 2)* (1992) 175 CLR 1, also contains immensely important implications for the environmental legal system.³⁴² In *Mabo*, Brennan J defined the content of “native title” as:

The term ‘native title’ conveniently describes the interests and rights of indigenous inhabitants in land, whether communal, group or individual, possessed under the traditional laws acknowledged by and the traditional customs observed by the indigenous inhabitants.

As a practical example, in *Yarmirr v Northern Territory* (1998) 82 FCR 533 (the Croker Island Case), Olney J found the native title of the claimant group was:³⁴³

- (a) to fish, hunt and gather within the claimed area for the purpose of satisfying their personal, domestic or non-commercial communal needs including observing traditional, cultural, ritual and spiritual laws and customs; and
- (b) to have access to the sea and sea-bed within the claimed area:
 - (i) to exercise the above rights;
 - (ii) to travel through, or within, the claimed area;
 - (iii) to visit and protect places within the claimed area which were of cultural or spiritual importance; and
 - (iv) to safeguard the cultural and spiritual knowledge of the claimants.

One of the major challenges that native title creates for the environmental legal system is traditional hunting in protected areas and of threatened species.³⁴⁴ Joint management arrangements incorporating the wisdom and knowledge of traditional owners are likely to be critical to protected area and species management in the future.

The Common Law, including native title, will remain an important component of the Queensland environmental legal system in the future. However, the principal development of this system will be due to legislative reform and in this area the Queensland environmental legal system will continue to experience considerable ongoing change.

SUMMARY

The description of the Queensland environmental legal system in this chapter provides an example of how an entire environmental legal system may be described using the “structural hierarchy” or “jigsaw” approach. The next topic is how to evaluate an environmental legal system.

³³⁹ See, for example, *Graham Barclay Oysters Pty Ltd v Ryan* (2002) 211 CLR 540.

³⁴⁰ “Standing” is the legal right to commence and maintain litigation. See generally *Australian Conservation Foundation v Commonwealth* (1980) 146 CLR 493 and Bates, n 2, pp 145-164.

³⁴¹ For example, section 475 of the EPBC Act and McGrath, n 262.

³⁴² See generally, Bartlett R, *Native Title in Australia* (2nd ed, Butterworths, Sydney, 2003).

³⁴³ Upheld by the High Court on appeal: *Commonwealth v Yarmirr* (2001) 208 CLR 1.

³⁴⁴ See Havemann P, Thiriet D, Marsh H and Jones C, “Traditional use of marine resources agreements and dugong hunting in the Great Barrier Reef World Heritage Area” (2005) 22 EPLJ 258.

Figure 6: Major pieces of the Queensland environmental legal system

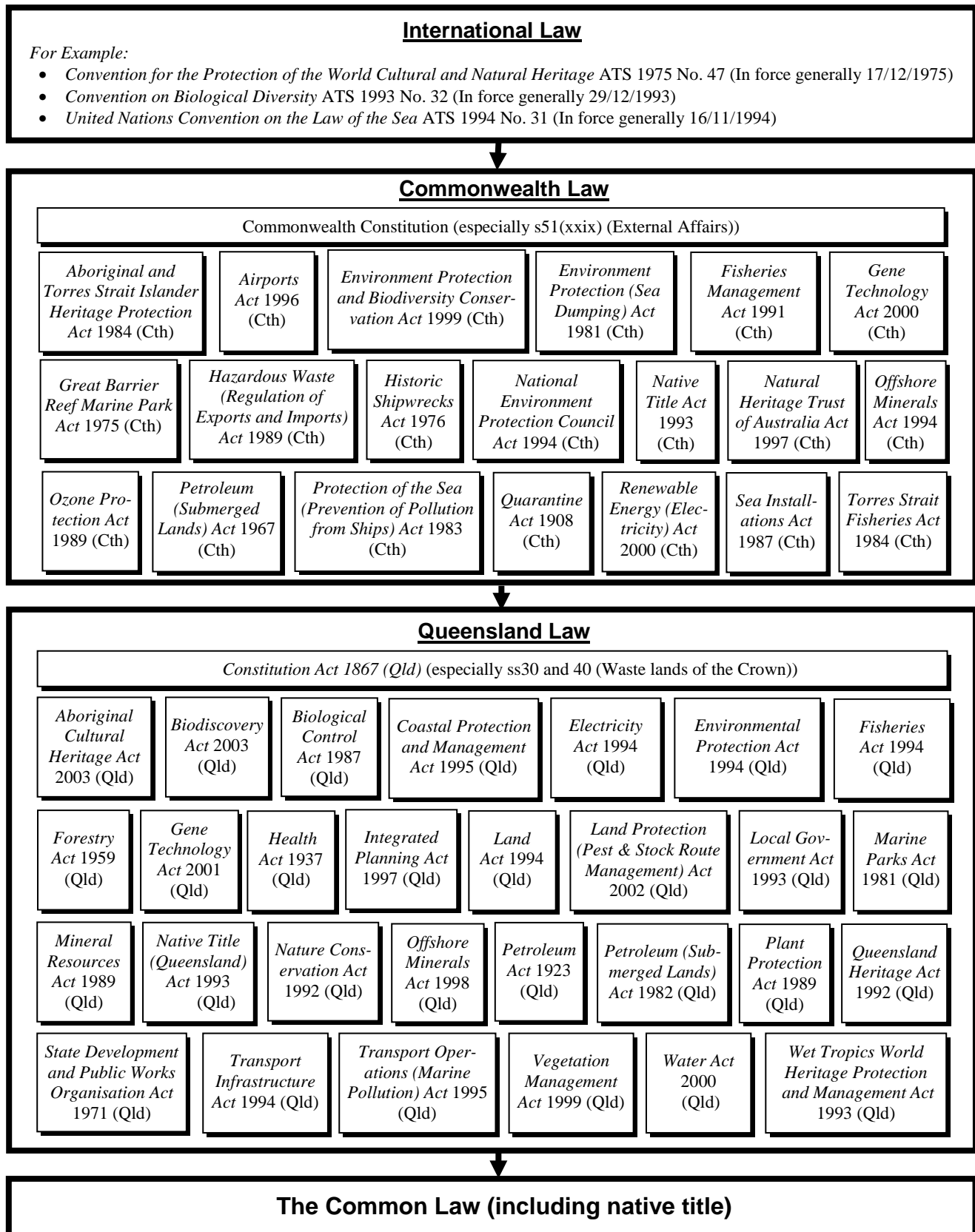


Figure 7: Summary of Queensland fisheries laws

Subject area	Relevant legislation
1. Fisheries other than prawns and tuna on the east coast of Queensland (from the NSW border to the tip of Cape York)	<i>Fisheries Act 1994 (Qld)</i> from land within the limits of the State and Queensland waters to the outer edge of the Great Barrier Reef Marine Park and thereafter the <i>Fisheries Management Act 1991 (Cth)</i> to the limit of the Australian fishing zone
2. Fisheries other than tuna in Torres Strait (within the Australian section of the Torres Strait Protected Zone)	<i>Torres Strait Fisheries Act 1984 (Cth)</i> and the <i>Torres Strait Fisheries Act 1984 (Qld)</i>
3. Fisheries other than prawns and tuna in the Gulf of Carpentaria (from Cape York to the Northern Territory border)	<i>Fisheries Act 1994 (Qld)</i> from land within the limits of the State and Queensland waters to the limit of the Australian fishing zone
4. Prawn fisheries on the east coast of Queensland (from the NSW border to the tip of Cape York)	<i>Fisheries Act 1994 (Qld)</i> from land within the limits of the State and Queensland waters to the outer edge of the Great Barrier Reef Marine Park (seaward of this point no prawn fishery exists)
5. Prawn fisheries in the Gulf of Carpentaria (from Cape York to the Northern Territory border)	<i>Fisheries Management Act 1991 (Cth)</i> from the inner boundary of coastal waters to the limit of the Australian fishing zone. <i>Fisheries Act 1994 (Qld)</i> landward of the inner boundary of coastal waters
6. Tuna fisheries in all waters in the Australian fishing zone	<i>Fisheries Management Act 1991 (Cth)</i>
7. Great Barrier Reef Marine Park	<i>Great Barrier Reef Marine Park Act 1975 (Cth)</i> and associated regulations, zoning plans and plans of management
8. Queensland Marine Park	<i>Marine Parks Act 1982 (Qld)</i> and associated regulations and zoning plans
9. Fisheries habitat area	<i>Fisheries Act 1994 (Qld)</i> and associated regulations and zoning plans
10. Actions causing a significant impact on a matter of national environmental significance (including Commonwealth marine areas and Commonwealth managed fisheries)	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i> ss 12-28
11. Whales and other cetaceans and listed marine species in Australian waters	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i> ss 224-266
12. Protected wildlife (eg. dugong) in Queensland coastal waters	<i>Nature Conservation Act 1992 (Qld)</i> and regulations and relevant conservation plans

Chapter 5

Methods for evaluating the effectiveness of an environmental legal system

Having discussed the methods for describing an environmental legal system and given as an example the Queensland environmental legal system, the focus of the discussion can now shift to the main topic of the thesis: how to evaluate the effectiveness of an environmental legal system. Four groups of methods for evaluating the effectiveness of an environmental legal system are discussed in this chapter: State of the Environment (“SoE”) reporting using the pressure-state-response (“PSR”) method; variations on the PSR method for SoE reporting; best practice; and other methods.

SOE REPORTING USING THE PSR METHOD

History and concepts

The United States of America was the first country to introduce formal SoE reporting with the enactment of the *National Environmental Policy Act of 1969* (US) (“NEPA”).³⁴⁵ Section 201 [42 USC § 4341] of the NEPA provided:

The President shall transmit to the Congress annually beginning July 1, 1970, an Environmental Quality Report (hereinafter referred to as the “report”) which shall set forth (1) the status and condition of the major natural, manmade, or altered environmental classes of the Nation, including, but not limited to, the air, the aquatic, including marine, estuarine, and fresh water, and the terrestrial environment, including, but not limited to, the forest, dryland, wetland, range, urban, suburban and rural environment; (2) current and foreseeable trends in the quality, management and utilization of such environments and the effects of those trends on the social, economic, and other requirements of the Nation; (3) the adequacy of available natural resources for fulfilling human and economic requirements of the Nation in the light of expected population pressures; (4) a review of the programs and activities (including regulatory activities) of the Federal Government, the State and local governments, and nongovernmental entities or individuals with particular reference to their effect on the environment and on the conservation, development and utilization of natural resources; and (5) a program for remedying the deficiencies of existing programs and activities, together with recommendations for legislation.

Section 202 of the NEPA established a Council on Environmental Quality to assist the President in preparing annual Environmental Quality Reports.³⁴⁶ An Office of Environmental Quality was also established and the duties of its Director were stated to include “assisting the Federal agencies and departments in appraising the effectiveness of existing and proposed facilities, programs, policies, and activities of the Federal Government.”³⁴⁷

A significant step in the evolution of widespread SoE reporting occurred in 1979 when the Organisation for Economic Co-operation and Development (“OECD”) recommended that its member countries prepare periodic national reports on the state of

³⁴⁵ See generally the NEPA website at <http://ceq.eh.doe.gov/nepa/nepanet.htm> (viewed 1 July 2006).

³⁴⁶ 42 USC § 4342. See generally the CEQ website at <http://www.whitehouse.gov/ceq/> (viewed 1 July 2006).

³⁴⁷ 42 USC § 4372.

the environment and its changes over time.³⁴⁸ The OECD produced its first SoE report for member countries in the same year.³⁴⁹ The template for SoE reporting was evident even then with the first OECD SoE report broken into three chapters: human activities having major impacts on the environment; environmental conditions; and responses to stresses on the environment.

SoE reports using the PSR model emerged in the early 1990s, no doubt catalysed by the heightened and widespread concern for the environment at that time.³⁵⁰ The PSR, or condition-pressure-response,³⁵¹ model for SoE reporting was developed by the OECD to provide an improved and consistent method or framework for environmental reporting. By 1996 the Canadian and Dutch Governments combined with the UNEP to produce a synthesis and source book of methods and approaches to SoE reporting, authored by Paul Rump, which found widespread adoption of the PSR model.³⁵² Australia, as a member of the OECD, played an important role in the development of this model.³⁵³ The Australian,³⁵⁴ State, Territory and many local governments in Australia have now adopted this model for reporting on the environment³⁵⁵ as have many governments around the globe.³⁵⁶

The theory underpinning the PSR model of SoE reporting and its conceptual framework are based on the concept of causality: human activities exert pressures on the environment; these change the state or condition of the environment; society responds by developing or implementing policies that influence those human activities and so change

³⁴⁸ Recommendation C(79)114 – 8 May 1979. Available at <http://www.oecd.org> (viewed 10 Sept 2003).

³⁴⁹ OECD, *The State of the Environment in OECD Member Countries* (OECD, Paris, 1979).

³⁵⁰ For example, Chapter 8 of *Agenda 21*, adopted at the United Nations Conference on Environment and Development (UNCED) at Rio de Janeiro in 1992, called for regular assessments and monitoring of the effectiveness of legal and regulatory frameworks. See <http://www.un.org/esa/sustdev/documents/agenda21/> (viewed 5 July 2006).

³⁵¹ “State” and “condition” are often used as synonyms. The SoE method was initially termed “the pressure-state-response model” and some publications still use these terms. Australian SoE reports now generally refer to the “condition-pressure-response model”.

³⁵² Rump, n 81.

³⁵³ An important contribution was made by the Department of the Environment, Sport and Territories (“DEST”), *State of the Environment Reporting: Framework for Australia* (DEST, Canberra, 1994), which was developed following a discussion paper entitled, Commonwealth Environment Protection Agency, *Development of a National State of the Environment Reporting System* (Commonwealth of Australia, Canberra, 1992). Available at <http://www.environment.gov.au/soe/publications/> (viewed 31 May 2006).

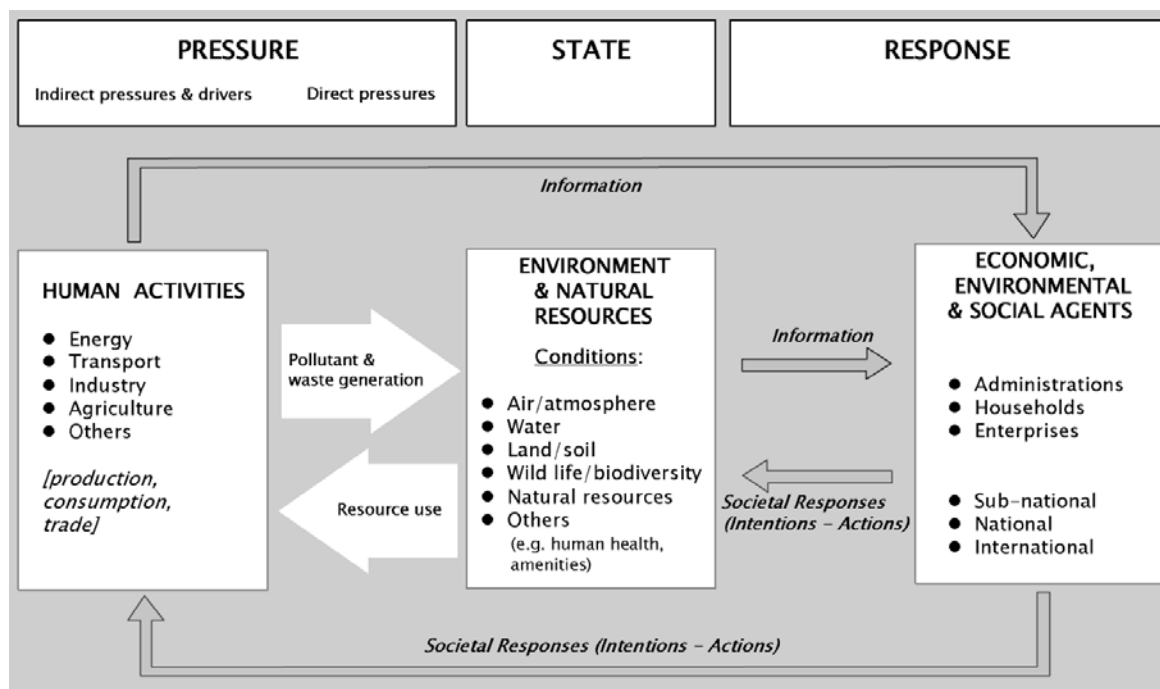
³⁵⁴ Five SoE reports have been prepared for Australia: Department of Arts, Heritage and Environment, *State of the Environment in Australia 1985* (AGPS, Canberra, 1986); Department of Arts, Heritage and Environment, *State of the Environment in Australia 1986* (AGPS, Canberra, 1987); SEAC, n 1; ASEC, n 1; Beeton et al, n 1. See generally <http://www.environment.gov.au/soe> (viewed 20 December 2007).

³⁵⁵ For the early history of SoE reporting in Australia, see Lloyd B, “State of Environment Reporting in Australia: A review” (1996) 3 AJEM 151. Links to State and Territory SoE reports are available at <http://www.environment.gov.au/soe> (viewed 30 May 2006). The latest NSW and Queensland SoE reports are: Department of Environment and Conservation, *New South Wales State of the Environment 2006* (DEC, Sydney, 2006); and Environmental Protection Agency, *State of the Environment Queensland 2003* (EPA, Brisbane, 2003).

³⁵⁶ See in relation to global SoE reporting: the UNEP website at <http://www.grida.no/soe/index.htm> (viewed 30 May 2006), which provides links to SoE reports in many countries; and DEH, *SoE in an international context*, paper prepared for the 2006 Australian SoE Committee (DEH, Canberra, 2006), available at <http://www.environment.gov.au/soe/2006/publications/emerging/soe-international/index.html> (viewed 20 December 2007).

the pressures.³⁵⁷ The OECD illustrated the conceptual framework of the PSR method in the following diagram.

Figure 8: OECD conceptual framework of SoE reporting³⁵⁸



The OECD summarised the conceptual framework of the PSR model as follows:³⁵⁹

The pressure-state-response (PSR) model has initially been developed by the OECD to structure its work on environmental policies and reporting. It considers that: human activities exert pressures on the environment and affect its quality and the quantity of natural resources ('state'); society responds to these changes through environmental, general economic and sectoral policies and through changes in awareness and behaviour ('societal response').

- The PSR model highlights these cause-effect relationships, and helps decision makers and the public see environmental, economic, and other issues as interconnected. It thus provides a means of selecting and organising indicators (or state of the environment reports) in a way useful for decision-makers and the public, and of ensuring that nothing important has been overlooked.
- The PSR model has the advantage of being one of the easiest frameworks to understand and use, and of being neutral in the sense that it just says which linkages exist, and not whether these have negative or positive impacts. This should however not obscure the view of more complex relationships in ecosystems, and in environment-economy and environment-social interactions.
- Depending on the purpose for which the PSR model is to be used, it can easily be adjusted to account for greater details or for specific features. ...

[position of Figure 8 in original text]

- Environmental pressures describe pressures from human activities exerted on the environment, including natural resources. 'Pressures' here cover underlying or indirect pressures (i.e. human activities themselves and trends and patterns of environmental

³⁵⁷ DEST, n 353, p 15; SEAC, n 1, pp ES-6 and 1-6.

³⁵⁸ OECD, *OECD Environmental Indicators: Development, Measurement and Use – Reference Paper* (OECD, Paris, 2003), p 21. Available at <http://www.oecd.org/dataoecd/7/47/24993546.pdf> (viewed 31/5/06).

³⁵⁹ OECD, n 358, p 21.

significance) as well as proximate or direct pressures (i.e. the use of resources and the discharge of pollutants and waste materials). Indicators of environmental pressures are closely related to production and consumption patterns; they often reflect emission or resource use intensities, along with related trends and changes over a given period. They can be used to show progress in decoupling economic activities from related environmental pressures, or in meeting national objectives and international commitments (e.g. emission reduction targets).

- Environmental conditions relate to the quality of the environment and the quality and quantity of natural resources. As such they reflect the ultimate objective of environmental policies. Indicators of environmental conditions are designed to give an overview of the situation (the state) concerning the environment and its development over time. Examples of indicators of environmental conditions are: concentration of pollutants in environmental media, exceedance of critical loads, population exposure to certain levels of pollution or degraded environmental quality and related effects on health, the status of wildlife and ecosystems and of natural resource stocks. In practice, measuring environmental conditions can be difficult or very costly. Therefore, environmental pressures are often measured instead as a substitute.
- Societal responses show the extent to which society responds to environmental concerns. They refer to individual and collective actions and reactions, intended to:
 - mitigate, adapt to or prevent human-induced negative effects on the environment;
 - halt or reverse environmental damage already inflicted;
 - preserve and conserve nature and natural resources.

Examples of indicators of societal responses are environmental expenditure, environment-related taxes and subsidies, price structures, market shares of environmentally friendly goods and services, pollution abatement rates, waste recycling rates, enforcement and compliance activities. In practice, indicators mostly relate to abatement and control measures; those showing preventive and integrative measures and actions are more difficult to obtain.

In 1994 the Australian Government adopted a framework for SoE reporting based upon the PSR model proposed by the OECD.³⁶⁰ In 1996, the State of Environment Advisory Council (“SEAC”), an independent body established by the Australian Government to prepare the Australian SoE report, made the following refinements to the PSR model proposed by the OECD for SoE reporting in Australia:³⁶¹

- pressures are defined as human-induced;
- natural conditions are primary states (e.g. soil salinity, climate variability, soil nutrients, topography and natural hazards);
- inappropriate human actions, including responses to such natural conditions as drought, are pressures;
- states reflect pressure and the effectiveness of responses;
- responses can be aimed at both pressures and states;
- appropriate responses reduce pressures; and
- lack of action can be a pressure.

The SEAC noted that the PSR model is not the only conceptual approach to reporting on the state of the environment and warned about its limitations. The SEAC commented that the PSR model implies simple relationships in the interaction between human activity and the environment, but that this should not obscure the complexity of ecological relationships themselves or the difficulties in taking into account the natural variability of

³⁶⁰ DEST, n 353, p 15.

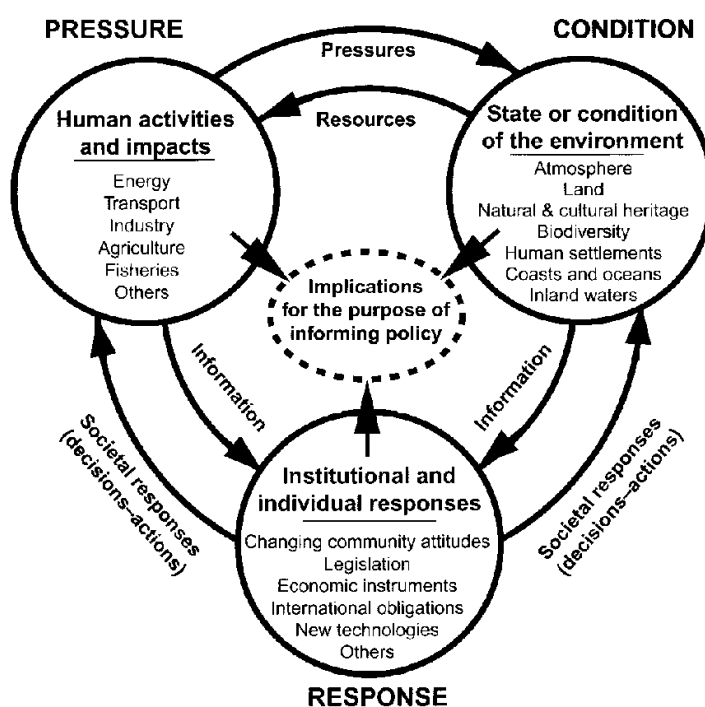
³⁶¹ SEAC, n 1, pp1-7.

ecological systems.³⁶² The SEAC also noted that the interaction between pressures, states and responses is not uni-directional. For example, the availability of a fish (a condition) may affect the level of fishing (a pressure).³⁶³

Diagrams of the PSR model

The conceptual model of the PSR method in SoE reporting is often depicted diagrammatically to illustrate the relationship between pressures, state/condition, and response. There are many variations of diagrams showing the PSR model, such the OECD diagram above. The following diagram shows the conceptual model of SoE reporting provided in the *State of the Environment Australia 2001* report, which has been adapted from earlier OECD models.

Figure 9: The PSR model of SoE reporting³⁶⁴



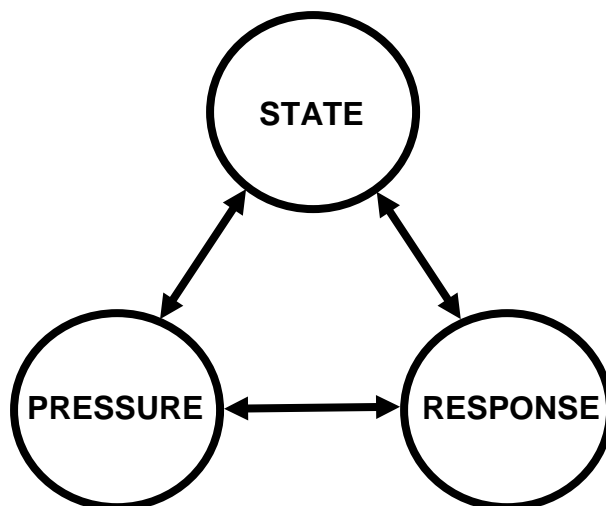
The following diagram provides a simpler representation of the PSR reporting framework that emphasises the importance of the state/condition of the environment as the critical factor for assessing environmental quality.

³⁶² SEAC, n 1, p 1-6.

³⁶³ SEAC, n 1, p 1-6.

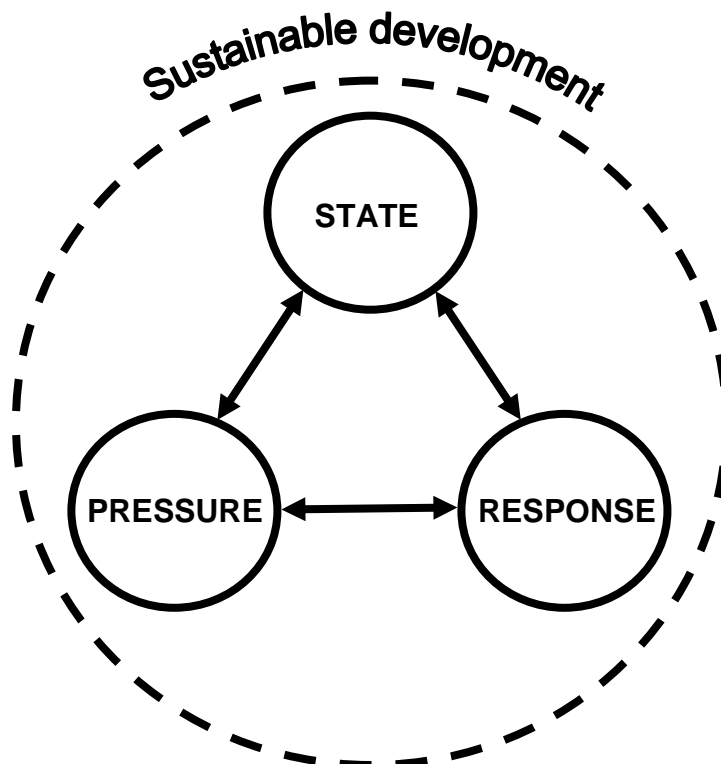
³⁶⁴ ASEC, n 1, p 115.

Figure 10: Simplified PSR model



Sustainable development is the overall global environmental policy objective and therefore encircling the diagram of the PSR method for SoE reporting with this objective will encapsulate the concepts even better. The following diagram provides such representation of the PSR model for SoE reporting within the context of sustainable development.

Figure 11: PSR model within the context of sustainable development



Guiding principles and objectives

The guiding principles and objectives of SoE reporting are significant because they explain the intended nature of the system and provide criteria against which its effectiveness can be evaluated. Rump captured the nub of SoE reporting as follows:³⁶⁵

The purpose of State of the Environment Reporting (SOER) is to support sustainable development decision making through the provision of credible environmental information. ... three objectives can be specified for SOER:

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

The Australian Government has contributed a great deal to the development of SoE reporting at an international level. It stated the guiding principles of the SoE reporting system in Australia in 1994 as follows:³⁶⁶

- *Rigour* – The system will always be guided by the best available scientific information, methods and advice, and it will present accurate data and information in a balanced and accessible way.
- *Objectivity* – Data and information will be presented without bias or modification.
- *Cooperation* – The system will establish partnerships and agreements with the community, industry and government, to facilitate the sharing of information, expertise and resources.
- *Openness* – The system will always seek to ensure open access to information about Australia's environment.
- *Global vision* – Wherever possible, the system will report information in a comparative manner, seeking to place local and regional information in national and international contexts.
- *Ecological sustainability* – The system will always seek to assess environmental information and issues against the principles of ecologically sustainable development. The precautionary principle will be applied and potential impacts for future as well as present generations will be assessed.
- *Maintenance of biological diversity* – The system will always seek to assess environmental information and issues against the principles of biodiversity conservation, as stated in the draft National Strategy for the Conservation of Australia's Biological Diversity.

In addition to articulating these guiding principles, the Australian Government stated the following as the broad objectives of the SoE reporting system:³⁶⁷

- to regularly provide the Australian public, its governments and decision makers with accurate, timely and accessible information about the condition of and prospects for the Australian environment;
- to increase public understanding of the Australian environment, its condition and prospects;
- to facilitate the development of, and review and report on, an agreed set of national environmental indicators;
- to provide an early warning of potential problems;

³⁶⁵ Rump, n 81, p 1.

³⁶⁶ DEST, n 353, p 12. Expressly adopted in the 1996 by SEAC, n 1, p 1-5.

³⁶⁷ DEST, n 353, p 13. Expressly adopted in the 1996 by SEAC, n 1, p 1-5.

- to report on the effectiveness of policies and programs designed to respond to environmental change, including progress towards achieving environmental standards and targets;
- to contribute to the assessment of Australia's progress towards achieving ecological sustainability;
- to contribute to the assessment of Australia's progress in protecting biological diversity and maintaining ecological processes and systems;
- to create a mechanism for integrating environmental information with social and economic information, thus providing a basis for incorporating environmental considerations in the development of long-term, ecologically sustainable economic and social policies;
- to identify gaps in Australia's knowledge of environmental conditions and trends and recommend strategies for research and monitoring to fill these gaps;
- to fulfil Australia's international environmental reporting obligations;
- to help decision makers to make informed judgments about the broad environmental consequences of social, economic and environmental policies and plans.

These principles and objectives were adopted by the SEAC in preparing the 1996 Australian SoE report but they were narrowed by the Australian State of the Environment Committee ("ASEC") in preparing the 2001 Australian SoE report.³⁶⁸ The ASEC summarised the objectives of the 2001 SoE report to just four objectives, namely to:³⁶⁹

- provide accurate, up-to-date and accessible information about environmental conditions, and where possible, trends for the Australian continent, surrounding seas and Australia's external territories
- increase public understanding of issues related to the Australian environment
- provide an early warning of potential problems
- report on the effectiveness of policies and programs designed to respond to environmental change.

The reduction from 11 objectives in the 1994 SoE framework to 4 objectives of the 2001 SoE report appears to have been merely intended to simplify and condense the objectives. The essential message and purpose remained the same. From these principles and objectives it is clear that a central tenet for SoE reporting in Australia is to strive, using the best information and methods available, to be objective and accurate in reporting pressures on, conditions of, and responses to the environment. Evaluating the effectiveness of legislation and policies (and, inherently, their administration) is one of the objectives of SoE reporting.

Environmental indicators

Environmental indicators have been increasingly used in SoE reporting to provide simple and measurable criteria for evaluating environmental health and the effectiveness of environmental policies.³⁷⁰ The use of indicators can even be viewed as a key component of SoE reporting to amalgamate raw environmental data into a small set of

³⁶⁸ The ASEC is an independent committee that replaced the SEAC with responsibility for preparing an Australian SoE report.

³⁶⁹ ASEC, n 1, p 10.

³⁷⁰ See generally Rump, n 81, pp 71-92; and Moldan B, Billharz S and Matravers R (eds), *Sustainability indicators: report of the project on indicators of sustainable development* (Wiley, Chichester, 1997).

numbers that can be used to monitor change and the effectiveness of response strategies.³⁷¹ The essential rationale for the use of environmental indicators is pragmatism in the face of complexity and large gaps in information about the environment. While the overarching objective against which the effectiveness of environmental policy (and an environmental legal system) must be assessed is sustainable development, this objective is too large and unmeasurable to provide a criterion for assessment in its own right. Virtually no conceivable human action (except perhaps of global nuclear war) will destroy the Earth to the extent that the action can be said to be “unsustainable” in its own right. Because of the scale, complexity and uncertainty of the environment, the objective of sustainability needs to be broken down into more measurable indicators. As Dovers points out, measurable policy goals are essential for later evaluating the success of a policy.³⁷²

As with SoE reporting, the OECD has played a leading role in the development of a common conceptual framework for environmental indicators. The OECD and International Network for Environmental Compliance and Enforcement provide a useful explanation and metaphor for environmental indicators:³⁷³

The word ‘*indicator*’ is rooted in the Latin verb *indicare*, which means to disclose or point out, to announce or make publicly known, or to estimate or put a price on ... Indicators can be thought of as pieces of evidence that provide information on matters of broader concern. For example, a legendary environmental indicator was ‘the canary in the coal mine.’ Miners would bring a caged canary into a coal mine. If the canary perished, it served as an ‘indicator’ that harmful gases were building toward a level unsafe for miners.

The OECD defines an “indicator” as a parameter, or a value derived from parameters, which points to, provides information about, and describes the state of a phenomenon / environment / area, with a significance extending beyond that directly associated with a parameter value.³⁷⁴ A “parameter” is a property that is measured or observed.³⁷⁵ An alternative definition of “environmental indicators” is physical, chemical, biological or socio-economic measures that can be used to assess natural resources and environmental quality.³⁷⁶ The OECD suggests the two principal functions of indicators are:³⁷⁷

- they reduce the number of measurements and parameters that normally would be required to give an *exact* presentation of a situation.
- they simplify the communication process by which the results of measurement are provided to the user.

The OECD produced a “core set of environmental indicators” designed to help track environmental progress and the factors involved in it, and analyse environmental policies.³⁷⁸ The OECD Core Set is a set commonly agreed upon by OECD countries for OECD use. It contains about 50 indicators, covers major issues such as climate change that reflect the main environmental concerns in OECD countries. The OECD has also

³⁷¹ Lloyd, n 355, p 152.

³⁷² Dovers, n 22, pp 101-102.

³⁷³ INECE Expert Working Group on Environmental Compliance and Enforcement Indicators, “Discussion Paper: Environmental Compliance and Enforcement Indicators: Measuring What Matters” (INECE, Washington, 2003). Available at <http://www.inece.org/indicators/workshop.html> (viewed 31/5/06).

³⁷⁴ OECD, n 358, p 5.

³⁷⁵ OECD, n 358.

³⁷⁶ DEST, n 353, p 13.

³⁷⁷ OECD, n 358.

³⁷⁸ OECD, n 358, p 6.

produced a reduced set of “key indicators” to inform civil society and to support wider communication with the public.³⁷⁹

OECD indicators are classified following the pressure-state-response model of SoE reporting: indicators of environmental pressures, both direct and indirect; indicators of environmental conditions; indicators of society’s responses. For example, atmospheric concentrations of greenhouse gases and global mean temperature are indicators of the condition of climate change.

The OECD warns that indicators are only one tool and that care needs to be taken in their use in evaluating environmental policies:³⁸⁰

Indicators are not designed to provide a full picture of environmental issues, but rather to help reveal trends and draw attention to phenomena or changes that require further analyses and possible action.

Indicators are thus only one tool for evaluation; scientific and policy-oriented interpretation is required for them to acquire their full meaning. ... indicators are not a mechanical measure of environmental performance. They need to be complemented with background information, data, analysis and interpretation. One should also note that some issues or topics do not lend themselves to evaluation by quantitative measures or indicators.

The leading work of the OECD in developing environmental indicators has been largely adopted in Australia. The Australian and New Zealand Environment and Conservation Council (“ANZECC”) developed a core set of environmental indicators that largely reflect the OECD Core Indicators. ANZECC explained the rationale for the use of environmental indicators as follows:³⁸¹

The environment is complex, and discerning environmental trends can be difficult. Environmental indicators help track changes in the environment by selecting key measures – which may be physical, chemical, biological or socio-economic – that provide useful information about the whole system. Using indicators, it is possible to evaluate the fundamental condition of the environment without having to capture the full complexity of the system. Indicators are based on the best scientific understanding currently available so that changes in these simple measures can be related to more complex environmental trends. When time series data for an indicator show a trend, then there is a need to provide some interpretation of the trend and its implications. Therefore an indicator must be backed by a sound theoretical framework so that accurate interpretations can be made.

The concentration of ozone depleting substances in the atmosphere is a good example of an indicator. The complex chemistry of stratospheric ozone depletion need not be understood in order to use this indicator. We know that increases in the concentration of ozone depleting substances are harmful to the stratospheric ozone layer, while decreases show that efforts to protect the ozone layer are succeeding.

The core set of environmental indicators adopted by ANZECC provide a useful, quantitative basis for evaluating the effectiveness of an environmental legal system in achieving the objective of sustainability. In total, 75 core indicators were defined by ANZECC in six themes/issues: atmosphere; biodiversity; land; inland waters; estuaries

³⁷⁹ OECD, n 358, p 14. See also OECD, *OECD Key Environmental Indicators 2004* (OECD, Paris, 2004). Available at <http://www.oecd.org/dataoecd/32/20/31558547.pdf> (viewed 31/5/06).

³⁸⁰ OECD, n 358, pp 14 and 16.

³⁸¹ ANZECC, *Core Environmental Indicators for Reporting on the State of the Environment* (ANZECC, Canberra, 2000), pp 4-5. Available at <http://www.deh.gov.au/soe/publications/coreindicators.html> (viewed 1 July 2006).

and the sea; and human settlements. Of these, the indicators most relevant to the case study of the environmental legal system protecting the Great Barrier Reef are those that relate to the greenhouse effect, biodiversity and estuaries and the sea. Some of these are as follows:³⁸²

Theme / Issue	Core Indicator
ATMOSPHERE	
...	...
Enhanced Greenhouse Effect	Greenhouse gas atmospheric concentrations Annual greenhouse gas emissions
...	...
BIODIVERSITY	
Threatening Processes	Native vegetation clearing Aquatic habitat destruction Fire regimes Introduced species Species outbreaks
Loss of Biodiversity	Extinct, endangered and vulnerable species and ecological communities Extent and condition of native vegetation Extent and condition of aquatic habitats Populations of selected species
Biodiversity Conservation Management	Terrestrial protected areas Marine and estuarine protected areas Recovery plans Area revegetated
ESTUARIES & THE SEA	
Marine Habitat and Biological Resources	Changes in coastal use Disturbance of marine habitat Total seafood catch Estimated wild fish stocks
Estuarine and Marine Water Quality	Coastal discharges Marine pollutions incidents Exceedences of marine and estuarine water quality guidelines Bio-accumulated pollutants Algal blooms in estuarine and marine environments Waste water treatment (coastal waters) Disturbance of potential acid sulfate soils
Global Processes	Sea level Sea surface temperature

ANZECC explained the indicators in more detail than in this summary table. Importantly, the use of environmental indicators provides measurable criteria for assessing trends in the environment and, thereby, assessing the sustainability of human impacts on the environment. Four of the ANZECC core environmental indicators can be set out here as examples of the types of measurable criteria used in defining environmental indicators:³⁸³

ATMOSPHERIC INDICATORS

Environmental indicator A4: Greenhouse gas atmospheric concentrations – Annual average atmospheric concentrations of carbon dioxide, methane, nitrous oxide, halocarbons, and substitute halocarbons.

Environmental indicator A5: Annual greenhouse gas emissions – Annual greenhouse gas emissions, in carbon dioxide equivalents, in total and by sector. Following the National Greenhouse Gas Inventory (NGGI), sectors are: stationary energy, transport, fugitive emissions from fuel, industrial processes, solvents, agriculture, land use change and forestry, and waste. The greenhouse gases controlled

³⁸² ANZECC, n 381, Table 1, pp 8-9.

³⁸³ ANZECC, n 381, pp 16, 17, 27 and 28.

under Annex A of the Kyoto Protocol are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

BIODIVERSITY INDICATORS

Environmental indicator BD1: Native vegetation clearing – Rate of clearing, in hectares per annum, of terrestrial native vegetation types, by clearing activity.

Environmental indicator BD 2: Aquatic habitat destruction – Rate of destruction, in hectares per annum, of freshwater and marine habitats, by the types of disturbing activities (e.g. trawling through seagrass beds). Marine habitat types include algal beds, beaches and dunes, coral reefs, intertidal reefs, intertidal sand/mudflats, mangroves, saltmarshes, and seagrass. Freshwater habitat types include those found in streams, rivers, lakes and impoundments.

ANZECC's 75 core indicators have proven problematic in practice and have been further modified in the 2006 Australian State of the Environment Report. Some of the problems with earlier indicators and the reasons for changing the ANZECC indicators were explained by the Australian Government as follows:³⁸⁴

At the conclusion of the first independent Australian State of the Environment Report in 1996, the then State of the Environment Committee recommended that environmental indicators be developed to ensure a much greater rigour in the reporting process and to communicate trends in the environment to decision-makers. From 1996 to 1998 a process of developing indicators was undertaken, resulting in the development of a total of 454 indicators for the seven SoE themes, covering indicators of pressures on the environment, the state (or condition) of the environment and responses to those pressures.

The next Australian State of the Environment Report in 2001 attempted to use all these indicators but failed because many of them were impractical, and because it was not clear what many of the indicators were trying to assess. In many cases, data were not available to populate the indicators. A follow up process through the ... ANZECC ... established a smaller 'core' set of 75 indicators but even efforts to report at a national level on this smaller core set were not altogether successful. The methodology for many of these indicators had still to be developed and others incorporated elements of up to four of the original indicators.

In summary, environmental indicators are being used extensively and can be a very useful tool for measuring progress for sustainability. However, they are not yet and probably never will be a comprehensive measure of sustainability. Their use requires caution, and often a great deal of background knowledge and information.

Risk assessment

Some form of risk assessment needs to be incorporated into the SoE method to evaluate the likely future effects of the response to pressures and state of the environment and the need for changes to the response to improve the likely future effects. The purpose of the assessment should be to provide a transparent and rigorous description of the likely effects likely to result from the proposed course of action.³⁸⁵ Tom Beer and Frank

³⁸⁴ DEH, *Environmental indicators for reporting*, paper prepared for the 2006 Australian SoE Committee (DEH, Canberra, 2006), available at <http://www.deh.gov.au/soe/2006/emerging/indicators/index.html> (viewed 31 December 2006), p 3.

³⁸⁵ Sullivan R & Hunt AR, "Risk assessment: the myth of scientific objectivity" (1999) 16 EPLJ 522 at 529.

Ziolkowski provide a good summary of the major concepts in the field of risk assessment:³⁸⁶

Environmental risk deals with the probability of an event causing a potentially undesirable effect. Quantitative risk thus deals with statistics, because probability is the mathematical measure of risk, and with hazard assessment which determines the nature of the undesirable effect. The terms have different meanings and different definitions in different areas of study.

... The concept of risk has two elements, i.e. the likelihood of something happening and the consequences if it happens. ...

Environmental risk analysis considers the risk to human health, welfare and ecosystems that result from adverse developmental impacts on the natural environment.

Beer and Ziolkowski identify five steps in a generic risk management process: establish the context; identify the risks; analyse the risks; assess and prioritise risks; and treat the risks.³⁸⁷ In a slightly broader sense than merely assessing risks of various events, Rump noted the need to interpret the likely future state of the environment in SoE reporting.³⁸⁸ He noted that this allows SoE reporting to remain a tool to provide sound information on potential further environmental conditions in order that decision-makers can respond with effective policies and strategies.

All risk assessment techniques require some means of estimating the likelihood of something happening. Yet that is inherently difficult because of the significant uncertainties involved. As Rump points out:³⁸⁹

The future cannot be predicted with precision due to our limited knowledge of ecosystem behaviour, including socioeconomic changes. No one knows for sure what future population levels, energy prices, or technological breakthroughs will occur or the effects of these socioeconomic changes on environmental issues such as climate change or acidification. No one can accurately predict future resource demands and consumer consumption levels and their effects on biodiversity. Furthermore, it is extremely hard to predict the consequences of existing policy. The degree of implementation and compliance may be divergent from anticipated levels due to a host of unanticipated reasons.

Nevertheless, the profound potential impacts of possible future change oblige us to heed the signs with appropriate information as a foundation for awareness raising and anticipatory response. We can use the knowledge we do have to create long-term scenarios of probably future socioeconomic and environmental conditions. Consistent with SOER principles, these scenarios should be based on the best science and information, probability theory, and realistic interpretation, not on conjecture or divine prophesy. ...

The key to forecasting the future state of the environment is the formation of realistic scenarios which describe the progression of events leading from a baseline, usually the current state, to a future situation. Scenarios in the context of SOER are based on the likely sequence of socioeconomic pressures taking into account a prevailing mode of societal response. These situations are then used to predict future environmental consequences through the use of qualitative and quantitative approaches.

³⁸⁶ Beer T and Ziolkowski F, *Environmental risk assessment: an Australian perspective* (Commonwealth Supervising Scientist, Canberra, 1995), p 1.

³⁸⁷ Beer and Ziolkowski, n 386, p 10.

³⁸⁸ Rump, n 81, p 93.

³⁸⁹ Rump, n 81, pp 93-95.

Predicting or projecting future scenarios or the likelihood of different environmental conditions is undoubtedly difficult yet essential to evaluating the effectiveness of an environmental legal system using the PSR model for SoE reporting. The critical questions that arise are: is the current response likely to alleviate the pressures and protect the condition within desired levels (i.e. consistently with sustainable development)?

Evaluating the effectiveness of the response using SoE reporting

The PSR method of SoE reporting using environmental indicators and risk assessment offers a logical and comprehensive framework to evaluate the effectiveness of the environmental legal system. Somewhat surprisingly, very few legal scholars recognise it, although many use its conceptual framework when attempting to evaluate the effectiveness of an environmental legal system.³⁹⁰ This is possibly because of its relatively recent development and that it is generally viewed as a scientific method rather than a legal method.

More surprising than the fact that legal writers rarely acknowledge using the PSR method to evaluate the effectiveness of an environmental legal system, the SoE reports produced in Australia to date have themselves tended not to evaluate the effectiveness of the environmental legal system. SoE reports relevant to the Great Barrier Reef are reviewed in chapter 7. From this analysis it appears that SoE reporting in Australia tends to merely *describe* the pressures, state and response rather than critically analysing or *evaluating* the effectiveness of the response.

The PSR method of SoE reporting can be applied as an over-arching framework to place environmental laws in their proper context and to lay the foundation for evaluating the effectiveness of an environmental legal system in two stages. The first stage, which current SoE reports are typically limited to, is to describe the condition of the environment, the pressures on the environment and then to describe and understand the environmental legal system as part of society's overall response to the condition and pressures. The second stage, which current SoE reports rarely address, is to answer two questions. First, is the legal system effective or likely to be effective in protecting and rehabilitating the condition of the environment? Second, is the legal system effective or likely to be effective in reducing the pressures on the environment? The second question is incidental to, and less important than, the first question.

There are major advantages of using the PSR model of SoE reporting as a framework to evaluate the effectiveness of an environmental legal system, particularly in OECD countries such as Australia that use the PSR model. First, it is simple, logical and comprehensive. Second, it provides a common sense, meaningful and objective approach to analysing environmental problems at the level of the legal, social and government systems. Third, it incorporates internal feedback to allow monitoring over time. Fourth, it provides a systematic method to integrate environmental science and law by placing an environmental legal system in the context of threats (pressures) to the environment and the state of the environment thereby allowing the effectiveness of the system to be judged against the known reality of the environment (or at least the best available scientific

³⁹⁰ Rare exceptions of authors who acknowledge the SoE method in evaluating an environmental legal system or part of it include: Gardner, n 43 (uses SoE to explain the need for reform); McGrath, n 330; and Wulf P, "Diffuse land-based pollution and the GBR World Heritage Area: the Commonwealth's responsibilities and implications for the Queensland sugar industry" (2004) 21 EPLJ 424.

information and knowledge). Fifth, it allows gaps and deficiencies in an environmental legal system to be identified and changes to the system prioritised. Sixth, it has been widely adopted internationally and nationally as an accepted method for reporting on the SoE and therefore there is a large body of information and data currently available from which the effectiveness of environmental legal systems may be judged. The seventh, and final, reason is that it is consistent with the approach of many international bodies and national and State governments for reporting on and evaluating the SoE.

Unrecognised use of the PSR method

Many authors implicitly adopt the PSR method of SoE reporting without recognising it or acknowledging it. This is because many writers implicitly adopt a cause-and-effect / problem-and-answer approach for environmental policy and law that reflects the PSR method without acknowledging that methodology. Many examples of this approach were encountered during the literature survey of articles in the *Environmental Planning and Law Journal* and the literature review. These authors rarely use the words “pressure”, “state” or “response” but the concepts are implicit in their writing and methodologies. Some of the authors who use this approach can be mentioned here to illustrate these points.

Bjørn Lomborg provides a striking example of implicitly using of the PSR method, without acknowledging it, to evaluate the effectiveness of environmental management and, thereby, to argue that there is no looming environmental catastrophe. He discusses the conditions, pressures and responses of society in relation to air pollution, water pollution, waste, biodiversity, and global warming before suggesting:³⁹¹

Conditions in the world are not getting worse and worse. ... we have more leisure time, greater security and fewer accidents, better education, more amenities, higher incomes, fewer starving, more food, and healthier and longer lives. There is no ecological catastrophe looming around the corner to punish us. ... We are actually leaving the world a better place than when we got it and this is the really fantastic point about the real state of the world: that mankind's lot has vastly improved in every significant measurable field and that it is likely to continue to do so.

Lin Gan provides a second example of implicitly adopting a PSR method in considering environmental policy in China.³⁹² Without acknowledging any methodology, he begins his article with facts about Chinese economic growth rates and greenhouse gas emissions (i.e. pressures) and “severe pollution problems” (i.e. condition), before reviewing the recent development of Chinese governmental policy in responding to global warming problems (i.e. response).

Kibuta Ongwamuhana provides a third example of an implicit use of the PSR method as a conceptual model to evaluate the effectiveness of part of an environmental legal system in his outstanding critique of environmental protection in Papua New Guinea (“PNG”).³⁹³ He discusses the environmental impacts of mining, such as pollution of land and water (i.e. pressures), focusing on a case study of the Ok Tedi Mine and the negative ecological changes that these have caused to the PNG environment such as the Fly River

³⁹¹ Lomborg, n 50, pp 348 and 350.

³⁹² Gan L, “Global Environmental Policy in Social Contexts: The Case of China”, *Knowledge and Policy: The International Journal of Knowledge Transfer and Utilization*, Winter 1992-93, Vol 5, No 4, pp 30-50 (reproduced in Rist, n 117, pp 423-446).

³⁹³ Ongwamuhana K, “Mining and environmental protection in Papua New Guinea” (1991) 8 EPLJ 133.

(i.e. condition). He discussed the laws regulating mining and water pollution (i.e. response) before evaluating the effectiveness of this system as follows:³⁹⁴

Although the period immediately after Independence [of PNG in 1975] saw the enactment of an array of environmental laws, this legal regime remains largely ineffective. ... protection of the environment has in recent times been relegated by the State to mere rhetoric. Clearly the State seems to have veered away from the high ideals of the late seventies when there was a serious commitment on conservation. Currently, the actions of the State underlie a serious conflict of interests. The State finds itself in the impossible position of regulator ..., equity participant in mining companies, and receiver of tax revenue from mining operations. ... It seems that the State is now influenced more by pragmatic and very short-sighted considerations. The State's bungled handling of the Ok Tedi environmental issues is the best example of how far the State is prepared to sacrifice the environment for a quick buck. ...

Helga Johnsen provides a fourth example of an implicit use of the PSR model as the conceptual model for evaluating a part of an environmental legal system in her critique of contaminated land management in New South Wales ("NSW").³⁹⁵ She begins by discussing "the nature and scope of the problem" (i.e. pressure) and the "scale of the problem of land contamination in Australia" (i.e. condition). She then discusses the "responses to the problem" including "policy responses" and "legislative responses" before evaluating the "adequacy of current responses" before concluding:³⁹⁶

If we consider the effectiveness of clean-ups alone and the limits of a deterrence regime focused on liability (as exemplified by the United States experience), the current responses of the New South Wales and Federal Governments are exposed as reprehensively weak and short-sighted. It is clear that even with sophisticated legal and technical responses the problem of contamination will continue. The clean-ups effected will be inadequate, with consequent public health and environmental effects and constraints on the use of land by future generations. ...

Charmian Barton provides a fifth example of an implicit use of the PSR method to evaluate the effectiveness of soil and land conservation in Western Australia.³⁹⁷ She begins by identifying soil erosion as having serious environmental effects (i.e. pressure). She then discusses the extent of the problem in Australia (i.e. condition) and the laws and policies controlling soil erosion in Western Australia (i.e. condition) before concluding:³⁹⁸

An attempt to achieve voluntary soil conservation through legislation which relies on education has not been successful. It is evident that landholder self-interest has not been effective in preventing soil degradation. There is also no evidence that landowners take greater care of their land than lessees and therefore leasehold regulation does not result in higher levels of soil conservation.

Donna Curran provides a sixth example of an implicit use of the PSR method to evaluate the effectiveness of the conservation of biodiversity on private property in NSW.³⁹⁹ She begins with an explanation of the richness of biodiversity in NSW (i.e. condition) and the recent serious decline in biodiversity (i.e. trend in condition). She then considers the major threats (i.e. pressures) to biodiversity in NSW, including: introduction

³⁹⁴ Ongwamuhana, n 393, pp 139 and 142.

³⁹⁵ Johnsen H, "The adequacy of the current response to the problem of contaminated sites" (1992) 9 EPLJ 230.

³⁹⁶ Johnsen, n 395, pp 241-242.

³⁹⁷ Barton C, "Soil and land conservation in agricultural areas of Western Australia: A proposal for more effective legislation" (1993) 10 EPLJ 251.

³⁹⁸ Barton, n 397, p 257.

³⁹⁹ Curran D, "The conservation of biological diversity on private property in NSW" (2000) 17 EPLJ 34.

of exotic species; hunting and poaching; habitat modification, loss and fragmentation. She then turns to the use of protected areas, private property, education, motivational instruments, and economic incentives for the conservation of biodiversity in NSW (i.e. responses). As a result of her evaluation she concludes that traditional methods for conserving biodiversity such as the establishment of protected areas are no longer sufficient and a new approach using economic instruments is needed.

There are many other articles that use a PSR model without acknowledging it or using these precise terms. For example, Jakeman and Simpson used the PSR method when considering air pollution from dustfall from coal mining and water pollution from salinity due to irrigation in Australia.⁴⁰⁰ Sandra Burns used a similar approach to discuss the ineffectiveness of toxic waste laws in Australia.⁴⁰¹ Naughton implicitly used the PSR method when considering medium-density development in Australian cities.⁴⁰² Kevin Andrews used the PSR approach for biotechnology regulation in Australia in the 1980s.⁴⁰³ John Bradsen used it to evaluate the effectiveness of soil and land conservation in Australia.⁴⁰⁴ Ted Christie used it for greenhouse gases.⁴⁰⁵ Klaus Bosselmann used it to evaluate the ineffectiveness of New Zealand's response to climate change.⁴⁰⁶ Poh-Ling Tan used it as the basis of evaluating the ineffectiveness of allocation and management of water resources in the Lower Balonne River, Queensland.⁴⁰⁷ There are many other articles that use this approach.⁴⁰⁸

⁴⁰⁰ Jakeman AJ and Simpson RW, "Towards more effective environmental quality control policies: A technical perspective for air and water pollution" (1986) 2 EPLJ 124.

⁴⁰¹ Berns S, "Out of sight, out of mind: Toxic waste as an environmental risk" (1986) EPLJ 107.

⁴⁰² Naughton TFM, "Medium-density development (1988) 4 EPLJ 135.

⁴⁰³ Andrews K, "Australian controls on the environmental application of biotechnology" (1988) 3 EPLJ 194.

⁴⁰⁴ Bradsen J, "Perspectives on Land Conservation" (1991) 8 EPLJ 16.

⁴⁰⁵ Christie E, "The Greenhouse Gases and Environmental Law" (1990) 7 EPLJ 114.

⁴⁰⁶ Bosselmann K, "Power, plants and power plants: New Zealand's implementation of the climate change convention" (1995) 12 EPLJ 423.

⁴⁰⁷ Tan P, "Conflict over water resources in Qld: all eyes on the Lower Balonne" (2000) 17 EPLJ 545.

⁴⁰⁸ The following are a selection: Berzins K, "Development control on escarpments in the Sydney metropolitan area" (1984) 1 EPLJ 258; Dovers SR and Day DG, "Australian rivers and statute law" (1988) 5 EPLJ 98; Tsamenyi BM and Bedding JM, "The Australian legislative framework for the protection of the ozone layer" (1990) 7 EPLJ 3; Eaton P, "Forest policy and legislation in Borneo" (1990) 7 EPLJ 49; Lipman Z, "The Convention on the Control of Transboundary Movements and Disposal of Hazardous Wastes and Australia's waste management strategy" (1990) 7 EPLJ 283; Horn L, "The greenhouse effect and international law" (1990) 7 EPLJ 294; Cossins A, "Uncertainty, risk assessment and legal regulation: a look at the debate surrounding the release of genetically-engineered organisms into the environment" (1992) 9 EPLJ 320; Mossop D, "Coastal wetland protection law in New South Wales" (1992) 9 EPLJ 331; Carruthers R, "International controls on the impact on the environment of wartime operations" (1993) 10 EPLJ 38; Blay SKN and Piotrowicz RW, "Biodiversity and conservation in the twenty-first century: a critique of the Earth Summit 1992" (1993) 9 EPLJ 450; Brunton N, "Water pollution law in New South Wales and Victoria: current status and future trends" (1994) 11 EPLJ 39; Hardaway R and Dacres JD, "Tropical forest conservation legislation and policy: focus on South-East Asia" (1994) 11 EPLJ 419; Preston BJ, "The role of law in the protection of biological diversity in the Asia-Pacific region" (1995) 12 EPLJ 264; See also Gumley WS, "Legal and Economic Responses to Global Warming – An Australian perspective" (1997) 14 EPLJ 341; Mahony S, "Efficacy of the 'threatening processes' provisions in the Threatened Species Conservation Act 1995 (NSW): bush-rock removal and the endangered broad-headed snake" (1997) 14 EPLJ 3; Smith J, "Skinning cats, putting tigers in tanks and bringing up baby: A critique of the TSCA" (1997) 14 EPLJ 17; Baird RJ, "Ocean dumping – an overview of the international and domestic regulatory system" (1998) 15 EPLJ 174; Cusack V, "Perceived costs versus benefits of meeting the Kyoto target for greenhouse gas emission reduction: the Australian perspective" (1999) 16 EPLJ 53; Sperling K, "If caution really mattered" (1999) 16 EPLJ 425; Marshall DG and Moore SA, "Tragedy of the commons and the

Several contributors to a recent text edited by David Ervin, James Kahn and Marie Livingston on methods for evaluating environmental policy through the lens of environmental economics implicitly use the PSR concepts to evaluate the effectiveness of various laws.⁴⁰⁹ While the strong emphasis in the text is on economic efficiency three contributors who address environmental effectiveness do so by using environmental conditions to measure effectiveness consistently with the PSR method. Air pollution levels (i.e. condition) in Central Europe are used to evaluate the effectiveness and cost-effectiveness of pollution controls.⁴¹⁰ Improvements in environmental conditions are used as indicators to judge the success of agro-environmental policy in the UK.⁴¹¹ Environmental indicators are used to evaluate the effectiveness of the Danish pesticide programme.⁴¹²

Similarly, in a recent compilation of international environmental enforcement and compliance writing, Madhava Sarma uses a PSR method to evaluate the effectiveness of the *Montreal Protocol on Ozone Depleting Substances*. Sharma noted the recognition of ozone-depleting substances in the 1970s (i.e. pressure), the hole that developed over Antarctica (i.e. condition and trend), and the entry into the Montreal Protocol (i.e. response) before stating that “scientific assessment has verified the success” of the Protocol in slowly halting rapid loss of ozone and slow recovery of the ozone layer (i.e. effectiveness).⁴¹³

Another, large study of the state of the global environment that uses the PSR method without acknowledging it is the *State of the World* published annually by the Worldwatch Institute. Contributing authors to the *State of the World 2007* all use a PSR method, with heavy reliance on case studies, to analyse a diverse array of sustainable development topics such as urbanization and providing clean water.⁴¹⁴

These examples show the pervasive, if unacknowledged, use of the PSR method when evaluating the effectiveness of environmental law and policy.

VARIATIONS ON SOE REPORTING

There are several recognisable variations on the PSR method used in environmental reporting. The work of Paul Rump in the *SoE Source Book* provides a very useful overview of the concepts underpinning SoE reporting as well as the main variations and alternatives to the PSR framework.⁴¹⁵ Rump considered four alternative organisational

neglect of science: planning and management of the Shark Bay World Heritage Area” (2000) 17 EPLJ 126; Farrier D, “Fragmented law in fragmented landscapes: the slow evolution of integrated natural resource management legislation in NSW” (2002) 19 EPLJ 89; McDonald L, Bradshaw SD, Gardner A, “Legal protection of fauna habitat in Western Australia” (2003) 20 EPLJ 95; Bartel, n 115; Riddell G, “A crumbing wall: The TSCA 10 years on” (2005) 22 EPLJ 446; Sullivan R, “Greenhouse Challenge Plus: A new departure or more of the same?” (2006) 23 EPLJ 60.

⁴⁰⁹ Ervin, Kahn and Livingston, n 113.

⁴¹⁰ Archibald S and Bochniarz Z, “Environmental outcomes assessment: using sustainability indicators for Central Europe to measure the effects of transition on the environment”, Ch 5 in Ervin, Kahn and Livingston, n 113.

⁴¹¹ Hanley N and Whitby M, “Alternative criteria for judging the success of agro-environmental policy in the UK”, Ch 8 in Ervin, Kahn and Livingston, n 113.

⁴¹² Dubgaard, A, “The Danish pesticide programme: success or failure depending on indicator choice”, Ch 9 in Zaelke, Kaniaru and Kružíková, n 18.

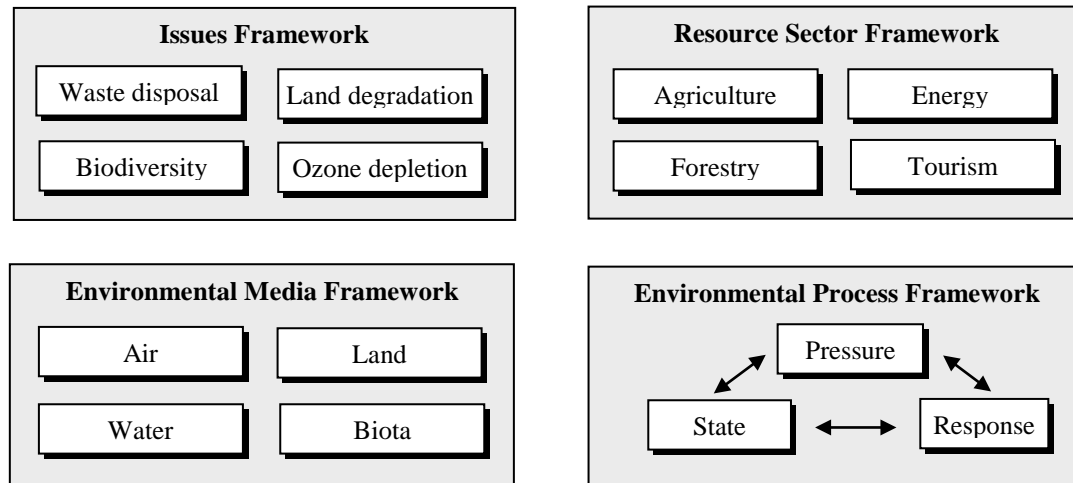
⁴¹³ Sarma KM, “Compliance with the Montreal Protocol” in Zaelke, Kaniaru and Kružíková, n 18, p 301.

⁴¹⁴ Starke L (ed), *State of the World: Our Urban Future* (Earthscan, London, 2007).

⁴¹⁵ Rump, n 81.

frameworks for reporting on the environment based on: environmental issues (e.g. acid rain); economic sectors (e.g. agriculture); environmental media (e.g. air); and environmental process.⁴¹⁶ “Environmental media” are sometimes referred to as “environmental themes”. These are shown diagrammatically in Figure 12.

Figure 12: Different SoE organisational frameworks⁴¹⁷

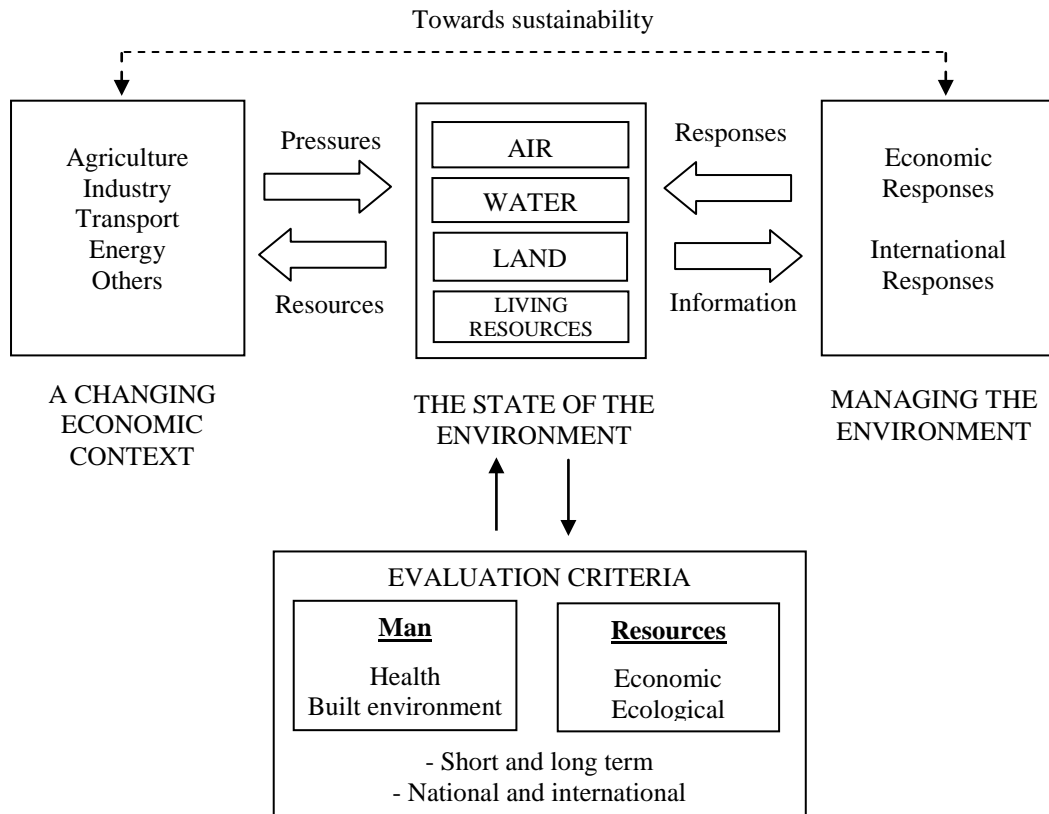


Prior to the development of the PSR method, SoE reports used a combination of the other approaches identified by Rump. For example, the 1991 OECD SoE report used the conceptual framework shown in Figure 13. This approach combined resource sectors and environmental media in a very different conceptual framework to later OECD models (as shown in Figure 8 and Figure 9 on pages 111 and 113).

⁴¹⁶ Rump, n 81, pp 43-44 and 48. The comments in this paragraph summarise the discussion in this book.

⁴¹⁷ Adapted from Rump, n 81, p 42, citing Campbell M and Maclaren V, et al, *Municipal State of the Environment Reporting in Canada: Current Status and Future Needs* (Occasional Paper No 6, State of the Reporting Directorate, Environment Canada, Ottawa, 1995).

Figure 13: Scope and framework for 1991 OECD SoE report⁴¹⁸

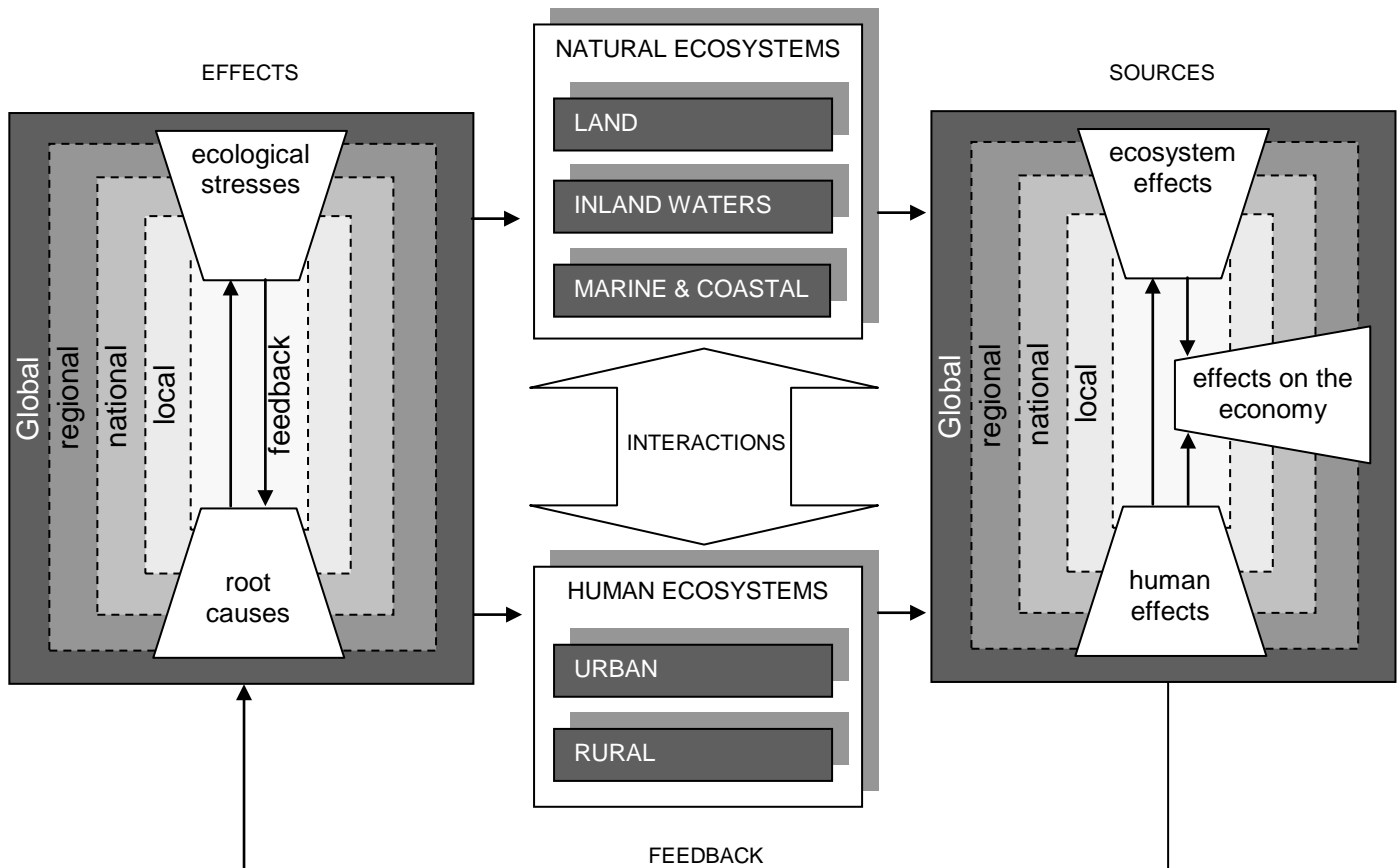


Apart from direct variations on the PSR model, there are quite different approaches sometimes adopted. For example, Rump noted the early approach taken by the United Nations Economic and Social Commission for Asia and the Pacific (“ESCAP”) incorporating both the notion of cause-and-effect and the spatial context.⁴¹⁹ In this approach the interactions between the natural ecosystems and the human ecosystems are examined according to sources and effects. Sources are considered as root causes which result in stresses affecting natural systems. Figure 14 shows the analytical model used by ESCAP.

⁴¹⁸ Adapted from OECD, *State of the Environment* (OECD, Paris, 1991), p 14.

⁴¹⁹ Rump, n 81, p 54, citing ESCAP, *State of the Environment in Asia and the Pacific 1990* (United Nations, Bangkok, 1992).

Figure 14: ESCAP conceptual framework⁴²⁰



ESCAP has since refined this conceptual approach to more closely follow the UNEP approach,⁴²¹ which will be explained shortly. The interest at this stage is simply to see some of the variety of conceptual models for reporting on the SoE.

Rump considered the advantages and disadvantages of each major stream of approaches to organising SoE reporting. He found that *environmental issues*, such as “pollution” and “global warming”, are a popular method for reporting on the environment but that, in practice, this approach tends to represent a “react and cure” approach which emphasises certain issues at the expense of a more systematic and comprehensive analysis. Reporting based on *economic sectors* use categories of human activities, such as “agriculture”, “mining”, and “tourism”, as the basis for organisation. This approach takes advantage of the way national governments and statistical systems tend to be organised but is rather narrow in focus and may neglect ecosystems linkages and implications. *Environmental media*, such as “air”, “oceans” and “biodiversity”, are the traditional way of reporting on the state of the environment reflecting the way we commonly divide the environment into components but is weak at accommodating ecological processes or pervasive problems affecting more than one environmental medium. *Environmental processes* provide an approach that organises reporting based on the assessment of the impact of human activities on the physical and biological processes of ecosystems. The

⁴²⁰ Extracted in Rump, n 81, p 55, from ESCAP.

⁴²¹ See ESCAP, *State of the Environment in Asia and the Pacific 2005* (United Nations, Bangkok, 2005). Available at <http://www.unescap.org/esd/environment/soe/2005/> (viewed 4 July 2006).

concentration on dynamic relationships reflecting both cause and effects provides systematic and comprehensive coverage in a cross-sectoral and integrative manner. Such a framework facilitates the development and evaluation of policy responses to environmental problems.

Rump also considered three typical spatial frameworks that are used in SoE reporting: jurisdictional units; environmental components; and ecosystem spatial frameworks.⁴²² Jurisdictional units refer to political or administrative boundaries. A major difficulty with using *jurisdictional units* as a basis for SoE reporting is that these boundaries do not generally reflect environmental processes. Rump suggested that single *environmental components* such as soil type, vegetation, or climate can be used to determine reporting units when linked to spatial units such as watersheds but that this approach was not holistic. In contrast, *ecosystem spatial frameworks* use multiple environmental components to define geographic units which contain distinctive sets of abiotic and biotic features that are ecologically interrelated. Modern SoE reporting uses a combination of these approaches.

Rump noted that SoE reporting (for which he and some other authors use the acronym “SOER”) around the world uses the full suite of these approaches and frameworks.⁴²³ Over time SoE reporting has developed from sectoral reporting to integrated reporting using an ecosystem spatial framework. The environmental processes approach and the ecosystem spatial framework in many ways incorporated the less-comprehensive approaches.⁴²⁴ He assessed the various frameworks and commented that:⁴²⁵

The desirability of an integrative, holistic structure which focuses on cause-and-effect linkages between the environment and socioeconomic systems must be recognized and pursued for SOER to serve the sustainable development paradigm. For these reasons, the pressure-state-response model based on an ecosystem spatial framework represents the best existing conceptual model on which to structure SOER.

While preferring an integrated PSR assessment within an ecosystem spatial framework, Rump noted several variations on this approach:⁴²⁶

There are several elaborations on the basic pressure-state-response model. In some discussions, a distinction is made between driving or underlying forces, such as population growth and technology development, and the more specific human activities on the pressure side; while others split the state part into functional changes called impacts from changes in the characteristics of the environment. ...

The OECD acknowledged the Driving force – State – Response (“DSR”) and Driving force-Pressure-State-Impact-Response (“DPSIR”) models as two variations on the PSR model:⁴²⁷

Depending on the purpose for which the [pressure-state-response (PSR)] model is to be used, it can easily be adjusted to account for greater details or for specific features. Examples of adjusted versions are the Driving force - State - Response (DSR) model formerly used by the United Nations Commission for Sustainable Development in its work on sustainable development indicators, the framework used for OECD sectoral

⁴²² Rump, n 81, pp 44-45 and 48. The comments in this paragraph summarise the discussion in this book.

⁴²³ Rump, n 81, pp 48-53.

⁴²⁴ Rump, n 81, p 44.

⁴²⁵ Rump, n 81, p 47.

⁴²⁶ Rump, n 81, p 44.

⁴²⁷ OECD, n 374, p 21.

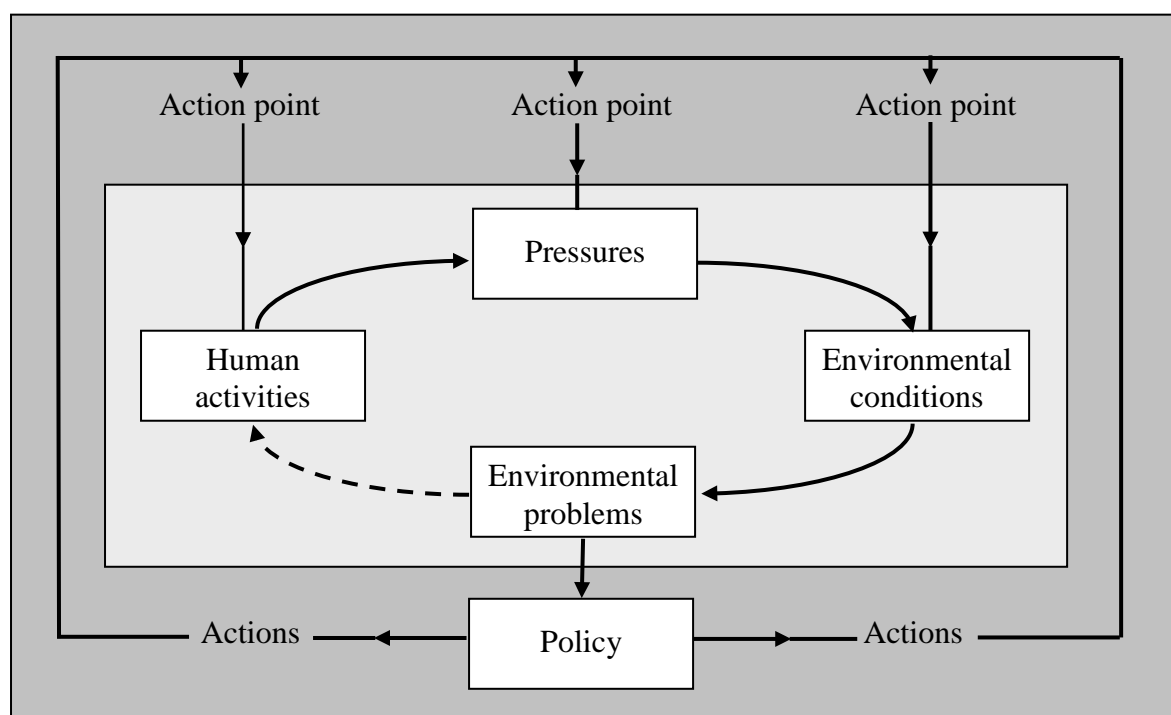
environmental indicators and the Driving force-Pressure-State-Impact-Response (DPSIR) model used by the European Environment Agency.

The European Environment Agency and the UNEP developed the DPSIR model. Europe's first SoE report in 1995,⁴²⁸ known as the "Dobris Assessment" laid the foundations for this variation in SoE reporting and it is convenient to consider this approach prior to the DPSIR and DSR models to show their evolution.

Dobris Assessment

The European Environment Agency adopted a variation of the PSR model the Dobris Assessment that was intended to present environmental complexities better than the PSR model.⁴²⁹ The similarities between the Dobris Assessment and the PSR model are evident in the conceptual framework shown in the diagram below.

Figure 15: Report model for the Dobris Assessment⁴³⁰



The European Environment Agency explained the approach it took in the Dobris Assessment as follows:⁴³¹

For the significance of the material being presented to be properly realised, and for the causes and consequences of environmental problems to be discussed (from which priorities for action can be decided), a simple presentation strategy is required which nonetheless accommodates the complexities. Previous state-of-the-environment reports have tackled this in various ways. A common approach, first proposed and adopted by

⁴²⁸ Stanners D and Bourdeau P (eds), *Europe's environment: The Dobris Assessment* (European Environment Agency, Copenhagen, 1995). Available at <http://reports.eea.europa.eu/92-826-5409-5/en> (viewed 4 July 2006).

⁴²⁹ Stanners and Bourdeau, n 428, Figure 1.1. See also Rump, n 81, p 49.

⁴³⁰ Rump, n 81, p 54, citing Stanners and Bourdeau, n 428.

⁴³¹ Stanners and Bourdeau, n 428, quoted from the "Introduction – Presentation Strategy".

the OECD, is one that covers: information on the pressures acting on the environment; descriptions of the actual condition or state of the environment (including trends); and descriptions of the responses taken in order to check and control environmental degradation. A different configuration of these information blocks has been adopted here. ...

The analytical structure of the report illustrated schematically in [in Figure 15] shows a simplified chain from the sources of environmental pressures (human activities), through the pressures themselves to the effects (environmental conditions and problems). The origins and the multiple contributory pathways which lead to environmental problems cannot be adequately illustrated by the model in the figure since the way in which 'causes' lead to 'effects' are many and complex. Responses can be made or, more specifically, actions can be taken, at different points in the chain, treating the sources or the agents of pressure, or treating the environment directly. The figure specifies the inter-relationships between the environmental assessment per se (the central part of the figure, and the task of the current report), and the area where policy is made and actions can be taken (the role of society at large and politicians in particular). ...

As will be seen below, the European Environment Agency has since altered its conceptual reporting model further. Little, therefore, needs to be said about the model used in the Dobbris Assessment. It is merely a variation on the PSR model with no particularly striking improvements or benefits.

DSR model

Lars Mortensen of the United Nations Commission for Sustainable Development described the DSR, DPSIR, and the Pressure-State-Impact-Response ("PSIR") models in the context of selecting indicators of sustainable development. He explained the range of variations on the basic PSR model as follows:⁴³²

The Driving force–State–Response framework (DSR) was adopted by the United Nations Commission on Sustainable Development (CSD) in 1995 as a tool for organizing information on sustainable development and for developing, presenting and analysing indicators of sustainable development. The framework is used in the CSD work programme on indicators of sustainable development ...

The DSR framework used by the CSD has basically been adapted from the Pressure – State – Response framework (PSR) used by the OECD in its work on environmental indicators. In the DSR framework, the term pressure has been replaced by that of driving force in order to accommodate the inclusion of economic, social and institutional aspects of sustainable development. The term 'driving force' indicates ... an impact on sustainable development. This impact can be both positive and negative, which is not the case for the pressure category used by the OECD. This is particularly relevant for some driving forces which have a positive impact on the development aspects of sustainable development, but negative impact on the environmental aspects.

Some organizations and governments, for example the European Environment Agency ... distinguish between driving forces and pressures [DPSIR] in the development and use of environmental indicators. The reasoning behind this distinction is that driving forces can be seen as activities that have an impact on the pressure on the environment.

... some organizations divide the state category into two sub-categories. For example, the Pressure-State-Impact-Response framework (PSIR) used by UNEP and RIVM has added a category of impact (or effect) indicators. ... The reasoning behind this distinction between state and impact is that impacts are seen as the consequences of the

⁴³² Mortensen LF, "Description of the Driving Force-State-Response Framework (DSR)" in Moldan, Billharz, and Matravars, n 370, pp 47-49.

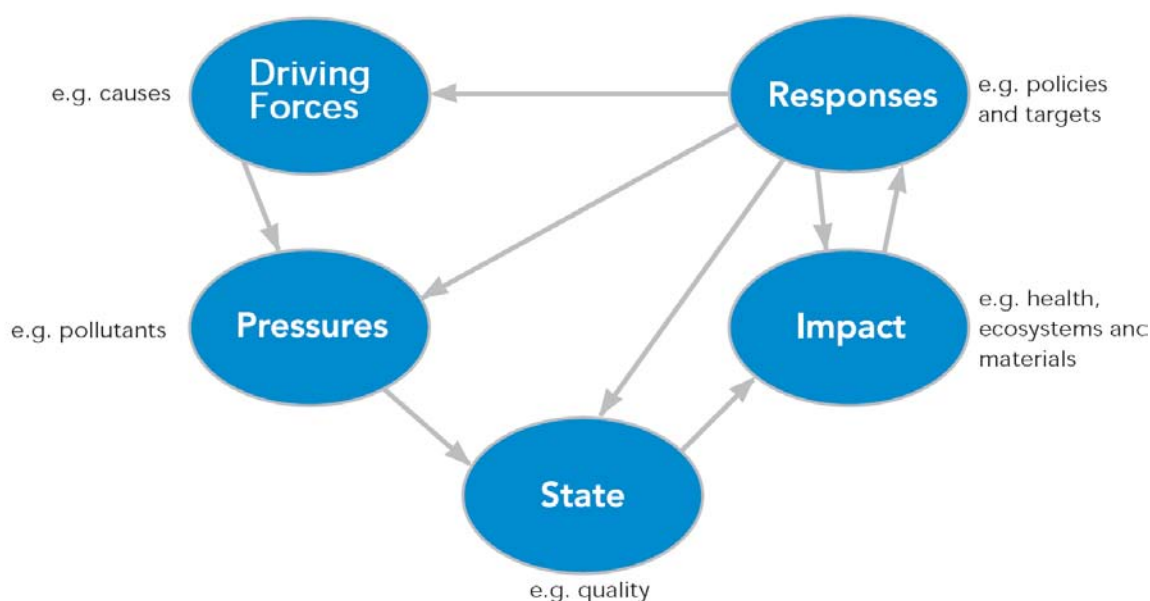
changes in the state of the environment. ... Another example of the use of an additional category is the Framework on Indicators of Sustainable Development (FISD) of the United Nations Statistics Division (UNSD) which distinguishes between impacts and effects, and inventories, stocks and background conditions. ...”

Mortensen argued for the superiority of the DSR model over the PSR and DPSIR models, at least as a framework for developing sustainability indicators. Mortensen’s essential reason for replacing the term “pressure” with that of “driving force” was that pressure is not an accurate reflection of the impacts of human activities on sustainable development, which can be positive and/or negative. He also noted that, unlike the pressure-state-response model, the DSR framework is not based on an assumption that there is a causal link between indicators. He saw that “a major advantage of no implied causality is that no simplistic assumptions have been made on causal links that may or may not exist.”⁴³³ These points can be addressed after considering the DPSIR model.

DPSIR model

The DPSIR model has been adopted by the European Environment Agency and UNEP as their environmental reporting framework over the past ten years. The model is shown diagrammatically as follows:

Figure 16: DPSIR model⁴³⁴



The DPSIR model divides pressures in the PSR model into three categories: driving forces, pressures, and impacts. In this model, drivers refer to fundamental processes in society that drive human activities which have a direct impact on the environment such as population growth. Pressures or “direct drivers” are human activities that have a direct impact on the environment such as fishing, land clearing or release of contaminants. State is the condition of the environment such as 50% of the land in a specified area has been

⁴³³ Mortensen, n 432, p 52.

⁴³⁴ European Environment Agency (“EEA”), *Europe’s environment: the third assessment* (EEA, Copenhagen, 2003), p 15, available at http://reports.eea.europa.eu/environmental_assessment_report_2003_10/en. See also EEA, *Europe’s environment: the fourth assessment* (EEA, Copenhagen, 2007), p 50, available at <http://www.eea.europa.eu/pan-european/fourth-assessment> (viewed 20 December 2007).

cleared of vegetation. Trends in the state/condition of the environment are also recorded, for example, land clearing in a certain area is continuing to remove 1% of vegetation per year. Impacts are the effects on the environment of pressures, such as habitat destruction or pollution. Responses are the things that society is doing to manage drivers, pressures and impacts so as to protect, maintain and restore the state or condition at or to a desired level. Responses include education, economic incentives, and regulation.

The UNEP has further developed the DPSIR model through the MA process. It is convenient to consider these developments before commenting on the DPSIR model.

Millennium Ecosystem Assessment 2005

The MA was conducted between 2001 and 2005 to assess the consequences of ecosystem change for human well-being in the context of achieving the Millennium Development Goals set by the United Nations in 2000.⁴³⁵ It was conducted by four working groups on condition and trends, scenarios, responses, and sub-global assessments. A core concept in the MA was “ecosystem services”:⁴³⁶

Ecosystem services are the benefits people obtain from ecosystems. These include *provisioning services* such as food, water, timber, and fiber; *regulating services* that affect climate, floods, disease, wastes, and water quality; *cultural services* that provide recreational, aesthetic, and spiritual benefits; and *supporting services* such as soil formation, photosynthesis, and nutrient cycling.

The conceptual framework around which the MA was built has similarities with the PSR and DPSIR methods, but is also a significant departure from those models. The conceptual framework for the MA is shown below in Figure 17. The framework is explained in the MA with reference to this diagram as follows:⁴³⁷

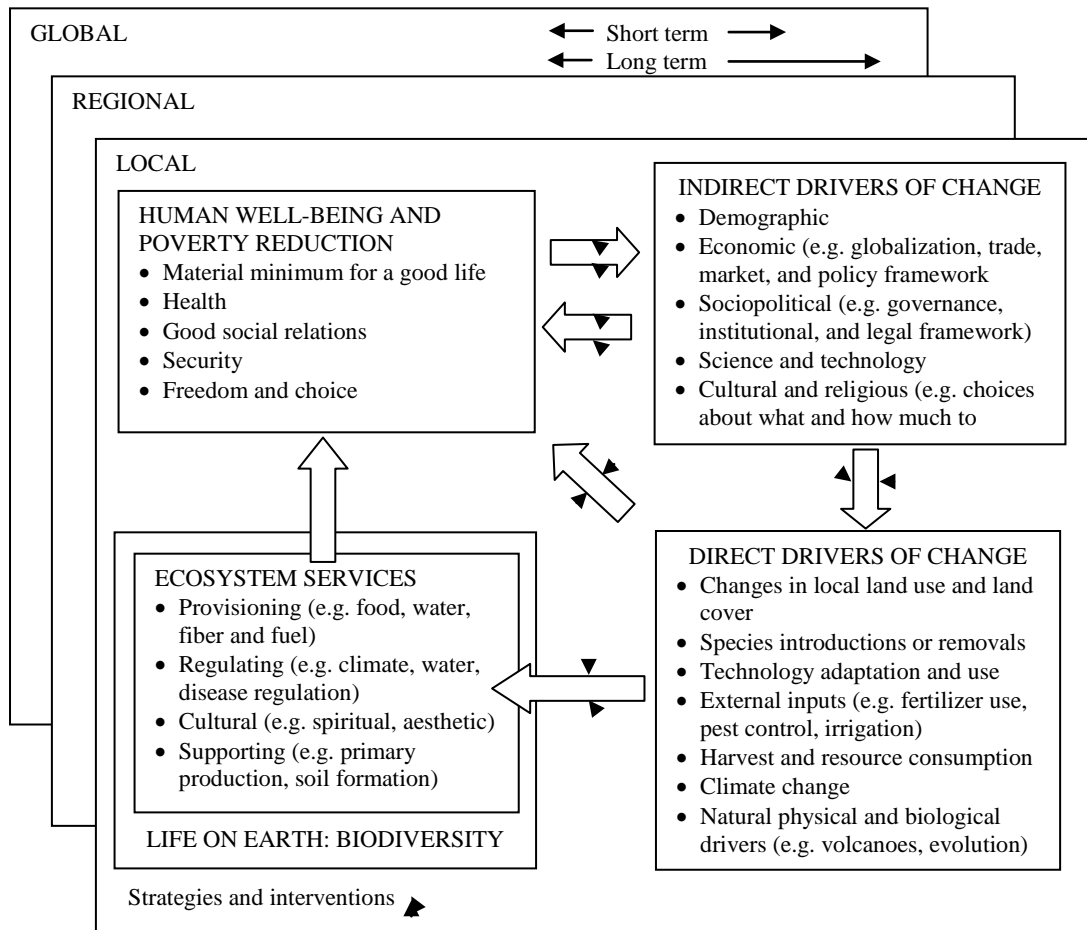
Changes in drivers that indirectly affect biodiversity, such as population, technology, and lifestyle (upper right corner of figure), can lead to changes in drivers directly affecting biodiversity, such as the catch of fish or the application of fertilizers (lower right corner). These result in changes to ecosystems and the services they provide (lower left corner), thereby affecting human well-being. These interactions can take place at more than one scale and can cross scales. For example, an international demand for timber may lead to a regional loss of forest cover, which increases flood magnitude along a local stretch of a river. Similarly, the interactions can take place across different time scales. Different strategies and interventions can be applied at many points in this framework to enhance human well-being and conserve ecosystems.

⁴³⁵ There are eight Millennium Development Goals, including: halving extreme poverty; providing universal primary education; halting the spread of HIV/AIDS; and ensure environmental sustainability, all by the target date of 2015. See <http://www.un.org/millenniumgoals/index.html> (viewed 1 July 2006).

⁴³⁶ MA Board, n 147, p 9.

⁴³⁷ MA Board, n 147, p 14.

Figure 17: MA conceptual framework of interactions between biodiversity, ecosystem services, human well-being, and drivers of change⁴³⁸



The MA conceptual model bears only passing resemblance to the DPSIR model. However, the UNEP is currently adopting a hybrid approach that integrates the MA approach with the DPSIR more closely. This new approach is considered in the next section.

Before passing to the further developments of this approach, the philosophy underpinning the MA approach may be noted. There is an explicit return to a strong anthropocentric worldview inherent in the Millennium Development Goals and the MA. William Cunningham and Barbara Woodworth summarise two very different historical worldviews of “natural resource management” and “nature conservation”:⁴³⁹

... President Theodore Roosevelt and his chief conservation advisor, Gifford Pinchot [adopted forest management policies in the United States in the early 1900s based on] pragmatic **utilitarian conservation**. They argued that the forests should be saved “not because they are beautiful or because they shelter wild creatures of the wilderness, but only to provide homes and jobs for people.” ... “The first principle of conservation is development and use of the natural resources now existing ... for the benefit of the people who live here now.”

⁴³⁸ Reproduced from MA Board, n 147, p 14.

⁴³⁹ Cunningham and Woodworth, n 55, p 6. For more detail on environmental philosophy, see the texts cited in footnote 73.

John Muir ... strenuously opposed Pinchot's influence and policies. Muir argued that nature deserves to exist for its own sake, regardless of its usefulness to us. ... This outlook has been called **altruistic preservation** because it emphasizes the fundamental right of other organisms to exist and to pursue their own interests.

The philosophy underpinning the Millennium Development Goals and the MA is clearly a view that the world is made of natural resources that have meaning only or largely because of the services that these resources provided to humans. Thus, the term "ecosystem services" that forms the conceptual centerpiece of the MA is a return to an anthropocentric, utilitarian worldview. However, the philosophical debate that this generates is not the topic of this thesis. The focus here is on evaluating the effectiveness of environmental legal systems in achieving sustainable development. Returning to that topic, the conceptual framework in the MA has been developed further by the UNEP.

UNEP approach in GEO-3 and GEO-4

The UNEP is currently using an approach for SoE reporting that integrates the MA approach with the DPSIR but it is worth noting at this point why the UNEP does not use the PSR method. In the *Global Environment Outlook 3* ("GEO-3"), the UNEP made similar criticisms as Mortensen of the PSR method and advocated the advantages of a more complex model:⁴⁴⁰

Many approaches [to SoE reporting] have been used: some focused on media such as land and water, some on sectoral themes such as agriculture and forestry, some on issues such as land degradation and pollution (and some combined these approaches). Other frameworks have included the pressure-state-response (PSR) and later the driving force-pressure-state-impact-response (DPSIR). These different approaches have served their purpose but their inherent weakness is a linear approach to complex ecological processes and human-environment interactions. The reports often down played the fact that people not only have an impact on the environment but also that the environment has an impact on people.

Over time, therefore, a more integrated environmental assessment and reporting framework has emerged; one that aims to show the cause-and-effect of human-nature linkages. It seeks to connect causes (drivers and pressures) to environmental outcomes (state) to activities (policies and decisions) that have shaped the environment over the past three decades, and the impacts such changes now have on people.

The GEO-3 report presented conditions and trends in a number of socio-economic factors before presenting four future scenarios based on seven "driving forces": demography; economic development; human development; science and technology; governance; culture and environment.⁴⁴¹ The UNEP commented that "the environment is included as a driving force because it is more than a passive receptacle for change."⁴⁴²

The GEO-3 report did not explain clearly the conceptual framework it adopted but the *Global Environment Outlook 4* ("GEO-4") report expressly adopts the DPSIR method.⁴⁴³

⁴⁴⁰ UNEP, n 165.

⁴⁴¹ UNEP, n 165, pp 322-349.

⁴⁴² UNEP, n 165, pp 322-323.

⁴⁴³ UNEP, *Global Environment Outlook 4 (GEO-4)*, (UNEP, Nairobi, 2007), available at <http://www.unep.org/geo/geo4/media/index.asp> (viewed 27 October 2007), pp xxi-xxiii. Note: GEO-4 is scheduled for publication in September 2007.

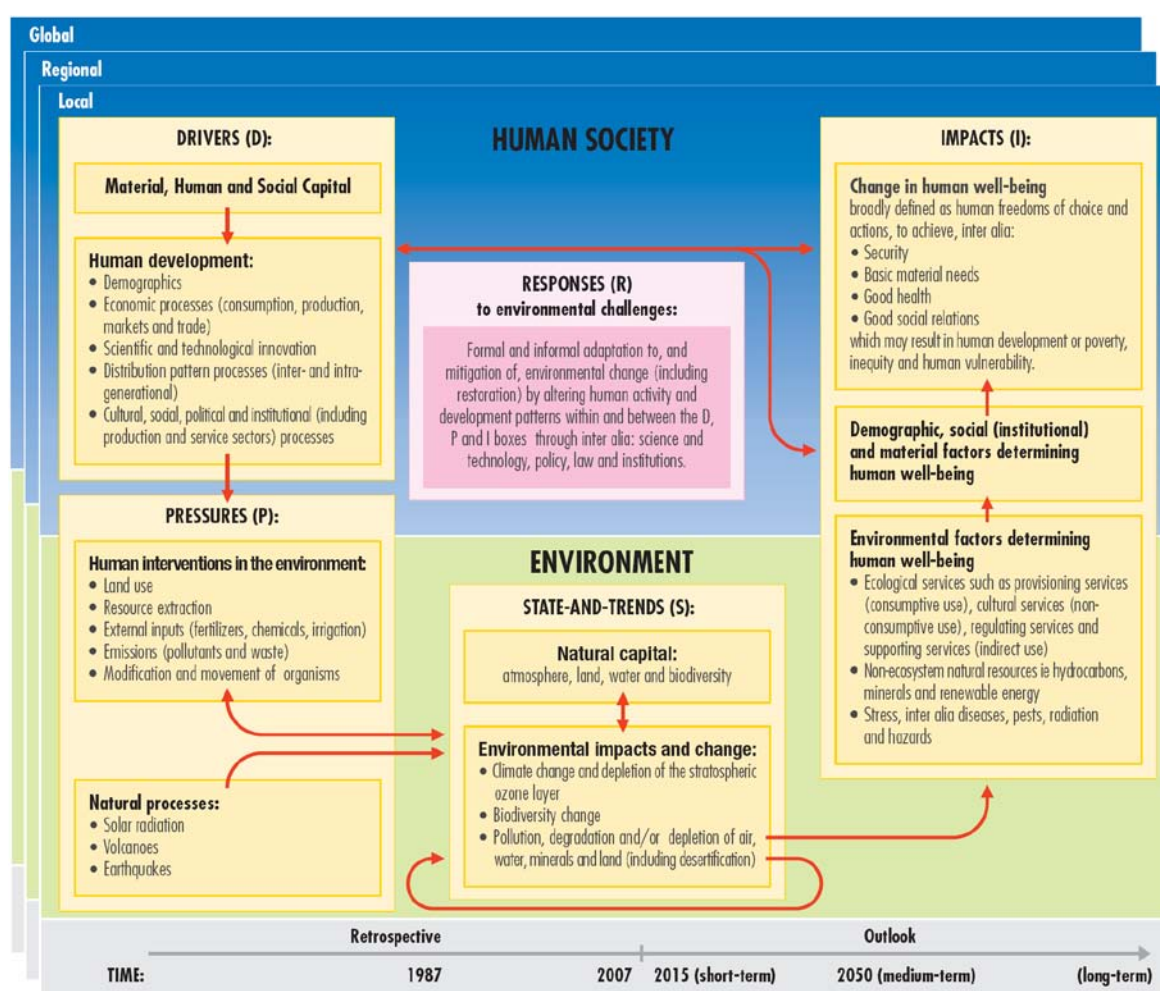
GEO-4 conceptual framework

The *GEO-4* assessment uses the drivers-pressures-state-impacts-responses (DPSIR) framework in analysing the interaction between environmental change over the past two decades as well as in presenting the four scenarios [for the future].

The concepts of human well-being and ecosystem services are core in the analysis. However, the report broadens its assessment from focusing exclusively on ecosystems to cover the entire environment and the interaction with society. The framework attempts to reflect the key components of the complex and multidimensional, spatial and temporal chain of cause-and-effect that characterizes the interactions between society and the environment. ...

A diagram of the conceptual framework used in *GEO-4* is shown in Figure 18, which combines the conceptual framework used in the MA with the DPSIR terminology. It is interesting to compare Figure 17 and to see the nuances between the two models.

Figure 18: GEO-4 conceptual model⁴⁴⁴



⁴⁴⁴ UNEP, n 443, p xxii.

Critique of variations on the PSR method

It is useful now to concentrate on the models that have the most widespread acceptance and use apart from the PSR model. These are the DPSIR, MA and GEO-4 models.

The differences between the PSR model and the DPSIR, MA and GEO-4 models are largely one of form rather than one of substance as the methods are, fundamentally, the same. The conceptual basis for each is that human activities impact on the environment, change its condition, and that society can manage these changes through its responses. The GEO-4 framework emphasises the impact of the environment on people but this does not fundamentally alter the conceptual basis compared with the other approaches. The impacts of changes to the environment (e.g. deterioration in air quality) on humans are implicit in the other approaches. Given that all of the methods have the same conceptual basis, it probably does not matter greatly which method is used, provided that it is done carefully and the results are communicated clearly.

The OECD accommodates the UNEP and European Environment Agency approaches by acknowledging that, “depending on the purpose for which the pressure-state-response model is to be used, it can easily be adjusted to account for greater details or for specific features.”⁴⁴⁵ “Driving forces” or “drivers” in the DPSIR model can easily be incorporated into the PSR model as “indirect pressures”. “Impacts” in the DPSIR model can easily be incorporated in the PSR model in the pressures category. These are significant points because they mean the DPSIR, MA and GEO-4 models can all be accommodated within the PSR model. In such a case, from a purely Occam’s Razor approach, the PSR model appears preferable.

If the PSR model can accommodate the DPSIR, MA and GEO-4 models, which is the best model to use for SoE reporting? Considering this question, there appear to be several advantages to retaining the PSR method as the basic conceptual framework for SoE reporting. Its simplicity, flexibility and wide adoption provide a very useful common analytical framework for SoE reporting. The PSR model is much simpler than the other models for policy-makers and ordinary people to visualise and understand.

In summary, there are a number of variations on the PSR model but it is probably not critical which of them is used in terms of evaluating the effectiveness of environmental policy or an environmental legal system. The conceptual models presented here to show some of the most important of the many possible variations on the PSR model as an analytical framework for environmental reporting. The rationale behind these different approaches, particularly the DSR, DPSIR and PSIR frameworks, seems to be largely semantic distinctions in terminology for concepts that the PSR model is capable of incorporating. In comparison with these approaches, the PSR model is clearly the simplest analytical structure. Combined with its flexibility and ability to comprehensively incorporate any environmental issue while answering practical policy issues, this simplicity is what makes the PSR method so attractive as a universal framework for environmental reporting. For this reason, as explained by Rump in the *SoE Source Book*,⁴⁴⁶ an integrated PSR assessment within an ecosystem spatial framework has been the most widely adopted analytical approach to environmental reporting. It is preferable to the approaches in the DPSIR, MA, GEO-4, and other variations as a generally analytical

⁴⁴⁵ OECD, n 358, p 21.

⁴⁴⁶ Rump, n 81.

framework for environmental reporting, including environmental policy analysis of which evaluating the effectiveness of an environmental legal system is a part. However, as the OECD noted, “depending on the purpose for which the PSR model is to be used, it can easily be adjusted to account for greater details or for specific features.”⁴⁴⁷ The precise choice of which variation of the model is used in SoE reporting is, therefore, not critical.

Apart from variations on the PSR model, there are other methods used for evaluating environmental legal systems. Some of these will now be considered.

BEST PRACTICE

Definition and conceptual model

While common usage in other fields, “best practice” is a concept rarely applied to environmental law or environmental legal systems.⁴⁴⁸ Best practice generally refers to the use of the best available technology or management practice irrespective of “normal” or industry practice. “Best practicable environmental option” (BPEO) and “best available technology not entailing excessive cost” (BATNEEC) are terms that are also used to similar effect in Britain.⁴⁴⁹ Section 21 of the *Environmental Protection Act 1994* (Qld) provides a legislative definition of best practice environmental management within the Queensland environmental legal system as follows:

21 Best practice environmental management

(1) The “**best practice environmental management**” of an activity is the management of the activity to achieve an ongoing minimisation of the activity’s environmental harm through cost-effective measures assessed against the measures currently used nationally and internationally for the activity.

(2) In deciding the “**best practice environmental management**” of an activity, regard must be had to the following measures—

- (a) strategic planning by the person carrying out, or proposing to carry out, the activity;
- (b) administrative systems put into effect by the person, including staff training and monitoring and review of the systems;
- (c) public consultation carried out by the person;
- (d) product and process design;
- (e) waste prevention, treatment and disposal.

(3) Subsection (2) does not limit the measures to which regard may be had in deciding the “**best practice environmental management**” of an activity.

However, the concept of best practice for an environmental legal system must differ from definitions of best practice for technology or management practices because law is fundamentally based upon the facts of individual cases, social policy and the available

⁴⁴⁷ OECD, n 358, p 21.

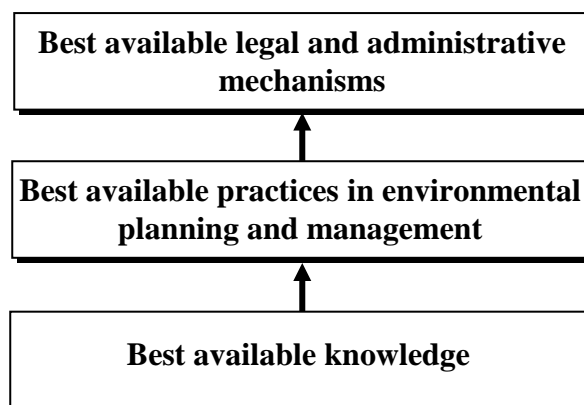
⁴⁴⁸ Examples of the use of “best practice” to evaluate part of an environmental legal system include: Australian Manufacturing Council (AMC), *The Environmental Challenge: Best Practice Environmental Regulation* (AMC, Canberra, 1993); URS Australia and Griffin NRM, *Independent Evaluation of the National Framework for the Management and Monitoring of Australia’s Native Vegetation and Jurisdiction Work Plans* (ANZECC, Canberra, 2000); Maher M, Cooper S and Nichols P, *Australian River Management Restoration: Criteria for the legislative framework for the twenty-first century - Occasional Paper 02/00* (LWRRDC, Canberra, 2000); Brown AL and Nitz T, “Where have all the EIAs gone?” (2000) 17 EPLJ 89 at 95 citing the International Association for Impact Assessment (IAIA), *Principles of Environmental Impact Assessment Best Practice* (IAIA, Fargo, USA, 1999), see <http://www.iaia.org/> (viewed 28 June 2006).

⁴⁴⁹ Eyre N, “Setting the objectives for environmental regulation” in Smith HL and Woodward N (ed), *Energy and Environment Regulation* (Macmillan Press Ltd, London, 1995), p 38.

legal and administrative mechanisms that are not adequately accounted for by definitions such as section 21 of the *Environmental Protection Act* 1994 (Qld).⁴⁵⁰ There is, therefore, a need to incorporate the factual and policy basis of legal rule and decision-making to define what constitutes best practice for an environmental legal system. Best practice for an environmental legal system can be considered at two levels: the micro-level for best practice problem solving in the environmental legal system; and the macro-level of principles of best practice in the wider environmental legal system.

At a micro-level in terms of problem solving, best practice for an environmental legal system may be defined as using the best available legal and administrative mechanisms to implement the best available practices in environmental planning and management based upon the best available knowledge (including applying a precautionary approach where gaps in knowledge are identified) to achieve sustainable development. In this context, “best” means most likely to achieve or promote sustainable development. There are three levels to this definition, which form a conceptual model for best practice in an environmental legal system. These levels can be represented diagrammatically as follows:

Figure 19: Best practice in an environmental legal system



The essence of applying best practice for evaluating the effectiveness of an environmental legal system is decision-making based upon the best available knowledge (usually the best available scientific evidence) rather than politics, ignorance or bias.

Features of best practice in a modern environmental legal system

The concept of best practice in environmental law may be applied to the existing legal system to identify eight features of best practice. These principles were presented at a conference⁴⁵¹ at an early stage of the research for this thesis but for reasons that will become apparent, it is unnecessary to discuss them or their justification in detail.

1. Global, regional and local planning instruments with the objective of sustainable development provide for the maintenance of the ecological processes upon which life depends and improving the total quality of life.

⁴⁵⁰ Hutter BM, “Socio-Legal Perspectives on Environmental Law: An Overview” in Hutter BM (ed), *A Reader in Environmental Law* (Oxford University Press, Oxford, 1998), p 3.

⁴⁵¹ McGrath C, “Best Practice in Environmental Law and Regulation” in the Conference Proceedings of the Environment Institute of Australia National Conference 2002 (EIA, Brisbane, 1 August 2002).

2. Development and resource use is consistent with global, regional and local planning instruments.
3. Development assessment processes provide for rigorous environmental impact assessment.
4. Sustainable management practices are implemented in accordance with global, regional and local planning instruments (e.g. fire, weed and feral animal management in conservation areas).
5. The general environmental duty is complied with. That is, in carrying out any activity a person (including a company) does all that is reasonable and practical to prevent or minimise harm to others or the environment having regard to:
 - (a) the potential environmental harm caused;
 - (b) the sensitivity of the receiving environment;
 - (c) the state of scientific knowledge;
 - (d) the likelihood of successful application of the measure; and
 - (e) the financial implications.
6. An independent enforcement organisation that is not responsible for the promotion of economic development enforces environmental law in the public interest.
7. Public enforcement of environmental laws is facilitated by open access to information, open standing and government funding (legal aid) for public interest litigation to protect the environment.
8. Independent, peer reviewed and comprehensive SoE reports are prepared at regular intervals.

Difficulties with using “best practice” for evaluating an environmental legal system

There are several problems with using principles or features of best practice, such as those discussed above, to evaluate the effectiveness of an environmental legal system. Firstly, the principles are somewhat arbitrary. Secondly, except for the SoE report in principle 8, this approach can largely only be used to analyse an existing environmental legal system and provides no clear or systematic method to identify gaps in the existing regulatory framework due to new or existing threats to the environment that are not regulated by the existing system (e.g. to identify that the system does not contain laws regulating global warming). Thirdly, except for principle 8, this approach is limited to ‘best current practice’ and therefore does not address a number of major environmental issues that the current environmental legal system regulates poorly if at all (e.g. population growth). If the SoE report in principle 8 is the means by which the effectiveness of an environmental legal system is evaluated then the first seven principles are largely superfluous to this task.

The concept of best practice may be a useful adjunct to a method for evaluating the effectiveness of an environmental legal system, such as the SoE reporting method, but used in isolation it has the real potential to reach conclusions that have little relevance in terms of levels of degradation of the environment. Use of even the best available technology may not achieve sustainable development. The *SS Titanic* represented world best practice in marine construction when it was built, yet was sunk by an iceberg on its maiden voyage. Use of best practice as a criterion for evaluating the effectiveness of a measure does not ensure that the outcomes are themselves sustainable.

The “best practice” method is, therefore, inferior to the PSR method for SoE reporting. However, the concept of best practice in environmental law may complement the PSR method of SoE reporting by providing a further objective, analytical tool or standard for analysing the response to pressures on the environment. That is, the value of the concept of best practice in environmental law may be to complement an analysis of the response of an environmental legal system, not to replace the SoE method.

OTHER METHODS

Some authors have suggested or used different methods of evaluating the effectiveness of environmental legal systems that do not fall clearly, even if implicitly, within either a PSR approach or “best practice” style approach. Their variety means they do not fall within a more definite category. To group them together here they are simply referred to as “other methods” and considered in chronological order.

Hollick 1984

Malcolm Hollick provided an early overview of principles for regulatory design of environmental policy in Australia.⁴⁵² To a large extent his work reflects the more recent contribution to this issue of Gunningham, Grabosky and Sinclair, particularly in relation to minimising regulatory intervention.⁴⁵³ Hollick suggested the following criteria are relevant for assessing the relative effectiveness of alternative environmental policies:⁴⁵⁴

1. The probability of success is important since assured achievement of modest objectives may be considered preferable to the less certain attainment of more ambitious objectives.
2. A policy which is likely to be permanently effective is preferable to one which will only work while it captures public interest, or is being implemented by a new and energetic agency. ...
3. Policies which are flexible enough to respond to spatial variations in the environment, and to changing circumstances resulting from economic growth, inflation, technological innovation and changing values, are more likely to be effective than inflexible ones.
4. Overlaps and conflicts with other policies, whether environmental or not, should be avoided. The simpler the policies, the more likely is it that this can be achieved.
5. Policies should be simple enough that all those affected can reasonably expected to become aware of them and to understand them.

To be fair to Hollick, these principles were written in 1984 and represented an initial attempt to identify criteria for effective policy. To a large extent he merely states the obvious by calling for a high probability of success, permanent solutions, flexibility, avoiding overlap, and simplicity. He seems to assume that “effectiveness” means achieving improved environmental protection although he does not say this explicitly. Unlike the PSR method of SoE reporting his approach does not link the criteria he identifies with improving environmental protection so it is not possible to use his approach to determine whether a law or legal system is effective, merely that, according to his criteria, it is *likely to be* effective. The PSR method is superior by moving beyond theory into the factual evidence of whether the law is successful in achieving its objectives or not.

⁴⁵² Hollick, n 116. See also, Hollick M, “The role of statute law in environmental management: a case study of Western Australia” (1985) 2 EPLJ 116.

⁴⁵³ Gunningham and Grabosky, n 14; Gunningham and Sinclair, n 115.

⁴⁵⁴ Hollick, n 116, p 59.

Preston 1987

Brian Preston suggested the following as the basic criteria or elements of “effective environmental laws”:⁴⁵⁵

1. Adoption of an ecological view of the environment which recognises the importance of ecosystems and the inter-relationships between humans and nature, between various regions and countries and between present and future generations.
2. Early input of environmental and social considerations in the planning stage of developments which will impact on the environment.
3. Facilitating citizen participation in the planning, decision-making and monitoring stages of development.
4. Encouraging public education about the environment and the public’s role in protecting the environment.
5. Integration of traditional values and approaches towards protection of the environment with modern approaches.

Preston’s approach of deciding criteria for an effective environmental legal system is a similar approach to deciding criteria that represent “best practice”. It has some attractive features and certainly, it is hard to fault the five criteria that Preston suggests. However, it suffers from the same weaknesses as the “best practice” approach in that it is somewhat arbitrary and does not allow the environmental legal system to be evaluated against scientific evidence of the condition of the environment. For these reasons, such an approach is inferior to the PSR method.

It might be assumed that the approaches of authors such as Hollick, Wood and Preston reflected early writing prior to the development of the PSR method and that more recent writers have now adopted the PSR method or variations of it. This, however, is not reflected in some of the major, recent works published on evaluating the effectiveness of environmental law.

Sand 1992

Peter Sand edited a survey of the effectiveness of international environmental agreements for the United Nations Conference on Environment and Development in 1992 based on criteria proposed by a preparatory committee for the conference in 1991.⁴⁵⁶ This was undertaken pursuant to the recommendations in Chapters 8(B) (Providing an effective legal and regulatory framework) and Chapter 39 (International instruments and mechanisms) of *Agenda 21*.⁴⁵⁷ The survey considered a wide range of international environmental agreements concerning nature conservation, atmosphere, marine environment, transboundary pollution, hazardous substances, and nuclear safety. While the criteria used in the survey are lengthy and many are not directly relevant to evaluating effectiveness, they are useful to set out in full here to show what some of the leading international experts considered important for evaluating the effectiveness of international environmental agreements. The criteria used in the survey were as follows:⁴⁵⁸

⁴⁵⁵ Preston B, “Some elements of effective environmental laws” (1987) 4 EPLJ 280 at 281.

⁴⁵⁶ Sand PE, *The effectiveness of international environmental agreements: a survey of existing legal instruments* (Grotius Publications Ltd, Cambridge, 1992).

⁴⁵⁷ See <http://www.un.org/esa/sustdev/documents/agenda21/> (viewed 5 July 2006).

⁴⁵⁸ Sand, n 456, pp 4-7.

A. Objectives and achievement

1. What are the basic objectives formulated in the international agreements and instruments evaluated, and how do these objectives relate to the effective integration of environment and development?
2. In the case of regional agreements and instruments, what is their actual and potential bearing on global environmental protection and sustainable development?
3. Do these agreements or instruments take into account the special circumstances of developing countries?
4. To what extent have the basic objectives (environmental / developmental) formulated in international agreements and instruments been met, and how is goal achievement measured?

B. Participation

5. Is membership limited or open-ended?
6. Are reservations possible, and to what extent have they been used?
7. What is the current geographical distribution of membership in existing environmental agreements and instruments, especially as regards developing countries?
8. What is the record of actual participation by developing countries in the negotiation and drafting of these agreements and instruments, and in what programme activities and meetings organized under these agreements and instruments?
9. Which incentives (e.g. financial, trade, technology benefits) are available to encourage participation and facilitate implementation by developing countries?
10. Which measures have been taken to promote and support the effective participation of developing countries in the negotiation and operation of international agreements or instruments, including technical and financial assistance and other available mechanisms for this purpose?
11. Which factors influence the participation, especially of developing countries, in the agreement or instrument? For example:
 - (a) Financial resources required and available for participation in the agreement or instrument;
 - (b) Technical assistance required and available for participation in the agreement or instrument;
 - (c) Scientific assistance required and available for participation in the agreement or instrument;
 - (d) Information on the (operation of the) agreement or instrument to Governments, parliaments, press, non-governmental organisations, industries and the general public;
 - (e) Role of parliaments, press, non-governmental organizations, industries and public opinion in general;
 - (f) Availability of reservations.

C. Implementation

12. To what extent has the implementation of agreements or instruments been constrained or accelerated by provisions regarding their entry into force?
13. What are the commitments imposed on parties by these agreements and instruments, and how is compliance by parties with their commitments monitored and measured?
14. How do parties report on their performance in implementing agreements and instruments, and to what extent have they complied with reporting duties?
15. Which are the specific requirements (if any) of data supply and data disclosure, and to what extent have they been met by the parties?
16. Which possibilities exist to promote compliance and to follow up on non-compliance, and to what extent have they been used?
17. Which mechanisms are available to deal with disputes over implementation and to what extent have they been used?
18. What factors favoured implementation? For example:

- (a) Financial resources required and available for implementation of the agreement or instrument;
- (b) Technical assistance required and available for implementation of the agreement or instrument;
- (c) Scientific assistance required and available for implementation of the agreement or instrument;
- (d) Information on the (operation of the) agreement or instrument to Governments, parliaments, press, non-governmental organisations, industries and the general public;
- (e) Role of parliaments, press, non-governmental organizations, industries and public opinion in general;
- (f) International supervisory or implementing bodies;
- (g) Obligations to report on compliance and/or supply and disclose data;
- (h) Non-compliance procedures and procedures for settlement of disputes (including fact-finding procedures).

D. Information

- 19. In which form and in which languages are the texts of existing agreements and instruments published and disseminated?
- 20. How is current information on the operation and implementation of international agreements and instruments made available to Governments, to the industries concerned and to the general public?
- 21. What additional materials are available to provide guidance for the implementation of international agreements at the national level?
- 22. To what extent is the above information used in international and national training and education programmes?

E. Operation, review and adjustment

- 23. Which are the institutional arrangements for international administration of existing agreements and instruments?
- 24. What are the annual (1990) costs of international administration (secretariat, meetings, programmes) of agreements and instruments, and how are they financed?
- 25. Which are the main benefits and the main cost elements of national participation in existing agreements and instruments, and which possibilities exist to reduce participation costs for developing countries?
- 26. Which mechanisms are available to ensure that scientific knowledge and advice is taken into account in policy-making decisions under these agreements and instruments?
- 27. How do these arrangements and mechanisms ensure the effective participation of (a) national authorities, especially from developing countries; and (b) non-governmental participants, including the industries concerned and the scientific community?
- 28. Which mechanisms are available to ensure periodic review and adjustment of international agreements and instruments in order to meet new requirements, and to what extent have they been used?

F. Codification programming

- 29. Which new drafts, or draft revisions of existing agreements and instruments, in the environmental field are currently under preparation or negotiation?
- 30. To what extent and through which mechanisms is drafting coordinated with related work regarding other agreements and instruments?
- 31. Which are the remaining gaps that need to be covered by legal provisions?
- 32. To what extent are mechanisms other than formal agreements or instruments contributing to the development of international law in the field of the environment?

Criterion A(4) is the only criterion directly relevant to evaluating the effectiveness of an international legal instrument, but many of the other criteria are indirectly related to

assessing or reporting on effectiveness. The survey found most international instruments formulated their objectives in highly general and abstract terms, with very few setting quantitative targets and criteria of compliance, which made it difficult to evaluate actual goal achievement.⁴⁵⁹ Membership statistics alone were regarded as not sufficient as indicators of effectiveness.⁴⁶⁰

The list of criteria used in this survey is useful as a checklist for international agreements, but neither the list nor individual criteria provide a simple, systematic or comprehensive method for evaluating effectiveness. The surveys of different international instruments did not develop a method for evaluating effectiveness, other than to ask whether the objectives of the instruments were being met and measured. This approach, therefore, does not represent a better method than the PSR method of SoE reporting for evaluating the effectiveness of an environmental legal system generally.

Bartlett 1994

As noted in earlier chapters, Robert Bartlett identified three general categories of systematic environmental policy evaluation: outcomes evaluation; process evaluation; and institutional evaluation.⁴⁶¹ While he made a very useful contribution to the issue of evaluating the effectiveness of environmental laws, he did not suggest a method by which this should occur, merely the different types of evaluations that can occur. For this reason his writing is not necessary to consider further in this section.

Wood 1995

A variety of other criteria have been suggested for evaluating the effectiveness of parts of environmental legal systems, particularly EIA systems. For example, Christopher Wood stated the following criteria to evaluate EIA systems in the United States, the Netherlands, the United Kingdom, Canada, Australia, New Zealand and elsewhere:⁴⁶²

1. Is the EIA system based on clear and specific legal provisions?
2. Must the relevant environmental impacts of all significant actions be assessed?
3. Must evidence of the consideration, by the proponent, of the environmental impacts of reasonable alternative actions be demonstrated in the EIA process?
4. Must screening of actions for environmental significance take place?
5. Must scoping of the environmental impacts of actions take place and specific guidelines be produced?
6. Must EIA reports meet prescribed content requirements and do checks to prevent the release of inadequate EIA reports exist?
7. Must EIA reports be publicly reviewed and the proponent respond to the points raised?
8. Must the findings of the EIA report and the review be a central determinant of the decision on the action?
9. Must monitoring of action impacts be considered at the various stages of the EIA process?

⁴⁵⁹ Sand, n 456, p 8.

⁴⁶⁰ Sand, n 456, p 9.

⁴⁶¹ Bartlett, n 24, p 170.

⁴⁶² Wood C, *Environmental Impact Assessment: A Comparative Review* (Prentice Hall, London, 1995), p12. See also Grinlinton DP, "Integrated Environmental Assessment in New Zealand" (2000) 17 EPLJ 176 at 193; and Sadler B, *International Study of the Effectiveness of Environmental Assessment* (Environment Protection Agency, Canberra, 1996).

10. Must the mitigation of action impacts be considered at the various stages of the EIA process?
11. Must consultation and participation take place prior to, and following EIA report publication?
12. Must the EIA system be monitored and, if necessary, be amended to incorporate feedback from experience?
13. Are the financial costs and time requirements of the EIA system acceptable to those involved and are they believed to be outweighed by discernable environmental benefits?
14. Does the EIA system apply to significant programmes, plans and policies, as well as to projects?

The criteria suggested by Wood for evaluating EIA systems obviously cannot be applied to evaluate the effectiveness of an environmental legal system. His approach is similar to the “best practice” approach discussed above but limited to EIA.

Gunningham and Grabosky 1998

Neil Gunningham and Peter Grabosky’s leading work on designing environmental policy also provides a set of criteria for what they term “smart regulation.”⁴⁶³ They suggest that “optimal policy” is both effective and efficient, and this is the essence of “smart regulation”.⁴⁶⁴ The principles of “smart regulation” that they suggest are:

- Principle 1. Prefer policy mixes incorporating a broader range of instruments and institutions.
- Principle 2. Prefer less interventionist measures.
- Principle 3. Ascend a dynamic instrument pyramid to the extent necessary to achieve policy goals.
- Principle 4. Empower participants which are in the best position to act as surrogate regulators.
- Principle 5. Maximize opportunities for win-win outcomes.

Gunningham and Grabosky’s work is insightful and extremely useful but it does not incorporate a mechanism to test whether the regulations are achieving their objectives. These principles cannot, therefore, be used as criteria to test whether an environmental legal system is effective. They can, however, be used to complement the PSR method of SoE reporting in designing better environmental policies that are more likely to achieve their intended outcomes.

Bellamy et al 1999

Jennifer Bellamy, Daniel Walker, Geoffrey McDonald and Geoffrey Syme assessed evaluation of natural resource management (“NRM”) policies in the context of a major study of integrated catchment management (“ICM”) in the Queensland Wet Tropics. Their analysis was made within the context of standard Policy Analysis and Evaluation Theory explained in chapter 2. They argued:⁴⁶⁵

Although approaches to natural resource management based on the integration of community involvement, technical knowledge, and organisational structure and policy

⁴⁶³ Gunningham and Grabosky, n 14, Ch 6.

⁴⁶⁴ Gunningham and Grabosky, n 14, pp 26-27 and 379.

⁴⁶⁵ Bellamy JA, Walker DH, McDonald GT and Syme GJ, “Tracking Progress in Natural Resource Management: A systems approach to evaluation”, Ch 1, Vol 1 in Bellamy JA (compiler), *Evaluation of Integrated Catchment Management in a Wet Tropical Environment* (7 Volumes, CSIRO, Brisbane, 1999), p 4. Available at <http://irum.sl.csiro.au/icm/publications.htm#chapters> (viewed 20 December 2007). See also Ch 2 of the same publication by the same authors, entitled “Evaluating NRM policy initiatives”.

objectives are endorsed both in Australia and overseas, there are no generally accepted models of evaluation of such initiatives. Existing frameworks may provide a checklist of multiple-disciplinary criteria relating to the environmental, social, economic and institutional perspectives but not an integrated evaluation (Bellamy et al. 1999). Significantly, no clear evaluative framework has emerged to guide continuous improvements in the way natural resource management policy initiatives and research contribute to on-going improvements in the sustainability of resource use and social well-being of the communities concerned. In effect, an over-arching systemic framework to guide the evaluation of NRM policy initiatives is lacking.

Bellamy and her colleagues suggested:⁴⁶⁶

... there are a number of common factors that make the natural resource management evaluation process implementationally demanding and potentially costly. These difficulties are particularly pertinent to evaluation of sustainability initiatives with broad societal purposes. The key challenges on the basis of our experience are breadth of evaluation, multi-dimensionality of impacts, intangible objectives and outcomes, additionality, short term versus long term impacts, evolution or drift in objectives, multiple perspectives on criteria for success, transaction costs and intrusiveness.

Most of these factors are self-explanatory, however, their references to “additionality” and “intrusiveness require further explanation. They explained these terms as follows:⁴⁶⁷

Relationships between initiatives/Additionality There is considerable ambiguity associated with cause-and-effect relationships in natural resource management problems. These problems involve dynamic, complex, multi-dimensional processes that are affected by a number of factors. There are many influences on resource use and management such that it is not generally possible to provide definitive answers with regard to causality, that is to identify uniquely the difference that particular policies or programs can make to what would have happened without their implementation. ...

Intrusiveness. There is a fundamental requirement that the evaluation process should be as non-intrusive as possible on effective implementation of the project, policy, or research initiative. As Heisenberg’s uncertainty principle has shown, the act of observation itself can interfere with the very system one is observing.

Bellamy and her colleagues proposed that to account for the common factors that make the NRM evaluation process implementationally demanding and potentially costly, evaluation in NRM:⁴⁶⁸

... needs to:

- (a) address a system that links objective to consequence;
- (b) be conducted in terms of the fundamental assumptions and instrumental hypotheses that underpin core policy, program or research objectives;
- (c) be grounded in the natural resource, policy/institutional, economic, socio-cultural and technological contexts of implementation in practice;
- (d) be based on the establishment of practical, valid and equitable evaluation criteria by which change can be monitored and assessed;
- (e) involve methodological pluralism (including both quantitative and qualitative methods) to ensure rigour and comprehensiveness in assessment; and
- (f) provide for the integration of the different disciplinary perspectives on evaluation (i.e. social, economic, environmental, policy and technological perspectives).

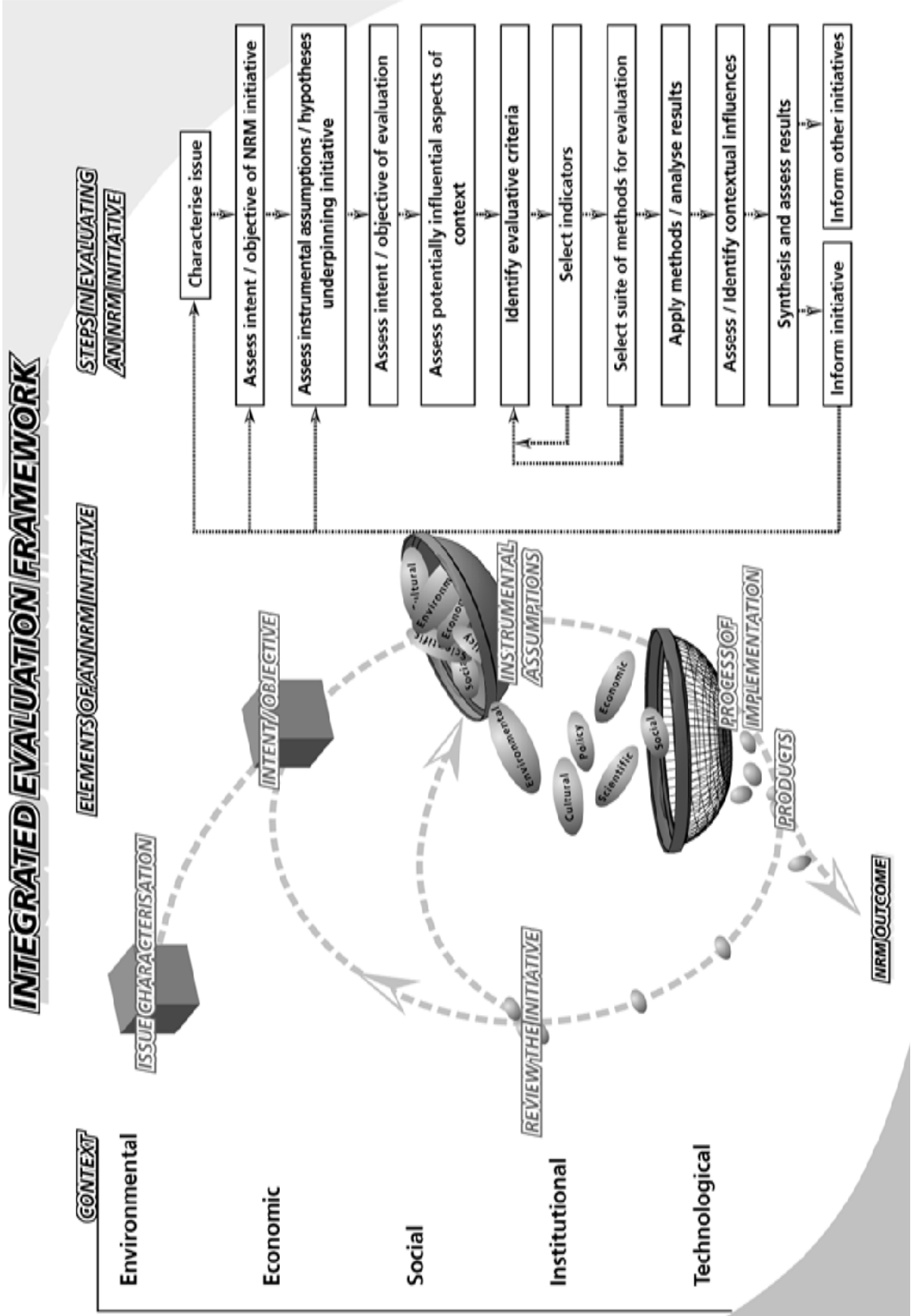
To respond to these issues Bellamy and her colleagues proposed an integrated evaluation framework for NRM policies, shown diagrammatically in Figure 20.

⁴⁶⁶ Bellamy et al, n 465, p 6.

⁴⁶⁷ Bellamy et al, n 465, p 6.

⁴⁶⁸ Bellamy et al, n 465, p 7.

Figure 20: Integrated evaluation framework for NRM ⁴⁶⁹



⁴⁶⁹ Reproduced from Bellamy et al, n 465, p 9.

Bellamy and her colleagues suggested their integrated evaluation framework:⁴⁷⁰

... recognises the multiple levels and nested nature of natural resource management policy, namely: issue characterisation, policy formulation and intent, program logic, and on-ground implementation. It links both the intent and rationale of the natural resource management policy, process or tool to its implementation and performance 'on the ground'. It also provides the basis for synthesising the multiple perspectives on the evaluation of the phenomenon of interest.

Bellamy and her colleagues explained their integrated evaluation framework in detail in their text; however, for present purposes it is sufficient to set out the definitions they gave to the key elements of the framework:⁴⁷¹

- “Context” is the social, economic, environmental, institutional and technological factors that influence the framing or characterisation of the problem, rationality underlying the policy response, the implementation process and on-ground performance.
- “Issue characterization” involves identifying the nature of the issue or problem underlying the initiative being evaluated (e.g. program or policy, activity, process, method/tool, body of knowledge), and the context in which the issue or problem developed.
- The “intent / objective” connotes the objectives or intent of (a) the initiative being evaluated, its expected outcomes and key stakeholders, and (b) the evaluation itself.
- “Instrumental assumptions” involves stating the theoretical assumptions and instrumental hypotheses or rationality underpinning the implementation of the initiative.
- “Evaluation criteria” are the environmental, economic, social, policy/institutional and technological measures or indicators that reflect on performance in achieving key objectives and outcomes. In turn, performance is influenced by contextual factors (e.g. environmental, economic, social, institutional, and technological) that constrain or otherwise influence the implementation of the initiative.
- “Process of implementation” means the activities, strategies or operations by which the initiative is implemented or delivered and which produce the outputs and, in turn, outcomes of the initiative.
- “Evaluation methods” refers to the quantitative and qualitative performance assessment methods for (a) the evaluation of performance measures/criteria and (b) the interpretation or analysis of findings.
- “Products” are the outputs or deliverables produced by an initiative over which it has control.
- “Outcomes” are the impacts that are achieved, both anticipated and unanticipated, by the initiative.

Bellamy and her colleagues suggested a need for “methodological pluralism” in relation to evaluation methods:⁴⁷²

⁴⁷⁰ Bellamy et al, n 465, p 7.

⁴⁷¹ Bellamy et al, n 465, p 8.

⁴⁷² Bellamy et al, n 465, pp 15-16.

No single evaluation method will be comprehensively applicable. As Patton (1987) notes “evaluation has moved into a period of methodological diversity with a focus on methodological appropriateness”. As a consequence, the framework for evaluation presented in this report is designed to be independent of the methods for evaluation applied.

Methodological pluralism can contribute to rigour in evaluation research Multiple methods will be needed at different stages of the project, for different project components, and for different implementational contexts. These may include both quantitative and qualitative methods. Moreover, many will be concurrent, involving multiple parallel tasks.

The purpose and design of an evaluation will determine, and be influenced by, the timing of evaluation. ...

Bellamy and her colleagues also suggested the following design criteria for evaluation methods:⁴⁷³

Design Criteria

In designing a pluralistic approach to evaluation of the performance and impact of an natural resource management initiative, a number of criteria need to be considered including:

1. *Scope of assessment* (eg. scale or level of impact, as well as impact of overall approach or focussed evaluations of specific components).
2. *Form of evaluation* (eg. self-evaluation or external assessment).
3. *Mode(s) of analysis* (eg. longitudinal study, cross-sectorial study, focussed/case study, needs analysis, on-going monitoring).
4. *Unit(s) of analysis* (eg. individual, group, organisational, regional resources, regional economy, regional community, state policy development).
5. *Information required and types of comparisons* to be made (eg. description, judgments, interpretation, qualitative assessments, quantitative assessments).
6. *Method(s) for inferring process of change* (eg. methods for representing raw data to identify process patterns, comparison of change in performance criteria).

Bellamy and her colleagues suggested the following were the strengths and ongoing challenges of the evaluation framework they proposed:⁴⁷⁴

Based on our collective experience in applying the framework in these case studies, it was found to have a number of strengths:

- *Multiple perspectives:* the framework forces a broad perspective through facilitating the consideration of a wide range of hypotheses or underlying assumptions and therefore evaluation criteria (eg. environmental, social, economic, institutional and technological). Specifically, the logic of the framework was not confined to traditional program evaluation methods.
- *Integration of perspectives on the evaluation:* the framework provided the basis for integration of the multiple perspectives on the evaluation of each initiative, particularly when used in a formative evaluation context.
- *Problem bounding:* the framework forced a ‘bounding’ of the problem or issue of interest through forcing a focus on the specific elements of relevance to the assumptions underlying an initiative and importantly the purpose of the evaluation.
- *Structuring logic:* the framework provides a logical structure and set of steps for undertaking an evaluation.
- *Reporting structure:* the framework provided an effective structure for rapidly reporting on an evaluation.
- *Descriptive assessment:* the framework was found to facilitate the development of descriptors for critical or comparative assessment of natural resource management

⁴⁷³ Bellamy et al, n 465, p 16.

⁴⁷⁴ Bellamy et al, n 465, p 16.

initiatives rather than being confined to only evaluations of performance of initiatives.

However, there were a number of important challenges posed in applying the framework:

- *Manageable array of criteria*: a significant challenge was how to deal with the potentially unbounded scope of possible evaluation criteria in light of the practical realities of available resources and the need for 'sensitive' evaluation that moves the process forward rather than undermines it.
- *Motivation*: the framework challenged the user to carefully consider the purpose of the evaluation, that is what is motivating the evaluation and in this sense it was considered that the evaluation process could be seen as threatening.
- *Capacity to address*: in fostering a focus on the big picture, the framework encourages the development of a whole suite of indicators or evaluative measures. However, it is not usually possible to address all the elements of the big picture such that the extent that the evaluation can address each criterion may vary greatly.
- *Demanding iterative process*: in recognition of the dynamic nature of the implementational context of natural resource management policy initiatives, evaluation objectives and related criteria need to be reviewed and refined regularly to ensure continuing relevance and this can be very demanding.

In summary, the framework proved effective in all case studies, that is across a range of contexts of use and for different scales of application and levels of intervention. However, there were some important issues relating to the scope and complexity of the task at hand that need to be considered in the evaluation of complex issues relating to natural resource management policy

The evaluative framework and discussion of the issues surrounding evaluation of NRM policies made by Bellamy and her colleagues is a valuable contribution to the literature for evaluating environmental policy generally, including environmental legal systems. They use the term "natural resource management" synonymously with environmental management and their analysis is equally applicable to evaluating environmental policies generally. Their integrated evaluation framework is a useful synthesis of much of the literature on Policy Analysis and Evaluation Theory in the context of evaluating NRM / environmental policy. Their discussion and emphasis of considering the context of any evaluation is particularly valuable.

The integrated evaluation framework proposed by Bellamy and her colleagues is particularly valuable for program evaluation of specific policy measures; however, their work does not replace the PSR method of SoE reporting as an over-arching evaluation framework. To the contrary, the authors in the many chapters of their study of ICM in the Herbert River Catchment from 1993 to 1998 all implicitly adopted the PSR framework in their studies. For example, Bellamy and her colleagues referred to the following pressures when explaining the context of the study of ICM in the Herbert River Catchment:⁴⁷⁵

The impact of the impact of land and water use on freshwater and marine ecosystems, water quality, soil erosion and sedimentation of watercourses, salinity induced through clearing of vegetation, loss of habitat on land in rivers and streams, the spread of weeds by water and competition for land and water resources are the important issues requiring a new approach under ICM.

⁴⁷⁵ Bellamy JA, McDonald GT, Syme GJ, Cottrell A, Johnson AKL, McCreddin JA, Robinson J and Walker DH, "The Herbert River Integrated Catchment Management Process: A Longitudinal Study – 1993-1998", Ch 3, Vol 1 in Bellamy, n 465, pp 72-73.

Bellamy and her colleagues also explained the condition of the Herbert River Catchment when discussing the context of their study. The following passage is part of their explanation of the condition of the catchment:⁴⁷⁶

At the commencement of European settlement in the late 1800s, the Herbert catchment was heavily timbered with extensive freshwater wetlands in the coastal lowlands. The catchment has since undergone significant modifications. Although large areas of the catchment still remain under natural vegetation, about 40% of the coastal lowlands in the lower catchment have been cleared for crop production or improved pastures. Agricultural and pastoral activities are the largest users of land (in area) in the catchment. The sugar industry located in the lower catchment is dominant both socially and economically. Other important industries are forestry and small crops such as pineapples, melons and pumpkins but given its proximity to the wet tropical coast including the Great Barrier Reef Marine Park fishing and recreational activities are also important contributors. The middle and upper catchment have significant areas of rainforest in protected areas and State Forest Reserves. The upper catchment is, however, dominated by natural pastures for beef cattle production. Small areas of the catchment are utilised for mining and industrial activities, or alienated for urban development.

Bellamy and her colleagues also explained the response through ICM to pressures on the Herbert River Catchment and its deteriorating condition:⁴⁷⁷

ICM in the Herbert River catchment is a voluntary process initiated by key actors in the local community from the sugar industry and local government with the convening of Catchment Management Steering Committee in July 1992. The impetus for principal stakeholders in the catchment to lobby the then Minister for Primary Industries for support and endorsement of an ICM process in the Herbert River catchment was threefold ...

In short, far from replacing the PSR method of SoE reporting as an over-arching conceptual framework for evaluating the effectiveness of environmental policies, the approach taken by Bellamy and her colleagues illustrates its implicit use in practice. Read in context and considering their approach in practice, their suggestion that “methodological pluralism” is needed for evaluation methods refers to the specific research methods (e.g. case studies, questionnaire surveys, in situ monitoring, etc) that are required to evaluation different policy outcomes. These comments do not appear to be directed at the level of the over-arching conceptual framework for evaluating the effectiveness of NRM / environmental policies.

Bridgstock et al 1999

Martin Bridgstock, Bruce Heath, Michele Sheumack, and Ian Lowe discussed the problems of command-and-control regulation of environmental problems and suggested the following broad principles should underpin any form of environmental regulation:⁴⁷⁸

- prevention of effects agreed to be unacceptable, on best scientific advice;
- moderation of effects agreed to be undesirable, on best scientific advice;
- economic efficiency – meeting those goals in the most cost-effective way;
- equity – similar enterprises treated in similar ways;
- transparency – conditions on the public record and subject to public scrutiny;

⁴⁷⁶ Bellamy et al, n 475, p 73.

⁴⁷⁷ Bellamy et al, n 475, p 86.

⁴⁷⁸ Bridgstock M, Heath B, Sheumack M, and Lowe I, “The working of environmental protection legislation in the regulation of the used oil industry in Queensland” (1999) 16 EPLJ 109.

- predictability – potential investors know the likely conditions; and
- social justice – any burdens of environmental damage should not fall disproportionately on the already disadvantaged.

The first of two of these principles are very similar to the “best practice” approach discussed above and all of the principles suffer from the same problems as the best practice approach: fundamentally they cannot be used to evaluate effectiveness of an environmental legal system. As for the principles of “best practice” discussed earlier, they might be used as an adjunct to SoE reporting to evaluate the response to pressures and conditions in the environment, but they do not offer a viable alternative method to evaluate the effectiveness of an environmental legal system.

Gardner 1999

Alex Gardner also attempted to define criteria for an effective environmental legal system. After explaining the need for reform of the administrative framework for the management of land and water resources in Australia using the 1996 Australian SoE Report⁴⁷⁹ he suggested three basic criteria for judging the current administrative frameworks and their reform: integration; accountability; and effectiveness. “Integration” refers to integrating ecological factors, cumulative effects into resource management decision across boundaries defined by natural systems and within different levels of government. “Accountability” refers to separating regulatory and commercial functions of government, transparency of decision-making, and democratic accountability. He defined “effectiveness” and the criteria by which it may be judged as follows:⁴⁸⁰

Effectiveness

Effectiveness, in this context, means both efficiency and success in the performance of natural resources management functions. It is suggested that there are at least three means of achieving effectiveness.

1. The administrative framework should be designed to ensure that there is minimal duplication and conflict in the performance of functions by various agencies.
2. The natural resources management agencies should endeavour to minimize the regulatory burden created by the performance of their functions by ensuring that the regulatory techniques adopted are the most efficient for the situation and that ‘alternative compliance mechanisms’ are considered in the package of measures that may be adopted. The design of planning procedures should facilitate this goal.
3. The institutional arrangements and regulatory powers and techniques created by Parliament should enable the natural resources management agencies to demonstrate progress in the achievement of ESD. This means that the agencies should have statutorily created planning functions with the facility to set clear natural resources management objectives and performance indicators and the necessary powers and resources to monitor, evaluation and report upon the fulfilment of those objectives.

Gardner defined effectiveness as both “efficiency and success”, the latter of which is consistent with the normal meaning of effectiveness as it is clearly intended to mean success in fulfilling the objectives of the performance of natural resources management functions. As explained in chapter 2, efficiency is a different, though obviously related, criterion for evaluation. Gardner’s first two means of achieving what he defines as “effectiveness” relate to efficiency rather than effectiveness. The third criterion focuses on monitoring, evaluating and reporting and is only indirectly linked to achieving the

⁴⁷⁹ SEAC, n 1.

⁴⁸⁰ Gardner, n 43 at 217 (footnotes omitted).

objectives of the systems. He does not provide a method for this monitoring, evaluating and reporting to occur, although earlier in his article he discussed the 1996 Australian SoE Report, which used the PSR method, and is clearly aware of the PSR method. Ultimately, Gardner's approach focuses on efficiency of administration rather than effectiveness or a method of evaluating effectiveness. He appears to accept the PSR method of SoE reporting as an appropriate framework to evaluate effectiveness by demonstrating "progress in the achievement of ESD". To this extent his analysis does not go beyond the PSR method in proposing an appropriate framework to evaluate effectiveness of an environmental legal system.

Young (ed) 1999

Oran Young edited a 1999 text on a major research study of the effectiveness of international environmental regimes.⁴⁸¹ The research project involved fifteen researchers from five countries examining a series of cases studies over several years to formulate and test a theoretical analysis of the determinants of regime effectiveness. The case studies included oil pollution from ships, management of the Barents Sea fisheries, and transboundary pollution. The researchers looked for causal mechanisms based on changes in behaviour to explain why each of these international regimes was effective or ineffective. The behavioural pathways they suggested were:

- *Regimes as Utility Modifiers.* This model assumed that actors are self-interested utility maximizers whose behaviour will be guided by institutional arrangements to the extent that they alter the costs and benefits individual actors attach to well-defined options. For example, until the law imposes a penalty exceeding the benefit of doing so, an factory will continue to pump out pollution as the cheapest solution to waste disposal.
- *Regimes as Enhancers of Cooperation.* In this model, regimes affect behaviour by mitigating the collective-action problems that stand as barriers to the realization of joint gains otherwise available to parties engaged in interactive decision making. That is, a regime can be the cause of an environmental success where individual actors perceive a problem and that the benefits exceed the costs of solving the problem but where a collective solution is required and the regime facilitates that cooperation.
- *Regimes as Bestowers of Authority.* In this model, considerations of legitimacy guide behaviour so that individuals and groups obey the regime because it is authoritative without engaging in detailed calculations of the benefits and costs of compliance. That is, individuals and groups obey the regime because they are told to.
- *Regimes as Learning Facilitators.* In this model, regimes facilitate individual and social learning that help solve the environmental problem in question.
- *Regimes as Role Definers.* In this model, regimes influence the roles actors have and therefore shape their interests and actions to promote effective environmental outcomes.
- *Regimes as Agents of Internal Realignments.* In this model, regimes facilitate positive internal changes in collective groups, for example, by bringing a new CEO to head a company who has a less confrontationist and "greener" perspective on world affairs.

Each of the case studies outlined the facts of the particular international regime of interest then explored the causal relationships based on these six behavioural pathways.

⁴⁸¹ Young, n 9.

Young and his authors were concerned with understanding behavioural pathways and exploring how they work in practice. They summarised their methodology as follows:⁴⁸²

In the course of our work, we have devised a three-stage procedure for evaluating the effectiveness of specific international regimes. We begin in each case by taking snapshots that document differences in the relevant behavioural complex before and after the introduction of the regime and that serve as a means of delineating the range of its potential effects. We then deploy a battery of analytic techniques designed to demonstrate causal connections between the operation of the regime and the changes we have documented, a process that narrow the focus of our analysis and spotlights changes deserving further consideration. This paves the way for an assessment of the behavioural mechanisms or pathways under lying these links, a final step that moves the discussion beyond measures of association and raises the possibility of developing usable knowledge about the success of international institutions.

Young and his contributing authors all used the PSR response method to evaluate the effectiveness or otherwise of the international regimes, although they did not acknowledge it. They began with a detailed discussion of the facts of each case, which in all cases dealt with the pressures, the trends in conditions and the response. The six behavioural pathways only explain why a regime was, or was not, effective – not whether the regime was effective or not. The question of whether the regime was effective or not is answered by a factual evaluation of whether it appropriately solved or managed the problem it was designed for and the method by which that is done implicitly uses the PSR approach. Young's method is, however, useful in focusing on the importance of establishing a causal connection between the regime and the observed changes. It complements the PSR method in this regard, but does not replace it.

Zammit, Cockfield and Funnell 2000

Charlie Zammit, Geoff Cockfield and Sue Funnell produced a major review of how to evaluate the effectiveness of NRM. Unfortunately, their work largely catalogues concepts from the field of Evaluation Theory and re-states these concepts with some environmental language.⁴⁸³ Their proposed conceptual framework is shown in Figure 21.

The conceptual framework shown in Figure 21 is a very confused and convoluted conceptual model for evaluating the effectiveness of NRM. The goals they suggest reflect normal concepts of sustainable development. The outcomes they suggest reflect desired environmental conditions (e.g. ecosystem integrity and health maintained). The mechanisms, programs and activities they suggest reflect a response or path to achieving the goals they have set. There is nothing similar to the “pressures” element in the pressure-state-response model, but presumably they conceive of these issues being inherent in the model, such as through research.

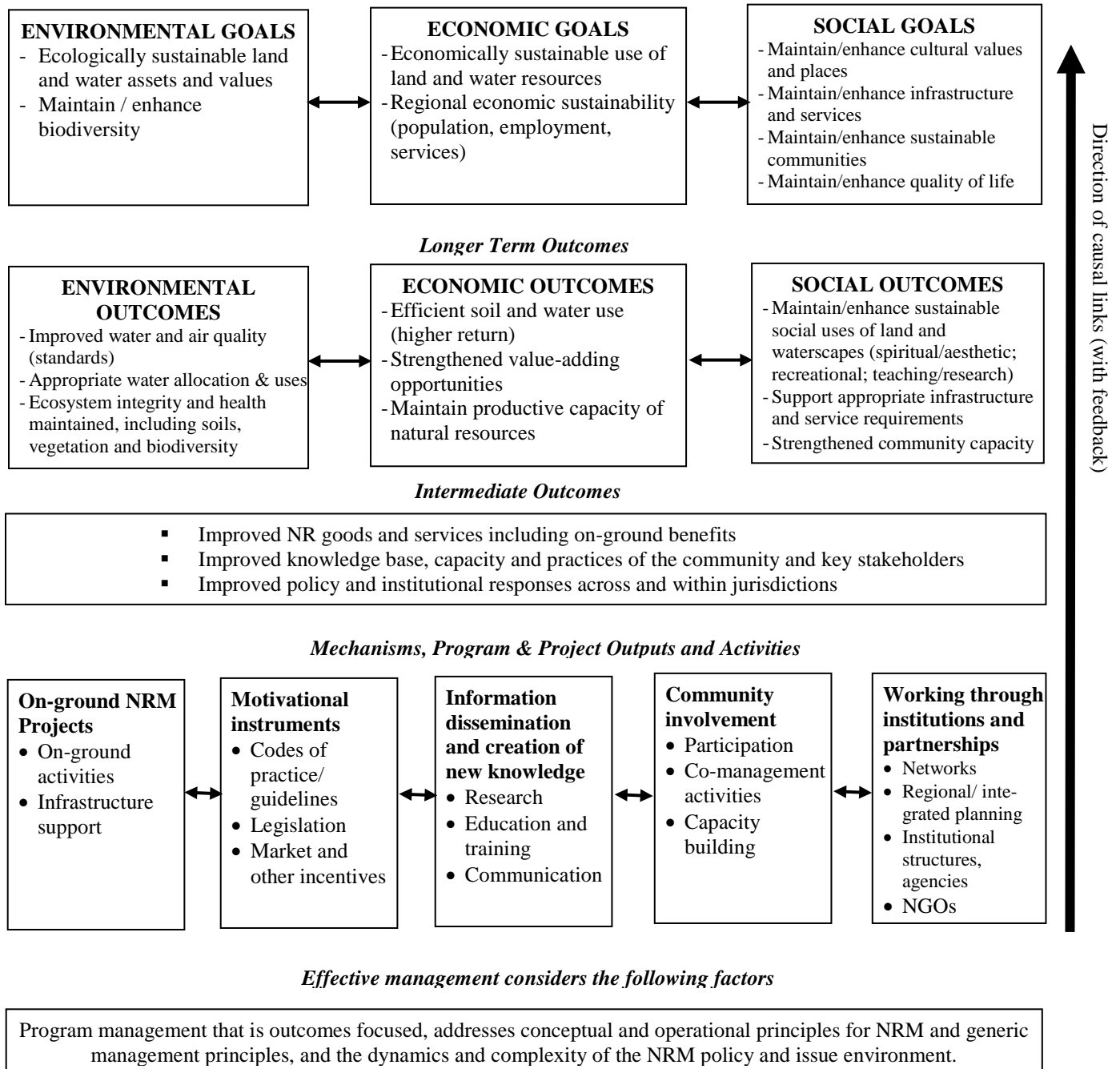
Overall, this is a very cluttered and unwieldy conceptual model. The PSR model is far simpler, more logical, and has greater predictive power. For these reasons it is preferred to the approach suggested by these authors.

⁴⁸² Young, n 481, p 250.

⁴⁸³ Zammit, Cockfield and Funnell, n 79.

Figure 21: Outcomes framework for NRM⁴⁸⁴

ULTIMATE GOAL: SUSTAINABLE NATURAL RESOURCE USE THROUGH INTEGRATING:



⁴⁸⁴ Reproduced from Zammit, Cockfield and Funnell, n 79, p 63.

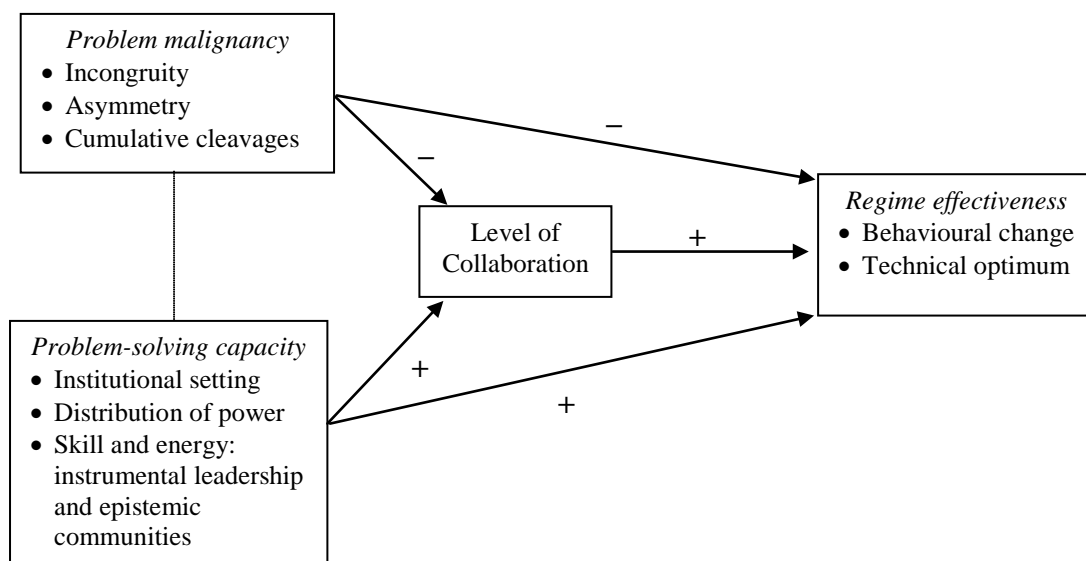
Hain and Cocklin 2001

Monique Hain and Chris Cocklin used evidence of how courts dealt with environmental offences to evaluate the effectiveness of the judiciary in achieving the goals of environmental laws.⁴⁸⁵ They assessed the activities of courts in Queensland, NSW, Victoria and South Australia in relation to: the proportion of charges proven; the conviction rate; the frequency of imposition of penalties; the level of penalties; the distribution of liability; and the level of community involvement in criminal enforcement. To link these matters with improvements in the protection of the environment they assumed laws must be credibly enforced to alter behaviour and, thereby, protect the environment. Their study has merit but their methodology cannot be applied to regulatory functions within an environmental legal system. It cannot be applied to evaluate an environmental legal system generally because there is much more to achieving the objective of sustainable development than merely enforcement. For one matter, if the law itself is totally deficient or has a major gap, enforcement of the law is largely irrelevant to achieving sustainability. The SoE method allows deficiencies and gaps to be identified and is, therefore, preferable as a general method for evaluating effectiveness.

Underdal 2002

Edward Miles, Arild Underdal, Steinar Andresen, Jørgen Wetterstad, Jon Skjærseth and Elaine Carlin reported on the outcomes of another major empirical study of the effectiveness of international environmental regimes.⁴⁸⁶ Underdal, writing the introductory chapter of this book, explained the importance of considering the difficulty in solving a complex environmental problem (problem malignancy) and the capacity of an instrument or institution to solve the problem (problem solving capacity) as two integers of regime effectiveness. He then set out the core model for the study as follows.

Figure 22: Underdal's core model for evaluating effectiveness⁴⁸⁷



⁴⁸⁵ Hain and Cocklin, n 151, p 322.

⁴⁸⁶ Underdal, n 36.

⁴⁸⁷ Underdal, n 36, p 37.

Underdal and his colleagues used behavioural change as a surrogate to measure the effectiveness of an international environmental legal system. The problems with this approach were discussed in chapter 2. Using a surrogate variable such as observable political effects is problematic and should generally be avoided. The great improvements in the quality of environmental data collection and development of comprehensive sets of environmental indicators noted earlier in this chapter also mean that researchers are increasingly able to test for direct improvements in the environment rather than rely on surrogate indicators of effects of policy regimes.

Ironically, Underdal and his colleagues have done precisely what Young and his colleagues did in evaluating the effectiveness of international environmental regimes: without acknowledging it, they use the PSR method to evaluate the effectiveness or otherwise of the regimes while claiming to be using a new method. They begin with a detailed discussion of the facts of each case, which in all cases deals with the pressures, the trends in conditions and the response. For example, in examining the end of dumping in the North Sea, Jon Skjærseth, looks at the historical practices of dumping toxic wastes in the North Sea (i.e. pressure), then the loss of water quality (i.e. condition and trend), before addressing the international regime that developed to regulate the dumping (i.e. response) and reduction in sea dumping (i.e. effectiveness of the legal regime).⁴⁸⁸ Skjærseth uses the PSR method while saying he is using the methodology proposed by Underdal and considering problem malignancy and benignity. Consequently, while these factors might be of some assistance in considering the cause-and-effect relationships necessary to evaluate the effectiveness of an environmental legal regime, they do not replace the PSR method but merely complement it.

Taylor, Suckling and Rachlinski 2005

Martin Taylor, Kieran Suckling and Jeffrey Rachlinski provide an unusual example of using statistical analysis of quantitative data to evaluate the effectiveness of part of an environmental legal system.⁴⁸⁹ They analysed population trends for 1095 species listed as threatened and endangered under the *Endangered Species Act* 1973 (US).⁴⁹⁰ They found a positive correlation between increases in population numbers and length of time of species listings, the existence of recovery plans, and the presence of critical habitat protection for more than two years. They concluded that the *Endangered Species Act* was effective and made recommendations on how its effectiveness could be improved by increasing the use of the policy instruments they had analysed. Their study did not, however, take into account pressures on listed species, merely trends in population numbers (i.e. condition) and the policy instruments applied to the species (i.e. response).

This quantitative method is, however, of limited general application. Aside from information gaps and the limited number of policy instruments capable of such a study being conducted, by focusing exclusively on trends in population numbers without reference to pressures on the species, the method has limited ability to predict the future. A pertinent example of this is climate change, which the method cannot account for yet may be the key pressure on threatened species at the present time and in the future. If climate

⁴⁸⁸ Skjærseth J, "Toward the end of dumping in the North Sea: The case of the Oslo Commission", in Miles, Underdal, Andresen, Wetterstad, Skjærseth, and Carlin, n 36, Ch 3.

⁴⁸⁹ Taylor MFJ, Suckling KF, and Rachlinski JJ, "The effectiveness of the Endangered Species Act: A quantitative analysis" (2005) 55(4) Bioscience 360.

⁴⁹⁰ USC §§ 1531-1540 [1988].

change is likely to destroy the habitat of an endangered species, analysing the effectiveness of the species protection in a way that does not account for it may be dangerously misleading. This method therefore fails the criterion of comprehensiveness used here to evaluate the best available method for evaluating the effectiveness of an environmental legal system.

EVALUATION OF METHODS

The principal hypothesis tested in this thesis is that the PSR method of SoE Reporting provides the best available framework for evaluating the effectiveness of an environmental legal system. Five criteria were chosen in chapter 1 to determine the “best available” method for evaluating the effectiveness of an environmental legal system:

- *Simplicity*: All other things being equal, the simplest method is the best.
- *Systematic*: The method must follow a logical, step-by-step approach that sets the problems and potential solutions in context.
- *Comprehensive*: The method must allow scope for all aspects of environmental problems and potential solutions to be considered in an integrated and holistic way.
- *Predictive power*: The method must allow the effectiveness of an environmental legal system to be evaluated and, as far as possible given natural uncertainty and gaps in information, allow predictions of the likely outcomes that will be achieved by the system. In particular, the method must be able to answer the question: is an environmental legal system likely to achieve sustainable development or, if not, why not? To have predictive power a method must have realistic assumptions and be testable.
- *Meaningful*: The method must be capable of identifying problems and potential solutions in a manner that is easily understood by the general community and politicians, not merely specialist researchers in a narrow field.

Considering the variety of methods discussed in this chapter, the PSR model of SoE reporting stands out as best meeting these criteria. The PSR method is, conceptually, very simple and easily grasped by both experts and non-experts. It allows for systematic and comprehensive description, categorisation and analysis of environmental problems and their management. It has predictive power within the limits of science and policy analysis. Predicting the future in all of the complexity and uncertainty of reality is inherently difficult. As Rump points out:

Forecasting is inherently difficult because of the significant uncertainties involved. The future cannot be predicted with precision due to our limited knowledge of ecosystem behaviour, including socioeconomic changes. No one knows for sure what future population levels, energy prices, or technological breakthroughs will occur or the effects of these socioeconomic changes on environmental issues such as climate change or acidification. No one can accurately predict future resource demands and consumer consumption levels and their effects on biodiversity. Furthermore, it is extremely hard to predict the consequences of existing policy. The degree of implementation and compliance may be divergent from anticipated levels due to a host of unanticipated reasons.

Within the limitations of science and policy analysis to predict the future, the PSR method of SoE reporting provides the best conceptual model in which to evaluate the effectiveness of an environmental legal system. The core reason for this is that it allows

the normative system created by an environmental legal system to be integrated with scientific knowledge of facts in the real world. As Rump found in his review of SoE reporting generally, including using the PSR method:⁴⁹¹

The desirability of an integrative, holistic structure which focuses on cause-and-effect linkages between the environment and socioeconomic systems must be recognized and pursued for SOER to serve the sustainable development paradigm. For these reasons, the pressure-state-response model based on an ecosystem spatial framework represents the best existing approach on which to structure SOER. ...

Nevertheless, certain reservations and cautions must apply. Care is necessary, for example, in the interpretation and application of the pressure-state-response model. Its connection to cause-effect associations make it attractive from a decision making perspective. However, the complexity of environmental problems and incomplete knowledge make it impossible to isolate specific pressures with specific impacts on a one-to-one cause-effect basis. Despite this limitation, the pressure-state-response model does provide a logical way of organizing and classifying environmental information for reporting purposes.

In comparison to the PSR method of SoE reporting, the variations on this method and other methods such as Best Practice do not meet the evaluation criteria as well. In particular, the method of using “best practice” to evaluate the effectiveness of an environmental legal system is problematic because it is based on its own normative system divorced from reality (unless SoE reporting is incorporated). The fact that some part of an environmental legal system can be said to be “best practice” does not mean that it will succeed or is even likely to succeed in achieving sustainable development. The method, therefore, has little predictive power. If SoE reporting is incorporated for evaluating effectiveness using a best practice approach, then it is simpler to focus on the SoE report alone or view the Best Practice concept as merely complementing the SoE report and an additional method that is not essential to evaluating effectiveness.

The differences between the PSR model and the DPSIR, MA and GEO-4 models are largely one of form rather than one of substance as the methods are, fundamentally, the same. Given that all of the methods have the same conceptual basis, it probably does not matter greatly which method is used, provided that it is done carefully and the results are communicated clearly. However, the DPSIR, MA and GEO-4 models can all be accommodated within the PSR model. In such a case the Occam’s Razor principle suggests the PSR model is preferable. Its simplicity, flexibility and wide adoption provide a very useful common analytical framework for SoE reporting. The PSR model is simpler for policy-makers and ordinary people to visualise and understand.

Based on this literature review and analysis, the hypothesis tested in this thesis, that the PSR method of SoE reporting is the best available framework for evaluating the effectiveness of an environmental legal system, is, therefore, accepted. It is the simplest, most systematic, comprehensive and meaningful framework with the greatest predictive power for evaluating the effectiveness of the total social and legal response to human-induced environmental degradation currently available.

The integrated evaluation framework proposed by Bellamy and her colleagues is particularly valuable for program evaluation of specific policy measures;⁴⁹² however, their work does not replace the PSR method of SoE reporting as an over-arching evaluation framework. They implicitly used the PSR framework in their own study of integrated

⁴⁹¹ Rump, n 81, p 47.

⁴⁹² Bellamy et al, n 465.

catchment management in the Herbert River Catchment by explaining pressures, conditions, and response as part of the context of their study.

Given the practical nature of the research undertaken here, where the overall aim is to improve environmental policy, the literature review of methods for evaluating the effectiveness of environmental legal systems needs to be complemented with analysis of how well the PSR method can evaluate the effectiveness of an environmental legal system in practice. To analyse how the PSR method can be used in practice, the next chapter applies it to a case study of evaluating the effectiveness of the environmental legal system protecting the Great Barrier Reef.

Chapter 6

A case study of evaluating the effectiveness of an environmental legal system

This chapter provides a case study of evaluating the effectiveness of an environmental legal system using the pressure-state-response (“PSR”) method of State of the Environment (“SoE”) reporting.⁴⁹³ The case study considers the environmental legal system protecting the Great Barrier Reef (“GBR”). The purpose of presenting this case study is to provide a working example of the application of the PSR method to evaluate the effectiveness of an environmental legal system.

A major reason for choosing the GBR as the subject of the case study is because the international and national importance of the GBR. The GBR is internationally and nationally recognised as a unique icon of natural beauty and wonder. Its outstanding universal values led to it being listed on the World Heritage List under the World Heritage Convention in 1981.⁴⁹⁴ The approach to multi-use planning for the GBR is often viewed as a model for marine protected area management around the world.⁴⁹⁵ The GBR has tremendous economic, social and environmental value for the Australian population.

Given the direct relationship between the health of coastal marine systems and their adjacent catchment areas, it would be clearly wrong to view the GBR as a marine system in isolation from the adjacent catchment area. Yet the GBR stretches for over 2,000 km and has an enormous catchment area in which land-use planning and management is controlled by many government agencies and local governments with different geographic responsibilities. For this reason, a single region of the coastal catchment of the GBR, the Cardwell-Hinchinbrook region, is used here to examine land-use planning and management as a representative sub-sample of the entire catchment. A locality map of the GBR showing its coastal catchment and the Cardwell-Hinchinbrook region is provided in Figure 23 on the following page.

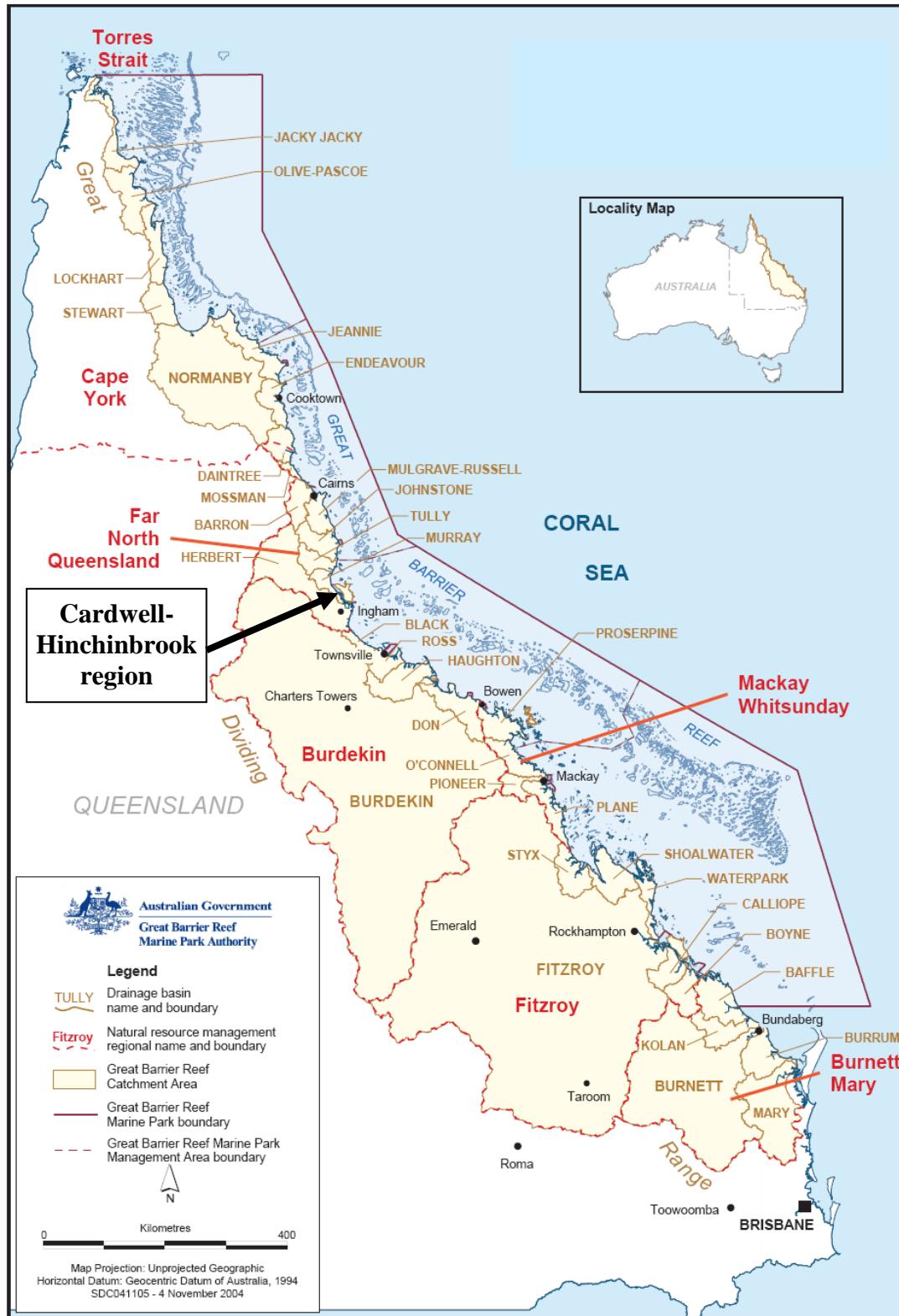
The Cardwell-Hinchinbrook region is used in this case study because it displays a suitable representation of the pressures on the entire catchment area and the responses in the environmental legal system to those pressures. It has experienced major agricultural development in the past, principally for sugarcane growing, and is currently experiencing pressure from coastal tourism and residential development. Yet the region also holds both major marine and terrestrial protected areas – straddling both the GBR World Heritage Area and the Wet Tropics World Heritage Area. This region is, therefore, a good example of the pressures, state and responses within the catchment of the GBR.

⁴⁹³ A synthesis of the climate change aspects of this chapter have been published as McGrath C, “Setting climate change targets to protect the Great Barrier Reef” (2007) 24 EPLJ 182.

⁴⁹⁴ See generally, Lucas P, Webb T, Valentine PS and Marsh H, *The Outstanding Universal Value of the Great Barrier Reef World Heritage Area* (GBRMPA, Townsville, 1997); Bowen J and Bowen M, *The Great Barrier Reef: history, science, heritage* (Cambridge University Press, Cambridge, 2002). The geological history of the GBR is examined by Hopley D, Smithers S and Parnell K, *The Geomorphology of the Great Barrier Reef Development, Diversity and Change* (Cambridge University Press, Cambridge, 2007).

⁴⁹⁵ Wilkinson, n 37, p 303.

Figure 23: Map of the GBR, its catchments, and the Cardwell-Hinchinbrook region⁴⁹⁶



⁴⁹⁶ Adapted from GBRMPA website at http://www.reefed.edu.au/explorer/downloads/Catchment_Map.pdf (viewed 22 July 2006). Note the GBR World Heritage Area broadly coincides with the GBR Marine Park shown in light blue. The boundaries shown in red are Commonwealth NRM regions.

Even with the narrowing of the geographic area of study, initial research of this case study struggled to cope with the enormous amount of scientific information, reports and policies concerning the GBR. Dr Britta Schaffelke, of the CRC Reef, greatly assisted in this stage as the co-author of a conference paper on this topic in 2004.⁴⁹⁷

PRESSURES ON THE GBR

Overview and risk assessment

The most recent international assessment of the status of coral reefs of the world, edited by Clive Wilkinson and published in 2004, indicates that, globally, reefs continue to decline due to threats from direct human pressure and indirect pressure such as climate change.⁴⁹⁸ It notes that:⁴⁹⁹

While Australian coral reefs remain in generally good condition due to relatively low levels of human pressures, there is rising concern about the increasing threats from land runoff from the wet tropical areas, climate change and over-fishing on the GBR.

Based on standard environmental risk assessment principles⁵⁰⁰ the major threat to the GBR at present is global climate change.⁵⁰¹ The likelihood of climate change impacts occurring to the GBR is now regarded as very high and the consequences to the reef ecosystem are expected to be severe, widespread and irreversible. In addition, the economic and social changes needed to avoid these impacts are extensive and the capacity of the community to make such changes is doubtful.

Land-sourced marine pollution and over-fishing are also serious, chronic pressures to the GBR able to cause severe damage at a local and regional scale. However, these pressures are potentially less severe, widespread and more readily managed than climate change and, therefore, are of lower risk to the GBR.

The pressures of climate change, land-sourced marine pollution, and over-fishing need to be considered in more detail to understand their nature, potential impacts, and likely effectiveness of current responses to them.

Before turning to these direct pressures it can be recognised that indirect pressures of human population growth and human consumption will not be considered in detail here. The growth of the human population, currently around 6.5 billion and growing rapidly, is a fundamental pressure on the environment. So too is human consumption. It may be impossible to decouple these issues from increasing impacts of climate change and other direct pressures. If so, these issues need to be addressed to respond effectively to climate change and other direct pressures. However, for present purposes the focus will be on the direct pressures impacting on the GBR and these indirect pressures will be left in the background.

⁴⁹⁷ McGrath C and Schaffelke B, "Evaluating the effectiveness of the protection of water quality in the coastal and marine environment from the hilltops to the oceans: A case study of the Great Barrier Reef, Australia" (Paper presented at the UNEP Hilltops-to-Oceans Conference, Cairns, 2004).

⁴⁹⁸ Wilkinson, n 37.

⁴⁹⁹ Wilkinson, n 37, p 304.

⁵⁰⁰ See generally, Beer and Ziolkowski, n 386.

⁵⁰¹ Wilkinson, n 37, pp 305-306, 324 and 327.

Climate change

Global temperatures, and hence the Earth's climate, are closely linked with the concentration of carbon dioxide ("CO₂") and other greenhouse gases in the atmosphere.⁵⁰² Increasing concentrations of greenhouse gases trap greater heat in the atmosphere causing a warming effect. For at least the past 650,000 years prior to the Industrial Revolution the concentration of CO₂ in the atmosphere varied between 180 and 300 parts per million ("ppm").⁵⁰³ Since the Industrial Revolution, globally averaged concentrations of CO₂, the major greenhouse gas in the atmosphere, have increased dramatically beyond the upper threshold of natural fluctuation for the past 650,000 years primarily due to anthropogenic emissions of greenhouse gases from the combustion of fossil fuels, agriculture, and land-use changes.

The Intergovernmental Panel on Climate Change ("IPCC"), the world's leading scientific body on climate change, released its Fourth Assessment Report in 2007. It concluded that mean global surface temperatures have increased by $0.74 \pm 0.18^{\circ}\text{C}$ in the past 100 years and that most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.⁵⁰⁴ The IPCC's best estimates of equilibrium temperature increases for different levels of greenhouse gases and aerosols in the atmosphere, measured in carbon dioxide equivalents ("CO₂-eq"), are shown in Figure 24.

Figure 24: IPCC best guess of mean global temperature rises for different concentrations of atmospheric greenhouse gases in carbon dioxide equivalents⁵⁰⁵

Equivalent CO ₂	Best guess
350	1.0
450	2.1
550	2.9
650	3.6
750	4.3
1,000	5.5
1,200	6.3

⁵⁰² See generally Pittock, n 21; and Houghton, n 21.

⁵⁰³ Petit JR, Jouzel J, Raynaud D, Barkov NI, Barnola JM, Basile I, Bender M, Chappellaz J, Davis M, Delaygue G, Delmotte M, Kotlyakov VM, Legrand M, Lipenkov VY, Lorius C, Péplín L, Ritz C, Saltzman E, and Stievenard M, "Climate and atmosphere history of the past 420,000 years from the Vostok ice core, Antarctica" (1999) 399 *Nature* 429; and Siegenthaler U, Stocker TF, Monnin E, Lüthi D, Schwander J, Stauffer DR, Barnola JM, Fisher H, Masson-Delmotte V, and Jouzel J, "Stable Carbon Cycle – Climate Relationship During the Late Pleistocene" (2005) 310 *Science* 1313.

⁵⁰⁴ IPCC [Solomon SD, Qin D, Manning M, Chen Z, Marquis M, Averyt KB, Tignor M, and Miller HL (eds)], *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the IPCC* (Cambridge University Press, Cambridge, 2007), p 5. Available at <http://www.ipcc.ch/ipccreports/ar4-wg1.htm> (viewed 20 December 2007).

⁵⁰⁵ IPCC, n 504, Table 10.8, p 826.

Atmospheric concentrations of greenhouse gases and aerosols have already passed 350 ppm CO₂-eq making stabilisation at that level extremely difficult if not impossible in practice particularly in the context of current global growth and energy use patterns. Atmospheric CO₂ reached 379 ppm in 2005 and was increasing by around 2 ppm per year.⁵⁰⁶ Including the effect of other greenhouse gases such as methane, the total concentration of atmospheric greenhouse gases was around 455 ppm CO₂-eq (range: 433–477 ppm CO₂-eq) in 2005.⁵⁰⁷ However, the cooling effects of aerosols and landuse changes reduce radiative forcing so that the net forcing of human activities was in the range of 311 to 435 ppm CO₂-eq, with a central estimate of about 375 ppm CO₂-eq for 2005.⁵⁰⁸ The current growth in CO₂ emissions from the burning of fossil fuels exceeds even the “worst case” IPCC projections.⁵⁰⁹

Compounding the difficulty of stabilising greenhouse gases and aerosols around 350 ppm CO₂-eq to attempt to keep global temperature rises beneath 1°C are the facts that, even if emissions are dramatically reduced, natural processes in the Carbon Cycle will be slow to remove the current levels of CO₂ from the atmosphere. Following perturbation of the natural Carbon Cycle about 50% of an increase in atmospheric CO₂ will be removed within 30 years, a further 30% will be removed within a few centuries and the remaining 20% may remain in the atmosphere for many thousands of years.⁵¹⁰

A critical issue for future regulation of climate change is what level of reduction of anthropogenic greenhouse gas emissions is required to stabilise the rise in atmospheric greenhouse gas concentrations and, thereby, stabilise temperature rises. Figure 25 shows the results of IPCC modelling for six stabilisation scenarios and the corresponding reductions in greenhouse gas emissions required globally by 2050.

Figure 25: IPCC stabilisation scenarios⁵¹¹

Stabilisation scenarios	Concentration of greenhouse gases (ppm CO ₂ -e)	Global mean temperature increase (°C)	Percentage change in global CO ₂ emissions 2000-2050 (%)
I	445 – 490	2.0 – 2.4	-85 to -50
II	490 – 535	2.4 – 2.8	-60 to -30
III	535 – 590	2.8 – 3.2	-30 to +5
IV	590 – 710	3.2 – 4.0	+10 to +60
V	710 – 855	4.0 – 4.9	+25 to +85
VI	855 – 1130	4.9 – 6.1	+90 to +140

⁵⁰⁶ IPCC, n 504, pp 2 and 137.

⁵⁰⁷ IPCC [Metz B, Davidson OR, Bosch PR, Dave R, Meyer LA (eds)], *Climate change 2007: Mitigation. Contribution of Working group III to the Fourth Assessment Report of the IPCC* (Cambridge University Press, Cambridge, 2007), p 102. Available at <http://www.ipcc.ch/ipccreports/ar4-wg3.htm> (viewed 20 December 2007).

⁵⁰⁸ IPCC, n 507, p 102.

⁵⁰⁹ Raupach MR, Marland G, Ciais P, Le Quéré C, Canadell JG, Klepper G, and Field CB, “Global and regional drivers of accelerating CO₂ emissions” (2007) 104(24) PNAS 10288-10293, available at <http://www.pnas.org/cgi/content/abstract/104/24/10288> (viewed 20 December 2007).

⁵¹⁰ IPCC, n 507, p 514.

⁵¹¹ Adapted from IPCC n 507, Table 3.5, p 198.

It is significant to note that the IPCC has not modelled emission reduction scenarios that it expects will stabilise global temperatures rises less than 2°C. A global mean temperature rise of 2°C is the lowest modelled stabilisation regime, requiring a reduction in global greenhouse gas emissions of 85% by 2050 compared with 2000 levels. It is unclear from the text itself why this approach has been taken but it may reflect a conclusion by the IPCC that stabilisation at less than a global mean temperature rise of 2°C is no longer practicable.

Likely impacts of climate change on coral reefs

Rising water temperatures and extreme heat events in summer months are now evident on the GBR and expected to increase in the future due to climate change. Average sea surface temperatures of the GBR for the most recent 30 years (1976 to 2005) are 0.4°C warmer than the earliest instrumental 30 years (1871 to 1900).⁵¹² Acknowledging the pressure of global climate change to the GBR the *Australia State of the Environment 2001* report noted that:⁵¹³

Rising sea surface temperatures in the tropics are considered responsible for widespread bleaching of corals, including on the Great Barrier Reef. ... This is a matter of major concern in the context of climate variability.

Coral reefs dominate coastal tropical environments between the latitudes 25°S and 25°N and roughly coincide with water temperatures between 18°C and 30°C.⁵¹⁴ Corals appear to be living only 1-2°C below their upper thermal limit at which bleaching occurs and an additional ~1°C in maximum sea temperatures results in mortality.⁵¹⁵

Climate change is expected to have severe impacts on the GBR in coming decades and is accepted as a major threat to coral reefs worldwide.⁵¹⁶ It is expected to affect coral reefs predominantly through changes of three variables: increases in sea surface temperature causing coral bleaching; decrease in calcification rates by increased

⁵¹² Johnson JE and Marshall PA (eds), *Climate Change and the Great Barrier Reef: A Vulnerability Assessment* (GBRMPA, Townsville, 2007), p 34, available at http://www.gbrmpa.gov.au/corp_site/info_services/publications/misc_pub/climate_change_vulnerability_assessment/climate_change_vulnerability_assessment (viewed 7 October 2007).

⁵¹³ ASEC, *Coasts and Oceans – Theme Report*, in ASEC, n 1, pp 12-13. Similarly, see Wilkinson, n 37, pp 305-306.

⁵¹⁴ Hoegh-Guldberg O, "Coral bleaching, climate change and the future of the world's coral reefs" (1999) 50(8) *Mar. Freshw. Res.* 839 at 841.

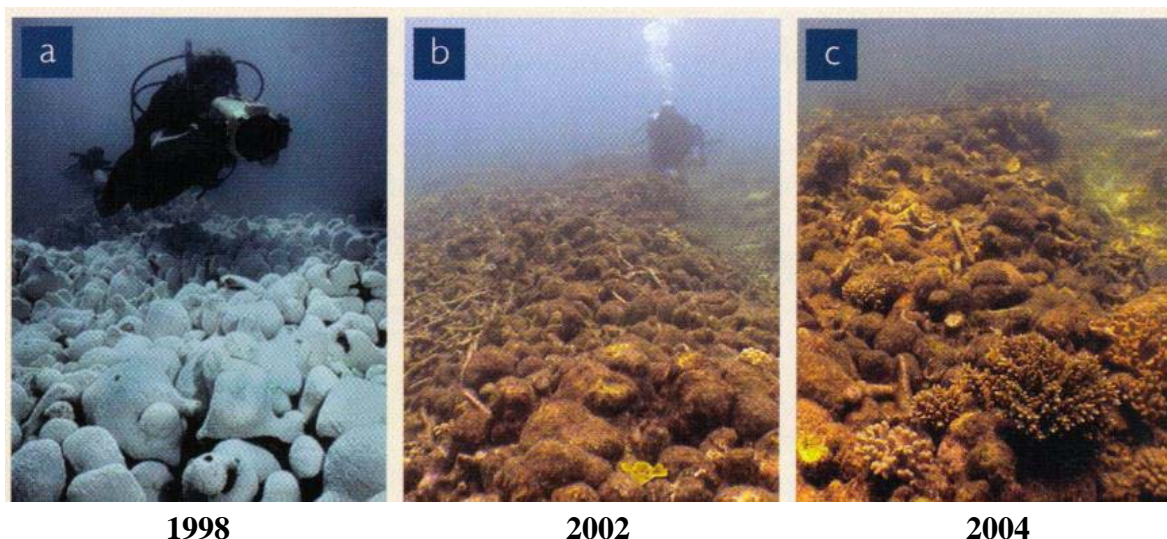
⁵¹⁵ Lough J, Berkelmans R, van Oppen M, Wooldridge S, Steinberg C, "The Great Barrier Reef and Climate Change" (2006) (19) *Bull. Aust. Meteorological and Oceanographic Soc.* 53 at 54.

⁵¹⁶ Hoegh-Guldberg, n 514; Hughes TP, Baird AH, Bellwood DR, Card M, Connolly SR, Folke C, Grosberg R, Hoegh-Guldberg O, Jackson JBC, Kleypas J, Lough JM, Marshall P, Nyström M, Palumbi SR, Pandolfi JM, Rosen B, Roughgarden J, "Climate Change, Human Impacts, and the Resilience of Coral Reefs" (2003) 301 *Science* 929; Done T, Whetton P, Jones R, Berkelmans R, Lough J, Skirving W, and Wooldridge S, *Global climate change and coral bleaching on the Great Barrier Reef* (DNR, Brisbane, 2003), available at: http://www.nrw.qld.gov.au/science/pdf/barrier_reef_report_1.pdf; Hoegh-Guldberg O and Hoegh-Guldberg H, *The implications of climate change for Australia's Great Barrier Reef* (WWF Australia, Sydney, 2004), available at <http://wwf.org.au/news/n65/>; Wilkinson, n 37, Ch 11; Grimsditch GD and Salm RV, *Coral Reef Resilience and Resistance to Bleaching* (IUCN, Gland, 2005), available at http://www.iucn.org/themes/marine/pdf/coral_reef_resilience_gg-rs.pdf; Hoegh-Guldberg O, "Low coral cover in a high-CO₂ world" (2005) 110 *J. Geophys. Res.* C09S06; Donner SD, Skirving WJ, Little CM, Oppenheimer M, Hoegh-Guldberg O, "Global assessment of coral bleaching and required rates of adaptation under climate change" (2005) 11 *Global Change Biology* 2251; Johnson and Marshall, n 512; and the Reef Futures website at <http://www.reeffutures.org/topics/bleach/cause.cfm> (all websites viewed 1 October 2007).

concentrations of carbon dioxide in the atmosphere changing seawater chemistry; and increases in sea level.⁵¹⁷

Increases in sea surface temperatures causing coral bleaching is the most immediate threat from climate change. Coral bleaching occurs when water temperatures exceed their normal maximum extremes causing corals to expel their symbiotic algae, known as zooxanthellae, and turn a brilliant white colour.⁵¹⁸ “Coral bleaching” is used to describe this phenomenon because the normally colourful corals appear to have been bleached white. Corals may recover from mild coral bleaching events but severe events can cause widespread death of corals.⁵¹⁹ The immediate effects of severe coral bleaching causing widespread mortality of corals allowing colonisation of the substrate by algae and subsequent partial recolonisation by corals in the absence of further bleaching events are shown in the following series of photographs by Paul Marshall.⁵²⁰

Coral bleaching and partial recolonisation by corals on Pelorus Island, GBR



Marshall explained the sequence of photographs as follows:

Photos of the reef at Pelorus Island [Palm Island Group, offshore from the Cardwell-Hinchinbrook Region] on the Great Barrier Reef during and after severe bleaching-induced mortality. (a) This large stand of *Goniopora*, or daytime coral, was completely bleached during the summer of 1998. It died shortly after. (b) Despite healthy conditions and effective control of algae by herbivores, only the earliest stages of recovery were evident by 2002. (c) There was good coral recruitment by 2004, but full recovery is likely to take decades.

The coral bleaching event in 1998 on Pelorus Island shown in photograph (a) was part of a mass coral bleaching event across the globe. In that year coral bleaching due to extreme water temperatures effectively destroyed 16% of the coral reefs of the world, with

⁵¹⁷ Reviewed in Hoegh-Guldberg O, Anthony K, Berkelmans R, Dove S, Fabricus K, Lough J, Marshall P, van Oppen MJH, Negri A and Willis B, “Vulnerability of reef-building corals on the Great Barrier Reef to climate change”, Ch 10 in Johnson and Marshall (eds), n 512, p 295 (citations omitted).

⁵¹⁸ Several other factors, such as changes in salinity and some toxins, may also cause coral bleaching but are not relevant to the present discussion. See Hoegh-Guldberg et al, n 517.

⁵¹⁹ Hoegh-Guldberg et al, n 517.

⁵²⁰ Schuttenberg H and Marshall P, *A Reef Manager's Guide to Coral Bleaching* (GBRMPA, Townsville, 2006), p 12.

losses in the Indian Ocean of almost 50%.⁵²¹ These impacts are unprecedented in the evolutionary history of the GBR or globally. The recent mass mortality of Caribbean reef corals dramatically altered reef community structure in a manner that is unprecedented for at least 95,000 years.⁵²²

There have been two major coral bleaching events on the GBR, in 1998 and 2002.⁵²³ Ray Berkelmans and his colleagues analysed the 1998 and 2002 events and found that spatial patterns of bleaching were similar in both years and that short periods of high water temperature are highly stressful to corals and result in highly predictable bleaching patterns.⁵²⁴ Figure 26 shows the results of the survey of coral bleaching and maximum sea surface temperatures in 1998 and 2002. Berkelmans and his colleagues found in 1998, 42% of reefs were bleached to some extent with 18% strongly bleached. In 2002, 54% of reefs were bleached to some extent with 18% strongly bleached. There was a close correlation between coral bleaching and maximum sea surface temperature. Modelling the relationship between the bleaching events and maximum sea surface temperature:⁵²⁵

... indicates that a 1°C increase [in maximum sea surface temperature over a 3 day period] would increase the bleaching occurrence of reefs from 50% (approximate occurrence in 1998 and 2002) to 82%, while a 2 °C increase would increase the occurrence to 97% and a 3 °C increase to 100%. These results suggest that coral reefs are profoundly sensitive to even modest increases in temperature and, in the absence of acclimatization/adaptation, are likely to suffer large declines under mid-range International Panel for Climate Change predictions by 2050.

Ove Hoegh-Guldberg found the size of a thermal anomaly and the time that corals are exposed to it in Degree Heating Weeks or Months (“DHM”) can give a fairly accurate projection of the outcome of exposure of corals to stress.⁵²⁶ He assumed, based on previous studies, that bleaching begins for corals exposed to DHM values of 0.5 or more. This is equivalent to two weeks exposure to a +1°C anomaly above long term sea temperatures. Severe mortality events begin when corals are exposed to DHM values equal to or greater than 3.2. This is equivalent to more than 9 weeks at +1°C anomaly above long-term sea temperatures at each site, or 4.5 weeks at +2°C anomaly above long-term sea temperatures at each site, and so on. Using the IPCC “business as usual” scenario for future greenhouse emissions, Hoegh-Guldberg found:⁵²⁷

If the projected increases in sea temperature follow the trajectory suggested by the [IPCC], reefs should soon start to decline in terms of coral cover and appearance. With a doubling of CO₂, thermal stress levels will soon reach the levels seen at isolated yet catastrophically affected sites in 1998. When these conditions arrive on reefs on the Great Barrier Reef more than three times per decade, coral cover should have declined to near zero. These dates are on average around 2030-2040 for southern, central and northern sectors of the Great Barrier Reef.

⁵²¹ Wilkinson, n 37, p 22.

⁵²² Pandolfi JM and Jackson JBC, “Ecological persistence interrupted in Caribbean coral reefs” (2006) 9 (7) *Ecology Letters* 818.

⁵²³ Johnson and Marshall, n 512.

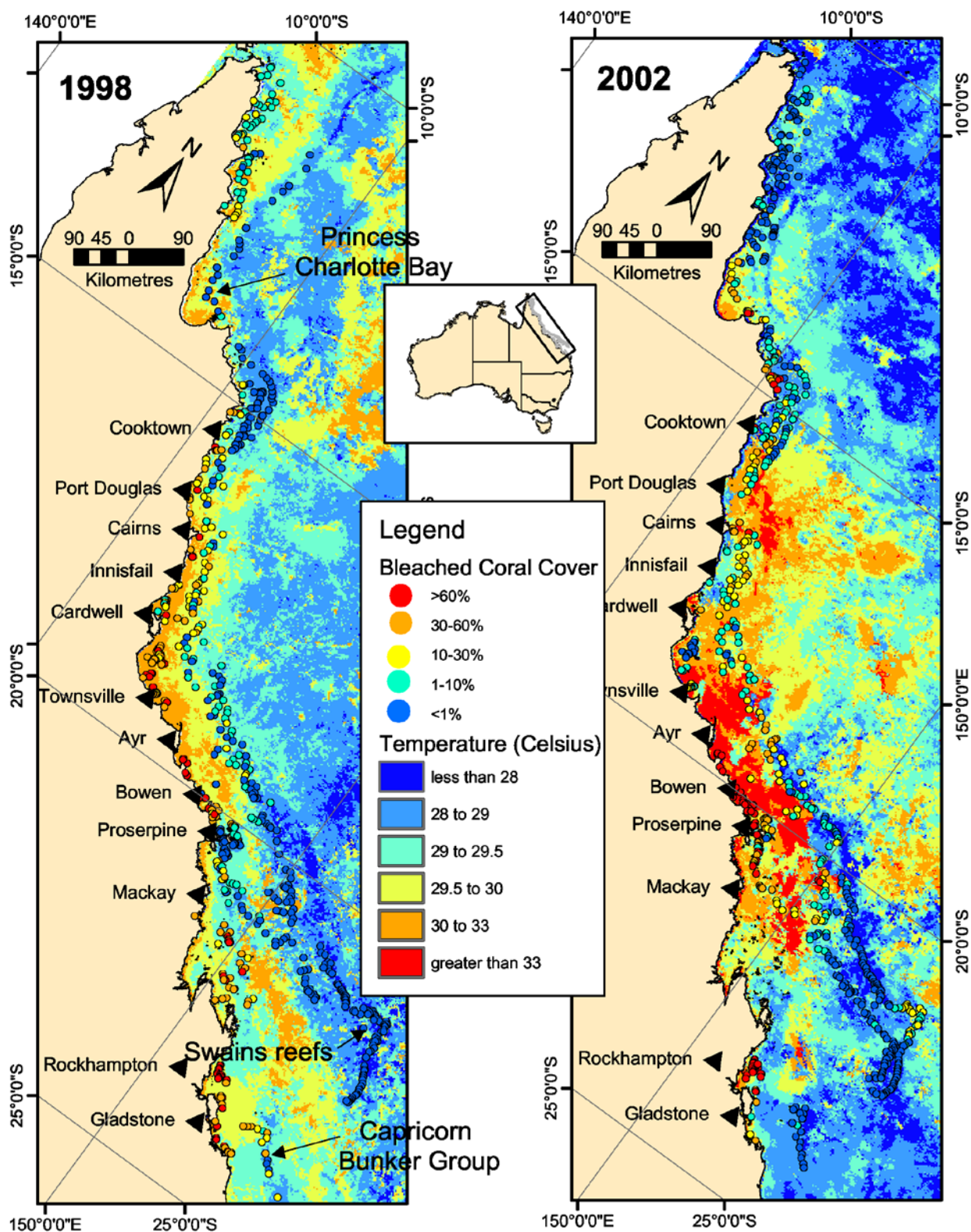
⁵²⁴ Berkelmans R, De’ath G, Kininmonth S, and Skirving WJ, “A comparison of the 1998 and 2002 coral bleaching events on the GBR: spatial correlation, patterns and predictions” (2004) 23 (1) *Coral Reefs* 74.

⁵²⁵ Berkelmans et al, n 524, pp 74 and 82; see also Done et al, n 516. Note: an increase in mean and variance increases the frequency of extremes: see Houghton, n 21, p 129.

⁵²⁶ Hoegh-Guldberg, n 514; Hoegh-Guldberg and Hoegh-Guldberg, n 516, p 62.

⁵²⁷ Hoegh-Guldberg and Hoegh-Guldberg, n 516, p 66.

Figure 26: Raw aerial survey results of coral bleaching in 1998 and 2002 overlaid on the maximum 3-day sea surface temperature for every pixel during the warmest months of the austral summer (December-March)⁵²⁸



⁵²⁸ Berkelmans, De'ath, Kininmonth, and Skirving, n 524, p 77.

Hoegh-Guldberg noted that a key observation regarding heat stress in reef-building corals is that not all corals are equally sensitive to temperature.⁵²⁹ Corals with thicker tissues and more massive growth forms tend to be more tolerant than corals that have thinner tissues and branching growth forms. The thermal threshold above which corals and their symbionts will experience heat stress and bleaching also varies geographically, indicating that corals and zooxanthellae have evolved over evolutionary time to local temperature regimes. Corals closer to the equator have thermal thresholds for bleaching that may be as high as 31°C while those at higher latitudes may bleach at temperatures as low as 26°C. Thresholds may also vary seasonally. However, Hoegh-Guldberg concluded that, while there is some variability in the impact of climate change according to latitude and proximity to the Queensland coast, the differences are small and delays in response to warming due to these factors are at most a couple of decades.⁵³⁰

This body of research has led to recent consensus statements from coral reef scientists on the multiple threats posed to coral reefs by climate change. The Third International Tropical Marine Ecosystem Management Symposium in Mexico in October 2006 and the International Coral Reef Initiative General Meeting held in Japan in April 2007 stated that the actions required to support reef resilience to climate change include:⁵³¹

Limit climate change to ensure that further increases in sea temperature are limited to 2°C above preindustrial levels and ocean carbonate ion concentrations do not fall below 200 mol. kg⁻¹.

The IPCC also concluded that climate change is a major threat to coral reefs worldwide, including the GBR.⁵³² Specifically in relation to Australia and New Zealand, it found that there is a very high confidence that, “significant loss of biodiversity is projected to occur by 2020 in some ecologically-rich sites including the Great Barrier Reef and Queensland Wet Tropics.”⁵³³ It found, when considering the impacts of climate change on coastal systems, there is very high confidence that:⁵³⁴

Corals are vulnerable to thermal stress and have low adaptive capacity. Increases in sea surface temperature of about 1 to 3°C are projected to result in more frequent coral bleaching events and widespread mortality, unless there is thermal adaptation or acclimatisation by corals.

Hoegh-Guldberg and his colleagues concluded in a recent, major review of the likely impacts of climate change to the GBR:⁵³⁵

The vulnerability of coral and the reefs they build to climate change was brought into sharp focus after 1998, when an estimated 16 percent of the world’s coral communities died. Analysing the literature since that time reveals that rapidly rising sea temperatures and increasing levels of acidity in the ocean remain the major threat to

⁵²⁹ Hoegh-Guldberg, n 514; Hoegh-Guldberg and Hoegh-Guldberg, n 516, p 37.

⁵³⁰ Hoegh-Guldberg and Hoegh-Guldberg, n 516, p 72.

⁵³¹ Available, respectively, at http://www.itmems.org/Coral_Reefs_Climate_Change.pdf and http://www.icriforum.org/library/Reso_CC_Tokyo_0407.pdf (viewed 30 October 2007). See also the ARC Centre of Excellence for Coral Reef Studies, “Consensus Declaration on Coral Reef Futures” at http://www.coralcoe.org.au/news_stories/communiqué.html (viewed 30 October 2007).

⁵³² IPCC [Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, and Hanson CE (eds)], *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, Cambridge, 2007). Available at <http://www.ipcc.ch/ipccreports/ar4-wg2.htm> (viewed 20 December 2007).

⁵³³ IPCC, n 532, p 11.

⁵³⁴ IPCC, n 532, p 9. “Very high confidence” is defined as “at least 9 out of 10 chance of being correct.”

⁵³⁵ Hoegh-Guldberg et al, n 517, p 295 (citations omitted).

coral reefs. Successive studies of the potential impacts of thermal stress on coral reefs have supported the notion that coral dominated reefs are likely to largely disappear with a 2°C rise in sea temperature over the next 100 years. This, coupled with the additional vulnerability of coral reefs to high levels of acidification once the atmosphere reaches 500 parts per million, suggests that coral dominated reefs will be rare or non-existent in the near future.

In relation to the potential for thermal adaptation and acclimatization noted by the IPCC, there is evidence that adult corals, at least in some circumstances, are capable of limited acclimatization or adaptation to increased water temperatures;⁵³⁶ however, there is not a strong case for adaptation playing a role in modifying the thermal tolerances of the reef-building corals to keep pace with the expected rate of water temperature increase due to climate change.⁵³⁷ The widespread coral bleaching events in 1998 and 2002 suggest that adaptation by corals will not avoid, at least, severe short to medium-term impacts of rising sea temperatures.

The potential for corals to keep pace with climate change by adapting to higher water temperatures is also likely to be limited by the fact that, as noted above, increase in temperature is not the only impact of climate change on coral reefs. Hoegh-Guldberg and his colleagues emphasised the importance of changes in seawater chemistry due to increasing carbon dioxide concentrations:⁵³⁸

Doubling atmospheric CO₂ above the ocean will cause the carbonate concentration to decrease to approximately 200 micromol per kg, with temperature having a small influence. A carbonate concentration of 200 micromol per kg is critical in that the calcification of corals and many other organisms declines effectively to zero at carbonate concentrations around this value. This impact is made even more significant because coral reefs are a balance between calcification and erosion and hence calcification needs to be well above zero to avoid a net erosion of coral reefs. There is overwhelming evidence that corals and the reefs they build will not be able to maintain themselves or grow if CO₂ concentrations rise above 500 parts per million. This level of CO₂ is at the lower end of the range of greenhouse scenarios for the end of this century.

Hoegh-Guldberg and his colleagues concluded in relation to vulnerability and thresholds for extinction risk and irreversibility for coral reefs from climate change that:⁵³⁹

As outlined above, 500 parts per million is the highest CO₂ concentration under which any semblances to the communities of corals we have today can survive. It is also the only scenario in which the climate will eventually stabilise. Above this point (500 parts per million), coral reefs will also change irreversibly and be lost for many thousands of years. To contemplate any higher CO₂ is untenable given the huge likelihood of such catastrophic events as runaway greenhouse effects and the flooding of the planet as the Greenland and Western Antarctic Ice Sheets melt. Even though 500 parts per million is seen as an ambitious greenhouse target, effects on ocean temperature and acidity will

⁵³⁶ See Baker AC, "Flexibility and specificity in coral-algal symbiosis: diversity, ecology, and biogeography of *Symbiodinium*" (2003) 34 *Annu. Rev. Ecol. Syst.* 661; Berkelmans R and van Oppen MJH, "The role of zooxanthellae in the thermal tolerance of corals: a 'nugget of hope' for coral reefs in an era of climate change" (2006) 273 *Proc. R. Soc. Lond. B* 2305.

⁵³⁷ Hoegh-Guldberg and Hoegh-Guldberg, n 516, pp 42-49; Hoegh-Guldberg (2005), n 516.

⁵³⁸ Hoegh-Guldberg et al, n 517, p 285 (citations omitted). See also, Hoegh-Guldberg O, Mumby PJ, Hooten AJ, Steneck RS, Greenfield P, Gomez E, Harvell CD, Sale PF, Edwards AJ, Caldeira K, Knowlton N, Eakin CM, Iglesias-Prieto R, Muthiga N, Bradbury RH, Dubi A, and Hatziolos ME, "Coral reefs under rapid climate change and ocean acidification" (2007) 318 *Science* 1737.

⁵³⁹ Hoegh-Guldberg et al, n 517, p 296 (citations omitted).

mean that coral calcification will decrease to 40 percent of today's value and major (1998 level) bleaching events will occur every 2 to 4 years.

Katherina Fabricius and her colleagues reached a similar conclusion in assessing vulnerability of coral reefs from climate change.⁵⁴⁰

A dramatic loss in reef biodiversity appears inevitable at atmospheric CO₂ concentrations approaching 500 parts per million. Given that impacts on many other ecosystems also become extreme at 450 to 500 parts per million, limiting emissions to below this point is critical for coral reefs.

In addition to the severe impacts on corals and marine life, terrestrial flora and fauna in the GBR catchment are also expected to be strongly impacted by global climate change. The likely impacts of climate change on terrestrial biodiversity within the Wet Tropics World Heritage Area will be very serious for even a 1°C mean temperature rise. The loss of endemic species in the Wet Tropics will rise rapidly beyond an increase of 2°C and losses will be catastrophic with a 3.5°C or greater increase.⁵⁴¹ Rainforests, wetlands, rivers and riparian systems are particularly vulnerable to climate change.

While improvements to coastal management may help reduce these impacts, based on current knowledge it is expected that the ecology of the GBR will change dramatically over the next decades due to climate change.⁵⁴² This indicates that climate change represents the most severe threat to the GBR in the immediate-medium term future.⁵⁴³

Land-sourced marine pollution and coastal development

Fifteen years of marine and land-based research on the GBR and the adjacent catchment have shown that water quality and ecological integrity of the coastal area of the GBRWHA are being affected by human activities. Agriculture, industrial development, and urban development in the GBR catchment all contribute to these impacts.

David Haynes edited a major review of the impacts of human activities on GBR water quality in 2001, including land-sourced and ship-sourced marine pollution, global climate change, and altered river flow regimes.⁵⁴⁴ He and his contributing authors noted that grazing of cattle for beef production is the largest single land use on the GBR catchment with cropping, (mainly of sugarcane) being a significant agricultural industry in coastal areas between Bundaberg and Port Douglas. There are approximately 4,500,000 beef

⁵⁴⁰ Fabricius KE, Hoegh-Guldberg O, Johnson J, McCook L and Lough J, "Vulnerability of coral reefs of the Great Barrier Reef to climate change", Ch 17 in Johnson and Marshall (eds), n 512, p 596.

⁵⁴¹ Krockenberger AK, Kitching RL and Turton SM (eds), *Environmental Crisis: Climate Change and Terrestrial Biodiversity in Queensland* (CRC for Tropical Rainforest Ecology and Management, Cairns, 2003), available at http://www.rainforest-crc.jcu.edu.au/publications/environmental_crisis.htm (viewed 28 December 2006); Williams SE, Bolitho EE and Fox S, "Climate change in Australian tropical rainforests: an impending environmental catastrophe" (2003) 270 *Proc. R. Soc. Lond. B* 1887.

⁵⁴² See the authors cited in footnote n 516, and Wolanski E and De'ath G, "Predicting the impact of present and future human land-use on the Great Barrier Reef" (2005) 64 *Estuarine, Coastal and Shelf Science* 504.

⁵⁴³ Miller I and Sweatman H, "Status of coral reefs in Australia and PNG in 2004", Ch 11 in Wilkinson, n 37, Vol 2, p 327; Johnson and Marshall, n 512.

⁵⁴⁴ Haynes D (ed), *Great Barrier Reef Catchment Water Quality Current Issues* (GBRMPA, Townsville, 2001), p 6. Available at http://www.gbrmpa.gov.au/corp_site/key_issues/water_quality/current_issues/ (viewed 22 July 2006). See also Williams D, *Review of the impacts of terrestrial runoff on the Great Barrier Reef World Heritage Area* (CRC Reef Research Centre, Townsville, 2002); and Productivity Commission, *Industries in the Great Barrier Reef Catchment and measures to address declining water quality: Research Report* (Commonwealth of Australia, Canberra, 2002).

cattle grazed in GBR catchments, with highest stock numbers in the Fitzroy and Burdekin catchments. The area under sugarcane cultivation in GBR catchments has increased steadily over the last 100 years reaching approximately 400,000ha by 2000. Other significant catchment land uses include aquaculture and mining of coal and various metals.

The extensive conversion of land in the GBR catchment to rangeland beef grazing has resulted in extensive tree clearance for conversion to pasture.⁵⁴⁵ This has resulted in greatly increased soil erosion due to woodland removal, overgrazing (especially in drought conditions where vegetation cover falls below 40%), and streambank erosion when cattle have direct access to streams.⁵⁴⁶

Sugarcane farming in the GBR catchment has resulted in significant amounts of soil erosion and nutrient input into the GBR. The traditional method of farming using burnt cane harvesting resulted in erosion rates of up to 500 tonnes/ha/year. However, the recent move to green cane harvesting/trash blanketing using minimum tillage in the majority of the GBR catchment has resulted in soil erosion rates dropping dramatically with average losses of 10 tonnes/ha/year, which is only marginally higher than the natural rate of soil erosion on the flood plain.⁵⁴⁷

Faced with mounting evidence of degradation in GBR water quality, the Australian Government and Queensland Government entered a Memorandum of Understanding on 13 August 2002 to develop the Reef Water Quality Protection Plan ("RWQPP") with the goal of stabilising and reversing the decline in water quality entering the GBR. An intergovernmental steering committee was formed and sought a report from an independent scientific panel. In 2003 the science panel concluded that near-shore reefs were being damaged by land-sourced pollution.⁵⁴⁸ It found that delivery of sediments and nutrients to rivers discharging into GBR waters has increased by at least four times over estimates of rates from before 1850. It found concentrations of nutrients in seasonal river flood plumes, which are the main transport mechanism for land runoff, are at a level that may cause harm to GBR ecosystems. Consequently, coral reefs at a number of inshore locations along the coast have been disturbed and have remained in a disturbed state, exhibiting characteristics consistent with impacts due to enhanced nutrient availability or sedimentation. There were detectable levels of herbicides (principally diuron) been found in coastal and intertidal sediments and seagrasses adjacent to catchments with high agricultural use, at levels shown to adversely impact the health of seagrasses. There was well-documented evidence from overseas studies demonstrating harmful effects of excess nutrients and sedimentation to reef systems. The overseas studies also indicate that by the time widespread effects are obvious, the system would be almost irreparably damaged.

Land-use, primarily agriculture, delivers most of the pollution loads to the GBR. Current land-use on the GBR Catchment differs widely between individual catchments⁵⁴⁹

⁵⁴⁵ Haynes, n 544, p 7.

⁵⁴⁶ Haynes, n 544, p 7.

⁵⁴⁷ Haynes, n 544, pp 9-10.

⁵⁴⁸ Science Panel for the RWQPP, *A report on the study of land-sourced pollutants and their impacts on water quality in and adjacent to the Great Barrier Reef* (Report to the Intergovernmental Steering Committee for the RWQPP, Brisbane, 2003), 187 pp. Available at <http://www.deh.gov.au/coasts/pollution/reef/science/index.html> (viewed 22 July 2006).

⁵⁴⁹ Furnas M, *Catchments and Corals: Terrestrial Runoff to the Great Barrier Reef* (Australian Institute of Marine Science, Townsville, 2003).

and each catchment will contribute differently to pollution loads.⁵⁵⁰ A rapid assessment methodology has been developed to profile and prioritise GBR catchments taking into account their potential discharge of sediments and nutrients to the GBR and the impacts of this discharge.⁵⁵¹ This assessment also considers socio-economic criteria. Two catchments, the Burdekin and Fitzroy, rated “high” against all four aspects of risk considered in this assessment. These rating and the ratings for the other GBR catchments may direct future planning and management actions, for example under the RWQPP discussed below. An earlier risk assessment approach assessed exposure of GBR inner-shelf reefs to riverine material.⁵⁵² This model used ratings of amount and frequency of discharge from major rivers, the predominant distribution of river plumes in GBR waters, loads of riverine pollutants, and distance of reefs to river mouths. Coastal areas at high risk of riverine pollution impacts were identified adjacent to the Wet tropics region, from Tully to north of Cairns, and in the Whitsunday’s area.

In addition to agricultural run-off, urban and coastal development is a potential pressure to the health of the GBR. It can alter the amount and quality of land run-off by vegetation clearing and water impoundments. Leaching of acidic water may occur from disturbed acid sulfate soil. Water pollution may also occur from fertilisers, pesticides, toxic chemicals, sewage, rubbish, detergents, heavy metals, and oil. The potential impacts on water quality and quantity from coastal development will be considered in a more detail in a case study of Stage 2 of the Port Hinchinbrook development below.

Commercial and recreational fishing

Commercial and recreational fishing create considerable pressure on the GBR.⁵⁵³ The pressures include direct loss to the ecosystem of individuals caught as well as habitat damage. Bottom trawling, in particular, causes a considerable amount of habitat damage.

The East Coast Inshore Finfish Fishery is Queensland’s largest fishery in terms of number of operators.⁵⁵⁴ It comprises the commercial sector, a large recreational sector of around 800,000 anglers and an Indigenous sector. The fisheries operate in estuaries and tidal rivers, on the foreshore and adjacent waters. The commercial net fishery comprises some 300 fishing vessels operating in the GBR Marine Park and landing around 2,800 tonnes per year, valued at \$15 million. The key target species is barramundi, but other commercially valuable species include threadfin salmon, small mackerels (grey and school mackerels) and tropical sharks. Most of the species taken by the commercial net sector are for domestic consumption. A smaller commercial line fishery also operates for school and spotted mackerel. Although highly variable from year to year, catches in the commercial East Coast Inshore Finfish Fishery have ranged from 6,000 to 7,500 tonnes per year.

⁵⁵⁰ GBRMPA, *Great Barrier Reef Water Quality Action Plan: A Report to Ministerial Council on targets for pollutant loads* (GBRMPA, Townsville, 2001).

⁵⁵¹ Greiner R, Herr A, Brodie J, Haynes D, Audas D, and Roth C, *Profiling and assessment of basins with respect to the sediment, nutrient and other diffuse-source loads they export to the Great Barrier Reef WHA* (CSIRO Sustainable Ecosystems, Townsville, 2003).

⁵⁵² Devlin M, Waterhouse J, Taylor J, and Brodie J, *Flood plumes in the Great Barrier Reef: Spatial and Temporal Patterns in Composition and Distribution* (GBRMPA Research Publication No.68, Townsville, 2001).

⁵⁵³ The summary of fishing pressure in this section is drawn from the GBRMPA website at http://www.gbrmpa.gov.au/corp_site/key_issues/fisheries (viewed 20 April 2007).

⁵⁵⁴ The information in this paragraph is drawn, almost verbatim, from http://www.gbrmpa.gov.au/corp_site/key_issues/fisheries/inshore_finfish_fishery (viewed 20 April 2007).

The East Coast Otter Trawl Fishery is the major commercial fishery in the GBR.⁵⁵⁵ It extends the length of Queensland's East Coast, but most of it (~70%) occurs in the GBR Marine Park. It is comprised of several sectors, which target particular species or species groups in specific geographical locations. The tiger and endeavour prawn fishery is the largest sector of the fishery in the GBR Marine Park. It is conducted mainly between Cape York and Cape Conway in the lagoonal areas of the GBR Marine Park. The northern king prawn fishery occurs mainly in waters north of Shoalwater Bay and operates in near-reef areas and inter-reefal gutters. Banana prawns are caught in shallow inshore areas adjacent to major estuaries. Apart from prawns, the fishery also targets saucer scallops (in the southern part of the GBR Marine Park) and bugs. Some 60 additional species of molluscs, crustaceans and finfish are taken as limited by-product. The number of trawlers in the fishery has declined significantly from its peak in the early 1980s, when some 1400 operators were licensed. As a result of structural adjustment in the fishery, there are now only 450 trawlers. Of these, about 400 operate in the GBR Marine Park, landing around 6,000 tonnes of product annually, the estimated value of which is about \$80 million.

Another major commercial fishery in the GBR is the East Coast Reef Line Fishery, is concentrated between Cooktown and the southern end of the GBR Marine Park.⁵⁵⁶ The fishery is made up of a commercial and recreational sector and more than 120 reef species are taken in this fishery. With the introduction of a quota system in 2004, commercial catches were capped at a Total Allowable Catch of 3,061 tonnes per year for coral reef fish and 619 tonnes per year for Spanish mackerel. Information on the recreational take in the Reef Line Fishery is less available. Surveys of recreational fishers in 1999 estimated the recreational catch of coral reef finfish species at 2,494, and 406 tonnes for Spanish mackerel.⁵⁵⁷

In addition to the larger fisheries, the East Coast Dive-Based Fisheries (also known as harvest or collection fisheries) involve five major commercial fisheries valued around \$15 million per year.⁵⁵⁸ A Tropical Rock Lobster Fishery is valued at \$6 million with 28 operators taking around 200 tonnes per year. An Aquarium Fish Fishery is valued at \$4 million with 41 full-time operators and 14 restricted operators in the GBR Marine Park. A Sea Cucumber (or Beche-de-Mer) Fishery is valued at \$4 million with 3 operators permitted to take a Total Allowable Catch ("TAC") of 380 tonnes per year. A Coral Fishery is valued at \$1 million with 36 operators permitted to take a TAC of 200 tonnes per year. A Trochus Fishery is valued at \$0.7 million with 6 operators permitted to take a TAC of 300 tonnes per year. In addition there are also two smaller collection fisheries for specimen shells and bait (worms and yabbies).

⁵⁵⁵ The summary of the ECOTF in this paragraph is drawn, almost verbatim, from http://www.gbrmpa.gov.au/corp_site/key_issues/fisheries/otter_trawl_fishery (viewed 20 April 2007).

⁵⁵⁶ The information in this paragraph is drawn, almost verbatim, from http://www.gbrmpa.gov.au/corp_site/key_issues/fisheries/reef_line_fishery (viewed 20 April 2007).

⁵⁵⁷ See http://www.gbrmpa.gov.au/corp_site/key_issues/fisheries/reef_line_fishery (viewed 20 April 2007).

⁵⁵⁸ The information in this paragraph is drawn, almost verbatim, from http://www.gbrmpa.gov.au/corp_site/key_issues/fisheries/dive_based_fishery (viewed 20 April 2007).

STATE OF THE GBR

General

The GBR is the largest system of coral reefs in the world with an area of about 350,000 km² and approximately 2,900 reefs, of which 760 are fringing reefs close to the coast. The GBR is one of the world's richest areas of biological diversity and comprises many different ecological community types, including extensive seagrass beds, mangrove forests, sandbanks, sponge and soft coral gardens, soft bottom and island communities. The following pictures show the some of the beauty of the coral communities within the GBR.⁵⁵⁹

GBR coral diversity



Aerial photograph of outer GBR



Green Island near Cairns



Coral cover is currently used as a principal indicator of the condition of the GBR.⁵⁶⁰ Trends in coral cover can usually be explained by current impacts or the recovery from past impacts. Coral cover on midshelf and outer shelf reefs is dynamic and generally controlled by disturbances from the coral eating crown-of-thorns starfish, coral bleaching events, and cyclones. Coral cover on surveyed inshore reefs is generally low compared to midshelf and outer shelf reefs and in several GBR regions has decreased to very low levels from beginning of the surveys to 2000.⁵⁶¹

⁵⁵⁹ All photographs courtesy of the GBRMPA website at <http://www.gbrmpa.gov.au> (viewed 22 July 2006). Used with permission provided on the website.

⁵⁶⁰ Sweatman H, et al, "Long-term monitoring of the Great Barrier Reef: Status Report No 5" (Australian Institute of Marine Science, Townsville, 2001), p 106.

⁵⁶¹ Sweatman, n 560.

In the late 1990s the GBR was considered one of the least-disturbed coral reef systems in the world with most of it still in a relatively good condition.⁵⁶² However, in 2001 the *Australia State of the Environment 2001* report noted that even though the GBR is generally in a “near-pristine state over large areas”, “runoff of freshwater carrying nutrients, sediments and pollutants is affecting the coastal margins of the GBR region” and “water quality in parts of the coastal margin is likely to be in slow decline from cumulative effects of human activities”.⁵⁶³ Similarly, the updated *State of the Great Barrier Reef World Heritage Area* report concludes that scientific evidence so far suggests that the increasing load of nutrients and sediment entering the GBR is already having an impact on the capacity of nearshore reefs to recover from disturbance.⁵⁶⁴ This points to the importance of the condition of the adjacent coastal catchment in protecting the GBR.

Climate change and coral bleaching events

Average sea surface temperatures in the GBR is now 0.4°C warmer than since at least the mid-18th century and could be between 1-3°C warmer by 2100.⁵⁶⁵ The rate of warming has increased over the past 30 years and the current rate of warming is now considered to be well over a degree per century.⁵⁶⁶ In 1998 and 2002 the GBR suffered major coral bleaching events linked to increased maximum sea temperatures. In 1998, 42% of reefs were bleached to some extent with 18% strongly bleached and in 2002, 54% of reefs were bleached to some extent with 18% strongly bleached.⁵⁶⁷

The expected trend for the condition of the GBR due to climate change and coral bleaching is very negative. Details of this trend were set out above in the discussion of pressures on the GBR. Using the IPCC “business as usual” scenario for future greenhouse emissions, Ove Hoegh-Guldberg projected coral cover would decline to near zero in all sectors of the GBR by 2030-2040.⁵⁶⁸ The IPCC also concluded there is a very high confidence that, “significant loss of biodiversity is projected to occur by 2020 [to] the Great Barrier Reef” due to climate change.⁵⁶⁹

Water quality and the coastal catchment

A comparison of historical reef photographs with the current condition suggests a long-term decline of inshore reef health: 4 out of 14 pairs of before-after photographs indicate significant decline (without associated recovery) and another 4 out of 14 indicated a partial decline.⁵⁷⁰ Some reefs in the Whitsunday Islands region, which historically had

⁵⁶² SEAC, n 1.

⁵⁶³ SEAC, n 1.

⁵⁶⁴ GBRMPA, *State of the Great Barrier Reef On-line* (GBRMPA, Townsville, 2005). Available at http://www.gbrmpa.gov.au/corp_site/info_services/publications/sotr/intro/ (viewed 1 January 2005).

⁵⁶⁵ Lough et al, 515, p 56.

⁵⁶⁶ Hoegh-Guldberg O, “Great Barrier Reef” in UNESCO World Heritage Centre, *Case Studies on Climate Change and World Heritage* (UNESCO, Gland, 2007), pp 31-32 (available at <http://whc.unesco.org>, viewed 18 April 2007), citing Lough JM, “Sea Surface Temperatures on the Great Barrier Reef”, a contribution to the *Study of Coral Bleaching, Final Report* (GBRMPA, Townsville, 1999).

⁵⁶⁷ Berkelmans et al, n 524.

⁵⁶⁸ Hoegh-Guldberg and Hoegh-Guldberg (2004), n 516, p 66.

⁵⁶⁹ IPCC, n 532, p 11.

⁵⁷⁰ Wachenfeld D, “Long-term trends in the status of coral reef-flat benthos - The use of historical photographs” in Wachenfeld D, Oliver J and Davis K (eds), *State of the Great Barrier Reef World Heritage Area Workshop: Proceedings of a Technical Workshop* (GBRMPA, Townsville, 1997), pp 134-146.

considerable reef-building coral populations, have lost those populations and have now much reduced reef building capability.⁵⁷¹

The GBR is connected to the adjacent coastal river catchments. The catchment to reef continuum is not simply downstream, but also involve migrations of many species, such as fish, between coastal marine habitats and inland waterways and wetlands. This connection implies that the health and ecological function of each, freshwater, estuarine and marine ecosystems depends on the health of the others. The GBR catchment covers 22% of Queensland's land area, in which 20% of Queensland residents live. Mining, tourism and agriculture are the most significant industries in the GBR catchment.⁵⁷² Significant growth is projected for urban areas in Queensland's coastal zone, with the challenge of balancing the demands of economic development with the maintenance of healthy coastal ecosystems.

The GBR coastal catchment covers an enormous area stretching the entire length of the GBR inland to the Great Dividing Range running along the north Queensland coastline. That area has been extensively developed for townships, industry and agriculture, but there are also substantial areas of protected reserves, particularly in the ranges. The coastal floodplains have, however, been extensively developed for sugarcane, cattle farming and other forms of agriculture. Examples of the current condition of the coastal catchment are shown in the maps and photographs on the following pages.

The Cardwell-Hinchinbrook region is typical of the development of the coastline in sugarcane-growing regions adjacent to the GBR. The satellite photograph on the following page (Figure 27) displays the development of the region. Note the large areas of cleared and cultivated areas (shown in pink) surrounding the townships of Ingham and Tully. Most of these areas are cultivated for sugarcane growing, although banana and other tropical fruits such as lychees are also a significant crop. Large areas are also used for cattle production. These areas account for the vast majority of coastal lowlands in the region. The uncleared areas (shown in green) are largely the steeper slopes of the catchments. A notable exception, however, is the large uncleared area of Edmund Kennedy National Park (shown as "Kennedy KCS") adjacent to the coast.

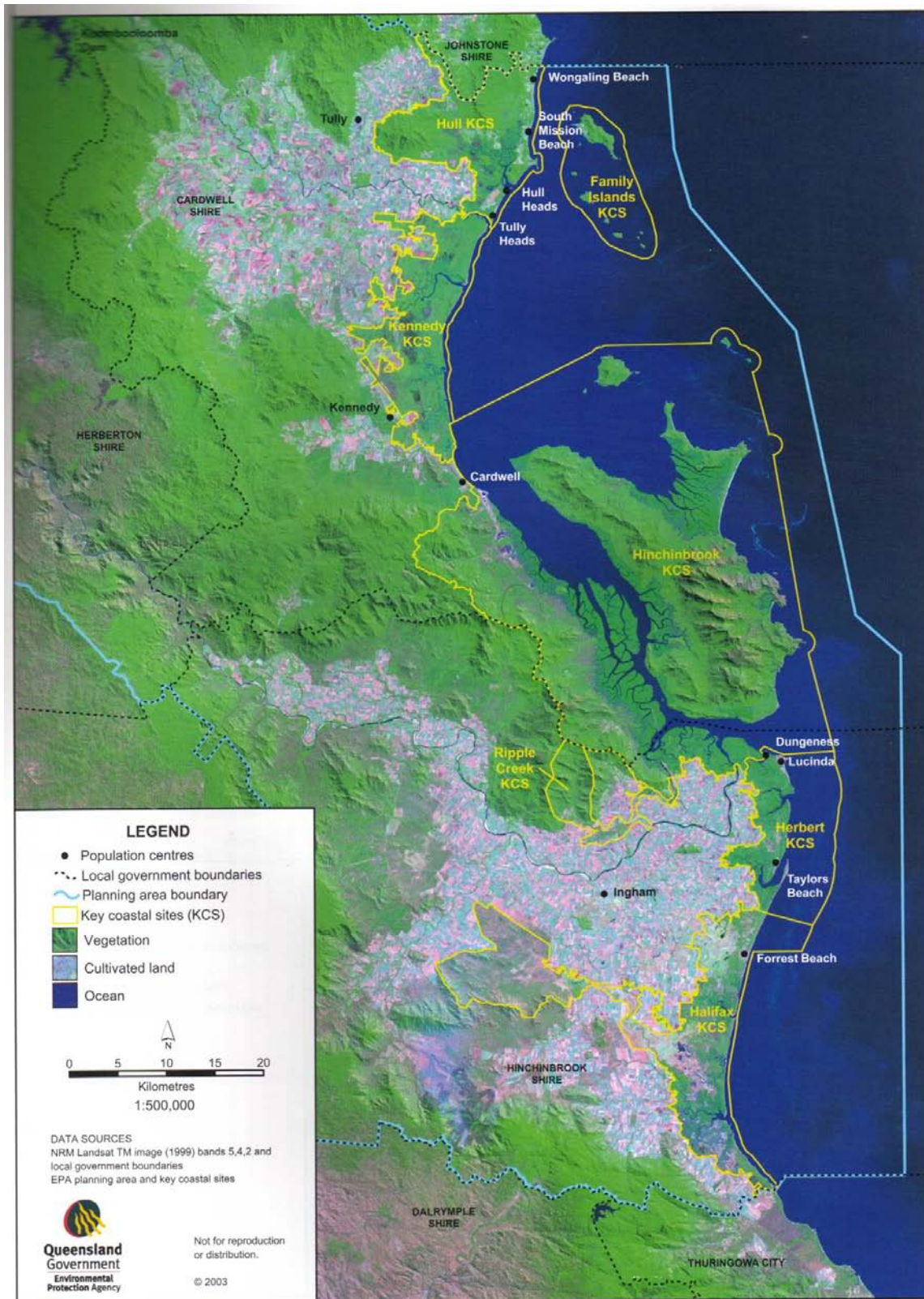
Land tenure is also a significant part of the condition of the catchment from a planning and management perspective. A map of land tenure in Cardwell Shire in Figure 28, on page 182, shows the land tenure in the northern part of the Cardwell-Hinchinbrook region. Note the large area of privately owned land, shown on the map in grey, covering the sugarcane farms surrounding the township of Tully. These areas have been heavily cleared of native vegetation as shown in the aerial photograph of the Tully catchment shown on a subsequent page. In contrast, the uncleared areas on the steeper slopes of the upper catchment are largely owned by the Queensland Government as State Forest or National Park. These areas also form part of the Wet Tropics World Heritage Area,⁵⁷³ while Hinchinbrook Island is part of the GBR World Heritage Area. The State-owned land is therefore generally highly protected from clearing of native vegetation or other development. The differences in the condition of creeks and riparian areas in the protected areas and on privately owned land is evident in the photographs on the following pages.

⁵⁷¹ van Woesik R, Tomascik T and Blake S, "Coral assemblages and physio-chemical characteristics of the Whitsunday Islands: evidence of recent community changes" (1999) 50 *Marine Freshwater Research* 427.

⁵⁷² Productivity Commission, n 544.

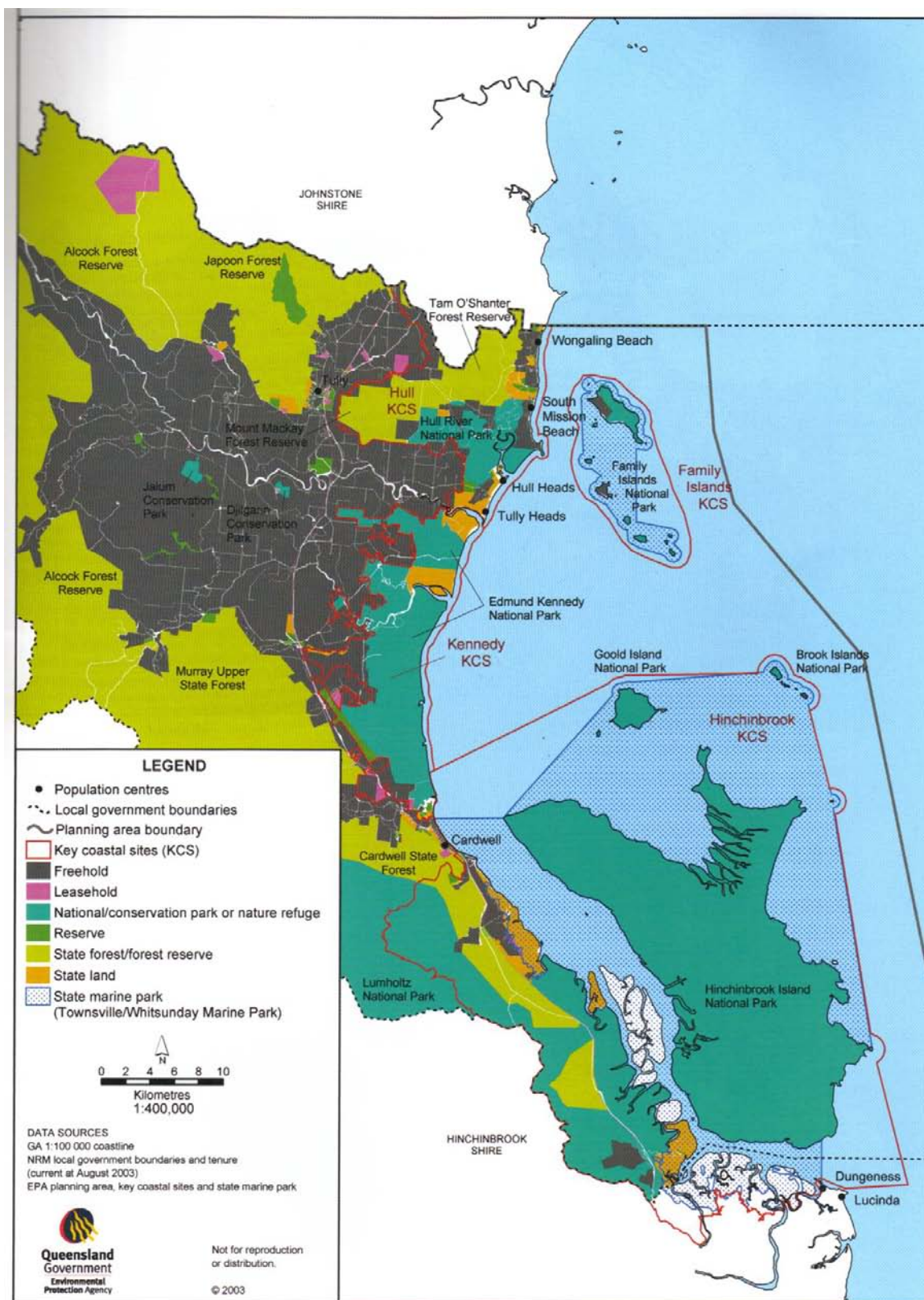
⁵⁷³ Inscribed on the World Heritage List in 1989.

Figure 27: Satellite image of the Cardwell-Hinchinbrook region⁵⁷⁴



⁵⁷⁴ Extracted from EPA, *Cardwell-Hinchinbrook Regional Coastal Management Plan* (EPA, Brisbane, 2003), Map 9 (Key coastal sites).

Figure 28: Map of land tenure in Cardwell Shire⁵⁷⁵



⁵⁷⁵ Extracted from EPA, n 574, Map 6 (Tenure: Cardwell Shire).

Hinchinbrook Island and Hinchinbrook Channel forming part of the Great Barrier Reef World Heritage Area⁵⁷⁶



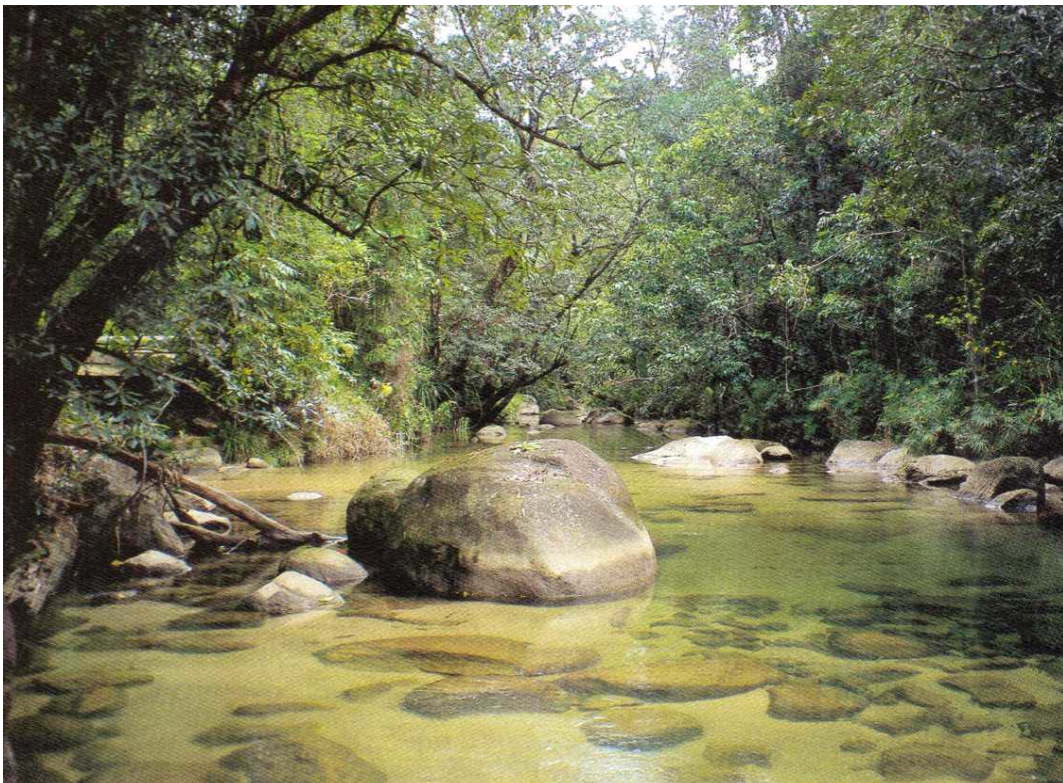
Coastal development at Port Hinchinbrook adjacent to Hinchinbrook Channel⁵⁷⁷



⁵⁷⁶ Photograph by Steven Nowakowski obtained from: <http://www.hinchinbrook.info/> (viewed 7 July 2006); and Nowakowski S, *Hinchinbrook Island: a sacred wilderness* (Little Ramsay Press, Cairns, 2003), p 81.

⁵⁷⁷ Photograph (taken 13 September 2003) extracted from Kieth Williams and Cardwell Properties Pty Ltd, *Referral Form for referral made under the Environment Protection and Biodiversity Conservation Act 1999: Reference No. EPBC 2003/1246 - Port Hinchinbrook Resort Stage II* (2003) obtained from the Department of the Environment & Heritage website <http://www.deh.gov.au/epbc> for EPBC referral 2003/1246 (viewed 1 January 2005). Large aquaculture developments are visible in the distance of this photograph.

Tributaries of the lower Tully River protected in the Tully Gorge National Park and Wet Tropics World Heritage Area⁵⁷⁸



⁵⁷⁸ Photographs courtesy of Johnson DP, *State of the Rivers: Tully and Murray Rivers and Major Tributaries: An Ecological and Physical Assessment of the Condition of Streams in the Drainage Basins of the Tully and Murray Rivers* (Department of Natural Resources, Brisbane, 1998), pages i and iv.

Development of sugarcane farms on the coastal floodplain of the lower Tully River⁵⁷⁹



Unnamed tributary of the lower Tully River converted to a drain for sugarcane farming⁵⁸⁰



⁵⁷⁹ Photograph courtesy of Wachenfeld D, Oliver J and Morrissey J (eds), *State of the Great Barrier Reef World Heritage Area 1998* (GBRMPA, Townsville, 1998), p 24.

⁵⁸⁰ Johnson, n 578, p 25.

Loss of riparian vegetation and bank erosion in lower reaches of Tully River basin⁵⁸¹



Clearing of riparian vegetation on tributary in lower reaches of the Herbert River⁵⁸²



⁵⁸¹ Johnson, n 578, p 22.

⁵⁸² Unpublished photograph by Chris McGrath (December 1999). Clearing for sugarcane production.

The most recent, comprehensive reports of the ecological and physical condition of rivers in the Cardwell-Hinchinbrook region were produced in the mid-1990s. Denise Johnson summarised the state of reach environs⁵⁸³ and riparian vegetation in the Tully and Murray Rivers in the north of the Cardwell-Hinchinbrook region as follows:⁵⁸⁴

The condition of reach environs for the Tully and Murray Rivers catchment shows a wide variety of ratings within and between the subcatchments. The Upper Tully River ... rated very good. The Lower Tully River ... and ... tributaries subcatchments rated considerably lower, the majority being rated as poor to very poor.

These lower ratings were associated with sugarcane production and/or the occurrence of grazing of various types. ... Overall, the greater part of the reach environs was considered to have high to extreme disturbance. ...

The riparian vegetation within the catchment ranged from a rating of very poor for 28% of the stream length to very good for 29%. ... The poor classifications can be attributed to the very narrow width of the riparian vegetation and to the prevalence of exotic species within the area.

Jim Tait found in 1994 that in the Tully and Murray River catchments less than 20% of land systems suitable for agricultural production remained under native vegetation.⁵⁸⁵ He found that large areas of *Melaleuca* wetland and riparian vegetation had been lost or degraded by clearing, draining, and exotic-weed invasion associated with agricultural development. This had severely reducing the fish habitat values of remnant floodplain wetlands in the area.

Similarly, Glenn Moller summarised the state of reach environs and riparian vegetation in the Herbert River and major tributaries in the south of the Cardwell-Hinchinbrook region as follows:⁵⁸⁶

The condition of the reach environs across the Herbert River catchment showed consistent ratings of good to very good for the majority of subcatchments. ... [catchments in the lower reaches] had greater proportions of their length rated as poor or very poor.

These poorer ratings were associated with higher concentrations of sugarcane production in the adjacent land use. Ratings improved as percentage of grazing land use increased. ...

Riparian vegetation across the catchment was generally poor or very poor, although there were areas within the study area which were good to very good. This poor classification is attributed to the narrowness of the remaining vegetation along the streams and the level of exotic plant species present within this area [due to agricultural development].

Andrew Johnson and his colleagues considered land cover change in the Herbert River catchment in 2000.⁵⁸⁷ They concluded that prior to European settlement the catchment was dominated by open grassland, rainforest, mangroves, *Eucalyptus*

⁵⁸³ "Environs" was used in this series of reports to refer to land use, vegetation, land tenure for the land immediately adjacent to the stream section.

⁵⁸⁴ Johnson, n 578, pages i and iii.

⁵⁸⁵ Tait J, *Lowland habitat mapping and management recommendations: Tully-Murray catchments: Final Report* (Department of Primary Industries, Brisbane, 1994).

⁵⁸⁶ Moller G, *State of the Rivers: Herbert River and Major Tributaries: An Ecological and Physical Assessment of the Condition of Streams in the Herbert River Catchment* (Department of Natural Resources, Brisbane, 1996), pages i and ii.

⁵⁸⁷ Johnson AKL, Ebert SP and Murray AE, "Land cover change and its environmental significance in the Herbert River catchment, north-east Queensland" (2000) 31 (1) *Australian Geographer* 75-86.

woodlands and *Melaleuca* wetlands. By the 1940s large losses of rainforest and *Melaleuca* wetlands had occurred with much of the native grassland being converted to either grazing or sugarcane. Land cover remained relatively stable through the 1960s and early 1970s but between 1977 and 1996 a rapid expansion of sugarcane production took place. The consequences of this expansion is a decrease of approximately 65% in the area of *Melaleuca* wetlands, a 60% decrease in beachside vegetation, a 20% decrease in *Eucalypt* woodland, and a 10% decrease in rainforest compared with pre-European estimates of area. Urban and industrial uses accounted for less than 1% of total landuse area.

In summary, these reports indicate a large number of pressures and wide range of conditions in the GBR and adjacent catchments within a diverse and complex setting.

Fisheries conditions and trends

Despite gaps in information, the condition and population trends of fisheries in the GBR appear to be generally stable following considerable strengthening of management regimes in the past decade. The CRC Reef Research Centre and the Queensland Department of Primary Industries and Fisheries provide considerable online information on the condition of fisheries.⁵⁸⁸ Total catch and catch per unit effort of target species in the Reef Line Fishery, such as coral trout and red emperor, appear stable within the quotas allocated for the species. In the East Coast Otter Trawl Fishery, tiger and endeavour prawn stocks in north Queensland are regarded as “fully exploited”, with stocks of eastern king, tiger and endeavour prawns considered close to the maximum sustainable yield.⁵⁸⁹

RESPONSE

General

The current response to pressures on and the condition of the GBR involves a wide range of measures operating at international, national, regional and local levels. While voluntary individual and community responses such as public education are important, the primary component of this response comprises legal and administrative measures to plan for and manage the GBR. These measures will therefore be the focus here.

As described in an earlier chapter, the Queensland environmental legal system is best described as having four layers: international law, Commonwealth/Australian law, Queensland law and the Common Law with the overarching purpose of sustainable development.⁵⁹⁰ This reflects the fact that Australia exists as a sovereign state within an international setting and has a federal system of government with a Common Law tradition.⁵⁹¹ This system imposes a complex system of laws that regulates both activities within the GBR and in the coastal catchments of the GBR.

⁵⁸⁸ See http://www.reef.crc.org.au/research/fishing_fisheries/statusfisheries/index.htm, http://www.dpi.qld.gov.au/cps/rde/xchg/dpi/hs.xsl/28_ENA_HTML.htm, and <http://www.chrisweb.dpi.qld.gov.au/> (viewed 20 April 2007).

⁵⁸⁹ See http://www.reef.crc.org.au/research/fishing_fisheries/statusfisheries/statustrawl.htm#Kerriganetal2004 (viewed 20 April 2007), and Kerrigan B, Gaddes S, and Norris W, *Review of sustainability of fishing effort in the Queensland East Coast Trawl Fishery* (Department of Primary Industries and Fisheries, Brisbane, 2004).

⁵⁹⁰ See generally chapter 3 of this thesis; and McGrath, n 209.

⁵⁹¹ The historical development of the Queensland environmental legal system is outlined by Grant R and Papadakis E, “Transforming environmental governance in a ‘laggard’ state” (2004) 21 EPLJ 144.

Despite a lack of constitutional obligations to protect the environment,⁵⁹² the Australian and Queensland environmental legal systems generally operate through several basic instruments to protect the environment, regulate development and control access to resources.⁵⁹³ These instruments are consistent with the environmental legal systems in developed countries around the world and include: ownership and property; planning systems; development approval and licensing systems; controlling harmful activities such as pollution. Ownership and property rights play a fundamental role in controlling access to resources and avoiding a “tragedy of the commons”. Planning systems are another fundamental regulatory mechanism for example by creating plans for geographic areas, resources and activities such as a local government planning scheme or fisheries management plan to identifying specially protected species, areas and things (usually by listing as a threatened species or protected area). Development approval and licensing systems complement the planning system by establishing a system to assess and approve development, resource use or other activities (for example, a fishing licence), often subject to performance conditions in accordance with relevant plans or desired objectives. This is typically combined with a prohibition of specific activities impacting on the environment unless approved by a regulator (for example, fishing without a licence) and other environmental duties.

Planning systems, environmental planning and adaptive management

The general reference to “planning systems” in the preceding list needs to be supplemented by two policy initiatives over the past three decades that deserve special note: “environmental planning” and “adaptive management”. The movement from traditional “town planning” to modern “environmental planning”, in particular, is one of the most important conceptual initiatives to implement sustainable development within Australia and globally. Traditional “town planning” and focused almost largely on avoiding landuse conflict, urban design and protecting human amenity.⁵⁹⁴ In contrast, the modern approach to “environmental planning” seeks to integrate all aspects of traditional town planning (including infrastructure planning) with planning at local, regional and wider scales for environmental issues such as water use, integrated catchment management and conservation of biodiversity using information based on environmental science.⁵⁹⁵ Environmental planning may also be understood to include the process of developing, implementing, monitoring, evaluating and refining environmental policy over time.⁵⁹⁶ Bioregional planning, in particular, has been considerably important in modern environmental planning.⁵⁹⁷

⁵⁹² Contrast the countries, such as India and South Africa, discussed in Chapter 4 of Fisher, n 2.

⁵⁹³ See Chapter 6 of Fisher, n 2.

⁵⁹⁴ Taylor N, *Urban Planning Theory since 1945* (Sage Publications, London, 1998) and Hall P, *Urban and Regional Planning* (4th ed, Routledge Press, London, 2002) provide good overviews of the history and evolution of the theories of town planning.

⁵⁹⁵ See generally, Kenny M & Meadowcroft J (eds), *Planning Sustainability* (Routledge, London, 1999); Conacher A and Conacher J, *Environmental Planning & Management in Australia* (Oxford University Press, Melbourne, 2000); Selman PH, *Environmental Planning: the conservation and development of biophysical resources* (2nd ed, Sage Pub Ltd, London, 2000). An excellent overview of environmental planning in the USA is provided by Randolph J, *Environmental land use planning and management* (Island Press, Washington, 2004).

⁵⁹⁶ Low Choy DC, Worrall RH, Gleeson J, McKay P, and Robinson J, *Environmental Planning Project: Volume 1 – Management frameworks, tools and cooperative mechanisms – Technical Report No 4* (CRC for

Adaptive management is a component of the modern approach to environmental planning. Darryl Low Choy explains that adaptive management is an “integrated, multidisciplinary method for natural resource management” in response to one of the major revelations of modern ecology: that ecological systems are characterised by non-linear, non-equilibrium and often chaotic dynamics:⁵⁹⁸

This is the idea that nature is full of surprises and that there will always be a degree of unknown within the patterns that can be scientifically established. The planning and management of natural resources and landscapes effectively requires the acknowledgement that some level of scientific uncertainty will always exist and that plans, policies and management strategies should anticipate change and the need to adapt over time. ...

Adaptive management should be viewed as an opportunity to learn from past experience and it should be based on a flexible management regime that can facilitate correction in the light of improved understanding and learning through trial and error. ... Natural resource management will always be an experiment with uncertain outcomes and therefore elasticity in implementation is needed by natural resource managers ... Adaptive management suggests that change is inevitable and should be anticipated, recognised and managed to respond to changing circumstances and new information.

... the essential components of an adaptive management framework ... include: goals and objectives, hypothesis development, assessment, scenario planning or identifying critical uncertainties, and monitoring and evaluation. (citations omitted)

Adaptive management, of course, is not a precise science just as environmental policy is often messy and sometimes seemingly chaotic. It is important, however, at conceptual and practical levels because, as Peter Cullen comments, “managing any natural resource is about managing uncertainty” and “in managing natural resources, knowledge is better than ignorance.”⁵⁹⁹

The importance of environmental planning and adaptive management is both conceptual and practical. Both form important paradigms in the overall response to environmental pressures in Queensland, including those affecting the GBR. Bearing these general matters in mind, we turn to look at the response in detail.

The response in detail

To understand the response to human activities impacting on the GBR, it is necessary to understand what planning systems, licenses, approvals and standards exist. Most of these are found in international treaties and legislation passed by the Australian and Queensland Parliaments as well as local government planning schemes. It is therefore necessary to examine these instruments in more detail.

Coastal Zone, Estuary and Waterway Management, Brisbane, 2002), pp 33-34. Available at http://www.coastal.crc.org.au/environmental_planning/documents.html (viewed 8 December 2005).

⁵⁹⁷ See, for example, in relation to vegetation management in Queensland, Sattler and Williams, n 333.

⁵⁹⁸ Low Choy, n 421, pp 155-156.

⁵⁹⁹ Cullen P, “Science brokering and managing uncertainty” in GBRMPA, *The Great Barrier Reef science, use and management - a national conference: proceedings* (GBRMPA, Townsville, 1997), Vol 1, pp 309-318.

At an international level, the inscription of the GBRWHA on the World Heritage List under the World Heritage Convention⁶⁰⁰ in 1981 utilized an international planning system that recognised the outstanding universal value of the GBR as the common heritage of humanity. The World Heritage Convention imposes international legal obligations upon Australia to identify, protect, conserve, present, transmit to future generations and, where appropriate, to rehabilitate the cultural and natural heritage of outstanding universal value of the GBR.

While other international treaties are relevant to the planning and management of the GBR it is the World Heritage Convention that provides comprehensive obligations in relation to its planning and management. Consequently, for practical purposes the World Heritage Convention defines Australia's international legal obligations for the planning and management of the GBR. Notable exceptions to this rule are obligations in relation to the passage of international shipping such as provided by the UNCLOS.⁶⁰¹

At a national level the enactment of the *Great Barrier Reef Marine Park Act 1975* (Cth) and creation of the GBR Marine Park in 1976 did much to protect the GBR.

The Great Barrier Reef Marine Park Act 1975 (Cth)

The principal legislation directly regulating activities within the GBR is the *Great Barrier Reef Marine Park Act 1975* (Cth) ("GBRMP Act"). The Act and regulations created under it provide a framework for planning and management of the Marine Park incorporating Zoning Plans and Plans of Management. Mining is prohibited in the GBR Marine Park unless approved for research. The regulations provide an important measure for reducing the risk of oil pollution through imposing a system for compulsory pilotage for certain ships in prescribed areas of the GBR. The Act and regulations also prescribe a range of other administrative provisions and enforcement powers.

At the time of the passage of the GBRMP Act in 1975 there was some perception that the GBR could be effectively managed as an "island". Under that philosophy, planning and managing human activities within the geographic area of the GBR without needing to regulate human activities outside of the GBR itself. This perception is now widely replaced by the recognition that activities occurring on the adjacent coastline, upstream catchments draining to the GBR and wider regional and global activities significantly impact on the health and integrity of the GBR. In 1994 the GBRMPA released its 25-year strategic plan, which recognises the need for integrated catchment management in catchments flowing to the GBR.⁶⁰² This brings with it the recognition that the GBRMP Act is not the sole piece of legislation providing for the planning and management of the GBR. Many pieces of legislation and administrators are involved.

In 2002-2003, the Representative Areas Program ("RAP") undertaken by the GBRMPA reviewed the level of protected areas in the GBR based on mapping of the reef within 70 bioregions. It found the existing 4.6% of no-take areas within reef and non-reef bioregions was not enough to adequately protect the biodiversity of the GBR. As a result

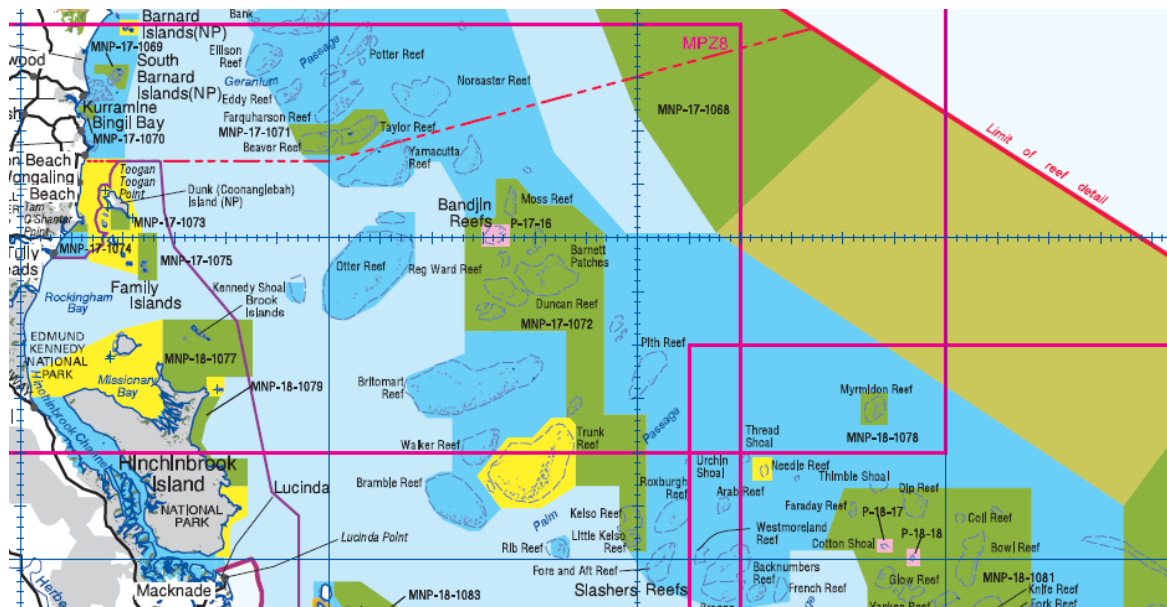
⁶⁰⁰ *Convention for the Protection of the World Cultural and Natural Heritage* done at Paris, 1972. Entry into force for Australia and generally: 17 December 1975. [1975] ATS No. 47.

⁶⁰¹ *United Nations Convention on the Law of the Sea* done at Montego Bay, 1982. Entry into force generally and for Australia: 16 November 1994. [1994] ATS No. 31.

⁶⁰² GBRMPA, *The GBR - Keeping it Great: A 25 Year Strategic Plan for the GBR World Heritage Area* (GBRMPA, Townsville, 1994). Available at <http://www.gbrmpa.gov.au> (viewed 30 June 2006).

the area of fully protected green zones was increased to 33.1% on 1 July 2004 when the *Great Barrier Reef Marine Park Zoning Plan 2003* commenced. Figure 29 shows the distribution of no-take areas adjacent to the Cardwell-Hinchinbrook region.

Figure 29: Map of multiple-use zoning in the GBR Marine Park adjacent to the Cardwell-Hinchinbrook Region⁶⁰³



ACTIVITIES GUIDE (see relevant Zoning Plans and Regulations for details)	General Use Zone (GUA)							State Zoning only Estuarine Conservation Zone
	General Use Zone (GUA)	Habitat Protection Zone (GUB)	Conservation Park Zone (MNP A)	Buffer Zone	Scientific Research Zone	Marine National Park Zone (MNP B)	Preservation Zone	
Aquaculture	Permit	Permit	Permit 1	X	X	X	X	Permit
Bait netting	✓	✓	✓	X	X	X	X	✓
Boating, diving, photography	✓	✓	✓	✓	✓ 2	✓	X	✓
Crabbing (trapping)	✓	✓	✓ 3	X	X	X	X	✓
Harvest fishing for aquarium fish, coral and beachworm	Permit	Permit	Permit 1	X	X	X	X	X
Harvest fishing for sea cucumber, trochus, tropical rock lobster	Permit	Permit	X	X	X	X	X	X
Limited collecting	✓ 4	✓ 4	✓ 4	X	X	X	X	✓
Limited spearfishing (snorkel only)	✓	✓	✓ 1	X	X	X	X	✓
Line fishing	✓ 5	✓ 5	✓ 6	X	X	X	X	✓
Netting (other than bait netting)	✓	✓	X	X	X	X	X	✓
Research (other than limited impact research)	Permit	Permit	Permit	Permit	Permit	Permit	Permit	Permit
Shipping (other than in a designated shipping area)	✓	Permit	Permit	Permit	Permit	Permit	X	Permit
Tourism program	Permit	Permit	Permit	Permit	Permit	Permit	X	Permit
Traditional use of marine resources	✓ 7	✓ 7	✓ 7	✓ 7	✓ 7	✓ 7	X	✓ 7
Trawling	✓	X	X	X	X	X	X	X
Trolling	✓ 5	✓ 5	✓ 5	✓ 5,8	X	X	X	✓

⁶⁰³ Extracted from the GBRMPA, *Great Barrier Reef Marine Park Zoning Plan 2003: Map MPZ31 – Townsville/Whitsunday Management Area* (GBRMPA, Townsville, 2003). Available at http://www.gbrmpa.gov.au/corp_site/management/zoning/zoning_maps.html (viewed 30 June 2006).

A panel of public servants in the Australian Government recently reviewed the operation of the GBRMP Act following public criticism of the 2004 re-zoning process and calls to dismantle the GBRMPA. The panel recommended the basic structure be maintained but updated to integrate it with the EPBC Act.⁶⁰⁴ The review has recommended that the GBRMPA be retained.

Other national initiatives to protect the marine environment

In addition to the GBRMP Act and policies developed under it, at a national policy level, in 1998 *Australia's Oceans Policy* duplicated the regional planning and management approach taken in the GBR for the rest of Australia.⁶⁰⁵ This policy is based upon a regional planning approach under the Coastal and Marine Planning Program and administered by the National Oceans Office. The stated vision of the policy is “healthy oceans: cared for, understood and used wisely for the benefit of all now and in the future”. A significant component of the policy is the development of the National Representative System of Marine Protected Areas and Regional Marine Plans. However, the ability of the policy to meet the objective of ecologically sustainable use of Australia's oceans is essentially limited in practice to marine areas. It does not regulate development on the Australian mainland such as coastal development and major water impoundments regulating river flows.

Fisheries controls

The law governing fishing in the marine environment is a complex area due to the size and variability of the marine environment, gaps in information about fisheries as well as divisions in the control of the marine environment between the Queensland and Commonwealth Governments, including the GBRMPA. Figure 7 on page 108 summarises the fisheries laws in Queensland.

The control of fisheries and the conservation of marine species in areas beyond Australian territorial waters are difficult and depend upon cooperative, multilateral arrangements.⁶⁰⁶ This is particularly a problem for the management of highly migratory species such as tuna and some species of turtles.

At a Queensland level, the *Marine Parks Act* 1982 (Qld) provides a system of State marine parks along the Queensland coastline that complements the zoning plan within the GBR Marine Park. Within the geographic areas protected under the GBR Marine Park and State marine parks, fishing is regulated under the *Fisheries Act* 1994 (Qld) and the *Fisheries Management Act* 1991 (Cth).

The *Fisheries Act* 1994 (Qld) provides the State's legislative framework for the regulation of fisheries, coastal areas important as fisheries habitat and marine plants. The Act provides a range of mechanisms aimed at the sustainable management of fisheries

⁶⁰⁴ Review Panel, *Review of the Great Barrier Reef Marine Park Act 1975 – Review Panel Report* (DEH, Canberra, 2006). Available at <http://www.deh.gov.au/coasts/publications/gbr-marine-park-act.html> (viewed 2 October 2006).

⁶⁰⁵ Commonwealth of Australia, *Australia's Oceans Policy* (AGPS, Canberra, 1998). A summary of the history of the policy is provided by Wescott G, “The development and initial implementation of Australia's ‘integrated and comprehensive’ Oceans Policy” (2000) 43 (10) *Ocean and Coastal Management* 853.

⁶⁰⁶ See Pecot M, “The conservation of marine biological diversity in areas beyond national jurisdiction” (2005) 22 EPLJ 459.

including management plans, quotas, offences, licences and declarations of closed seasons, closed waters and fisheries habitat areas. The *Fisheries Regulation 1995* (Qld) provides technical and geographic detail for these mechanisms. Management plans are gazetted as subordinate legislation such as the *Fisheries (East Coast Trawl) Management Plan 1999* (Qld). The Queensland Fisheries Service and the Queensland Boating & Fisheries Patrol (part of the Department of Primary Industries) administer the Act and Regulations. Some areas outside the GBR but within Australia's exclusive economic zone are regulated under the *Fisheries Management Act 1991* (Cth). Some highly migratory species, particularly tuna, are also regulated under this Act.

There is a major distinction in the regulation of commercial fishing and recreational fishing within the GBR. Commercial fishing requires a licence and is subject to special controls on fishing effort and equipment.

The East Coast Otter Trawl Fishery came under formal management arrangements in 1999 through the introduction of the *Fisheries (East Coast Trawl) Fisheries Management Plan 1999* (Qld).⁶⁰⁷ This plan was subsequently reviewed and more stringent management arrangements were introduced in January 2001. Effort was capped through the allocation of effort quota in the form of tradable effort units, based on an operator's fishing history in the fishery. There were also major closures (some 96,000km²) of previously untrawled grounds. A \$20 million structural adjustment program was offered to buy-out 99 licences, in what was considered an overcapitalised fishery. Trawling is permitted only in the General Use (light blue) Zone of the GBR Marine Park. There are restrictions on gear, areas and times of access and size and possession limits on the take of certain species. All trawl vessels operating in the fishery are monitored via a satellite-based Vessel Monitoring System, which allows managing agencies to locate a boat's position at any time. A major issue with demersal trawling is the large amount of unwanted bycatch and the physical impact on the seabed. All trawlers in the fishery must carry Turtle Excluder Devices (TEDs) and Bycatch Reduction Devices (BRDs) in the trawl nets to minimise the bycatch and benthic impact of trawling.

The East Coast Reef Line Fishery is made up of a commercial and recreational sector taking more than 120 reef species managed under the *Fisheries (Coral Reef Fin Fish) Management Plan 2003* (Qld).⁶⁰⁸ Until the introduction of a quota system in July 2004, the fishery was managed under a limited entry system. With the introduction of a quota system, commercial catches were capped at a Total Allowable Catch of 3,061 tonnes per year for coral reef fish and 619 tonnes per year for Spanish mackerel. Commercial operators in the fishery who were eligible were allocated Individual Transferable Quotas (ITQs) based on their catch history. The new system caps the level of harvest in the Reef Line Fishery.

The East Coast Inshore Finfish Fishery comprises the commercial sector, a large recreational sector, and an Indigenous sector.⁶⁰⁹ It has been a limited entry fishery for the commercial sector since 1984 but formal management arrangements through a management plan are yet to be introduced. Commercial operators are authorised to use

⁶⁰⁷ The information in this paragraph is drawn, almost verbatim, from http://www.gbrmpa.gov.au/corp_site/key_issues/fisheries/otter_trawl_fishery (viewed 20 April 2007).

⁶⁰⁸ This paragraph is drawn, almost verbatim, from http://www.gbrmpa.gov.au/corp_site/key_issues/fisheries/reef_line_fishery (viewed 20 April 2007).

⁶⁰⁹ The information in this paragraph is drawn, almost verbatim, from http://www.gbrmpa.gov.au/corp_site/key_issues/fisheries/inshore_finfish_fishery (viewed 20 April 2007).

specialised gear within prescribed areas. Gear limitations include restrictions on the number of nets, net design, length and mesh size. There are also rules about the deployment and attendance of nets. Legal size limits, designed to protect the spawning capacity of stocks, apply to many species in both the commercial and recreational sectors. For barramundi, there is a closed season during summer that applies to all sectors. Within the GBR Marine Park, net fishing is permitted only within the General Use (light blue) and Habitat Protection (dark blue) zones. Bait netting is permitted also in the Conservation Park (yellow) zone. Since 1997, 15 Dugong Protection Areas, in which netting is restricted or prohibited, have been established in the GBR Marine Park.

As is apparent from the preceding paragraphs, commercial and recreational fishing in the GBR is highly regulated using a variety of management instruments. The types of measures regulating commercial and recreational fishing in the GBR include:⁶¹⁰

- *Protected species*: A considerable number of species (but typically uncommon species) are protected by law and must not be deliberately killed or injured. Protected species include dugong (*Dugong dugong*), all marine turtles, whales, dolphins, porpoises, lungfish, clam shells, great white sharks and grey nurse sharks. Traditional hunting by Aboriginal and Torres Strait Islanders of such species creates a difficult management issue.⁶¹¹
- *Protected sexes*: Some sexes of certain species, notably female mud crabs and sand (blue-swimmer) crabs, are fully protected by law and may not be deliberately killed or kept. Other protected females include egg-bearing female spanner crabs, egg-bearing female Moreton Bay bugs, egg-bearing females of other species of sea bugs and egg-bearing female slipper lobsters. If females of these species are caught accidentally in crab pots they must be returned to the water.
- *Legal size limits*: For many species of fish in Queensland, there are limits on the size of fish that can legally be caught. There are minimum legal size limits and also some maximum legal size limits (for instance for barramundi on the Queensland east coast the minimum size is 58cm and the maximum size limit is 120cm);
- *In-possession limits* (“bag limits” or quotas): An in-possession limit refers to the total number of fish of that species that a person may have in their possession at any one time, and does not apply on a per day basis. For instance the current bag limit for mud crabs is 10 (males only). In addition to individual species limits, a person may not have more than a combined total of 30 of certain listed reef fish species (such as coral trout) or 60 fillets. Any combination of whole fish and fillets must not exceed the equivalent of 30 whole fish. Two fillets equals one whole fish. Similarly, removing oysters from any oyster ground is prohibited, however, a person may consume oysters on the spot in any public oyster reserve or on unlicensed oyster grounds.
- *Closed seasons*: Some species, such as barramundi and spanner crabs, are protected by closed seasons at times when they are more vulnerable to fishing pressure such as during spawning. It is prohibited to take or possess such species during the closed season. For example, the closed season for Australian bass is 1 June to 31 August except in and upstream of certain dams.
- *Closed waters and protected areas*: Some waters and areas are closed to fishing or certain types of fishing (such as spear fishing) for conservation purposes or to protect

⁶¹⁰ From McGrath, n 184.

⁶¹¹ See Havemann, Thiriet, Marsh and Jones, n 344.

fish stocks or fish habitat. For instance “Green Zones” in the GBRMPA are no-take zones where both commercial and recreational fishing are prohibited.

- *Gear restrictions*: There are a variety of restrictions on fishing gear for both freshwater and sea fishing. In tidal (marine) waters, hand-lines or rod-lines with up to 6 hooks on each line are permitted but when fishing from a boat only 3 lines per person are permitted. For bait nets a beach seine net can be used but must not exceed 16m in length, have a mesh not greater than 28 mm and a depth or drop of net not more than 3m (measured in the one plane). The net must not contain a bag, pocket or similar device and must not be anchored, staked or fixed (that is, set overnight across a tidal creek).
- *Leave skin on fish*: To combat illegal fishing and to assist inspections by Boating & Fisheries Officers, skin must not be removed from any fish (or fillets) on board a boat. Once fish are brought ashore, the skin may be removed. However, once the skin has been removed, the fish must not be taken back on board a boat. Special provisions apply to removing skin from fish taken on extended commercial fishing charter tours.
- *Crab meat*: A person must not possess the following (unless they are for immediate consumption): mud crabs or blue swimmer crabs with the carapace (shell) missing crab meat from any species.
- *Noxious fish*: Certain exotic fish species are declared noxious fish because of the danger they represent to native fish species. It is illegal to possess or keep, hatch, rear, sell, consign or place in any container any noxious fish. Tilapia, carp and gambusia are some of the declared noxious fish and along with other noxious and non-indigenous fish must not be released into Queensland waters and must not be used as bait, either live or dead. All noxious fish when caught should be destroyed and must not be returned to the water.
- *Destructive practices*: There are a range of destructive activities that are illegal throughout Queensland, for instance: jaggling or foul-hooking fish; using explosives, poisons or electrical devices to take fish (however, divers may use a power head on a spear or spear-gun for protection against sharks); and collecting of coral without lawful authority.
- *Prohibitions on interference*: Some activities are prohibited that interfere with other lawful activities including: interfering with authorised aquaculture activities; obstructing lawful netting operations, damaging or interfering with fishing apparatus, or removing fish from apparatus without lawful authority.

These measures reflect a recent strengthening of Queensland fisheries laws to tighten catch restrictions for recreational fishers due to evidence of overfishing. The enforcement of these regulations is critical. It is undertaken by Queensland Fisheries Officers together with QPWS and GBRMPA. Levels of illegal fishing and poaching in the GBR are low in comparison to other coral reefs around the world, which is critical to maintaining the ecological health of the reef.⁶¹²

Ocean dumping and ship-sourced marine pollution

Ocean dumping and ship-sourced marine pollution are highly regulated in the GBR and appear to be well controlled. Of particular importance in relation to these pressures

⁶¹² Mora C, Andréfouët S, Costello MJ, Kranenburg C, Rollo A, Veron J, Gaston KJ, and Myers RA, “Coral Reefs and the Global Network of Marine Protected Areas” (2006) 312 *Science* 1750 (23 June 2006).

are⁶¹³ the *Environment Protection (Sea Dumping) Act 1981* (Cth); *Australian National Plan to Combat Pollution of the Sea by Oil*;⁶¹⁴ REEFPLAN;⁶¹⁵ *Queensland Coastal Contingency Action Plan*; *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cth); and *Transport Operations (Marine Pollution) Act 1995* (Qld).

Land-use planning and management in the GBR catchment

A large number of measures are also in place to regulate land-use and development of the GBR catchment.⁶¹⁶ Of particular importance to the planning and management of land clearing, coastal development and land-sourced marine pollution impacting on the GBR are:⁶¹⁷ the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (“EPBC Act”); *Integrated Planning Act 1997* (Qld) (“IPA”); *Environmental Protection Act 1994* (Qld) (“EP Act”); *Coastal Protection and Management Act 1995* (Qld); *Water Act 2000* (Qld); *Land Act 1994* (Qld); *Vegetation Management Act 1999* (Qld); and *Nature Conservation Act 1992* (Qld).

As noted previously, in 2003 the Commonwealth and Queensland Governments agreed to adopt the RWQPP. This recognised that the water quality of near-shore reefs had declined due to coastal development, particularly agriculture, and set out a range of management measures to address this decline.⁶¹⁸ The management measures include education, economic incentives, planning, research and regulatory frameworks.

There are so many laws and policies that it is difficult to grasp their meaning and effectiveness in the abstract. A closer focus on the Cardwell-Hinchinbrook region will assist in understanding the operation and effectiveness of the system in practice.

Application of the laws in the Cardwell-Hinchinbrook region

The Cardwell-Hinchinbrook region provides a good example of the practical operation and effectiveness of the complex legal system discussed in the previous section. A satellite photograph of the Cardwell-Hinchinbrook region was provided earlier in Figure 27 on page 181.

A map of the World Heritage properties in the region is provided in Figure 30 on the following page. The region contains an intersection of the GBRWHA, listed on the World Heritage List in 1981, and the Wet Tropics World Heritage Area (“Wet Tropics WHA”), listed on the World Heritage List in 1989.⁶¹⁹ Note that Hinchinbrook Island is located

⁶¹³ An early review of oil spill control on the GBR was provided by Grose PR, “Oil spills, tourism and the Great Barrier Reef: An unpalatable mix – the role of regulation and self regulation” (1994) 11 EPLJ 395. See generally, White, n 189.

⁶¹⁴ Australian Maritime Safety Authority, *Australian National Plan to Combat Pollution of the Sea by Oil 1973 (extensively reviewed in 1993)* (AMSA, Canberra, 1973).

⁶¹⁵ Australian Maritime Safety Authority, *REEFPLAN - Oil Spill Contingency Plan for the Great Barrier Reef* (AMSA, Canberra, 1987).

⁶¹⁶ See generally, Wulf, n 390.

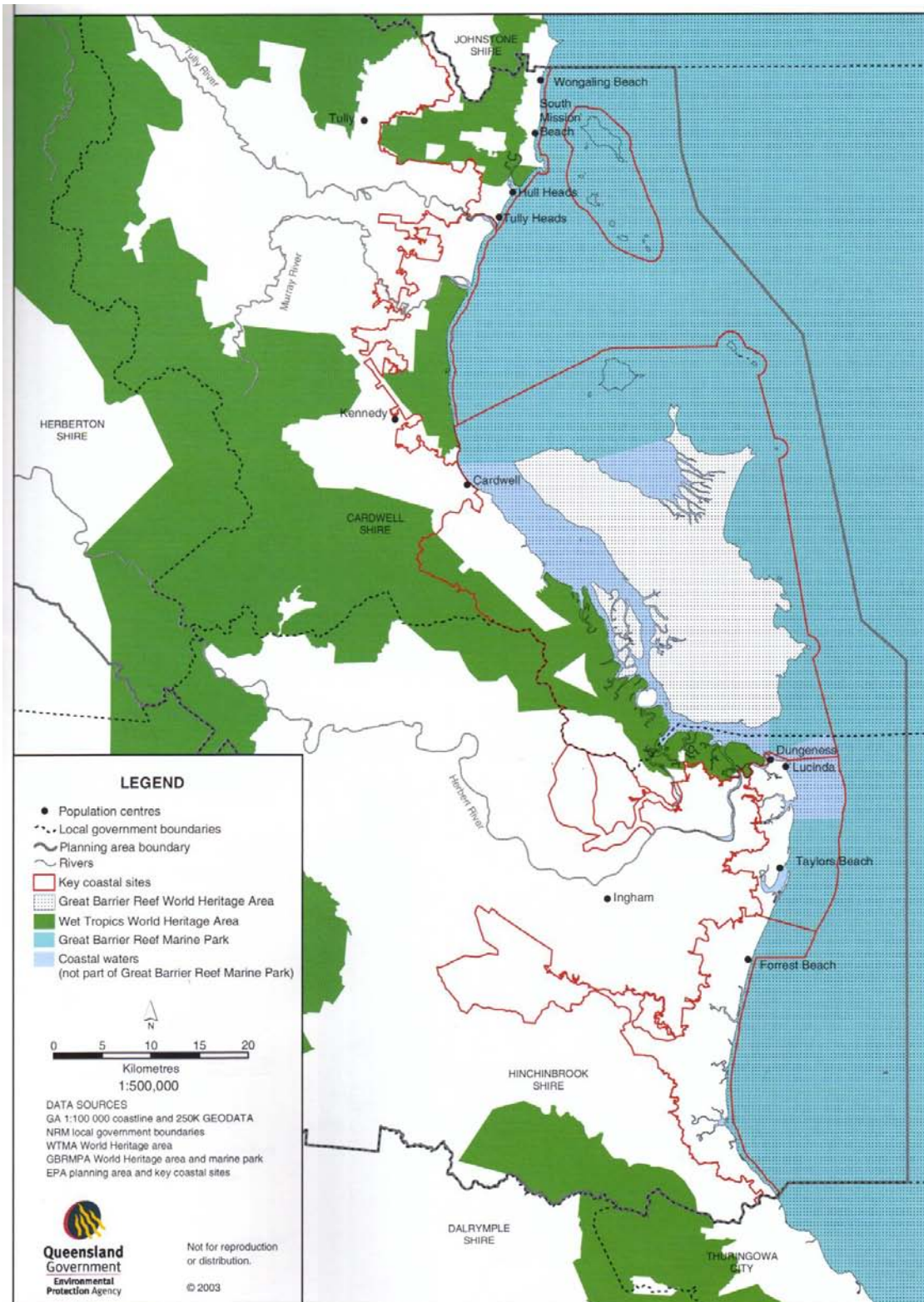
⁶¹⁷ See generally, chapter 3 of this thesis and McGrath C, n 209.

⁶¹⁸ Commonwealth of Australia & Queensland Government, *Reef Water Quality Protection Plan 2003* (Dept of Premier & Cabinet, Brisbane, 2003). Available at <http://www.premiers.qld.gov.au/library/pdf/reefplan.pdf> (viewed 30 June 2006).

⁶¹⁹ Lane M, “The importance of planning context: the Wet Tropics case” (1997) 14 EPLJ 368 provides a case study of the difficulties encountered in planning for the Wet Tropics WHA.

within the GBRWHA while the Wet Tropics WHA contains most of the steep slopes of the upper catchments that were previously held as National Parks and State Forests.

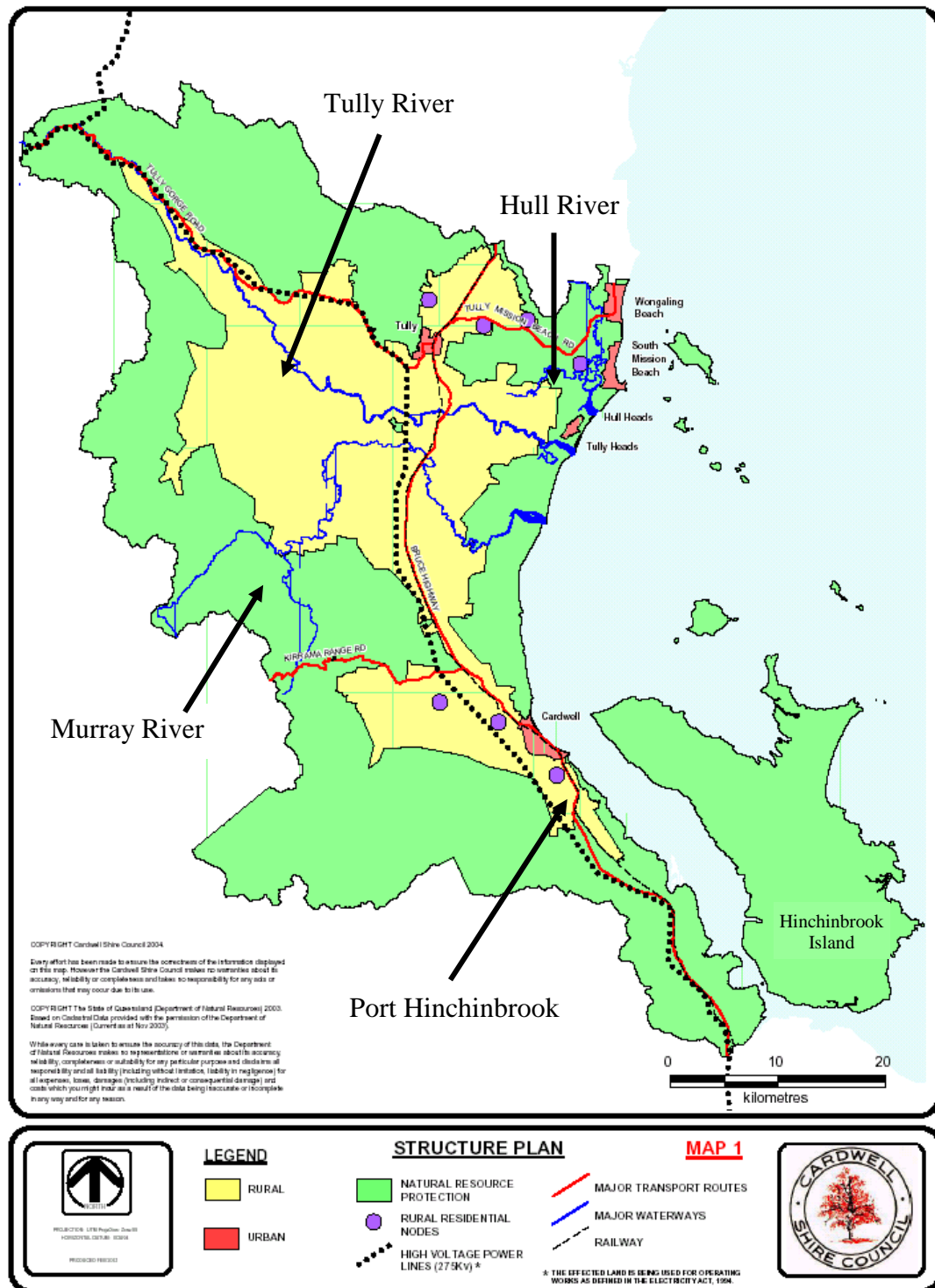
Figure 30: World Heritage areas in the Cardwell-Hinchinbrook region⁶²⁰



⁶²⁰ Extracted from the EPA, n 574, Map 8.

Figure 31 shows the 2004 Structure Plan for land-use in the Shire of Cardwell and the catchments of the Tully, Hull and Murray Rivers (note that the Tully River catchment extends outside the mapped area into protected forested areas in Herberton Shire).

Figure 31: Structure Plan for Cardwell Shire⁶²¹



⁶²¹ Extracted from Cardwell Shire Council, *Cardwell Shire Council Planning Scheme 2005* (Cardwell Shire Council, Tully, Qld, 2005), Map 1. Available at <http://www.csc.qld.gov.au/> (viewed 20 June 2006).

There are a number of conclusions that can be drawn immediately from comparing the satellite photograph of the Cardwell-Hinchinbrook region with the maps of the World Heritage properties in the region and Structure Plan for Cardwell Shire. The first and most obvious conclusion is that while the vegetation on the steep slopes of the upper catchments of the rivers has been well protected, the vegetation on the coastal plains has been largely cleared. A very notable exception of vegetation retained on the coastal plain is the Edmund Kennedy National Park, part of the Wet Tropics WHA. A second conclusion that can be drawn is that the plans largely protect the status-quo (that is, the existing situation) – vegetated areas are fully protected while historically cleared areas are intended to remain in agricultural and urban use. It is not simply the case that the plans are the end-result of historical, unplanned development of the area for agriculture, but this is certainly a large factor in the current reality in the region.

The planning and management for the region have clearly improved dramatically over the past 15 years. This, perhaps, logically reflects the major reforms to international and Australian environmental legal systems since the Bruntland Report in 1987 and the Rio Conference in 1992.

The published literature shows some of the ways in which the planning and management of the region have improved when compared with the current system. For instance, in 1996 Graeme Inglis analysed three case studies of environmental impact assessment of tourism infrastructure on the GBR⁶²² and concluded that the development of policy for tourism infrastructure in the GBR had largely been reactive.⁶²³ He suggested that management of tourism infrastructure in the GBR had been driven by large and controversial projects focused on direct impacts rather than cumulative and indirect impacts, with policy intended to avert the difficulties encountered with past developments. He suggested that there was a need to change the emphasis from project-specific environmental assessment to broader, regional and strategic planning for tourism development in the GBR entailing more sophisticated use of social and economic planning instruments.⁶²⁴

Important progress has been made in addressing the problems in managing development in the GBR identified by Inglis in 1996. The major reforms to environmental laws in Australia and Queensland in the mid-1990s have now trickled down to far more sophisticated planning instruments at local and regional levels. The rezoning of the GBR Marine Park to increase fully-protected areas to 33.3% in mid-2004 and the Cardwell-Hinchinbrook Regional Coastal Management Plan, approved on 13 January 2004, illustrate how recently these reforms have occurred.

The dramatic improvements to the control of coastal development can be illustrated by comparing State 1 and Stage 2 of the Port Hinchinbrook development at Cardwell. This was not one of the case studies considered in detail by Inglis but his work provides an important earlier study of similar tourism development in the GBR. The controversy surrounding this development arose not simply because of the environmental impacts of

⁶²² The Four Seasons Floating Hotel; day-trip pontoons; and the Magnetic Keys Marina on Magnetic Island.

⁶²³ Inglis GJ, "Science and tourism infrastructure on the GBR: learning from experience or just 'muddling through'?" in GBRMPA, *The Great Barrier Reef science, use and management - a national conference: proceedings* (GBRMPA, Townsville, 1997), Vol 1, pp 319-334. See also Zann L and Brodie J, "Towards a scientifically based implementation plan for ecologically sustainable use and biodiversity conservation in the GBRWHA" in GBRMPA, *The Great Barrier Reef science, use and management - a national conference: proceedings* (GBRMPA, Townsville, 1997), Vol 2, pp 128-136.

⁶²⁴ Inglis, n 623, p 330.

the project but the political manoeuvring and unusual approval processes that were followed for Stage 1 of the development.

Comparison of Port Hinchinbrook Stages 1 and 2

The development of a marina and tourist resort at Oyster Point in Cardwell, later to be known as “Port Hinchinbrook”, was first proposed in 1985.⁶²⁵ The land was held in freehold tenure and in 1988 and 1989, at a time when no vegetation clearing controls were in place for freehold land, the developer cleared the land and partly excavated a marina on the site. In 1990 the developer went into liquidation and the project was abandoned. The site was left degraded and no rehabilitation measures were carried out.

Stage 1

In May 1993 a new developer emerged and secured support for the project from the local government and State Government. The land was bought by Cardwell Properties Pty Ltd to develop the site as a marina, tourist resort, and residential subdivision. On 29 September 1994 the Queensland Government, Cardwell Shire Council and Cardwell Properties Pty Ltd signed a Deed of Agreement. The Deed was a very unusual document under the law for private development in Queensland. It was not made under any statute and, at least as a matter of law, did not over-ride normal planning approval processes.⁶²⁶ In effect it was a private contract which set out various baseline studies and environmental controls and monitoring which the State and the Council required from the developer as a condition of granting further permits necessary for the development.

In 1994 development started briefly only to be brought to a dramatic halt by the unusual intervention of the Australian Government. In October 1994 Cardwell Properties Pty Ltd started clearing of mangroves on the foreshore of the proposed marina site immediately to the north of the land. On 15 November 1994 clearing of the mangroves was halted after the Australian Government Minister for the Environment, Senator Faulkner, made proclamations under the *World Heritage Properties Conservation Act* 1983 (Cth) to stop further clearing of the mangroves. On 18 November 1994 regulations were made under the *World Heritage Properties Conservation Act* 1983 (Cth) prohibiting without consent certain work, including dredging, removing native plants, and constructing a breakwater for the development. This effectively halted work on the development for a period.

A change of Federal Government in 1996, when the Keating-Labor Government lost power to the Howard-Coalition Government, rekindled the development. On 20 August 1996 the newly elected Australian Government became a party to the Deed of Agreement through a “Deed of Variation”. Also on 20 August 1996 the Australian and Queensland governments concluded a Memorandum of Understanding establishing processes to expedite a regional coastal management plan for the area under the *Coastal Protection and Management Act* 1995 (Qld). Several drafts of the regional coastal management plan were proposed, ultimately resulting in approval of the final *Cardwell-Hinchinbrook Regional Coastal Management Plan* on 13 January 2004.

⁶²⁵ The history of the development of this site is taken from Australian Senate Environment, Communications, Information Technology and the Arts References Committee, *The Hinchinbrook Channel Inquiry: Report of the Senate Environment, Communications, Information Technology and the Arts References Committee* (Senate Printing Unit, Canberra, 1999).

⁶²⁶ *Cudgen Rutile (No 2) Ltd v Chalk* [1975] AC 520 at 533; *R v BCC; ex parte Read* [1986] 2 Qd R 22 at 37.

On 22 August 1996 the Australian Government gave consent for work to resume on the development of the marina. From 1996 to 2004 the developer constructed a marina, residential housing and hotel on the site. This became known as “Stage 1 of Port Hinchinbrook”.

The controversy surrounding the development of Stage 1 of Port Hinchinbrook led to an inquiry by an Australian Senate committee in 1999.⁶²⁷ After reviewing the facts of the approval processes undertaken by the Australian, Queensland and local governments, the majority report concluded:

6.2 The Port Hinchinbrook dispute was caused by the regrettable lack of a thorough up-front environmental impact assessment of this major development proposal *before approval*. The most important question – ‘*Having considered environmental impacts*, should the development be approved or refused?’ – was never asked. This omission has left the field wide open for ongoing argument about what the environmental impacts will be. It is at the root of claims by environment groups that all subsequent environmental management actions are prejudiced by the political need to justify the initial approval decision. ...

6.13 Many witnesses on both sides of the Port Hinchinbrook debate stressed the need for better regional planning policies to give clear ground rules to developers about what sort of developments will or will not be acceptable.

6.14 The Committee agrees. Regional plans are most important to prevent future Port-Hinchinbrook style disputes, by giving more certainty to developers and giving more confidence to environmental groups that regional environmental issues have been adequately considered.

A dissenting report was delivered in the Hinchinbrook Inquiry by the Liberal-National senators (who represented the party in government at the time), which did not agree that the decision-making process was in any way flawed. However, the majority report is far more rigorous, objective, and supported by the evidence cited by it to support its conclusions. For this reason the minority report may be viewed with caution.

Stage 2

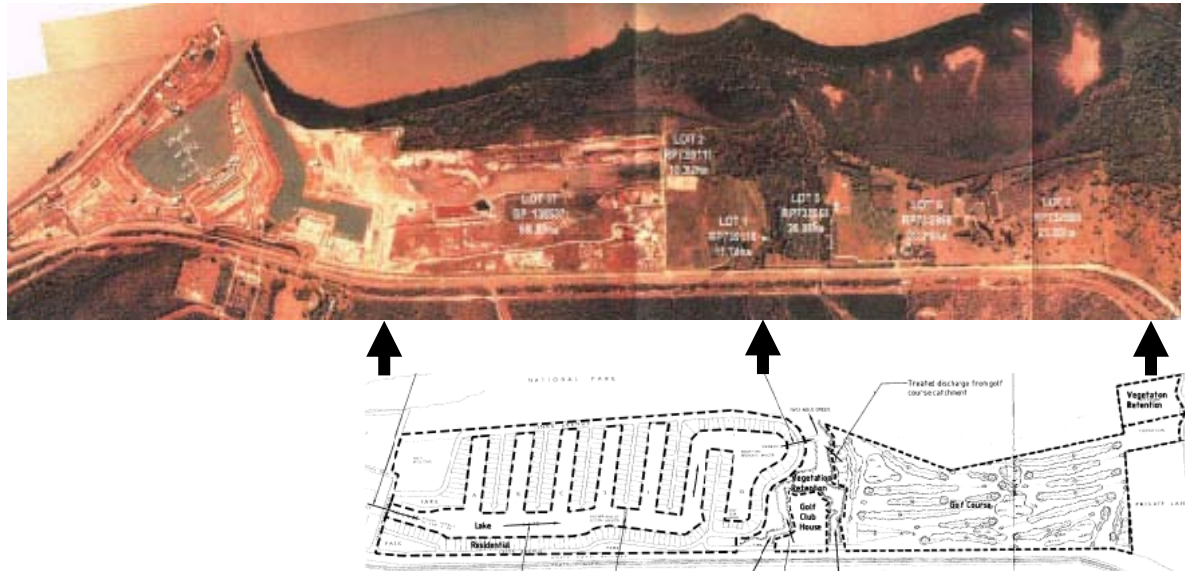
Stage 2 of Port Hinchinbrook is currently proposed and the legal framework for deciding whether to approve or refuse it has changed dramatically since the approvals of Stage 1. The proposed Stage 2 involves the development of a 291 lot canal estate with 16 hectare lake, 100-room motel and 18-hole golf course.⁶²⁸

The Port Hinchinbrook site is shown in the following aerial photograph and an oblique aerial photograph of the site was provided earlier in this chapter. The marina constructed in Stage 1 is on the left of the photograph. The land proposed to be developed as Stage 2 is the cleared area in the centre and right of the photograph. The layout of the proposed canal estate, hotel and golf course for Stage 2 is shown below the photograph. A large area of State coastal land containing a wetland area fringing the Hinchinbrook Channel is shown as an uncleared area along the coastline.

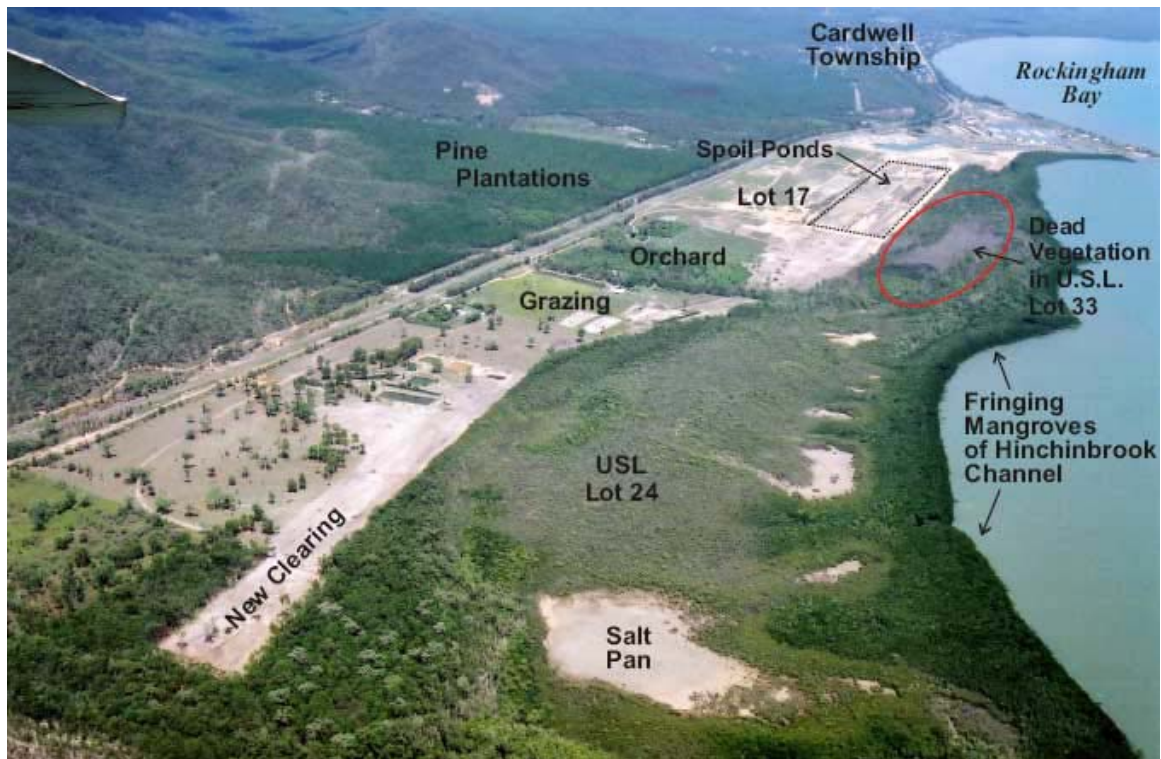
⁶²⁷ Australian Senate Environment, Communications, Information Technology and the Arts References Committee, n 625.

⁶²⁸ See Williams and Cardwell Properties Pty Ltd, n 395.

Figure 32: Aerial photograph of Port Hinchinbrook and map of proposed Stage 2⁶²⁹



Aerial photograph of proposed site of Stage 2 of Port Hinchinbrook⁶³⁰



The clearing of mangroves on the Port Hinchinbrook site generated a large amount of the criticism of Stage 1 and the potential impacts on the adjacent wetland area holds a similar degree of controversy for Stage 2. The wetland area adjacent to Stage 2 contains regional ecosystems listed as *endangered* or of *concern* conservation status under the

⁶²⁹ Extracted from Williams and Cardwell Properties Pty Ltd, n 395.

⁶³⁰ Source: <http://www.hinchinbrook.info/campaign/campaign.php> (viewed 7 July 2006). Annotations added by the Alliance to Save Hinchinbrook Inc.

Vegetation Management Regulation 2000 (Qld) such as swamp paperbark wetland.⁶³¹ This vegetation is habitat for threatened species such as the Mahogany Glider (*Petaurus gracilis*) and the Southern Cassowary (*Casuarius casuaris johnsonii*), both of which are listed as endangered under the *Nature Conservation Act* 1992 (Qld) and the EPBC Act. It is clearly an area of high nature conservation value.

The wetland area adjacent to Stage 2 is designated as “State coastal land”. Its vegetation is mapped as a freshwater wetland and an Area of State Significance (Natural Resources) – Significant Coastal Wetland under the *Cardwell-Hinchinbrook Regional Coastal Management Plan* 2003.

The wetland area and State coastal land adjacent to Stage 2 is held in a land tenure known as Unallocated State Land (“the USL”). Since the mid-1990s it has been proposed to be included in the Edmund Kennedy National Park under the *Nature Conservation Act* 1992 (Qld).⁶³²

Likely environmental impacts

While the proposed development of Stage 2 of Port Hinchinbrook will not involve clearing of any vegetation in the USL, the development has the potential to disrupt freshwater flows to the wetland area, thereby impacting on ecological processes, flora and fauna. Relevant scientific reports suggest that the proposed development of a large saltwater waterway or canals on the land for Stage 2 will cause serious environmental harm to the USL. A report prepared by Peter Stanton, an ecologist, for a public submission on the proposed Stage 2 development found:⁶³³

The vegetation of the USL is dominated by three broad communities which have been shaped by their relationship to soil depth and drainage, and by the nature of the water that covers the ground intermittently or lies at depth as a permanent water table. Essentially, there are two swamp forest communities, and a forest type developed on former beach dunes stranded by a prograding (seawards building) coast line. The dominant swamp forest communities are mangroves, which depends on intermittent tidal inundation, and freshwater swamp forests dominated by various species of *Melaleuca*, dominantly *Melaleuca quinquenervia*. These communities, in relation to most other vegetation types have a high tolerance of salt in the groundwater, and to occasional tidal inundation. They can, however, be killed if salt concentrations in the groundwater reach certain critical levels, and if tidal incursions are not quickly diluted by fresh ground water or flushed by fresh water from surface flows, or rainfall. The forest of the stranded dunes, because of the depth and free drainage of the soil on which it is developed, is relatively insensitive to changes in the nature of the ground water.

Any influence that development of the adjoining property might have on the forests of the USL would be expressed through changes it brings to the water regimes that support them, or through toxic substances that enter the land in drainage water. Such influence would first be seen in changes to the nature of the most sensitive of these communities, the swamp forests of *Melaleuca quinquenervia*.

⁶³¹ Meaning that between 10% to 30% of this RE type remains since pre-european clearing began.

⁶³² Media release of the Minister for the Environment, Hon Desley Boyle MP, 29 September 2005, available at <http://statements.cabinet.qld.gov.au/MMS/StatementDisplaySingle.aspx?id=42849> (viewed 1 April 2005).

⁶³³ Peter Stanton, “The potential effects on adjoining allocated State land of proposed development of Port Hinchinbrook resort stage II by Cardwell properties Pty Ltd” (unpublished report dated 22 August 2005 prepared for the Alliance to Save Hinchinbrook Inc), p 1.

A report prepared by Simon McNeilage, a hydrologist, for a public submission on the proposed Stage 2 development found:⁶³⁴

The vegetation communities within the USL have developed in response to the available soil conditions and the available surface and groundwater resources. They exist due to an established balance between the available fresh water flowing from the west to the sea and the uptake of that water by the vegetation. ... The proposed saline lake presents a high risk of contaminating the underlying fresh groundwater aquifer, which would in turn adversely impact the vegetation on the USL. It must be assumed that [proposed liners for the lake] will always leak. The only way to fully remove that risk to the vegetation of the USL is to not build the seawater lake system. It is recommended that construction of the lake is not permitted.

The fact that a proposed development will cause serious environmental harm does not necessarily mean it cannot proceed. To decide whether it can proceed requires its impacts to be assessed against the relevant laws, plans and policies that are in force or adopted by the various levels of government with responsibilities for assessing the development. This brings us to consider the legal regime applying to Stage 2.

Legal regime for the assessment of Stage 2

The legal regime under which Stage 2 must be assessed is very different from the legal regime under which Stage 1 was assessed. Stage 2 is subject to several layers of planning and two main levels of decision-making, namely: local government and Queensland Government; and the Australian Government.

The local government and State Government must assess the project as a planning application under the IPA. The project is assessed against the *Cardwell Shire Town Planning Scheme 1987* (“the Transitional Planning Scheme”) and other relevant planning documents including the *State Coastal Management Plan* and *Cardwell-Hinchinbrook Regional Coastal Management Plan 2003*. Acid sulfate soil issues are also considered under a State Planning Policy.

The Australian Government assesses the project under the EPBC Act. The project was declared a controlled action by the Minister in 2004 and requires environmental impact assessment by Public Environment Report for potential impacts on World Heritage; listed threatened species and migratory species.⁶³⁵

Conflicts with the planning scheme

The proposed development can be assessed against the relevant planning documents and laws regulating environmental impacts and land use in light of the environmental impacts outlined above.

The USL is designated in the “natural resource protection” preferred dominant land use of the Strategic Plan of the Transitional Planning Scheme. Section 1.2.2 of the Strategic Plan states the intent of the natural resource protection preferred dominant land use as follows:

⁶³⁴ Simon McNeilage, “A review of the potential water related impacts of the proposed Port Hinchinbrook Resort Stage II development” (unpublished report dated 4 September 2005 prepared for the Alliance to Save Hinchinbrook Inc), pp 2 and 11.

⁶³⁵ The Minister’s decision under the EPBC Act is available on the EPBC Act public notices website <http://www.deh.gov.au/epbc> for referral 2003/1246 (viewed 1 January 2005).

1.2.2 Natural Resource Protection

This designation contains public and private lands which due to their natural resource values such as remnant vegetation, wetlands, habitat and steep terrain on the mainland and islands, warrants responsible, sustainable and appropriate management, whilst retaining the ability to achieve economic, social and community needs. ...

The Strategic Plan provides strategic aims in part 1.3 that depict the preferred future direction and goals of development in the Shire, which are to be considered in conjunction with the intent of the zones, all zoning maps, Council policy and all relevant supporting documentation. As relevant to the protection of the environmental values of the State coastal land, sections 1.3.2 and 1.3.7 of the Strategic Plan state:

1.3.2 AIM 2 – Natural Resource Protection

Promotion of the protection and management of the environment to ensure all values associated with the environment are retained and enhanced.

This Strategic Aim is intended to ensure the conservation and preservation and enhancement of the environment for the benefit of current and future generations. This will be achieved by:

- (a) managing environmental resources in an integrated way which aims to maintain and enhance ecological systems while meeting economic, social and community needs;
- (b) protecting areas both aquatic [sic] and terrestrial from the overall impacts associated with land use development, and ameliorating existing impacts so to maintain and enhance the environment; ...
- (c) protecting and managing the coastal zone by ensuring coastal development is completed in a balanced, well planned and environmentally-sensitive way; ...
- (d) protecting biological diversity [sic] and maintaining ecological process of terrestrial, freshwater, coastal, estuarine and marine environments, in a manner consistent with ecologically sustainable development;
- (e) fostering a conservation ethic, ensuring that effective management tools are in place for the continual preservation, conservation and enhancement of Cardwell Shire's natural environment. ...

1.3.7 AIM 7 – Ecologically Sustainable Development

Enhancement of individual and community well-being and welfare by following a path of economic development that safeguards future generations, provides equity between generations and [sic] which protects biological diversity and maintains essential ecological processes and support systems upon which life depends. ...

It is clear that, accepting the environmental impacts to the USL suggested by Peter Stanton and Simon McNeilage,⁶³⁶ the proposed development conflicts with the intent and strategic aims of the Strategic Plan.

Conflicts with the State Coastal Management Plan

In addition to the local government's planning scheme, a State Coastal Plan and a regional coastal management plan applies to the area within which the development is proposed. This regional coastal management plan was prepared in direct response to the controversy that arose over Stage 1 of the development.

The *State Coastal Management Plan – Queensland's Coastal Policy* (August 2001) ("the State Coastal Management Plan") was made under Part 2 of the *Coastal Protection and Management Act 1995* (Qld) and is a State Planning Policy under section 2.4.1 of the IPA. The State coastal land that is USL adjacent to Stage 2 is protected under this regime.

⁶³⁶ Unsurprisingly, the developers' consultants took a different view of the environmental impacts of the proposed development.

It is a “coastal resource”, portions of it are a “coastal wetland”, it is part of the “coastal zone”, and it is “State coastal land”, as defined in sections 12, 14, 15 and 17 of the *Coastal Protection and Management Act*. Section 2.8 (Conserving nature) of the State Coastal Management Plan states:

Coastal management outcome

Coastal ecosystems, including their ecological processes, opportunities for survival, biological diversity and potential for continuing evolutionary adaptation, are maintained, enhanced and restored.

Principles

-
- 8A** The biological diversity of marine, freshwater and terrestrial systems and the ecological processes essential for their continued existence are conserved.
- 8B** Further loss or degradation of native vegetation on the coast, particularly of endangered regional ecosystems, is avoided wherever possible.
- 8C** Further loss or degradation of coastal wetlands, including the loss of biological diversity and abundance of wetland-dependent wildlife, is avoided wherever possible.
- 8D** Further loss or degradation of coastal habitats, particularly habitats for rare, threatened and migratory species, is avoided wherever possible. ...
-

Policies

2.8.1 Areas of state significance (natural resources) ...**Policy context**

The following areas ... are defined as ‘areas of state significance (natural resources)’ for the purposes of coastal management:

- (a) significant coastal wetlands; ...

Policy

... Land allocation for uses and activities adjacent to ‘areas of state significance (natural resources)’ is to be compatible with the maintenance of the area’s values.

2.8.2 Coastal wetlands ...**Policy**

Further loss or degradation of coastal wetlands is to be avoided and impacts on coastal wetlands prevented, minimised or mitigated (in order of preference).

The following matters are relevant to the conservation and management of Queensland’s coastal wetlands, including land within 100m of a coastal wetland: ...

- (b) minimising any modification of the natural characteristics of the wetland, including the topography, groundwater hydrology, water quality, and plant and animal species; ...
-

2.8.3 Biodiversity ...**Policy**

Biodiversity on the coast is to be safeguarded through conserving and appropriately managing the diverse range of habitats including ... dune systems, saltflats, coastal wetlands and riparian vegetation. ...

As was the case for the Transitional Planning Scheme, the environmental impacts of the proposed development on the adjacent USL mean that it conflicts with provisions of the State Coastal Management Policy.

Conflicts with the Cardwell-Hinchinbrook RCMP

The land is located within Coastal Locality 4.2 (Port Hinchinbrook) of the Hinchinbrook Key Coastal Site in the Cardwell-Hinchinbrook RCMP. The State coastal land is located within Coastal Locality 4.3 (Hinchinbrook Channel) of the Hinchinbrook Key Coastal Site in the Cardwell-Hinchinbrook RCMP. The desired coastal outcomes of the Hinchinbrook Key Coastal Site include:

Key coastal site 4: Hinchinbrook Desired coastal outcome

- The site's overall high natural integrity and outstanding biodiversity ... are maintained, including:
 - the impressive range of terrestrial and marine ecosystems;
 - endangered and 'of concern' regional ecosystems associated with coastal wetlands;
 - rare and threatened animals such as Southern Cassowary and Mahogany Glider;
 - ...
 - coastal wetlands ...; and
 - native vegetation providing critical habitat for the Mahogany Glider.

The desired coastal outcomes of Coastal Locality 4.2 (Port Hinchinbrook) include:

Coastal locality 4.2: Port Hinchinbrook Desired coastal outcomes

- ...
- Any future development of Port Hinchinbrook is low-key and can demonstrate that coastal resources and their values are not adversely affected. In particular, development should not contribute to degradation and loss of coastal wetlands, ... or shorebird roost areas ...

The desired coastal outcomes of Coastal Locality 4.4 (Hinchinbrook Channel) include:

Coastal locality 4.4: Hinchinbrook Channel Desired coastal outcomes

- The extent, integrity and biological diversity of the significant coastal wetlands ... are maintained and protected from incompatible development activities.
- ...
- The high natural integrity of the coast north of the mouth of Five Mile Creek is maintained, and the esplanade remains free of development.
- ...
- The following State land on the coast is managed for conservation of the high environmental values and features, including the significant coastal wetlands, remnant vegetation and wildlife habitats:
 - ...
 - USL Lot 33 on Plan USL38644;
 - USL Lot 24 on Plan USL38644; ...

The parcels of land identified in this extract form the USL adjacent to Stage 2, therefore, the USL is specifically identified and protected in the Cardwell-Hinchinbrook RCMP. Consequently, because of the environmental impacts to the USL the proposed development of Stage 2 conflicts with provisions of the Cardwell-Hinchinbrook RCMP.

Stage 2 application refused

Assessment of the environmental impacts of Stage 2 on the adjacent USL under the Cardwell-Hinchinbrook RCMP led to the project being refused by the State Government. On 29 September 2005 the Queensland Government Minister for Environment, the Hon

Desley Boyle MP, announced that the proposed Stage 2 had been rejected on the following grounds:⁶³⁷

Hinchinbrook Stage 2 Development rejected

The Environmental Protection Agency has rejected stage two of the Port Hinchinbrook development, Environment Minister Desley Boyle said today.

Stage Two is in addition to the controversial existing development approved in 1994 and is adjacent to important coastal wetlands and the world heritage listed Hinchinbrook Island.

“The proponents want to build a 26 hectare artificial waterway, 335 residential lots, a 60 room motel, and an 18-hole golf course and clubhouse beside this sensitive area.

“The EPA found the proposed development poses an unacceptable risk to the high environmental and conservation values of this land which has been earmarked for national park.

“It contains significant coastal wetlands, significant coastal dune systems and endangered regional ecosystems that were identified in the Cardwell-Hinchinbrook Regional Coastal Management Plan,” Ms Boyle said.

“There are also serious concerns about the work that would take place to construct the development. The area has already been cleared and construction work could lead to acid sulphate soil disturbance, water quality impacts, erosion, and salinity problems.

The developer had applied to Cardwell Shire Council for a Material Change of Use of land in the Coastal Management District.

The application was assessed under the provisions of the Coastal Protection and Management Act 1995, State Coastal Plan and the Cardwell-Hinchinbrook Regional Coastal Management Plan.

“This Act and the coastal plans were developed to ensure protection of important coastal environmental values and did not exist when stage one was approved.

“The Cardwell Hinchinbrook coastal area is a special part of Queensland and there has been significant public disquiet over development activity impacting on those natural values.

“There was significant controversy when stage one was developed.

“The EPA's decision has taken place under new laws that have been developed in response to community concern.

“Our coasts and wetlands are precious and we should do everything we can to protect them,” Ms Boyle said.

The EPA's refusal does not take effect until Cardwell Shire Council, as assessment manager, makes its decision.

At that time the applicant is able to appeal this decision in the Planning and Environment Court.

Contrast in outcomes: approval vs refusal

The differences in the assessment of the two stages of this project demonstrate the rapid changes that occurred in the planning system applying to the site in the past 15 years. The two proposed developments were different factually but the differences in responses are not adequately explained by these factual differences. The decision to refuse Stage 2 appears to have been based, primarily, upon the expert advice of the impact of the development on the adjacent wetland area and application of the many planning instruments relevant to the site that had been developed since Stage 1 was approved.

⁶³⁷ Obtained from <http://statements.cabinet.qld.gov.au/MMS/StatementDisplaySingle.aspx?id=42849> (viewed 21 April 2007).

The environmental legal systems regulating the two developments were very different and this played an important part in the rejection of Stage 2. This suggests that the system improved considerably during the period in which the two developments occurred, between 1990 and 2005, and has, thereby, improved protection of the GBR through better protection of its adjacent coastal catchment.

However, the improvements to the protection of the coastal catchment over the past 15 years are not mirrored in all parts of the environmental legal system protecting the GBR. In particular, the parts of the environmental legal system protecting the GBR from dangerous climate change have not yet responded adequately to prevent severe impacts to the GBR from global warming.

Climate change

While the case study of the Cardwell-Hinchinbrook region and Port Hinchinbrook indicates that the environmental legal system protecting the GBR from the direct pressure of coastal development has been remarkably improved in the last decade, a different picture emerges in relation to global warming.

To assess the regulation of greenhouse gas emissions contributing to global warming it is necessary to expand the scale of the case study beyond the Cardwell-Hinchinbrook region. This is necessary both because the “ecological footprint” of the region is much larger than its geographic area alone when energy and material inputs are considered and because activities outside the region contribute to climate change at a global level. In considering the ecological footprint it can be noted that industry in the region is largely based on agriculture, fisheries and tourism. Electricity generation, petroleum extraction, and the manufacture of most material goods consumed within the region occur outside the region. Base-load electricity generation for the region depends on coal-fired power stations, which contribute greenhouse gas emissions during the mining, transport and use of coal.

The response to global warming has involved the international community and all levels of government in Australia. The principal international agreements for collective action to address climate change is the *United Nations Framework Convention on Climate Change 1992* (“UNFCCC”)⁶³⁸ and the Kyoto Protocol.⁶³⁹ The Kyoto Protocol provides, amongst other things, binding targets for the reduction of greenhouse gas emissions by developed countries for 2008-2012.

Australia’s policy response

After considerable delay and controversy, Australia ratified the Kyoto Protocol following the election of a new federal government in November 2007. Under the Protocol Australia has a target of limiting its greenhouse gas emissions to 108% of its 1990 levels during 2008-2012. Principally through reductions in the rates of land clearing, Australia is expected to nearly achieve this target. Australia’s greenhouse gas emissions are projected

⁶³⁸ For full citation, see n 237. See generally, Birnie and Boyle, n 2; Sands, n 2; Yamin and Depledge, n 10; and Triggs, n 215.

⁶³⁹ For full citation, see n 238.

to reach 603 million tonnes annually of greenhouse emissions over 2008–12, which is 109% of 1990 levels.⁶⁴⁰

The new Australian Government has been elected on a policy platform clearly recognising the need to address climate change but its detailed policy response has not yet emerged.⁶⁴¹ The State and federal governments have commissioned Professor Ross Garnaut to conduct a major review of the impacts of climate change on the Australian economy for the purpose of recommending medium to long-term policies and policy frameworks to improve the prospects for sustainable prosperity.⁶⁴² That review is due to be completed in mid-2008 and the new Australian Government has stated it will not proceed with detailed policy announcements before receiving the report. However, based on pre-election policies the government has committed to two far-reaching policies: establishment of a national emissions trading scheme by 2010 and reducing Australia's year 2000 greenhouse emissions by 60% by 2050. The government has not stated the overall global temperature rise that it considers should be avoided.

The policy response of the previous Australian Government, while now quickly becoming obsolete, is relevant here in the context of understanding and evaluating the effectiveness of Australia's policy response over the past 10 years. During this period, particularly following the mass coral bleaching event in 1998, climate change has been recognised as a major threat to coral reefs.

The previous government's policy response was almost entirely based upon non-legislative and non-regulatory programs loosely coordinated under the 1998 *National Greenhouse Strategy* with the aim of meeting Australia's Kyoto target. These programs have been summarised elsewhere.⁶⁴³ They included, for example, the Low Emissions Technology Demonstration Fund, a \$500 million fund, over 15 years, that was a flagship initiative under the government's 2004 Energy White Paper, *Securing Australia's Energy Future*.⁶⁴⁴ The fund supported the commercial demonstration of technologies that have the potential to deliver large-scale greenhouse gas emission reductions in the energy sector, such as "clean coal" initiatives. An example of a grant under the fund is a \$60 million grant for the Gorgon CO₂ Injection Project. This project involves separating and capturing the CO₂ from the natural gas produced from the Gorgon fields off Western Australia. The CO₂ will be injected deep underground into a saline aquifer. When fully operational the project will be capturing and storing up to 3 million tonnes of CO₂ a year, making it the largest geosequestration project in the world.

In addition to entirely voluntary, non-legislative programs, the previous federal government had established a limited regulatory framework for greenhouse gas emissions. The UNFCCC is nominally incorporated into Australian domestic law. It is annexed, in whole, in Schedule 3E of the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989* (Cth). That Act, however, focuses on ozone depleting substances and not greenhouse gas emissions contributing to climate change.

⁶⁴⁰ Australian Greenhouse Office, *Tracking to the Kyoto Target: Australia's Greenhouse Emissions Trends 1990 to 2008-2012 and 2020* (AGO, Canberra, 2006), p 1, available at <http://www.greenhouse.gov.au> (viewed 6 March 2007).

⁶⁴¹ See the new departmental website at <http://www.climatechange.gov.au/> (viewed 20 December 2007).

⁶⁴² See <http://www.garnautreview.org.au/> (viewed 1 December 2007).

⁶⁴³ McGrath, n 493, pp 188-189; These programs are described on the AGO's website at <http://www.greenhouse.gov.au/> (viewed 18 March 2007).

⁶⁴⁴ Energy Task Force, *Securing Australia's Energy Future* (Australian Government, Canberra, 2004), available at http://www.dpmc.gov.au/publications/energy_future/docs/energy.pdf (viewed 18 March 2007).

There are three pieces of Commonwealth legislation passed by the previous government of note in relation to greenhouse issues. First, the *Renewable Energy (Electricity) Act 2000* (Cth) aims to reduce greenhouse gas emissions by imposing a Mandatory Renewable Energy Target, or “MRET”, which requires electricity providers to source 2% of their energy from renewable sources.⁶⁴⁵ The Scheme requires an additional 9,500 GWh of electricity to be sourced from renewables by 2010. The scheme was reviewed in 2004 and recommendations were made by the review panel to extend the scheme a new target of 20,000 GWh between 2010 and 2020;⁶⁴⁶ however, the previous government decided not to increase or extend the MRET target for 2010.⁶⁴⁷ Second, in addition to the MRET, the *Energy Efficiency Opportunities Act 2006* (Cth) requires large energy using businesses to undertake and report publicly an assessment of their energy efficiency opportunities and one of the objects of that Act is to reduce greenhouse emissions. Third, the *National Greenhouse and Energy Reporting Act 2007* (Cth) requires corporations producing greenhouse emissions or using energy over specified thresholds to report their emissions and energy usage from mid-2008. This legislation was intended to provide the basis for a national emissions trading scheme but it is unclear at this stage whether the new government will retain it.

The centrepiece of the previous government’s environmental laws, the EPBC Act, is largely silent on greenhouse gas emissions and climate change. Section 520(3)(k) of the EPBC Act allows for regulations to give effect to the UNFCCC but no regulations have been made for that purpose. Two decisions of the Federal Court indicate that greenhouse gas emissions are effectively not regulated under the Act as even projects involving extremely large emissions of greenhouse gases, such as major coal mines, are not considered by the government to have a significant impact on the matters protected by the EPBC Act in the context of total global greenhouse emissions.⁶⁴⁸ The new government has indicated it will amend the Act to insert a greenhouse trigger, which should overcome this gap in the legislation.⁶⁴⁹

In recognition of the threat climate change poses to the GBR, the GBRMPA has established a Climate Change Response Program to better understand and respond to climate change threats, including coral bleaching.⁶⁵⁰ The GBR Coral Bleaching Response Plan, which is part of the Climate Change Response Program, is implemented every summer to monitor and document coral bleaching as part of a global protocol for assessing

⁶⁴⁵ A tax penalty is imposed for failing to achieve this target by the *Renewable Energy (Electricity) (Charge) Act 2000* (Cth).

⁶⁴⁶ Mandatory Renewable Energy Target (MRET) Review Panel, *Renewable Opportunities: A Review of the Operation of the Renewable Energy (Electricity) Act 2000* (Australian Greenhouse Office, Canberra, 2003), available at <http://www.mretreview.gov.au/report/pubs/mret-review.pdf> (viewed 26 November 2006).

⁶⁴⁷ Energy Task Force, n 644, p 147.

⁶⁴⁸ *Wildlife Preservation Society of Queensland Proserpine/Whitsunday Branch Inc v Minister for the Environment & Heritage & Ors* [2006] FCA 736 (Dowsett J); *Anvil Hill Project Watch Association Inc v Minister for the Environment and Water Resources* [2007] FCA 1480 (Stone J).

⁶⁴⁹ However, note the criticisms of such a trigger made by Macintosh M, “The greenhouse trigger: where did it go and what of its future?”, Ch 4 in Bonyhady T and Christoff P (eds), *Climate Law in Australia* (The Federation Press, Sydney, 2007).

⁶⁵⁰ See http://www.gbrmpa.gov.au/corp_site/info_services/science/climate_change. See also ReefTemp, a mapping product that provides information on coral bleaching risk for the GBR region, at <http://www.cmar.csiro.au/remotesensing/gbrmpa/ReefTemp.htm> (viewed 1 November 2006).

and monitoring coral bleaching.⁶⁵¹ It uses a combination of satellite imagery, aerial surveys, underwater surveys, and community monitoring to determine the extent and severity of a coral bleaching event, and to understand the impacts on the GBR. The plan has three main components, an early warning system, bleaching assessment and monitoring, and a communication program. It is intended to enable the GBRMPA to:

- develop a system to forecast coral bleaching events;
- provide early warnings of a major coral bleaching event;
- measure the spatial extent and severity of mass coral bleaching events;
- assess the ecological impacts of mass coral bleaching events;
- involve the community in monitoring the health of the GBR;
- communicate and raise awareness about coral bleaching and climate change impacts on the GBR;
- provide information to evaluate the implications of coral bleaching events for management policy and strategies.

The threat of climate change has been used by the GBRMPA, in part, to justify reduction of other stresses to the GBR, such as declining water quality and overfishing, to support the natural resilience of the reef ecosystem to help it survive climate change.

In addition to these laws, programs and policies of the previous and new Australian Government, various State and Territory laws, programs and policies seek to address climate change. An important, legislative contribution made by the Queensland Government was to end broad-scale land clearing for agricultural development in 2006. In early 2004 the Queensland Government passed the *Vegetation Management and Other Legislation Amendment Act 2004* (Qld), with a stated objective of reducing greenhouse emissions.⁶⁵² This aims to reduce greenhouse gas emissions due to vegetation clearing by 20-25 megatonnes per year by 2008.⁶⁵³ This major change in the law has been a key to Australia reducing its greenhouse gas emissions almost within the targets set under the Kyoto Protocol for the 2008-2012 commitment period, but rises in energy use and transportation emissions mean that Australia will need to find further means of reducing emissions to meet its targets beyond this period.

Consistent with the policies of the new Australian Government, as part of its *ClimateSmart 2050* strategy the Queensland Government has announced a policy of reducing the State's greenhouse emissions by 60% by 2050 based on year 2000 levels.⁶⁵⁴ The details of how this will be achieved have not yet emerged and the State government is awaiting the recommendations of the Garnaut Climate Change Review before setting short-term targets for emissions reductions.

Aside from reining in greenhouse emissions by regulating land-clearing and committing to a 60% reduction in emissions by 2050, the Queensland Government has adopted the policies of the previous Australian Government by relying on voluntary development of new technologies to lower emissions. The simple reason for this appears to be that Queensland's economy is heavily reliant on coal mining and coal-fired power stations. These are major sources of greenhouse gas emissions contributing to climate

⁶⁵¹ See http://www.gbrmpa.gov.au/corp_site/info_services/science/climate_change/response_plan.html (viewed 1 November 2006).

⁶⁵² Section 3(1)(g) of the amended *Vegetation Management Act 1999* (Qld).

⁶⁵³ See Queensland Government, *State Policy for Vegetation Management* (May 2004). Available at <http://www.nrm.qld.gov.au/vegetation>.

⁶⁵⁴ See <http://www.thepremier.qld.gov.au/news/initiatives/climate/index.shtm> (viewed 20 December 2007).

change yet controlling them may have serious adverse effects on the State economy. Queensland's approach is, therefore, to emphasise the need for new technologies, particularly "clean coal" technology, to reduced greenhouse emissions. There are no significant mandatory controls on coal mining or power generation in relation to greenhouse emissions.

Queensland Government policies to address energy efficiency and climate change have included the *Queensland Energy Policy: A Cleaner Energy Policy 2000*, *Queensland Greenhouse Policy Framework: A Climate of Change 2001*, *Queensland Greenhouse Strategy 2004*, and the *ClimateSmart 2050*.⁶⁵⁵ The Queensland Government has established the Office of Climate Change and the Queensland Climate Change Centre of Excellence, now within the Environmental Protection Agency, for climate change science and policy.

This concludes the description of the pressures on the GBR, the condition of the GBR and the response to these pressures and trends in conditions. The next section evaluates the effectiveness of the response to protecting the GBR.

EVALUATION OF EFFECTIVENESS

Outline

The analysis presented above suggests that the response to the condition of, and pressures on, the GBR is in many respects sound. Five responses in particular have contributed to protecting the condition of the GBR and reducing pressures on it. First, the establishment of the GBRMPA has provided important leadership for protecting the GBR. Second, the establishment of the GBR Marine Park and inclusion of the GBRWHA on the World Heritage list has improved the protection of the GBR greatly when implemented through planning and management of the marine park as a whole under the GBRMP Act, regulations, zoning plans, and plans of management. Third, within this legislative framework, fisheries laws and the expansion of fully protected areas within the GBR Marine Park in 2004 from 4.6% to 33.1% of the total area based upon a bioregional planning approach have made very significant contributions to protecting the GBR. Fourth, the regulation of ship-sourced marine pollution through legislation such as the *Protection of the Sea (Prevention of Pollution from Ships) Act 1982* (Cth), has largely been effective in preventing major marine pollution incidents on the GBR. Fifth, after allowing largely unregulated coastal development and vegetation clearing for over a century, regulation of development in the GBR catchment has improved dramatically in the past 15 years. This is illustrated by the changes in the development approval processes for Stage 1 and Stage 2 of Port Hinchinbrook and the much greater controls on vegetation management in the catchment.

However, a number of significant gaps currently exist in relation to the planning and management of activities affecting the GBR. First, a lack of regulation of greenhouse gas emissions contributing to global warming to avoid mean global temperature rises above 1°C is a particularly significant gap in the protection of the GBR. Second, poor regulation of land-sourced pollution from agricultural run-off in catchments has damaged near-shore

⁶⁵⁵ See the Queensland Government Climate and Greenhouse website at http://www.epa.qld.gov.au/environmental_management/sustainability/climate_change_and_greenhouse/ (viewed 18 March 2007).

reefs and is likely to continue to do so under current regulatory arrangements. Recent improvements to managing these impacts under the RWQPP are unlikely to be effective because they largely based on voluntary measures and because existing lawful uses are largely not regulated in the catchment of the GBR. These issues require more detailed discussion to understand how damaging they may be for the GBR.

Climate change

Philippe Sands provided a strong critique of the legal and policy failure evident in failing to address anthropogenic climate change through comprehensive and effective means.⁶⁵⁶ The seriousness of the threat it poses demands a comprehensive response as a matter of commonsense and good policy. In terms of creating good public policy, there is a clear need to recognise and use the full width of available regulatory and non-regulatory policy options for complex environmental problems such as climate change.⁶⁵⁷

Setting targets for greenhouse policies

An obvious problem in the international response and the response of the previous Australian and current Queensland governments is the failure to set binding targets to avoid climate change that is expected to damage the GBR. The previous Australian Government in particular relied almost entirely on technological breakthroughs to solve the problem of global warming. Under it, Australia refused to ratify the Kyoto Protocol and, thereby, refused to accept a binding target of a 108% increase in its greenhouse gas emissions over 1990 levels during 2008-2012. By not setting targets it is difficult to gauge the effectiveness of the regime or to take corrective action if the regime does not appear to be achieving suitable outcomes. Setting ambitious targets can also be used as a means of “technology forcing” by signalling to industry what standards must be met in the future even if they are currently not achievable.

The question that the failure to set targets for greenhouse gas reductions raises then is what targets should be set? The objective of the UNFCCC, stated in Article 2, is “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” This is commonly referred to as avoiding “dangerous climate change” and it can be understood as synonymous with the overall objective of environmental legal systems, “sustainable development”, in relation to protecting the atmospheric processes on which life depends. The objective of the UNFCCC is a useful starting point but it is a qualitative target only, as is “sustainable development”. The quantitative targets set for some countries under the Kyoto Protocol, such as Australia’s target of a 108% increase in greenhouse gas emissions over 1990 levels during 2008-2012, are relative targets that do not define the levels of unacceptable climate change. One must turn to climate change science to establish a scientifically valid, quantitative target to determine the effectiveness of the response to avoiding dangerous climate change or achieving sustainable development measured in terms of an environmental indicator or suite of environmental indicators.

The topic of target setting for climate change policy has generated a large amount of literature, particularly since 2001, of which the work of Michael Oppenheimer is

⁶⁵⁶ Sands P, *Lawless World: Making and Breaking Global Rules* (Revised ed, Penguin, London, 2006).

⁶⁵⁷ See Dovers, n 22, pp 106-107 and 124-125.

particularly outstanding.⁶⁵⁸ The most widely adopted interpretation and target for avoiding dangerous climate change is that of the European Union: “to limit global warming to no more than 2°C above the temperature in pre-industrial times.”⁶⁵⁹ The target of “no more than 2°C” is a quantitative, and measurable, target.

However, as the focus here is on protecting the GBR, the discussion will be limited to what target is required to protect the GBR. Oppenheimer and Petsonk suggest the uneven regional distribution of impacts mean that levels of climate change that impact severely on only one region might not be regarded as “dangerous climate change” for the purposes of Article 2 of the UNFCCC.⁶⁶⁰ This wider debate is not necessary to address here.

When the conclusions of the IPCC are synthesised, it becomes clear that reductions of greenhouse emissions of 60% by 2050, such as proposed by the new Australian Government⁶⁶¹ and the Queensland Government,⁶⁶² are not likely to prevent serious damage to the GBR. A 60% reduction in global emissions by 2050 is likely to lead to a mean global temperature rise around 2.4°C, which is likely to severely degrade the GBR. If a developed country such as Australia achieves a reduction in emissions of 60% by 2050 it is unlikely that global emissions will meet this target. The new Australian Government does not have an express stabilisation target for global temperature rises but the emissions reductions target of 60% by 2050 appears to be based on stabilising global temperature rises around 3°C.⁶⁶³

The critical need to stabilise global mean temperatures at less than 2-3°C is clear from the work of Berkelmans and his colleagues, and Hoegh-Guldberg, noted earlier. Berkelmans’ modelling of the relationship between the bleaching events and maximum sea surface temperature:⁶⁶⁴

... indicates that a 1°C increase [in maximum sea surface temperature over a 3 day period] would increase the bleaching occurrence of reefs from 50% (approximate occurrence in 1998 and 2002) to 82%, while a 2 °C increase would increase the occurrence to 97% and a 3 °C increase to 100%.

As noted earlier Hoegh-Guldberg found that:⁶⁶⁵

⁶⁵⁸ See, for example, Oppenheimer M and Petsonk A, “Article 2 of the UNFCCC: Historical origins, recent interpretations” (2005) 73 *Climate Change* 195.

⁶⁵⁹ There have been repeated EU resolutions to this effect. A recent one is the EU Environment Council Conclusion at its 2785th meeting, Brussels, 20 February 2007, available at http://europa.eu-un.org/articles/fr/article_6790_fr.htm (viewed 7 March 2007). Note that the reference period for change is important to consider. For instance, Corfee-Morlot J, Smith J, Agrawala S, and Franck T, “Long-term goals and post-2012 commitments: where do we go from here with climate policy?” (2005) 5(3) *Climate Policy* 251, discuss global mean temperature increases of 1-4°C “compared with 1990 levels”. Global mean temperatures had risen by approximately 0.6°C by 1990. A reference period of 1900 or pre-industrial temperatures accounting for this 0.6°C rise is used here. Consequently, references to 1-3°C temperature rises in this thesis are compared with 1900 or pre-industrial levels.

⁶⁶⁰ Oppenheimer and Petsonk, n 658, p 208.

⁶⁶¹ Based on the climate change policy stated by the new Australian Prime Minister, Kevin Rudd, in May 2007, available at <http://www.alp.org.au/media/0507/speloo300.php> (viewed 25 November 2007).

⁶⁶² Queensland Government, *ClimateSmart 2050: Queensland's Climate Change Strategy* (Queensland Government Department of Premier and Cabinet, Brisbane, 2007), p 1. Available at <http://www.thepremier.qld.gov.au/news/initiatives/climate/index.shtm> (viewed 25 June 2007).

⁶⁶³ See Spratt D, “Is Labor's climate policy ‘backed by the science’?” (Carbon Equity, Melbourne, 2007), available at <http://www.carbonequity.info/docs/alppolicy.html> (viewed 14 November 2007).

⁶⁶⁴ Berkelmans et al, n 524, pp 74 and 82.

⁶⁶⁵ Hoegh-Guldberg and Hoegh-Guldberg (2004), n 516, p 66.

With a doubling of CO₂, thermal stress levels will soon reach the levels seen at isolated yet catastrophically affected sites in 1998. When these conditions arrive on reefs on the Great Barrier Reef more than three times per decade, coral cover should have declined to near zero. These dates are on average around 2030-2040 for southern, central and northern sectors of the Great Barrier Reef.

Hoegh-Guldberg and his colleagues found that:⁶⁶⁶

Successive studies of the potential impacts of thermal stress on coral reefs have supported the notion that coral dominated reefs are likely to largely disappear with a 2°C rise in sea temperature over the next 100 years. This, coupled with the additional vulnerability of coral reefs to high levels of acidification once the atmosphere reaches 500 parts per million, suggests that coral dominated reefs will be rare or non-existent in the near future.

These studies indicate that a doubling of the global warming effect of greenhouse gases and aerosols to 550 ppm CO₂-eq, allowing a probable rise of 3°C in mean global temperature, is far too high a target to set if the policy objective is to avoid severe damage to the GBR. Stabilizing greenhouse gas concentrations and aerosols at 450 ppm CO₂-eq and allowing a rise of 2°C also appears too high; however, it may be impossible to avoid exceeding this target because the global atmospheric concentrations of CO₂ is already over 379 ppm and the atmospheric concentration of CO₂ is currently rising by around 2 ppm each year. The current warming effect of greenhouse gases, aerosols and landuse changes was about 375 ppm CO₂-eq in 2005. This rises to around 455 ppm CO₂-eq in 2005 if the cooling effect of aerosols is removed.

Detlef van Vuuren and his colleagues recently suggested that, technically, stabilizing greenhouse concentrations at 650, 550, 450 ppm and, under specific assumptions, 400 ppm carbon dioxide equivalents is feasible from median IPCC baseline scenarios on the basis of known technologies.⁶⁶⁷ They suggested that creating the right socio-economic and political conditions for mitigation is more important than any of the technical constraints.

Given the difficulties in the negotiations of the Kyoto Protocol, targets of stabilizing atmospheric greenhouse gases and aerosols at 450 ppm CO₂-eq with a likely warming of around 2°C appear to be the lowest targets that are politically possible to achieve. They are not targets that are desirable to set if the objective is to avoid severe damage to the GBR and other coral reefs around the world but they are still likely to be far better than a target of 550 ppm CO₂-eq with a warming of around 3°C.

Setting targets, such as stabilizing global greenhouse gas concentrations and aerosols at no greater than 450 ppm CO₂-eq, is an essential step to normal policy setting and evaluation of effectiveness. It is a principal criticism of the policy response of the previous and new Australian governments and the Queensland Government that no targets have been set for stabilizing atmospheric greenhouse gas concentrations. The policies of the previous and the new Australian Government are inconsistent with protecting the GBR from severe impacts from climate change. Simply ignoring the impacts scientists believe will occur to the GBR is not a satisfactory or even tenable policy option.

⁶⁶⁶ Hoegh-Guldberg et al, n 517, p 295 (citations omitted).

⁶⁶⁷ van Vuuren DP, den Elzen MGJ, Lucas PL, Eickhout B, Strengers BJ, van Ruijven B, Wonink S, and van Houdt R, "Stabilizing greenhouse gas concentrations at low levels: an assessment of reduction strategies and costs" (2007) 81 *Climate Change* 119 at 152.

Focus on voluntary policy measures and research

Another criticism of the policy response of the previous Australian Government was that it was virtually entirely based on voluntary policy instruments and research. There appeared to be no back-up plan if technological development failed to produce alternative energy sources and sufficient reductions in emissions.⁶⁶⁸ The conundrum that such policies created is that, from a policy perspective merely relying on technological change without a regulatory safety net is a huge risk. As Rump noted, forecasting the future is inherently difficult because of the significant uncertainties involved. No one knows for sure what future technological breakthroughs will occur or when.⁶⁶⁹ Needless to say, the stakes are extremely high in this gamble. Taking a risk assessment approach, the high likelihood and severe consequences of global warming suggest that a failure to address it in a comprehensive and effective manner is a serious policy failure in terms of achieving sustainable development.

In contrast, the new Australian Government appears to be much more prepared to use direct regulation as well as market-mechanisms to regulate greenhouse gases.

Effectiveness of current policy measures

As discussed in chapter 1, evaluating the likely effectiveness of current policy measures for climate change requires them to be assessed in terms of the likelihood that they will achieve sustainable development. In terms of climate change, this means the response is likely to avoid “dangerous climate change” under the UNFCCC.

Based on the likely impacts on the GBR, targets of holding the rise of global temperatures beneath 2-3°C based on stabilizing greenhouse gas concentrations between 450-550 ppm CO₂-eq appear too high. Stabilizing greenhouse gases around 350 ppm CO₂-eq, and allowing a rise in mean global temperature of 1°C appear to be the highest targets that should be set if the GBR is to be protected from serious degradation.

Whether a target of 350, 450, or 550 ppm CO₂-eq is set, to determine the effectiveness of the legal system and overall response the question becomes whether any of these can be achieved in practice. It appears unlikely that even the 550 ppm target will be achieved under the current legal and policy framework.

Even if all parties to the Kyoto Protocol achieved their emissions targets (something that appears completely unrealistic at this point in time), the Protocol would reduce global emissions of greenhouse gases by only a small fraction of the emissions that would be likely to occur without the Protocol being in force. There are three main reasons for this. First, the Protocol sets binding targets only for developed countries thereby excluding developing countries with large emissions such as India and China. Second, it sets binding targets only for a short period (2008-2012). Third, the targets set – a net reduction of emissions from developed countries of around 5% – are themselves small. Tom Wigley modelled reductions in global temperatures assuming no further emissions reductions are achieved after 2010 than specified under the Kyoto Protocol and found the reduction in temperature by 2100 would only be 4% lower than under a “business as usual” scenario.⁶⁷⁰

⁶⁶⁸ Parker, n 10 at p 64, made the same comment about the lack of targets or sanctions in the Australian Greenhouse Challenge.

⁶⁶⁹ Rump, n 81, pp 93-104.

⁶⁷⁰ Wigley TML, “The Kyoto Protocol: CO₂, CH₄ and climate implications” (1998) 25(13) *Geophys. Res. Letters* 2285 at 2287. Note: Wigley assumed a climate sensitivity of 2.5°C for doubling CO₂ concentrations, which is roughly consistent with the latest IPCC projection of 3°C for doubling CO₂ concentrations.

Therefore, even under a best case scenario with perfect compliance by all signatories including the United States and Australia, the Kyoto Protocol would achieve only small reductions in greenhouse emissions and expected climate change. It remains to be seen whether the current negotiations for the post-2012 commitment period will achieve significantly greater reductions.

The observation evidence also indicates that current policies are failing to curb greenhouse gas emissions effectively. Current growth in CO₂ emissions from the burning of fossil fuels exceeds even the “worst case” IPCC projections and no region in the world is decarbonizing its energy supply.⁶⁷¹

In 2003 Rosemary Lyster reviewed the legal framework for the Australian energy sector. Her overall conclusions still appear applicable generally for Australia’s regulation of greenhouse emissions. After reviewing Australia’s policies and regulatory framework for greenhouse emissions she concluded:⁶⁷²

There have been various initiatives at both the Federal and State government levels to combat the greenhouse gas emissions associated with the stationary energy sector. The question remains, however, whether or not these have been effective, and what more needs to be done before Australia has a sustainable energy policy and law framework. The overall conclusion will be that to date the efforts to control greenhouse emissions ... are not sufficient. The largely voluntary measures resorted to by Australian governments have not delivered effective greenhouse emissions reductions. To be effective, mechanisms must be written into statute and be enforceable.

Lyster’s conclusions in relation to the failure of voluntary measures to reduce greenhouse emissions reflects the findings of Neil Gunningham and Darren Sinclair’s research into the ability of voluntary policy mechanisms to effectively control non-point source river pollution. Based on their analysis of non-point source pollution in the Swan-Canning river catchment in Western Australia they concluded:⁶⁷³

There is little evidence to suggest that various forms of exhortation, *when used in isolation*, have the capacity to deliver tangible environmental improvements when applied to matters of non-point source pollution. Indeed, there is a substantial body of evidence ... which suggests quite the contrary. Unless landholders have a self-interest in engaging in the desired environmental improvements, then information, education and voluntarism alone will usually be unable to overcome the costs barriers (and sometimes conservatism) that often inhibit change. For these reasons such measures should *not* be used as “stand alone” approaches to reducing non-point source agricultural pollution in the Swan-Canning river catchment. This is an important conclusion, yet one which policymakers have been most reluctant to hear notwithstanding a growing, and now almost overwhelming, body of evidence to support it.

Gunningham and Sinclair’s conclusions appear highly relevant to greenhouse gas emissions, even though these emissions occur from both point sources and non-point sources. Their conclusions cast considerable doubt on the ability of voluntary measures alone to reduce greenhouse gas emissions to provide an effective policy response to global warming.

⁶⁷¹ Raupach et al, n 509.

⁶⁷² Lyster R, “The implications of electricity restructuring for a sustainable energy framework: what’s law got to do with it?” (2003) 20 EPLJ 359 at 367.

⁶⁷³ Gunningham N and Sinclair D, “Non-point pollution, voluntarism and policy failure: lessons from the Swan-Canning” (2004) 21 EPLJ 93 at 103.

In 2006 Rory Sullivan evaluated the effectiveness of Australia's greenhouse policies. He noted that Australia was on target to meet its Kyoto targets, of a 108% increase over 1990 levels during 2008-2012, but commented that:⁶⁷⁴

looking beyond the Kyoto Protocol to the broader goals of climate change policy, a different picture emerges. There is a general consensus that stabilising atmospheric greenhouse gas emissions at an acceptable level would require a 60-80% reduction in greenhouse gas emissions over the period 1990 to 2050 (equivalent to reductions of between 1 and 1.5% per annum over this 60 year period). From these statistics, it is clear that the [policies of the Australian Government] did not have anything like the necessary effect on reducing greenhouse gas emissions ...

Sullivan's, Gunningham and Sinclair's analyses are supported by the facts of the current increases in levels of greenhouse gases in the atmosphere and the likelihood that the levels of these gases expected to cause "dangerous climate change" for the GBR are likely to be exceeded in the near future. These facts and analyses strongly suggest that the policies of the previous Australian Government, as part of a global response to climate change, were not likely to be effective in preventing climate change from causing very serious damage to the GBR.

Unfortunately, a similar conclusion appears correct for the policies of the new Australian Government also. As noted earlier, when the conclusions of the IPCC are synthesised, it becomes clear that reductions of greenhouse emissions of 60% by 2050, such as proposed by the Queensland Government and new Australian Government, are not likely to prevent serious damage to the GBR. A 60% reduction in global emissions by 2050 is likely to lead to a mean global temperature rise around 2.4°C, which is likely to severely degrade the GBR.

This indicates the environmental legal system protecting the GBR is not likely to be effective in relation to climate change. The failure to comprehensively and effectively reduce the pressure of greenhouse gas emissions appears likely to have severe impacts on the GBR. This indicates that the current environmental legal system protecting the GBR is not achieving its objective of sustainable development as it is not protecting the ecological processes on which life depends associated with climate.

Nutrient and sediment loads from agricultural run-off

Turning from evaluating the response to climate change to consider the response to land-sourced pollution to the GBR, the evaluation is more positive. The adoption of the RWQPP by the Australian Government and the Queensland Government is an important step in responding effectively to land-sourced pollution from agriculture affecting the GBR. However, the RWQPP lacks specific performance indicators and is unlikely to be effective in improving water quality because it is almost entirely based on voluntary mechanisms, particularly for non-point source pollution from agriculture. While discharges from aquaculture and non-agricultural industries (including sewage treatment plants) are relatively well regulated under the *Environmental Protection Act 1994* (Qld), agricultural run-off remains virtually unregulated in practice under the current Queensland environmental legal system.

⁶⁷⁴ Sullivan R, "Greenhouse Challenge Plus: A new departure or more of the same?" (2006) 23 EPLJ 60 at 64 (footnote omitted). See also Sullivan, n 95.

The results of Gunningham and Sinclair's research of non-point source pollution in the Swan-Canning catchment suggest that the heavy reliance on voluntary mechanisms to improve water quality from agricultural activities in the GBR catchment is unlikely to be successful.⁶⁷⁵ Their point is directly applicable to improving water quality on the GBR:⁶⁷⁶

Unless landholders have a self-interest in engaging in the desired environmental improvements, then information, education and voluntarism alone will usually be unable to overcome the costs barriers (and sometimes conservatism) that often inhibit change.

The current lack of regulation of water quality impacts from rural activities, particularly existing farms, means that the goals of the RWQPP of improving water quality in the GBR over the next 10 years are unlikely to be achieved.

A practical step that might be taken is a major revision of the *Environmental Protection (Water) Policy 1997* (Qld) to expressly provide for requirements for the protection and re-establishment of riparian buffers and farm management plans to manage water quality issues. A major revision of the *Environmental Protection (Water) Policy 1997* (Qld) recently occurred but it was limited to setting water quality targets for South-East Queensland.⁶⁷⁷ It established environmental values and water quality objectives for riverine (freshwater), estuarine and coastal waters in the following areas: Moreton Bay, South-East Queensland; Mary River Basin, Great Sandy Region; and Douglas Shire waters, north of Cairns. The Queensland Government accepted when making these amendments:⁶⁷⁸

Self-regulatory approaches and market-based instruments can provide important supporting mechanisms to regulatory approaches in the protection and enhancement of environmental values, but have not demonstrated effectiveness in achieving coordinated environmental outcomes and, in isolation, would not enhance or protect the environmental values in the waters of the three project areas.

The acceptance by the Queensland Government that self-regulatory and market-based approaches are not likely to be effective for protecting water quality unless placed within a regulatory framework is inconsistent with the approach taken in the RWQPP where voluntary measures and education are relied upon to improve water quality. This reflects the conclusions of Gunningham and Sinclair from their research of non-point source pollution in the Swan-Canning catchment. It also suggests that to be effective in remediating loss of water quality on the GBR the RWQPP needs more than self-regulatory approaches and market-based instruments. One seemingly obvious mechanism that could contribute to this is to extend the amendments to the *Environmental Protection (Water) Policy 1997* to cover the whole GBR catchment.

Failure to regulate the impacts of existing lawful uses in the GBR catchment

The significant threat posed by land-sourced pollution to the GBR is the continuing effect of past development, which raises another important criticism of the response. The vast bulk of past developments are "existing lawful uses" of land that are not regulated

⁶⁷⁵ Gunningham and Sinclair, n 673.

⁶⁷⁶ Gunningham and Sinclair, n 673, p 103.

⁶⁷⁷ See the *Environmental Protection (Water) Amendment Policy (No. 1) 2006* (Qld).

⁶⁷⁸ *Explanatory Notes to the Environmental Protection (Water) Amendment Policy (No. 1) 2006* at p 11. Available at http://www.legislation.qld.gov.au/LEGISLTN/SLS/RIS_EN/2006/06SL030E.pdf (viewed 30 June 2006).

under the existing planning and development approval framework provided by the IDAS in the IPA. The only significant regulatory mechanism in the RWQPP is based upon the IDAS and, therefore, cannot regulate the vast bulk of development that damages the GBR through pollution of coastal waters.

The IDAS is not able to regulate land-sourced marine pollution adequately and the impacts of existing uses in the GBR catchment on the GBRWHA because of the virtual complete protection afforded to existing lawful uses by Chapter 1, Part 4, sections 1.4.1-1.4.8 of IPA. For example section 1.4.1(1) provides as follows:

1.4.1 Lawful uses of premises protected

(1) If immediately before the commencement of a planning instrument or an amendment of a planning instrument the use of premises was a lawful use of the premises and there has been no material change of the use since the commencement of the instrument or the amendment, neither the instrument nor the amendment can—

- (a) stop the use from continuing; or
- (b) further regulate the use; or
- (c) require the use to be changed.

The *State Coastal Management Plan – Queensland Coastal Policy*, which became a state planning policy under IPA, and any coastal management plans eventually prepared under the *Coastal Protection and Management Act 1995* (Qld), also cannot regulate these impacts on the GBR because they are dependent on the IPA planning framework and IDAS process to be given effect.

In a similar manner, the EPBC Act effectively does not regulate existing lawful uses or activities that were fully approved under State and Federal laws as at the commencement of the EPBC Act on 16 July 2000 due to sections 43A and 43B. The same applies to the *Great Barrier Reef Marine Park (Aquaculture) Regulations 2000* (Cth), which do not apply to aquaculture facilities operating at 1 October 2000 unless after that day the volume, nature or composition of the aquaculture waste discharged is significantly increased or altered.

The protection of existing lawful uses is perfectly understandable from a political and equitable perspective. As a general proposition, the principle against the acquisition of property such as existing lawful use rights without fair compensation is commendable. However, existing lawful uses contribute the bulk of land-sourced marine pollution at the present time, yet are virtually unregulated by the law. This situation could be significantly redressed by a new Environmental Protection Policy for water, as was suggested in the previous section.

As the RWQPP currently stands, it does not adequately address this issue because it is based around regulating new development, not existing development. Existing development is addressed through voluntary changes to land-use practices and government funding for rehabilitation of degraded environments. For example the National Heritage Trust fund has provided funding for rehabilitation of some streambanks and wetlands since 1998.

This concludes the evaluation of the effectiveness of the response to pressures and the condition of the GBR for the purposes of this thesis. The results of this analysis will be compared in the next chapter with the extent to which published SoE reports relevant to the GBR attempt to evaluate the effectiveness of the response to pressures and the condition of the GBR.

Chapter 7

Do published SoE reports evaluate effectiveness?

This chapter analyses whether published State of the Environment (“SoE”) reports adequately evaluate the effectiveness of environmental legal systems. This is an important question because published SoE reports are the primary means by which policy-makers and the community can be informed about the effectiveness or ineffectiveness of an environmental legal system. These matters are reflected in the stated objectives of SoE reporting, which include:⁶⁷⁹

- to provide an early warning of potential problems;
- to report on the effectiveness of policies and programs designed to respond to environmental change, including progress towards achieving environmental standards and targets ...

If rigorous, objective evaluation of the effectiveness of environmental policies does not occur during the SoE process, not only are the reports not meeting these objectives but an important opportunity for improving environmental laws and policies is lost. If this occurs it is a serious loss because, at least in Australia, SoE reports are the only regular, comprehensive reviews of environmental policy and trends in the environment.

To test whether published SoE reports evaluate the effectiveness of the response, including the environmental legal system, the SoE reports relevant to the Great Barrier Reef (“GBR”) over the past ten years will be reviewed and compared with the results of the case study in the previous chapter. Only the major, official reports relevant to the GBR and the Cardwell-Hinchinbrook region will be dealt with here. These reports present the views of the government and/or the scientific community. The analysis is limited to the past ten years because this covers the period when SoE reporting has been widely adopted and during which the environmental problems that are currently recognised as the most serious for the GBR have been identified. Deteriorating water quality due to coastal development, fishing pressure, and coral bleaching due to climate change were all identified as pressures by 1996, although their causes and extent remained disputed.⁶⁸⁰

SOE REPORTS RELEVANT TO GBR

There have been many SoE reports and SoE-style reports published over the past ten years at international, national and State levels relevant to the GBR and Cardwell-Hinchinbrook region. International level reports, such as GEO-3 and GEO-4 discussed earlier in this thesis, that do not contain specific analysis of the legal regime protecting the GBR will not be considered here. This is because the focus here is on whether SoE reports evaluate the effectiveness of the protection of the GBR and global level reports do not contain specific information on this topic. The main reports relevant to the GBR and Cardwell-Hinchinbrook region, in chronological order, are as follows.

⁶⁷⁹ DEST, n 353, p 13. Expressly adopted in the 1996 by SEAC, n 1, p 1-5.

⁶⁸⁰ See GBRMPA, *The Great Barrier Reef science, use and management - a national conference: proceedings* (GBRMPA, Townsville, 1997). Note also in relation to downstream effects of land use on water quality, various papers in Hunter HM, Eyles AG, and Rayment GE (eds), *Downstream Effects of Land Use* (DNR, Brisbane, 1996).

Australia State of the Environment 1996

The *Australia State of the Environment 1996* report was ground-breaking in an Australian context for its scope, methodology, and rigour. In many ways it set the standard against which SoE reporting in Australia has been measured. The State of the Environment Advisory Council (“SEAC”) summarised the key issues for assessing and improving the state of Australia’s environment in relation to biodiversity, land degradation and global climate change as follows:⁶⁸¹

Biodiversity

The major threats to biodiversity are: land clearing; loss of native forests; introduced species; the absence of some representative ecosystems in national parks and other reserves; and the lack of knowledge about our biodiversity. ...

Global climate change

Global warming and other climatic changes which result from increased emissions of greenhouse gases pose a serious problem, both in terms of the direct impacts and the potential to aggravate other environmental problems such as biodiversity loss. While Australia’s total emissions of greenhouse gases are small in global terms, our per capita emissions are among the highest in the world. We do not appear to be making much progress in stabilising, let alone reducing, these emissions.

The SEAC evaluated some of the pressures, states, and responses and noted Australia is doing well – in some cases setting an international example – for a range of issues including our structural solutions to complex management problems such as the GBRMPA.⁶⁸² The SEAC also noted a number of questionable and poor responses, including:⁶⁸³

- Adequate measures are not yet in place to combat the threats to biodiversity.
- Concerns remain about whether the changes to fisheries management are enough to reverse the decline in fish stocks.
- Despite the commitment to ecologically sustainable development, some government agencies still see their primary role as promoting economic development, with little regard to environmental costs.
- While land clearing is restricted in some States, in others it continues to be tolerated and even encouraged.
- Urban planning in general, and transport planning in particular, are still problems, with few effective attempts to contain urban sprawl or discourage the use of private cars. There is no concerted attempt to redirect our pattern of energy consumption in a sustainable direction.
- Australia is falling short of its greenhouse gas emission reduction targets. In recent years, energy-related carbon dioxide emissions have grown much faster than the OECD average.

The SEAC went on to make more detailed and critical evaluations of Australia’s responses to pressures on the environment. Main chapters evaluated program effectiveness as “positive”, “inadequate”, or “uncertain”, and provided summary tables of the effectiveness of responses to specific pressures.⁶⁸⁴ The SEAC noted that habitat

⁶⁸¹ SEAC, n 1, p ES-7.

⁶⁸² SEAC, n 1, p ES-8.

⁶⁸³ SEAC, n 1, p ES-9.

⁶⁸⁴ For example, see SEAC, n 1, pp 3-47 – 3-48 and Table 3.42 (Summary – Human Settlements), p 3-46.

modification – especially the removal of native vegetation for agriculture, urban development and forestry – has been, and remains, the most significant cause of loss of biodiversity.⁶⁸⁵ It also made the following comments on Australia's response to the greenhouse effect:⁶⁸⁶

Unless large reductions in emissions occur, the concentrations of most greenhouse gases will continue to rise well into the next century. Models indicate that carbon dioxide levels will more than double unless global emissions are reduced to well below 1990 levels. Australia produces between one and two per cent of global greenhouse emissions, which come mainly from fossil-fuel burning, landclearing and agriculture.

Initiatives to reduce emissions under the National Greenhouse Response Strategy (NGRS) have achieved limited success. ...

Specific consideration was given to the pressures, state and response for the GBR.⁶⁸⁷ Coral bleaching due to climate change was not recognised as a pressure on the GBR but declining water quality and fishing were recognised as pressures. The response to protecting the GBR and coral reefs was generally evaluated as effective or partially effective.⁶⁸⁸

Eric Anderson and nine leading experts reviewed the report.⁶⁸⁹ While welcoming the ground-breaking nature of the report they noted a number of major deficiencies, including the fact that there was "little reporting on the ... effectiveness of policies and programs designed to respond to environmental change."⁶⁹⁰ Steven Dovers noted in relation to the concluding chapter of the SoE report, which was devoted to addressing the steps needed to move towards ecological sustainability:⁶⁹¹

The chapter makes a hugely important point, while recognising chronic shortages of information in all areas: the worst area for information is not "state", or "pressure", but *response*. That is, what policies and management strategies there are, what their status is, what their linkages to other policies are, and how effective they are.

The criticisms made by these authors are significant. It is clear that while the report did provide some evaluation of the effectiveness of the response, the evaluation was insufficient to make the report the highly useful tool for improving environmental policy that it had the potential to be. As will be seen, this was not rectified in later reports.

State of the Herbert, Murray and Tully Rivers 1996 and 1999

The state of the Herbert, Murray and Tully Rivers was assessed in 1996 and 1999 as part of a statewide assessment process to inform integrated catchment management in Queensland. These reports aimed to establish a baseline for use in long-term monitoring of watercourse condition by taking a 'snap shot' of a large number of sites within catchments.⁶⁹² Sites were assessed for a range of ecological and physical attributes as pristine, good, moderately degraded, or severely degraded. The reports noted pressures

⁶⁸⁵ SEAC, n 1, p ES-13.

⁶⁸⁶ SEAC, n 1, p ES-15.

⁶⁸⁷ SEAC, n 1, p 8-44.

⁶⁸⁸ SEAC, n 1, pp 8-44 and 8-50.

⁶⁸⁹ Anderson E (ed), *Review of National SoE Report* (1997) 4 AJEM 157.

⁶⁹⁰ Anderson, n 689, p 158.

⁶⁹¹ Dovers S, "Chapter 10 – Towards ecological sustainability" in Anderson, n 689, p 181.

⁶⁹² Anderson JR, *State of the Rivers Project: Report 1: Development and Validation of the Methodology* (Department of Primary Industries, Brisbane, 1993), pages ii-iii.

due to agricultural activities in particular but contained little information on responses to those pressures. With two significant exceptions, the reports provide a very useful assessment of the ecological and physical condition of the catchments. The exceptions are that the reports fail to include information on water quality and the levels of natural flow regimes in the catchments. These are significant omissions, however, the methodology for the reports conceded that water quality and stream flow measurements would be an optional part of the surveys due to the 'snap shot' approach taken not allowing temporal variation in water quality and flows to be assessed.⁶⁹³

Denise Johnson found the state of the Tully and Murray River catchments to be degraded particularly in the lower reaches adjacent to sugarcane production:⁶⁹⁴

Extensive clearing of native vegetation throughout the study area, for both agricultural and grazing purposes, has resulted in considerable land degradation. Degradation is most extensive in areas where appropriate management practices have not been employed.

Johnson did not address the effectiveness of responses to catchment degradation in detail. She made a number of rather obvious, general recommendations that were not related to any specific legislation or policies, including:⁶⁹⁵

Management practices within the riparian zone and reach environs of the streams should focus on minimising further degradation and on the rehabilitation and revegetation of degraded areas.

Retention and management of all existing areas of riparian vegetation should be promoted and the reestablishment of riparian vegetation along streams should be encouraged, particularly where stream bank erosion could occur. In addition, the clearing of vegetation within the riparian zones of watercourses should be restricted.

Glen Moller reported the condition of the Herbert River in the southern Cardwell-Hinchinbrook region to be generally better due to more of the catchment being subject to cattle farming and lesser extents of sugarcane production.⁶⁹⁶ He made similar, unspecific recommendations for improved management of catchment areas such as:

Riparian vegetation and reach environs should be managed to ensure further degradation of these areas does not occur and that those that are degraded are rehabilitated to a more functional condition.

The lack of any specific recommendations for improved legislation or policy for vegetation management can be seen in the context of the laws and policies that existed at the time when these reports were written. At that time there was no general protection of vegetation on private land in the Cardwell-Hinchinbrook region under Commonwealth, Queensland or local government law except for vegetation within the bed and banks of

⁶⁹³ Anderson, n 692, p 13. However, later studies have addressed water quality issues in these catchments. See Bramley RGV and Muller DE, *Water quality in the lower Herbert River: CSIRO Land and Water Technical Report 16/99* (CSIRO, Melbourne, 1999); Mitchell A, Reghenzani JR and Furnas M, "Nitrogen levels in the Tully River – a long-term view" (2001) 43(9) *Water Science and Technology* 99-105; and Brodie JE, Christie C, Devlin M, Haynes D, Morris S, Ramsay M, Waterhouse J, and Yorkston H, "Catchment management and the Great Barrier Reef" (2001) 43(9) *Water Science and Technology* 203-211.

⁶⁹⁴ Johnson, n 578, p 4.

⁶⁹⁵ Johnson, n 578, page vi.

⁶⁹⁶ Moller, n 586.

watercourses.⁶⁹⁷ The protection of vegetation largely depended on voluntary measures of landholders and the results of the studies show how ineffective this was in protecting the vegetation. The calls in these reports for “improved management” of riparian vegetation to prevent further degradation of the catchments appear, therefore, to be little more than platitudes.

OECD Environmental Performance Review 1998

The OECD reviewed environmental performance in Australia as part of a worldwide review of member countries.⁶⁹⁸ The review assessed Australia’s environmental performance in three areas: implementation of environmental policies for natural resources management and pollution control; integration of environmental concerns and economic decisions; and international co-operation on environmental protection. It also assessed the extent to which Australia’s domestic objectives and international commitments were being met, based on the criteria of environmental effectiveness and economic efficiency.

This review was very qualitative and lacked any real insight into the nature of Australia environmental politics and the Australian policy environment. It made broad, unmeasurable statements such as “there is considerable scope for improving waste management in Australia.” This is perhaps explained by the fact it was written by experts from Canada, New Zealand, Norway and Germany, and none of the authors were Australian. It is understandably difficult for people unfamiliar with a country to review a complex and foreign system of governance.

The review was also written in diplomatic language such as, “it is recommended that consideration be given to the following ...” This meant the review did not make clear recommendations for action, merely that consideration be given at some unspecified time and in some unspecified way to taking such actions. The review did not give a clear evaluation of Australia’s environmental performance either overall or in specific areas. Overall, the review contributed little of substance.

State of the GBRWHA 1998

The *State of the GBRWHA 1998* report loosely used the SoE framework to report on the environmental and management status of the GBRWHA.⁶⁹⁹ Environmental status was considered in relation to water quality, and the health of corals, plants and animals on the reef. Management status considered some specific management issues such as fisheries, tourism, shipping and oil spills. The report emphasised the lack of information about, and natural variability of, the reef environment to explain why “for most environmental attributes, it is not possible to say with certainty if they are in a satisfactory or unsatisfactory condition.” Despite this uncertainty, the report concluded that “the lack of any major declines and uncontrolled human pressures permits a cautiously optimistic conclusion” to be drawn about the health of the GBR.

The report lacked any detailed consideration of management of the adjacent catchment and did not evaluate the effectiveness of the responses in anything more than a

⁶⁹⁷ This protection was provided by the *Water Resources Act 1989* (Qld) but rarely enforced. General protection of vegetation on private land did not exist until late-2000 when the *Vegetation Management Act 1999* (Qld) commenced.

⁶⁹⁸ OECD, *Environmental Performance Reviews – Australia* (OECD, Paris, 1998).

⁶⁹⁹ GBRMPA, *State of the GBRWHA 1998* (GBRMPA, Townsville, 1998).

superficial manner. Overall, the report was merely descriptive and did not evaluate the effectiveness of planning and management responses either in the GBR or its adjacent catchment.

State of the Environment Queensland 1999

SoE reporting has been a statutory obligation in Queensland since 1994. The legislation's stated aims included to "evaluate the efficiency and effectiveness of environmental strategies implemented to achieve ESD."⁷⁰⁰

The *State of the Environment Queensland 1999* report was the first SoE report produced by the Queensland Government.⁷⁰¹ Unlike the national SoE report the Queensland SoE report was not produced by an independent body but by panels of experts for each chapter operating under the umbrella of the Queensland Environmental Protection Agency.

The report used the PSR framework of SoE reporting based on the structure of the national SoE report. There were eight chapters on substantive themes dealing with atmosphere, land, inland waters, coastal zone, energy resources, biodiversity, human settlements, and cultural heritage.

The report was almost entirely descriptive of pressures, state and responses. A glaring example of this was land clearing:⁷⁰²

Clearing of native ecosystems is the factor contributing most to the loss of biodiversity in Queensland. ... The current annual clearing rate is currently approximately 289,000 hectares ... Habitat clearance is the major cause of, or a cause contributing to, the decline of at least 44 threatened vertebrate species.

Despite such categorical statements about the pressure and declining state of the environment due to broadscale land clearing, the report merely catalogued the responses to these pressures without any comment on their patent ineffectiveness to achieve sustainable development.⁷⁰³ The report was written prior to the enactment of the *Vegetation Management Act 1999* (Qld) and consequently, there was no effective control of land clearing on the 23% of the State that was freehold land. The report did not criticise this glaring hole in the legislative framework for sustainability but merely stated the following without demurrer:⁷⁰⁴

The Queensland Government is committed to development of a comprehensive system of vegetation management across all tenures that provides for the ecologically sustainable development of land while protecting biodiversity and other environmental and social values.

In relation to the GBR, the report noted some impacts on water quality and coastal development but found no clear trends were discernable on the information available.⁷⁰⁵ Again, the report was very descriptive of pressures, state and responses and lacked critical evaluation of the effectiveness of responses even where problems were clearly evident.

⁷⁰⁰ EPA, n 326, p 1.3. The statutory obligations are imposed by section 218 of the *Environmental Protection Act 1994* (Qld) and section 102 of the *Coastal Protection and Management Act 1995* (Qld).

⁷⁰¹ EPA, n 326.

⁷⁰² EPA, n 326, p 7.3. See also p 7.11.

⁷⁰³ See EPA, n 326, pp 7.54-7.66. See the criticisms of vegetation laws in Queensland in McGrath, n 330.

⁷⁰⁴ See EPA, n 326, p 7.55. See also pp 7.63-7.64.

⁷⁰⁵ See, in particular, EPA, n 326, pp 5.38-5.39.

Such uncritical description of the response to clearly identified unsustainable pressures and declining conditions severely undermines the independence and credibility of the report. The report appears to merely repeat government policy rather than being an independent and rigorous evaluation of the SoE and response. Unlike the national SoE report the Queensland SoE report lacked a summary chapter synthesising its findings and making recommendations for improvement. Given the problems identified in the main body of the report, such a chapter, if well-written, independent and rigorous, would have greatly improved the usefulness of the report. The report, therefore, did not fulfil its stated or statutory requirement to “evaluate the efficiency and effectiveness of environmental strategies implemented to achieve ESD.”

Evaluation of ICM in the Herbert River Catchment 1999

Jennifer Bellamy and her colleagues made a major study of integrated catchment management (“ICM”) in Queensland using the Herbert River Catchment from 1993 to 1998.⁷⁰⁶ They reviewed organisational, economic, social, environmental and legal aspects of ICM in this catchment detail for their study. While they did not use the SoE framework, their analysis covered the pressures, state and response for ICM in this catchment in detail.

The study included a review of land use planning and management controls on agricultural development in the Herbert River Catchment. Geoff McDonald and Jennifer Bellamy made numerous criticisms of these processes, including noting the planning controls only regulated new development. They noted in relation to this that:⁷⁰⁷

Unfortunately, regulating new developments only through the planning process will not be effective in dealing with existing resources management problems. To the extent that existing uses are unsustainable or that minor variations in those uses will not be affected by any planning provisions, this approach will not contribute to ESD.

Karen Vella reviewed local government solutions to mangrove and wetland conservation in the Herbert River Catchment and made similar criticisms. She commented in relation to the incorporation of ICM by local governments responsible for the Herbert River Catchment:⁷⁰⁸

Considerable advances in environmental protection have been made in those shires that have sought to incorporate ICM principles into planning schemes. However local government land use planning is not the answer in itself. While it does have enormous scope in achieving catchment management objectives, it is limited in that it can only implement these strategies when a development application is triggered by the planning scheme. Therefore to effectively achieve ICM, planning schemes and development assessment will need to be integrated with other land management arrangements that can deal more effectively with existing unsustainable use rights.

Andrew Johnson and Jennifer Bellamy evaluated the environmental performance of the sugar industry in the Herbert River Catchment and concluded:⁷⁰⁹

The evidence presented in the preceding sections clearly suggests that the quality of the natural resource base on which the sugar industry depends is declining and that many

⁷⁰⁶ Bellamy, n 465.

⁷⁰⁷ McDonald G and Bellamy J, “ICM in the Herbert River Valley”, Ch 1 in Vol 3 of Bellamy, n 465, p 12.

⁷⁰⁸ Vella K, “Local government solutions to mangrove & wetland conservation”, Ch 2 in Vol 3 of Bellamy, 465, p 123.

⁷⁰⁹ Johnson AKL and Bellamy JA, “Managing for ecological sustainability: moving from rhetoric to practice in the Australian sugar industry”, Ch 6 in Vol 3 of Bellamy, 465, p 287.

key components of the surrounding terrestrial, aquatic and marine ecosystems are impacted by sugar industry activities.

Johnson, Ebert and Murray also evaluated wetland management and vegetation clearing in the Herbert River Catchment.⁷¹⁰ They concluded that there has been a significant reduction in the riparian and wetland area and that landscape diversity and quality have also declined. They suggested a range of motivational and voluntary incentives, tradable property rights, regulation, and taxation incentives to address these declines but gave little detail on these measures.

What is most impressive and instructive about the work of Bellamy and her colleagues is their multi-disciplinary approach and the detail of their research. They attempted to evaluate the achievement of ESD through ICM from many perspectives, not just environmental but social and cultural ones as well. They chose a relatively small study area with relatively large resources in terms of organisation and personnel. Even so, they did not produce a clear evaluation of the effectiveness of ICM or make clear recommendations on areas for improvement. This suggests that, other than through a general educative role, their substantial body of work will not be effective in promoting necessary changes in the response to pressures and declines in the conditions of catchments in the study area or elsewhere.

ANZECC review of the NSCABD 2001

The ANZECC review of the *National Strategy for the Conservation of Australia's Biological Diversity*, adopted in 1996, reported on progress in conserving Australia's biodiversity.⁷¹¹ It only loosely used the PSR method of SoE reporting. It evaluated the effectiveness of responses by assessing progress in achieving each objective of the strategy and designated each as: achieved; achieved, ongoing effort required; partially achieved; or not achieved.

The review was very short relative to the scale and complexity of the issues it considered. It was a mere 102 pages in total covering the whole of Australia. It lacked detail and tended to focus on policies of the Australian Government when it is the laws and policies of State, Territory and local governments that are far more important for conserving biodiversity in practice. A pervasive flaw in the methodology of the review was that the objectives of the 1996 strategy were so qualitative that it was possible to evaluate them as "achieved" without there being meaningful improvement in the condition of the environment. For instance, in relation to the management of conservation, the review assessed the following objective as "achieved":

Improve the standards of management and protection of Australia's biological diversity by encouraging the implementation of integrated management techniques.

Assessment of this objective as "achieved" is highly doubtful and can be justified only on the basis that the objective itself is so loosely worded that any "improvement by

⁷¹⁰ Johnson AKL, Ebert SP, and Murray AE, "Spatial and temporal distribution of wetland and riparian zones and opportunities for their management in catchments adjacent to the GBR Marine Park", Ch 6 and 7 in Vol 6 of Bellamy, 465.

⁷¹¹ ANZECC, *Review of the National Strategy for the Conservation of Australia's Biological Diversity* (ANZECC, Canberra, 2001). See <http://www.deh.gov.au/biodiversity/publications/review/index.html> (viewed 25 September 2006).

encouraging the implementation of integrated management techniques” is viewed as success even if there is no tangible improvement in biodiversity conservation.

While the review did make categorical assessments of “not achieved” in relation to the objectives to conserve native vegetation and minimising the impacts of climate change, this was poorly justified in terms of the information presented in the review. In relation to Queensland, which at the time of the review was experiencing very high rates of land clearing, the review merely noted the passage of new legislation, the *Vegetation Management Act 1999* (Qld), without criticism.⁷¹² Overall the review lacked rigour.

Australia State of the Environment 2001

The *Australia State of the Environment 2001* report was the second national SoE report.⁷¹³ It used a similar format as the first national SoE report built around the PSR method but using “condition-pressure-response” terminology rather than “pressure-state-response”. As the first national report had done, the 2001 report reported on “favourable, unfavourable, and uncertain” news about the environment. There was much greater use of quantitative indicators in the 2001 report, which was a significant improvement in the report methodology. Instead of a single document, the report was broken into a summary report and seven theme reports for atmosphere, coasts and oceans, land, inland waters, biodiversity, natural and cultural heritage, and human settlements.

As a general point, the theme reports, which are written by teams of independent experts, were more categorical, rigorous, and evaluative than the summary report. The theme report for biodiversity considered progress in relation to the key issues identified in the first SoE report.⁷¹⁴ In relation to land clearing it concluded:⁷¹⁵

The clearance of native vegetation remains the single most significant threat to terrestrial biodiversity. The situation is deteriorating as threatening activities continue.

In relation to the GBR the theme report for biodiversity stated:⁷¹⁶

Threats affecting Australia’s coral reefs include the effects of sediments, agricultural chemicals and nutrients, the effects of fishing and tourism, the threats of oil spills, and negative changes in habitats as a result of enhanced climate variability and climate change.

In relation to climate change the theme report for biodiversity stated:⁷¹⁷

Climate change remains a key issue confronting Australia. The response of the Australian government to the Kyoto Protocol has significantly changed the way climate change is viewed and the amount of resources directed to this issue. In terms of the climate change policy of the present Commonwealth government, emphasis has been placed on the mitigation of greenhouse gases emissions through processes such as the Greenhouse Challenge, with the direct and indirect effects of climate change on

⁷¹² See the criticisms of vegetation laws in Queensland at that time in McGrath, n 330.

⁷¹³ ASEC, n 1. That is, the second of the “modern” SoE reports and ignoring the SoE reports produced in the mid-1980s. See also, Environment Australia, *Are we sustaining Australia? A report against Headline Sustainability Indicators for Australia* (Environment Australia, Canberra, 2001) where an attempt was made to evaluate progress against sustainability indicators.

⁷¹⁴ Williams J, Read C, Norton A, Dovers S, Burgman M, Proctor W, Anderson H, *Biodiversity – Australian State of the Environment Report 2001 (Theme Report)* (CSIRO Publishing, Melbourne, 2001), Tables 3 and 4, pp 19-22.

⁷¹⁵ Williams et al, n 714, p 19.

⁷¹⁶ Williams et al, n 714, p 2. See also pp 61-69.

⁷¹⁷ Williams et al, n 714, pp 4-5.

biodiversity receiving much less attention. This situation must change if the potential impacts of climate change on terrestrial (e.g. alpine and arid zone) and marine (e.g. Great Barrier Reef) biodiversity are to be adequately researched, better understood and managed. The important role of native vegetation in carbon sequestration and the mitigation of climate change is well known. Despite this, some Australian jurisdictions continue to permit high rates of land clearance.

The theme report for biodiversity summarised its conclusions and evaluation as follows:⁷¹⁸

The destruction of habitat by human activities remains the major cause of biodiversity loss. Land management issues such as the clearance of native vegetation, control of exotic weeds and pests, provision of environmental flows in rivers, geographical expansion of dryland salinity, changed fire regimes and intensification of resource use in sectors such as forestry, fisheries and agriculture are well known and widely reported. Many attempts to address these issues have been inadequate or have stalled. This situation must change if the future of Australia's biodiversity is to be safeguarded. Failure to reverse these trends will not only guarantee further loss of biodiversity, but also will diminish the quality of life enjoyed by Australians and ultimately undermine the Australian economy.

Governments are fundamental and critical to biodiversity conservation in Australia. However, policies relating to biodiversity conservation have not been commonly matched by effective policy implementation and good biodiversity outcomes. During the 1990s, Australia's biodiversity has experienced continued degradation and decline. Clearly, the sustainable management of Australia's resource base will not be possible unless many more financial and human resources are directed to support improved understanding and management of the nation's terrestrial and marine ecosystems.

The clear evaluation and criticisms of the response to biodiversity conservation are not generally reflected in the summary report. For example, in summarising the trend in the condition of species the summary report stated:⁷¹⁹

The condition, although variable, is generally deteriorating, pressure is increasing and the response has been adequate in some respects.

The summary report hardly reflects the categorical language of the theme report on biodiversity and its "evaluation" is essentially meaningless. The statement that, "the response has been adequate in some respects" hardly seems justified if "the condition ... is generally deteriorating." The failure to include the clear criticisms of the response in relation to issues such as biodiversity conservation logically affects the communication of these criticisms and the need for change. Clear statements in such a summary report are essential because most users of the report will only read the summary and not delve into the detail of the theme reports.

Even comparing the theme reports there are major variations in the rigour of the assessment and level of evaluation undertaken. A glaring example of poor rigour and evaluation is the failure to address whether the response to greenhouse gas emissions is likely to be effective in preventing dangerous climate change in the theme report on atmosphere.⁷²⁰ The theme report recognises the seriousness of the threat of enhanced greenhouse effect but merely states what the policies of the Australian Government are without evaluating their likely effectiveness. In some ways the theme report is outright

⁷¹⁸ Williams et al, n 714, pp 6-7.

⁷¹⁹ ASEC, n 1, Summary Report, p 71.

⁷²⁰ Manins P, Allan R, Beer T, Fraser P, Holper P, Suppiah R, and Walsh K, *Atmosphere – Australian State of the Environment Report 2001 (Theme Report)* (CSIRO Publishing, Melbourne, 2001).

misleading. For example, in relation to the key indicator of greenhouse gas atmospheric concentrations the theme report notes that the state is “increasing, with current concentrations the highest in at least the last 1000 years.” However, it considers the response to this is “monitoring, calibration of measurements” which are “effective, but tropical measurements needed.”⁷²¹ This evaluation appears to say that the measurement and monitoring of greenhouse gas concentrations has been effective without considering whether the response to increasing greenhouse gas concentrations has been effective in reducing or stabilising them. This is a serious error and omission on a critical issue that is not corrected in the theme report or the summary report. In fact, the theme report goes on to almost accept that climate change as inevitable and that:⁷²²

Careful planning will minimise the harm caused to the environment and the economy, while maximising positive consequences of climate change.

It is very surprising that the atmosphere theme report would make such a statement, belittling the threat of climate change with such a cavalier attitude and almost welcoming it through seeking to maximise its “positive consequences”. This does not reflect the scientific literature of the likely catastrophic impacts of climate change – catastrophic not in the sense that humanity will not survive, but that the world will be radically altered with many species extinctions and severe disruption to ecological processes and human civilization.⁷²³

Climate change is poorly and misleadingly evaluated in the 2001 SoE report. Aside from this issue, the report does contain significant evaluation of the effectiveness of environmental policies although these are not well reflected or communicated in the summary report. The evaluations in the biodiversity theme report are generally justified by the evidence presented and in relation to the protection of the GBR at least, reflected the wider scientific literature. However, a reader must “dig” through the theme reports to really understand what is happening and what needs to be addressed.

National Land and Water Resources Audit 1997-2002

The National Land and Water Audit collected primary data and information related to Australia’s natural resource management to set the benchmark for reporting on the condition of Australia’s natural resources and to complement national SoE reporting.⁷²⁴ The audit was an initiative of the National Heritage Trust and the final report was released in 2002. The final reports were broken into themes, such as terrestrial biodiversity.⁷²⁵ As the focus of the audit was terrestrial land and water, its significance to the GBR is limited to the benchmarking of the condition of adjacent river catchments.

The final reports of the audit only loosely adopted the PSR method of SoE reporting to report on conditions and trends. Many of the issues identified in SoE reports were recognised in the audit. For example, land clearing was recognised as a key threat to terrestrial biodiversity. GBR catchments were assessed as having a wide range of

⁷²¹ Manins, n 720, p 8.

⁷²² Manins, n 720, p 59.

⁷²³ See, for example, Houghton, n 21, and Pittock, n 21.

⁷²⁴ See <http://www.nlwra.gov.au> (viewed 25 September 2006).

⁷²⁵ Sattler P and Creighton C, *Australian Terrestrial Biodiversity Assessment* (Land & Water Australia, Canberra, 2002). Available at <http://www.lwa.gov.au> (viewed 25 September 2006).

conditions from highly modified/poor to pristine.⁷²⁶ The lower catchments in the Cardwell-Hinchinbrook region were assessed as moderate to poor condition. The value of the reports is in benchmarking environmental conditions and there was little evaluation of effectiveness of responses.

GBR Water Quality: Current Issues 2001

David Haynes edited a major review of the impacts of human activities on GBR water quality in 2001.⁷²⁷ The activities and impacts considered were wide-ranging and included: land-sourced and ship-sourced marine pollution; global climate change; and altered river flow regimes from dams and weirs. Haynes and his contributing authors described the current institutional and policy arrangements for water quality management on the GBR and concluded:⁷²⁸

The greatest threat to the Great Barrier Reef has been identified as land-based run-off resulting from agricultural activities (cattle grazing, vegetation clearance and intensive cropping) in the catchments. Vegetation clearing on Queensland agricultural lands is still being carried out at rates that are up to an order of magnitude higher than in any other Australian State, and soil erosion and associated pollutant losses continue to be significant problems on Queensland agricultural properties. Agricultural industries, including grazing and cropping, are currently not accountable for pollutants discharged into Queensland's catchments. Agriculture is largely exempted from the Queensland Environmental Protection legislation and associated regulatory provisions. ...

Corals reefs worldwide, and including the Great Barrier Reef are threatened by increased seawater temperatures and altered water chemistry caused by global atmospheric change. This global threat may lead to progressive weakening of reef structures and eventually death of tropical coral reef ecosystems. Global warming will continue to threaten coral reefs worldwide unless effective action is taken to reduce carbon dioxide and other greenhouse gas emissions. The pre-eminent risk to inshore coral reefs and seagrass communities in the Great Barrier Reef is posed by water quality degradation resulting from pollutants contained in land run-off. If fundamental changes in land-management in Queensland do not occur (including immediate minimisation of vegetation clearance, erosion and responsible use of pesticides and fertilisers), the health of the inshore ecosystems of the Great Barrier Reef World Heritage Area is likely to continue to decline.

Despite reaching such strong conclusions, astoundingly, Haynes and his contributing authors made no direct criticisms or evaluation of the effectiveness of existing legislative and policy frameworks to protect the water quality of the GBR. Their report merely described the pressures, conditions, and responses to water quality on the GBR without in any way criticising the responses despite finding major pressures and deteriorating conditions for GBR water quality.

Science Panel for the RWQPP 2003

Partially as a result of the report by Haynes and his contributing authors the Commonwealth and Queensland Governments formed an Intergovernmental Steering Committee to prepare the Reef Water Quality Protection Plan ("RWQPP"). The

⁷²⁶ National Land and Water Resources Audit Advisory Council, *Australian Catchment, River and Estuary Assessment 2002 - a report of the National Land and Water Resources Audit* (Land and Water Australia, Canberra, 2002). Available at <http://www.lwa.gov.au> (viewed 25 September 2006).

⁷²⁷ Haynes, n 544.

⁷²⁸ Haynes, n 544, Ch 8, pp 61-68.

Committee sought a review of the evidence of impacts on GBR water quality. The science panel that conducted this review concluded that water quality on the GBR had declined due to land-sourced marine pollution. The science panel:⁷²⁹

found that there are clear indications that major land use practices in the river catchments, delivering waters to the Reef, have led to accelerated erosion and greatly increased the delivery of nutrients over pre-1850 levels. The reasons for this decline are varied but relate to activities within the river catchments, such as the extensive grazing practices in the drier catchments and overgrazing in general, urban development, agricultural (including horticultural) production, water use practices, extensive vegetation clearing and wetland drainage on coastal plains and development on acid sulphate soils ...

The Panel found that there is clear evidence of the effect of these practices on some rivers, estuaries and inshore areas. Reefs at a number of inshore locations along the coast have been disturbed and have remained in a disturbed state. These reefs exhibit characteristics consistent with altered ecological function due to enhanced nutrient availability or sedimentation. ...

Scientific measurements, calculations and predictive modelling of water quality conducted over the past 15 years consistently indicate that there has been at least a four-fold increase in sediment and nutrient delivery to rivers discharging to the Reef. ...

Extensive vegetation clearing and drainage works on coastal plains have significantly reduced the extent of riparian vegetation and wetlands (permanent and seasonal) and significantly degraded remnant habitats through weed infestations and loss of fringing vegetation.

The report of the science panel for the RWQPP reflected the wider scientific literature showing declining water quality in the inshore GBR discussed in the previous chapter of this thesis. The evaluation showed that the response to water quality was inadequate. This contributed to the adoption of the RWQPP the following year.

State of the Environment Queensland 2003

The *State of the Environment Queensland 2003* report was the second SoE report produced by the Queensland Government.⁷³⁰ As for the first report, it was structured around the PSR method of SoE reporting and its stated aims included to “evaluate the efficiency and effectiveness of environmental strategies implemented to achieve ESD.”⁷³¹ As the first report had done, it did not achieve this aim as the report was entirely descriptive and there was the complete absence of critical evaluation of the effectiveness of government policy.

Land clearing is again the clearest example of the purely descriptive nature of the 2003 SoE report and uncritical parroting of government policy. At the time the report was prepared a system to regulate clearing of vegetation on freehold land had commenced under the *Vegetation Management Act 1999* (Qld); however, the rate of land clearing remained extremely high.⁷³² The report noted:⁷³³

The major pressures on Queensland’s biodiversity induced by human settlement and land use continue to be the loss, degradation and fragmentation of native habitat.

⁷²⁹ Science Panel for the RWQPP, n 548, pp 9-11.

⁷³⁰ EPA, n 355.

⁷³¹ EPA, n 355, p 1.7.

⁷³² EPA, n 355, p 4.6. The legal regime for vegetation clearing at this time is described and critiqued in McGrath n 330.

⁷³³ EPA, n 355, p 7.3.

Despite recognising the major threat posed by land clearing, the 2003 SoE report failed to recommend changes to land clearing laws or policy in the State. The fact that this was a glaring omission from the report is clear from the fact that less than 12 months after the report was published the Queensland Government enacted major changes to laws regulating vegetation management in the State, including a complete phase-out of broadscale clearing by 31 December 2006.⁷³⁴ These laws were precipitated by a major political controversy that fuelled widespread “panic” clearing by farmers.⁷³⁵

The 2003 SoE report took a similarly uncritical view of government responses to climate change and changes in water quality to the GBR.⁷³⁶ While the 2003 report included an introductory chapter on “towards sustainability” this chapter merely described initiatives undertaken by the government and the community for sustainability – it did not synthesise the findings of the report or critically evaluate progress towards sustainability.

In short, the 2003 SoE report was purely descriptive and did not critically evaluate the effectiveness of the response. This was a major deficiency in the report. While major legislative and policy changes occurred shortly after the report was published they were in spite of the report failing to identify a need for changes rather than because of the report. A well written chapter summarising considering the effectiveness of environmental policy would have greatly improved the usefulness of this report.

Status of the Coral Reefs of the World 2004

The *Status of the Coral Reefs of the World 2004* was a major, international review of global coral reef health. It recognised that the major threat to the GBR is regarded as global climate change.⁷³⁷ It also noted rising concern about land-sourced marine pollution and over-fishing.⁷³⁸ It provided an overview of the monitoring and regulatory regimes for the GBR, noting particularly:⁷³⁹

The designation of 33% of the GBR Marine Park as no-take zones, coupled with moves to improve the sustainability of fisheries and a Reef Water Quality Protection Plan designed to improve coastal water quality over the next 10 years, represent active management to promote the sustainable use of the Marine Park. These initiatives will be increasingly important in supporting the capacity to recover from the major potential threat to all Australian reefs: global climate change and corresponding increases in sea surface temperatures causing frequent and intense coral bleaching events, and a likely increase in the incidence and intensity of tropical cyclones.

No analysis was made of the global or Australian response to climate change or the likelihood of the success of this response, yet the *Status of the Coral Reefs of the World 2004* concluded in relation to reefs in Australia and Papua New Guinea (PNG) generally:

Predictions for 2014: The prognosis for the reefs of Australia and PNG over the next decade is good. This is provided that the strengthening of management plans continues and there is ongoing support for monitoring programs to judge performance of those plans. ...

⁷³⁴ Under the *Vegetation Management and Other Legislation Act 2004* (Qld). See McGrath, n 331.

⁷³⁵ McGrath (2007), n 331, p 9.

⁷³⁶ See EPA, n 355, pp 3.6 and 6.28.

⁷³⁷ Wilkinson, n 37, pp 305-306, and 324.

⁷³⁸ Wilkinson, n 37, p 304.

⁷³⁹ Wilkinson, n 37, p 305.

However, there is one major caveat. The threat of warming seas from global climate change is the major threat facing coral reefs. ... In a worst-case scenario, it is conceivable that some coral reefs will suffer major reversals [in their current good condition over the] next decade, which will be exacerbated as many of these reefs are currently recovering from previous disturbances.

Recommendations

The future of the reefs of Australia and PNG remains relatively bright. Except for the unknown extent of the effects of global climate change, the essential conservation values of these reefs may be reasonably expected to persist. This depends on successful mitigation of the effects of terrestrial runoff and reduction in fishing pressure (particularly on parts of the GBR). Already steps are being taken to address these issues and enhance the ability of reefs to withstand the threat of climate change.

... Most Australian reefs are well protected against most anthropogenic pressures, both by law and by capacity to enforce those regulations. This situation needs to be maintained.

Despite reference to the “one major caveat” of the threat of global climate change, the overall impression given in the *Status of the Coral Reefs of the World 2004* was that the outlook for the GBR was positive. It is curious that the authors felt able to reach these conclusions without any analysis of the likely effectiveness of the response to climate change. This approach to evaluating the effectiveness of the response to pressures on the GBR is clearly superficial and of doubtful reliability.

Review of the GBRMP Act 2006

A review panel comprised of public servants from the Australian Government recently reviewed the operation of the GBRMP Act.⁷⁴⁰ The review panel considered the pressures on the GBR included water quality, climate change, coastal development, tourism, fishing, and shipping in some detail. The panel summarised those pressures as follows:⁷⁴¹

There are clearly many pressures on the health of the Great Barrier Reef Marine Park. The major threat of warming seas from global climate change is the overarching pressure on the Great Barrier Reef. Yet the extent of climate change and its impacts cannot be directly controlled by the Authority or the actions of the Australian and Queensland governments alone. Maintaining the Great Barrier Reef ecosystem in a healthy and resilient condition will be essential for it to withstand the major impacts of climate change, in particular coral bleaching. Thus effectively managing each of the pressures on the Great Barrier Reef—including water quality, coastal development, direct source pollution, tourism, shipping and fishing—in order to ensure the resilience of the ecosystem, will be of paramount importance over the next 30 years.

The review panel commented on the need for ongoing monitoring and reporting about the health of the GBR:⁷⁴²

The Great Barrier Reef, as a World Heritage Area, is an icon for Australia and the world. There is a high degree of interest in, and sometimes scepticism about, the protection of this complex ecosystem. The regular availability of information on performance and risk will be of paramount importance in future as a source of transparency and accountability in the public domain. This will require three fundamental sets of information.

⁷⁴⁰ Review Panel, n 604.

⁷⁴¹ Review Panel, n 604, p 104.

⁷⁴² Review Panel, n 604, p 137.

- regular monitoring of the use of the Marine Park and the performance of management measures against baselines and trends over time ...
- assessment of future risks and pressures. This information enables consideration of the level of protection of the ecosystem that is required over the longer term and whether there is a need for further action
- analysis of the full range of biophysical, social and economic factors necessary to support consideration of any changes to the level, area or type of protection.

The review panel recommended that “a regular and reliable means of assessing performance in the long-term protection of the Marine Park in an accountable and transparent manner” be “delivered through a statutory requirement for a *Great Barrier Reef Marine Park Outlook Report*, produced on a five-yearly basis”.⁷⁴³

The review panel’s recommendations for ongoing, transparent and accountable public reporting are commendable; however, there is no criticism of Australian Government policy on climate change or other matters affecting the GBR. This is perhaps unsurprising given that the members of the review panel were senior public servants but it is a failure nonetheless to recognise obvious deficiencies in government policy.

The review panel recognises climate change as “the major threat” and “overarching pressure” on the GBR but exonerates any criticism of current government policies by saying, “the extent of climate change and its impacts cannot be directly controlled by the Authority or the actions of the Australian and Queensland governments alone.” If this approach reflects a cultural issue of not criticizing government policy then the “transparency and accountability” in public reporting about the future health of the GBR that the review panel calls for is not being achieved.

The State of the Great Barrier Reef On-line (viewed 12 November 2006)

The *State of the GBR On-Line* provides the most up-to-date assessment of the condition of the GBR. It notes:⁷⁴⁴

Warmer sea temperatures associated with climate change are likely to increase the incidence of coral bleaching on reefs around the world. In 1998 and 2002, the Great Barrier Reef experienced the two worst recorded coral bleaching episodes, with the 2002 event causing declines of between 50 and 90 percent of coral cover on some inshore reefs. ...

The cumulative pressure from climate change and coral bleaching events, declining water quality and other localised pressures on top of natural disturbance events poses a significant risk to the long-term health of the Great Barrier Reef. The Reef Water Quality Protection Plan seeks to reduce the pressure on coral reefs from terrestrial run-off. The new Zoning Plan and improved fisheries management arrangements also aim to increase the protection of key examples of habitats and communities, and to maintain the ecological processes that sustain the Great Barrier Reef ecosystem. Collectively, these initiatives are vital to maintaining the resilience of the Great Barrier Reef and subsequently, the Reef’s ability to cope with multiple pressures and global factors such as climate change. The GBRMPA has also developed a Climate Change Response Programme to better understand the environmental, social and economic risks and impacts posed by climate change in the Great Barrier Reef, and to explore mechanisms to increase the resilience of the Great Barrier Reef ecosystem, and of the communities and industries that depend on it.

⁷⁴³ Review Panel, n 604, p 138.

⁷⁴⁴ GBRMPA, *The State of the GBR On-line* (GBRMPA, Townsville, February 2006). Available at http://www.gbrmpa.gov.au/corp_site/info_services/publications/sotr/overview/ (viewed 12 December 2006).

Despite recognising the threat of climate change, the *State of the GBR On-Line* contains no evaluation of the likely effectiveness of the current international or Australian response to this pressure. It adopts a similar approach in relation to the responses to land-sourced marine pollution and fishing.

Australia State of the Environment 2006

Structure

The *Australia State of the Environment 2006* report was published on 6 December 2006, making it the most recent SoE report directly relevant to the GBR.⁷⁴⁵ It used a similar structure and format as the first and second national SoE reports built around the PSR method but using “condition-pressure-response” terminology rather than “pressure-state-response”.⁷⁴⁶

As for the second SoE report in 2001, nine theme reports were written by individual or teams of independent experts. Theme reports were prepared for: atmosphere; biodiversity; coasts and oceans; human settlements; inland waters; land; natural and cultural heritage; and (two reports for) the Australian Antarctic Territory.

In addition to the theme reports, ten “integrative commentaries” were prepared by individual or teams of independent experts. The topics of these commentaries were very varied, and included “living in a variable climate”, “the role of local government in environmental and heritage management”, and “the suburbanisation of coastal Australia.” None of these commentaries was specifically relevant to the GBR.

A novel addition to the 2006 SoE report was the commission and publication of 33 short papers on “current or emerging issues” prepared by individual or teams of independent experts. Again, the topics covered by these papers were extremely varied. They included, “chemicals in the environment”, “desalination”, “groundwater fauna”, “property rights and the environment”, and “review of the EPBC Act”.⁷⁴⁷ Most were very short summaries, comprising six pages or less. None of the papers were specifically relevant to the GBR.

The theme reports, integrative commentaries, and current or emerging issues papers varied in how categorical, rigorous, and evaluative their conclusions were. This might be attributed to differences in the subject matter and data available, but the abilities and perspectives of their different authors are another likely source of these differences.

It is difficult to attribute either the good or poor aspects of the theme reports, integrative commentaries, and current or emerging issues papers to the 2006 SoE report itself because they were published with disclaimers, such as the following in relation to the theme reports:⁷⁴⁸

Independent contract authors prepared the commentaries and the opinions contained within them are those of the authors. The commentaries were used to inform and support the SoE 2006 report, *Australia State of the Environment 2006 (SoE2006)*, but are not formally a part of it.

⁷⁴⁵ See Beeton, Buckley, Jones, Morgan, Reichelt, and Trewin, n 1.

⁷⁴⁶ Somewhat strangely and inconsistently with the rest of the report, the biodiversity theme report used the pressure-state-response terminology and structure.

⁷⁴⁷ The author of this PhD wrote the review of the EPBC Act: McGrath C, *Review of the EPBC Act* (DEH, Canberra, 2006), available at <http://www.deh.gov.au/soe/2006> (viewed 31 December 2006).

⁷⁴⁸ See <http://www.deh.gov.au/soe/2006/publications/commentaries/index.html> (viewed 31 December 2006).

While the theme reports were not a formal part of the 2006 SoE report, the consideration given to land clearing, climate change and evaluating the response in each of the theme reports will be summarised before turning to consider the main report.

Atmosphere Theme Report

The atmosphere theme report summarised the Australian Government's policy position (in 2006) on climate change without any comment on the likely effectiveness or otherwise of these policies.⁷⁴⁹ The theme report on atmosphere largely repeated the figures for growth in greenhouse gas emissions set out in the *National Greenhouse Gas Inventory 2004* published by the Australian Greenhouse Office. There was generally little evaluation of the effectiveness of environmental policies for atmospheric protection, with the minor exception that it commented on the effectiveness of the response to urban and regional air quality as follows:⁷⁵⁰

[Vehicle emission controls that were introduced in 1997] appear to have been successful in stabilising maximum ozone concentrations (and thus smog concentrations) in most urban areas, but the situation in Sydney has got worse.

Biodiversity Theme Report

The biodiversity theme report was the most categorical and evaluative theme report. It considered progress in relation to the key issues identified in the first and second SoE reports and concluded in relation to land clearing, climate change and water:⁷⁵¹

Notably, vegetation clearing may become a less significant direct threat in the future. Most states and territories have now introduced legislation aimed at regulating broadacre vegetation clearing, but the legacies of past vegetation clearing—including changed hydrology, habitat loss and fragmentation, and impacts on seed supplies and regeneration of native vegetation—remain strong drivers of biodiversity decline.

Climate change will further compound and intensify pressures on biodiversity, especially by affecting rainfall patterns, and hence fire frequency, affecting regeneration of vegetation, and changing where plants and animals can live. ...

Notable recent responses to pressures on biodiversity include: major policy reforms intended to phase out broadscale vegetation clearing, and commitments to providing environmental flows for some rivers and wetlands. These reforms should make significant contributions to protecting Australia's biodiversity in the future.

The biodiversity theme report noted under the heading "Pressures on biodiversity" in relation to climate variability:⁷⁵²

Climate change, including associated change in the variability of climate, ranks with habitat modification as the biggest global threat to biodiversity ... In Australia, changes in average climate and climate variability are being recognised as among the most significant emerging threats. ... Efforts to reduce climatic pressures are long-term, expensive and multi-national. Mitigation of impacts will need a new focus on

⁷⁴⁹ Beer T, Borgas M, Bouma W, Fraser P, Holper P, and Torok S, *Atmosphere - Theme Commentary to the 2006 State of the Environment Australia Report* (DEH, Canberra, 2006), available at <http://www.deh.gov.au/soe/2006/> (viewed 28 December 2006), pp 11-22.

⁷⁵⁰ Beer, Borgas, Bouma, Fraser, Holper, and Torok, n 749, p 43.

⁷⁵¹ Cork S, Sattler P and Alexandra J, *Biodiversity - Theme Commentary to the 2006 State of the Environment Australia Report* (DEH, Canberra, 2006), available at <http://www.deh.gov.au/soe/2006/> (viewed 28 December 2006), p 3.

⁷⁵² Cork, Sattler and Alexandra, n 751, p 13.

ecosystem management and must consider the capacity of genes, species and ecosystems to adapt to change. Future mitigation plans should consider the possibility that extreme measures, such as active translocation of species to new habitat, might be needed.

The biodiversity theme report repeated these views:⁷⁵³

Climate change and habitat modification are the leading drivers of biodiversity decline worldwide ... In Australia, climate change will be one of the major pressures on biodiversity in the next few decades. Direct habitat loss through vegetation clearing is expected to decrease due to legislation to curtail it in most states and territories, but the remaining pressures are powerful: the legacy of past clearing together with the direct impacts on habitat and native species of total grazing pressure, altered fire regimes, and introduced species.

The biodiversity theme report was categorical about the certainty of climate change and the threat this posed for biodiversity in Australia:⁷⁵⁴

Variability in climate is a characteristic of many Australian environments, to which native species have adapted in their evolution. There is now scientific consensus of profound changes in both average climate and the extremes and timing of the components of climate in coming decades.

Coasts and Oceans Theme Report

The coasts and oceans theme report contained some evaluation of the effectiveness of the response⁷⁵⁵ but relatively little concern was given to climate change. It identified nine key issues for Australian coastal and ocean management. The first key issue identified is climate change, about which the report states:⁷⁵⁶

1. The effects of existing changes in the climate on biodiversity and fisheries resources

We now know that there are many changes underway that are measurable and will have an important ecological and economic impact on the oceans and their values; we know that the risk of major regime shift is increasing; but as yet almost no attention is paid to the preparation of management systems for the inevitable effects of these changes.

The report contained little evaluation of the effectiveness of the response and no criticism of government policies in relation to climate change.

Other theme reports

Other theme reports of the 2006 Australian SoE report also contained little evaluation of the response or criticism of government policies in relation to climate change. The human settlements theme report emphasized climate variability and likely damage to infrastructure of climate change but contained no detailed evaluation of relevant policies

⁷⁵³ Cork, Sattler and Alexandra, n 751, p 19.

⁷⁵⁴ Cork, Sattler and Alexandra, n 751, p 38.

⁷⁵⁵ Ward TJ and Butler A, *Coast and Oceans – Theme Commentary to the 2006 State of the Environment Australia Report* (DEH, Canberra, 2006), available at <http://www.deh.gov.au/soe/2006/> (viewed 28 December 2006), pp 37-40.

⁷⁵⁶ Ward and Butler, n 755, p 37.

and responses.⁷⁵⁷ The inland waters theme report noted an ongoing debate about climate change while finding evidence supporting climate change occurring.⁷⁵⁸ It provided some, broad-scale evaluation of the effectiveness of national level policies for protecting inland waters.⁷⁵⁹ The natural and cultural heritage theme report described the condition, pressures and responses to conserving Australia's non-indigenous and indigenous natural and cultural heritage.⁷⁶⁰ The response was described in terms of funding, Commonwealth programs such as NHT, and changes in legislation, but contained little evaluation. It did not recognise climate change as a threat to natural and cultural heritage.⁷⁶¹

Of the theme reports, the land theme report provided the most comprehensive evaluation regarding the effectiveness of the response and recommendations for improvements.⁷⁶² It concluded that the response was currently ineffective in achieving sustainable land management.⁷⁶³

We conclude that further and more effective responses will be required to arrest the decline in the extent and diversity of Australian native vegetation species and communities. ...

Responses to date to the pressures on the land resource have not been sufficient to prevent a continued deterioration in the state of the land resource or, at best, to remove the threat of a continued deterioration in the condition of the resource. ...

SoE 2006 main report

As noted above, the theme reports were not formally part of the 2006 SoE (main) report but were merely "used to inform and support" the main report. This differed from the approach taken in the 1996 and 2001 Australian SoE reports.

It is logical to expect that the main report will ordinarily be consistent with the theme reports yet this becomes problematic given the divergence of views expressed and the approaches taken to evaluating responses in the theme reports. How then did the main report deal with the question of climate change and the threat it poses to Australia's environment, particularly the GBR?

The SoE 2006 main report appears to have moved back to viewing climate change as uncertain and emphasises adaptation while making no evaluation of the likely effectiveness of the policies of the Australian Government:⁷⁶⁴

⁷⁵⁷ Newton PW, *Human settlements - Theme Commentary to the 2006 State of the Environment Australia Report* (DEH, Canberra, 2006), available at <http://www.deh.gov.au/soe/2006/> (viewed 28 December 2006), pp 8-9.

⁷⁵⁸ Harris G, *Inland waters - Theme Commentary to the 2006 State of the Environment Australia Report* (DEH, Canberra, 2006), available at <http://www.deh.gov.au/soe/2006/> (viewed 28 December 2006), pp 15-16.

⁷⁵⁹ Harris, n 758, pp 31-37.

⁷⁶⁰ Lennon JL, *Natural and Cultural Heritage - Theme Commentary to the 2006 State of the Environment Australia Report* (DEH, Canberra, 2006), available at <http://www.deh.gov.au/soe/2006/> (viewed 28 December 2006).

⁷⁶¹ Other than a passing reference noting concerns were raised about it in a survey of indigenous organisations at, n 760, p 16.

⁷⁶² Gleeson T and Dalley A, *Land - Theme Commentary to the 2006 State of the Environment Australia Report* (DEH, Canberra, 2006), available at <http://www.deh.gov.au/soe/2006/> (viewed 28 December 2006), pp 2-3.

⁷⁶³ Gleeson and Dalley, n 762, pp 2, 8 and 16.

⁷⁶⁴ See Beeton, Buckley, Jones, Morgan, Reichelt, and Trewin, n 1, p 3. Similar comments are made at pp 19, 34 and 58.

Climate change is an important issue for Australia. While there is debate about scientific predictions, it is almost universally accepted that temperatures are rising. The extent of rise is uncertain and continuous adaptation of environmental and sectoral policies, in an uncertain environment, is the key. ...

The SoE 2006 main report noted the threat posed by global warming to the GBR as follows:⁷⁶⁵

A possible impact of climate change is a change in how often coral bleaching events occur. In 1998, and again in 2000 [sic⁷⁶⁶], there was large-scale bleaching of the Great Barrier Reef, raising concerns about its long-term health. Sea surface temperatures are certainly a factor, as are other stressors in coastal and ocean systems. If maximum summer temperatures increase, an increase in the frequency of major bleaching events is very likely. The future of tropical coral reefs is causing worldwide concern (Reef Futures 2003).

If management and conservation strategies do not begin to take climate-driven variability and the likely long-term shifts into account, it may be difficult to mitigate or manage impacts effectively. The National Biodiversity and Climate Change Action Plan 2004–07 is one small step in the right direction (Natural Resource Management Ministerial Council 2004). ...

Monitoring in the Great Barrier Reef and in Ningaloo Reef shows considerable local damage and changes in resident species from cyclones, bleaching, fishing, sedimentation and pollution oceans. ...

Overall, the lack of knowledge makes it difficult to predict the impact of climate change on Australia's oceans. Even the effects of a small change in water acidity due to increasing carbon dioxide concentrations are not known.

In relation to the response to the pressure of land clearing, the main report recognised that the "loss of native vegetation continues to be one of the greatest threats to Australia's biodiversity"⁷⁶⁷ but made little comment on the effectiveness of the response to this pressure.⁷⁶⁸ The report did note an expectation that clearing rates would decrease:⁷⁶⁹

Clearing of native vegetation is an ongoing threat to Australia's environment. ... The rates of deforestation and forest regrowth vary across the states and territories, but there has been a recent increase in some states in advance of stronger clearing legislation. It is expected that most states will be clearing less native vegetation in the future as clearing regulations are progressively applied. ...

The section in the main SoE report on the response to pressures on the GBR was devoid of any evaluation of the effectiveness of the response.⁷⁷⁰ It merely described the pressures of agricultural and urban pollution.

While there was little evaluation of the response, for the first time the SoE report reviewed "environmental governance" in a separate chapter.⁷⁷¹ This review considered the roles of local government, the philanthropic sector, conservation organizations, and the business sector in environmental stewardship. It also considered critical issues in regional NRM and reviewed the operation of the EPBC Act. In addition, the 2006 SoE main report

⁷⁶⁵ See Beeton, Buckley, Jones, Morgan, Reichelt, and Trewin, n 1, pp 33 and 50.

⁷⁶⁶ The two major coral bleaching events were in 1998 and 2002.

⁷⁶⁷ Beeton, Buckley, Jones, Morgan, Reichelt, and Trewin, n 1, p 33.

⁷⁶⁸ Beeton, Buckley, Jones, Morgan, Reichelt, and Trewin, n 1, pp 43–45

⁷⁶⁹ Beeton, Buckley, Jones, Morgan, Reichelt, and Trewin, n 1, pp 70 and 76.

⁷⁷⁰ Beeton, Buckley, Jones, Morgan, Reichelt, and Trewin, n 1, p 55.

⁷⁷¹ Beeton, Buckley, Jones, Morgan, Reichelt, and Trewin, n 1, Ch 11.

also made brief comments about “future directions”, although without any detailed recommendations other than the need for ongoing monitoring.⁷⁷²

The 2006 SoE main report suggested in relation to the EPBC Act:⁷⁷³

The EPBC Act has made important contributions to environmental protection and sustainable development in Australia during its first five years of operation. Despite concerns by some community sectors about the inability of the EPBC Act to deal with cumulative environmental impacts, there is evidence that it has achieved its principal objective: the protection of matters of national environmental significance. It appears to be achieving at least some good, though mixed, results in terms of environmental outcomes beyond what would otherwise be achieved under state and territory laws. ...

It is difficult to quantify what has been achieved ‘on the ground’ by the EPBC Act but there are indications that it is achieving some positive results. ...

Despite the positive outcomes of these examples, the ‘on the ground’ results of the Act should not be overstated. State and territory laws and local government planning schemes continue to provide the bulk of environmental regulation in the Australian environmental legal system. The Act is only one component, albeit an important one, of an overall system responding to many strong pressures on the environment. Over the last four years, six of the eight Australian states and territories have collaborated in the listing of threatened species and the alignment of those efforts with ecological communities, but more needs to be done (DEH 2006c).

The statement that there is evidence that the EPBC Act “has achieved its principal objective: the protection of matters of national environmental significance” was not supported by the independent review of the EPBC Act⁷⁷⁴ and was not supported by separate evidence in the 2006 SoE main report or other theme reports. On the contrary, in light of the future projections of climate change and the sensitivity of the GBR and other matters of national environmental significance to these changes, the evidence suggests that the EPBC Act is not being, and is not likely to be, effective in protecting matters of national environmental significance from severe impacts of climate change. The review of the EPBC Act suggested the absence of a trigger for greenhouse gases was a gap in the regulatory framework of the EPBC Act but the 2006 SoE main report failed to note this point.

Based on this review of the 2006 SoE report and other SoE reports relevant to the GBR, some general points can be made about SoE reporting relevant to the GBR.

SOE REPORTS GENERALLY DO NOT EVALUATE THE RESPONSE

It is evident that official SoE reports and SoE-style reports relevant to the GBR currently tend to merely describe and catalogue conditions, pressures and responses, and, generally, do not evaluate the effectiveness of the response. This is a major deficiency of the Queensland SoE reports, although the three national SoE reports are also deficient in this regard, particularly in relation to climate change.

There are a number of potential reasons for the general failure to evaluate the response in SoE reports relevant to the GBR. The first reason might be a misunderstanding of the role and method of SoE reporting by the people preparing the reports. A second reason might be a lack of necessary, multi-disciplinary skills in the teams of people preparing the reports. For instance, most authors appear to be scientists and few lawyers or

⁷⁷² Beeton, Buckley, Jones, Morgan, Reichelt, and Trewin, n 1, Ch 12.

⁷⁷³ Beeton, Buckley, Jones, Morgan, Reichelt, and Trewin, n 1, pp 99-100.

⁷⁷⁴ McGrath, n 747.

policy experts contribute to evaluating legal and policy responses. A third reason might be an unstated policy of not criticizing government policy. There is some evidence of the first and second of these reasons in the 2001 and 2006 Australian SoE reports and their supporting theme commentaries. The 2001 and 2006 SoE main reports and their supporting commentaries were written by over 20 different individuals or groups of experts and each displays a marked difference in the emphasis (or lack thereof) given to evaluating responses.

Whatever the reasons for the general failure to evaluate the effectiveness of the response, this omission means that SoE reports are failing to achieve one of their primary objectives: evaluation of the effectiveness of the responses to pressures and conditions. The stated aims of Queensland SoE reports include to “evaluate the efficiency and effectiveness of environmental strategies implemented to achieve ESD.”⁷⁷⁵ This reflects the Australian Government’s stated objectives of SoE reporting, which include:⁷⁷⁶

- to provide an early warning of potential problems;
- to report on the effectiveness of policies and programs designed to respond to environmental change, including progress towards achieving environmental standards and targets;
- to contribute to the assessment of Australia’s progress towards achieving ecological sustainability;

Consideration of the SoE reports relevant to the GBR suggests that these principles and objectives are not being met by current practice in SoE reporting. In particular, while the latest SoE reports recognise climate change as a major threat facing the GBR, none evaluate the likely effectiveness of the international or Australian responses to this pressure. None suggest changes that need to be made to protect the GBR from the threat of climate change. This is a very serious deficiency in the current practice of SoE reporting.

Given how widespread the existing practice of not evaluating the effectiveness of the response appears to be, at least in relation to the GBR, changing this practice is unlikely to be a simple matter. One practical way in which evaluation of the effectiveness could be increased is to include a stand-alone chapter evaluating the effectiveness of the response in SoE reports rather than, or in addition to, spreading the evaluation through the report. This will bring evaluation of the response to the forefront of the report-writing process and thereby promote it. It seems logical to recommend also that such a chapter needs to be written by authors who are experts on law and policy, not just scientists.

To summarise, one of the major goals of SoE reporting is evaluating the effectiveness of the response but most SoE reports, at least those considered in this research in relation to the GBR, fail to achieve this goal. SoE reports are too important a policy-making tool to allow them to be merely descriptive of pressures, conditions and responses. The existing practice of not evaluating the effectiveness of the response should be changed by re-emphasising the important role of SoE reports in this regard and including a separate chapter evaluating the effectiveness of the response.

This brings the discussion to its conclusion. The next chapter will summarise the research, the major findings, and recommendations.

⁷⁷⁵ EPA, n 326, p 1.3.

⁷⁷⁶ DEST, n 353, p 13. Expressly adopted in the 1996 by SEAC, n 1, p 1-5. See also ASEC, n 1, p 10.

Chapter 8 – Conclusion

RESEARCH UNDERTAKEN

The principal purpose of the research undertaken in this thesis has been to determine the best available method for evaluating the effectiveness of an environmental legal system and, ultimately, to improve the system. Improving the effectiveness of environmental legal systems is an ongoing task, as Robert Bartlett noted in 1994:⁷⁷⁷

We have become accustomed to thinking about [environmental] policy as a problem of engineering or production on the one hand, and policymaking as a game or drama on the other, and we have sought to understand and direct it accordingly. These are all inappropriate metaphors, and the models we base on them are all fatally flawed. Policy, especially environmental policy, is more a matter of gardening than engineering or building; of cultivating than participating or acting. ... Policy is a result of organic interactive processes that can be partially understood and directed, processes that ultimately are dependent on an institution being changed by policy. Old policies contribute to the soil in which new policies are sown and nurtured. ... [E]valuation of environmental policy ... should be seen as [an aid] in starting, pruning, and weeding policies given the existing political landscape, not as a means to solve problems once and for all or as ways to devise a utopian policy system.

The broad theoretical frameworks within which the research has been undertaken are Policy Analysis and Evaluation Theory. This places the evaluation of the effectiveness of environmental legal systems within the Policy Cycle and part of overall evaluation of government policies.

The principal research question asked in this thesis was what is the best available method for evaluating the effectiveness of an environmental legal system? Within this research question, the hypothesis tested was that the pressure-state-response (“PSR”) method of State of the Environment (“SoE”) reporting provides the best available framework for evaluating the effectiveness of an environmental legal system. Five criteria were used to compare different methods for evaluating the effectiveness of an environmental legal system: how simple, systematic, comprehensive and meaningful is each method and does it have predictive power?

A subsidiary research question was whether the environmental legal system protecting the Great Barrier Reef (“GBR”) is likely to achieve sustainable development of it. The hypothesis tested was that the environmental legal system protecting the GBR is likely to achieve sustainable development of it.

The methods used to answer the research questions were a literature review, a literature survey and case studies. The case study of the Queensland environmental legal system provided an example of the complexity of an environmental legal system. The case study of the environmental legal system protecting the GBR showed the difficulty of evaluating the effectiveness of an environmental legal system due to the enormous amount of information available for large and complex ecosystems. However, this case study also showed the potential for the PSR method of SoE reporting to be used to evaluate the effectiveness of environmental legal systems.

⁷⁷⁷ Bartlett, n 24, pp 183-184.

MAJOR FINDINGS

There are five major findings that can be drawn from this research. The first major finding is that the majority of legal writing regarding environmental legal systems is descriptive, explanatory and interpretative rather than evaluative. This is not, in itself, a negative criticism because the purpose of most legal writing is to explain the law to others or to apply the law in practice. For these purposes evaluation is a secondary or irrelevant objective. The jurisprudential concepts associated with mainstream legal thinking – Legal Positivism – may also promote a frame of reference orientated towards identifying what the law *is* rather than what the law *ought* to be. Evaluating or improving the law is not necessarily relevant from this frame of reference.

The second major finding that arises from this research is that most legal writers who attempt to evaluate the effectiveness of part or the whole of an environmental legal system implicitly use the SoE method and refer to pressures, conditions and responses, but do not acknowledge this conceptual framework. These writers do not generally refer to “pressure”, “state” and “response” but where a writer considers the nature of an environmental problem and the solution provided by the legal system their methodology reflects the PSR framework in substance if not in form. The logical reason most writers adopt such an approach is that something like the PSR approach is necessary because of the nature of the task involved. Writers who do not adopt something like a PSR approach that acknowledges the pressures and condition of the environment before attempting to evaluate the effectiveness of some aspect of an environmental legal system may invariably be criticised for failing to provide evidence justifying why the system is or is not effective.

The third major finding that can be drawn from this research is that the best available conceptual and analytical framework for evaluating the effectiveness of an environmental legal system is the PSR method of SoE reporting. To put this finding in formal research terms, the hypothesis that the PSR method of SoE reporting provides the best available framework for evaluating the effectiveness of an environmental legal system was accepted. The PSR method is the simplest, most systematic, comprehensive and meaningful framework for evaluating the effectiveness of an environmental legal system. It also has predictive power within the limits of science, gaps in information, and uncertainty about future pressures, conditions, and responses. While not universally accepted, it is used globally as a method for reporting on the environment and, therefore, its use for evaluating the effectiveness of environmental legal systems complements a widely used and understood approach for which there is a great deal of published information available.

The fourth major finding that can be drawn from this research is that current SoE reporting, at least in relation to the GBR, rarely evaluates the effectiveness of the response to pressures and this is a deficiency in the reports. There are several possible reasons for this but, whatever the reasons, it means that SoE reports are not meeting their objective of evaluating the effectiveness of environmental policies. The failure to evaluate the effectiveness of the response to pressures and deteriorating conditions is a lost opportunity to inform decision-makers and the public of deficiencies in the response and thereby promote improvements in it. This failure is particularly significant because, at least in relation to the GBR and Australian environmental legal system, SoE reports are the only regular, systematic attempt to describe and evaluate pressures on the environment, trends in conditions, and the effectiveness of the response.

The fifth major finding of this research is that, while there are many effective parts of the response to pressures on the GBR, the current environmental legal system is not likely to be effective in preventing climate change from causing very serious damage to the GBR. In formal research terms, the hypothesis that the environmental legal system protecting the GBR is likely to achieve sustainable development of it was rejected.

A critical part of the normal policy response that has generally not occurred, or remains in its infancy, is setting quantitative targets for avoiding dangerous climate change and achieving sustainable development in relation to atmospheric climate processes. Two important environmental indicators of these matters that allow quantitative targets to be set are atmospheric greenhouse gas and aerosol concentrations, measured in parts per million of carbon dioxide equivalents (“ppm CO₂-eq”), and changes in mean global temperature.

The scientific literature indicates that to protect the GBR from severe impacts of coral bleaching requires global mean temperatures rises to be stabilized no higher than 1°C; however, it may be impossible in practice to avoid temperature rises above this threshold because of existing levels of greenhouse gases in the atmosphere and greenhouse gas emissions in the future. Limiting the total increase in mean global temperature to approximately 1°C requires stabilization of atmospheric greenhouse gases and aerosols around 350 ppm CO₂-eq but this concentration has already been exceeded. The atmospheric concentration of carbon dioxide in 2005 was approximately 379 ppm and rising by 2 ppm per year. Including the effect of other greenhouse gases such as methane, the total concentration of atmospheric greenhouse gases was around 455 ppm CO₂-eq in 2005, although the cooling effect of aerosols and landuse changes reduced the net effect to around 375 ppm CO₂-eq. Increasing the net effect of greenhouse gases and aerosols to 450-550 ppm CO₂-eq is expected to result in a 2-3°C rise in mean surface temperatures. These increases are expected to severely degrade the GBR by 2030-2040.

It is, therefore, difficult to set a logical target for stabilizing atmospheric greenhouse gas concentrations. Setting targets of 450-550 ppm CO₂-eq appear too high to avoid serious damage to the GBR. Policy targets of stabilizing atmospheric greenhouse gases at 450-550 ppm CO₂-eq to limit increases in mean global temperatures to 2-3°C are likely to be too high to avoid severe impacts of coral bleaching to the GBR. Stabilizing greenhouse gases around 350 ppm CO₂-eq, and allowing a rise in mean global temperature of 1°C appear to be the highest targets that should be set if the GBR is to be protected from serious degradation, yet such targets appear impossible to achieve in practice.

There are currently no international or national legal constraints to hold greenhouse gas concentrations at current levels or even beneath increases to levels that will raise global temperatures by 2-3°C over pre-industrial levels. Based on the existing rate of increase in atmospheric greenhouse gases, global temperature increases of 2-3°C over pre-industrial levels are likely to occur over the coming decades.

At an international level the emission reductions currently being achieved under the *United Nations Framework Convention on Climate Change 1992* and Kyoto Protocol are clearly insufficient to protect the GBR. Current policies are failing to curb greenhouse gas emissions effectively. Current growth in CO₂ emissions from the burning of fossil fuels exceeds even the “worst case” IPCC projections and no region in the world is decarbonizing its energy supply.

Australia’s national response and Queensland’s State response to climate change cannot protect the GBR unless they are part of an effective global response. Even so, the targets being set by the Queensland Government and the new Australian Government of

reducing Queensland and Australia's greenhouse emissions by 60% by 2050 based on year 2000 levels are clearly insufficient to protect the GBR. Even if similar reductions were achieved globally the IPCC projects a reduction of anthropogenic greenhouse gas emissions by 60% by 2050 would place us on track to stabilise mean global temperature rises around 2.4°C.

At a national level in Australia and at a State level in Queensland, the current policy approach largely relies on major technological advances to avoid dangerous climate change without a regulatory "safety net". Whether these technologies will be developed is a matter of speculation and reliance on them without a comprehensive regulatory system is not consistent with a sound risk management approach.

The lack of a regulatory "safety net" in Australia is changing rapidly under the newly elected federal government, which proposes to establish a national emissions trading scheme integrated into the Kyoto Protocol system by 2010. The details of the new government's response have not yet been finalised but the broad outline is already apparent. Most significantly, the new government aims to reduce Australia's greenhouse emissions by 60% by 2050. Such emission reductions appear too low to protect the GBR, however, there is no doubt the issues are difficult politically and in practice. The government is now at least acknowledging there is a major problem that requires a comprehensive response and beginning on the path to creating such a response.

However, as noted above, the overall targets for the scheme of reducing Australia's emissions by 60% by 2050 are insufficient to protect the GBR even if part of an equivalent global response. Consequently, based on what we do know at this point in time, particularly the technology that is currently available and current emissions, the impacts of climate change appear likely to swamp the many good aspects of the legal system protecting the GBR. This indicates the environmental legal system protecting the GBR is not being effective in relation to climate change.

MAJOR RECOMMENDATIONS

Three major recommendations are made based on the findings of this research. The first major recommendation is that legal writers attempting to evaluate an environmental legal system should use and acknowledge the PSR method of SoE reporting. There are three reasons for making this recommendation in addition to the criteria used in this thesis to evaluate the best available method. First, most legal writers who attempt to evaluate the effectiveness of an environmental legal system intuitively and implicitly use the PSR method of SoE reporting without acknowledging it. Second, legal writers and others attempting to evaluate the effectiveness of an environmental legal system are likely to benefit from awareness of the theoretical underpinnings of the methodology they are using. Third, writers who do not acknowledge pressures on, and the condition of, the environment before attempting to evaluate the effectiveness of part of an environmental legal system generally fail to provide evidence to justify their evaluation, which detracts from the credibility of their conclusions.

The second major recommendation from this research is SoE reports should include a stand-alone chapter evaluating the effectiveness of the response. This will bring evaluation of the response to the forefront of the report-writing process and thereby promote it. Such a chapter needs to be written by authors who are experts on law and policy, not just scientists. One of the major goals of SoE reporting is evaluating the effectiveness of the

response but most SoE reports, at least those considered in this research in relation to the GBR, fail to achieve this goal. SoE reports are too important a policy-making tool to allow them to be merely descriptive of pressures, conditions and responses.

The third major recommendation from this research is the environmental legal system protecting the GBR needs to take strong and comprehensive measures to reduce greenhouse gas emissions if sustainable development is to be achieved for the GBR. A critical part of the normal policy response that has not occurred is setting targets for stabilizing atmospheric greenhouse gas concentrations and limiting increases in global temperatures. Policy targets of stabilizing atmospheric greenhouse gases at 450-550 ppm CO₂-eq to limit increases in mean global temperatures to 2-3°C are likely to be too high to avoid severe impacts of coral bleaching to the GBR. Stabilizing greenhouse gases around 350 ppm CO₂-eq, and allowing a rise in mean global temperature of 1°C appear to be the highest targets that should be set if the GBR is to be protected from serious degradation.

Based on this analysis, the likely consequences of climate change for the GBR are profound. The targets for atmospheric greenhouse gases and increases in global temperatures that would be chosen to protect the GBR have already been exceeded and there is little indication that these factors will be stabilized in the foreseeable future at levels that will avoid severe impacts to the GBR. The failure to comprehensively and effectively reduce the pressure of greenhouse gas emissions appears likely to have unsustainable impacts on the GBR that will severely degrade its condition.

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