

Introduction



Contents

I1 About this Report	41
I2 About the Commissioner for Environmental Sustainability	41
I3 Ecosystem Services	42
I4 Environmental Awareness	43
Environmental change	43
Increasing awareness	43
Environmental governance	44
International governance	45
Australian national governance	45
State responsibilities	45
The role of local governments	45
The role of the Indigenous community	46
The role of the non-government sector	46
Environmental reporting	46
I5 Victoria's Report on the State of the Environment	47
The reporting framework	47
Issues and indicators	48
Objectives, responses and recommendations	48
Critical environmental issues for Victoria	49
Data limitations of this report	49
Future reports	49
Acknowledgments	49



I1 About this Report

The purpose of this report, the first comprehensive report prepared on the state of Victoria's environment, is to:

- provide access to scientifically credible, timely and relevant information on the current environmental conditions and trends in Victoria.
- identify driving forces and direct pressures influencing environmental change in Victoria.
- identify the likely implications of environmental trends.
- evaluate the effectiveness of current management responses to environmental issues.
- assist decision-making in policy development, environmental management and resource use.
- raise public awareness and understanding of environmental issues in order to improve the way Victorians use, manage and value the environment.
- make recommendations on specific actions and future directions required to advance Victoria's progress towards environmental sustainability.

This report considers the state of Victoria's environment not as an issue disconnected from the world but in the context of social and economic factors. These factors are explored through an analysis of the driving forces that lead to environmental change, and through an analysis of production, consumption and waste of three key resources – energy, water and materials, which identifies how the use of those resources places direct pressures on the natural environment. This provides the context for a full analysis of the condition of the natural environment, which is described through four chapters on the atmosphere; land and biodiversity; inland waters; and coasts, estuaries and the sea. The report concludes with a reflection on the implications of the state of Victoria's environment both now and into the future.

Throughout this report the capacity of the environment to provide essential ecosystem services is described. These include a stable climate, clean air and water, productive land, and thriving fisheries. Ecological Footprint is one measure of the impact of consumption on the capacity of the Earth to provide ecosystem services. Since the 1980s the planet has been in "ecological overshoot" as the world's population uses resources at a faster rate than they can be replaced. Australia as a rich nation has a footprint higher than the average but Victoria's own footprint is even higher such that if everyone lived like Victorians, almost four planets would be needed. This indicates that - in the global context - Victorians' way of life is not sustainable.

The Commissioner has assessed the effectiveness of current policy and management responses, and offers recommendations for consideration by the Government and the Victorian community. A repeating theme amongst the findings, and hence the recommendations, is lack of suitable data to enable analytical reporting. The Commissioner recommends that better data collection, monitoring and reporting regimes be implemented, with a stress on long-term, consistent data sets. A key focus of the next report, due by 2013, will be an assessment of progress in the condition of the environment over that five-year period. This will be a more useful assessment if data collection is improved. Improved environmental monitoring and improved coordination of reporting would enable the Government to better manage the environment as a valued asset from a more informed perspective.

I2 About the Commissioner for Environmental Sustainability

The Commissioner for Environmental Sustainability is an independent voice on environmental sustainability. His statutory objectives are to report on matters relating to the condition of the natural environment of Victoria; encourage decision making that facilitates ecologically sustainable development (ESD); enhance knowledge and understanding of issues relating to ESD and the environment; and encourage sound environmental practices and procedures to be adopted by the Government of Victoria and local government as a basis for ESD.

Box I1 Definition and guiding principles of Ecologically Sustainable Development

The *Commissioner for Environmental Sustainability Act 2003* (the Act) defines ESD as development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The Act requires that the following guiding principles are considered:

- that decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equity considerations.
- 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.
- the need to consider the global dimension of environmental impacts of actions and policies.
- the need to develop a strong, growing and diversified economy which can enhance the capacity for environment protection.
- the need to maintain and enhance international competitiveness in an environmentally sound manner.
- the need to adopt cost effective and flexible policy instruments such as improved valuation, pricing and incentive mechanisms.
- the need to facilitate community involvement in decisions and actions on issues that affect the community.

One of the key functions of the Commissioner is to prepare a report on the state of Victoria's environment at intervals not exceeding five years. The Minister is required to table the report in Parliament and the Government is required to table a response to the Commissioner's recommendations within 12 months.

13 Ecosystem Services

The international Convention on Biological Diversity defines an ecosystem as a 'dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit'. The Convention, to which Australia is a party, is dedicated to promoting sustainable development and recognises that:

biological diversity is about more than plants, animals and micro-organisms and their ecosystems – it is about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live.¹

Throughout this report many issues are reported in terms of the benefits provided to the environment, society and the economy by healthy ecosystems. These are known as ecosystem services. They are the services that nature provides which are essential for maintaining the Earth in a state that can support life. They include regulation of the atmosphere and climate; protection from the effects of extreme weather; provision and storage of water; production and protection of soils and associated nutrients; treatment of wastes; provision of systems that support biodiversity; food and fibre production; provision of natural medicines; opportunities for outdoor recreation; and a range of cultural values.

These services are complex and cannot easily or economically be replaced by technology, at least within the timescale in which humans have degraded some ecosystems. For example, it takes a combination of sunlight, carbon and nitrogen, plus activities of fungi, worms and bacteria, and about 300 years, to create a centimetre of soil². So, soil lost through poor vegetation management and erosion cannot be replaced in the short-term. Soil erosion is one example of the importance of ecosystem services and is a problem that can lead to a reduction in farm productivity and higher prices for primary produce.

In 2005 the United Nations (UN) reported that approximately 60 percent of global ecosystem services were being degraded or used unsustainably³:

Any progress achieved in addressing the goals of poverty and hunger eradication, improved health, and environmental protection is unlikely to be sustained if most of the ecosystem services on which humanity relies continue to be degraded.

Ongoing degradation of ecosystem services may prevent the UN's Millennium Development Goals being reached.

Since European settlement, much of Victoria's native vegetation has been cleared to make way for towns and primary production. Whilst those altered landscapes are no longer high quality habitat for indigenous flora and fauna, they do provide other ecosystem services such as food production. An example of what can be done to reverse the degradation is through the use of water sensitive urban design. This enables filtration of nutrients from stormwater that can create quality wetland habitat in urban settings. Protection and maintenance of Victoria's natural assets is essential not only for the environment but also for society and the economy. If ecosystems are degraded, their capacity to provide essential ecosystem services is diminished. Throughout this report information is presented on the condition of Victoria's natural assets and what that means for the environment and society.

Increasing community awareness of environmental issues is just one factor that is driving improvements in the way natural assets are managed. In addition, consideration of ecosystem services is now being made in more economic decisions. The CSIRO found that Australian farmers spend about \$1.6 billion a year on herbicides and pesticides, yet research indicates that if habitat were provided on farms to encourage natural predators the costs could be cut dramatically⁴.

Victoria has a legacy of natural resource exploitation that is now recognised as being part of the cause of environmental degradation such that now a more holistic suite of policy and management tools are being implemented to reverse the

decline, albeit unevenly⁵. The value of ecosystem services is being recognised as a monetary price is being placed on them. At the national level, the Carbon Pollution Reduction Scheme is the primary economic tool for managing greenhouse gas emissions to achieve a stable climate, though this is widely recognised as not sufficient alone and complementary measures are needed.

The Victorian Government's statement *Our Environment, Our Future* (OEOF) 2006 outlines actions to make Victoria a sustainable state. The ecoMarkets⁶ project uses a market-based approach to environmental policy to achieve a full range of ecosystem services whilst improving agricultural productivity. The scheme provides economic incentives for delivering ecosystem services such as biodiversity conservation, salinity control, maintenance of water quality and land protection. Instead of relying on income from primary production, ecoMarkets offers a potential new income stream that rewards land-holders for improving ecosystem health. However, economic instruments are only part of the solution for improving and maintaining healthy and functioning ecosystems, so caution is required in the use of these tools⁷.

Recognition of the need to maintain Victoria's natural assets, which include plants and animals found nowhere else in the world, and the ecosystem services they provide is a factor that has influenced the choice of issues reported here. A better understanding of ecosystems and the services they provide is needed. A commitment to improving and maintaining ecosystems will both ensure quality of life and lead to environmental sustainability by matching community needs with the ability of the natural environment to support our current and predicted needs.



Regenerating grass trees following the 2006 fire in the Brisbane Ranges west of Melbourne
Photo: Jane Tovey

14 Environmental Awareness

Environmental change

Change in the state of the environment is nothing new. The land on which the State of Victoria is located has undergone massive change over billions of years. Once part of a landlocked southern super-continent known as Gondwana, Victoria has been inundated by sea, creating limestone; frozen under glaciers; has supported rainforests which subsequently formed extensive coal deposits; has been uplifted by tectonic activity creating the Great Divide; and has been home to gigantic, now extinct, megafauna. Changes over billions of years have created the Victorian landscape of today, home to many unique plant and animal species whose ancestry can be linked back to times before dinosaurs roamed Victoria.

Victoria continues to be influenced by natural events that change the environment. These include climate variability, erosion, drought, bushfire and evolution. Indigenous people, whilst living in harmony with the environment, also changed the natural environment over a long period for their own benefit through such practices as firestick farming.

Over the last two centuries the activities of modern society have significantly altered the state of the environment. The global human population of 6.7 billion in 2007 is six times that of 1800 and is predicted to grow at a rate of 75 million people per year^{8,9}. This population growth has led to greater economic activity based on an increasing capacity to use natural resources. Forests have been cut down to produce timber for construction and paper, and wild rivers have been dammed to create artificial lakes for irrigated agriculture. Natural ecosystems have been transformed into farmland and built environments, with industrial cities facing the challenge of dealing with the pollution and waste from industrial processes.

Recent human activity is changing the environment at a much faster pace than ever before. If action to address climate change is not taken the Earth could experience temperature increases in the next 100 years that it has not experienced for 40 million years¹⁰. National governments must wake up from their complacency and start addressing the issues.

However, it is not climate change that has degraded Victoria's environment. In Victoria it is past and present management of Victoria's environmental assets and other overarching driving forces that have caused the majority of the State's environmental degradation to date. Climate change is a further compounding pressure which, if untreated, is likely to overwhelm environmental health.

Increasing awareness

Modern Australia has a long history of environmental awareness. In the 1820s the Philosophical Society of Australasia was formed to study natural history¹¹. By the late 19th century scientists were warning of the need to slow down clearing of land and forests, preserve natural landscapes and discourage exotic flora and fauna¹². Public interest in natural history led to the creation of national parks, with Mount Buffalo National Park being declared in 1898¹³. In the early 20th century, water catchments were protected and soil conservation was recognised as a serious environmental issue. Now, around 17.5% of the State's land and 5% of coastal waters are protected in the National Park system.

After the 1939 bushfires a Save the Forests campaign caught the attention of the Victorian public and led to community tree planting, with the campaign being transformed to become the Natural Resources Conservation League in 1951. This growing interest in nature and conservation also led to the formation of the Victorian National Parks Association in 1952¹⁴.

Through the industrial age new technologies have improved quality of life but have also damaged the environment. Pollution, the impact of toxic chemicals and species extinctions have been a cause for concern for many years, but it was during the 1960s that awareness of many environmental issues became more widespread, for example, through the publication of Rachel Carson's book on the impacts of pollution, *Silent Spring*¹⁵.

In the late 1960s a high profile dispute over the use of Victoria's Little Desert led to the creation of a national park and the establishment of the Land Conservation Council, raising the profile of environmental issues for Victorians¹⁶ so that today community awareness of issues such as logging old-growth forest in East Gippsland and human-induced climate change is high.

Globally and locally people are acutely aware of the big environmental challenges including climate change, ozone depletion, land clearing, loss of biodiversity, urban sprawl, pollution and soil erosion. This is in part due to the effectiveness of environmental lobby groups that have been working to raise awareness. Environment Victoria, the peak environmental non-government organisation, is supported by 150 smaller organisations to address the urgent and ongoing environmental challenges facing Victoria today¹⁷.

Victoria's school students have a good understanding of environmental issues, as environmental education is an integral part of school education at both primary and secondary levels. Further awareness of environmental sustainability comes through participation in the Australian Sustainable Schools Initiative, a partnership of the Australian Government, states and territories that supports schools to work towards a sustainable future. Interest in environmental issues continues at the tertiary level, with almost fifty undergraduate courses focusing on the environment on offer in 2008¹⁸.

Outside the formal education system are many opportunities for increasing environmental awareness, including visitor activities provided by national parks, zoos and museums. Both government and non-government providers are involved in community education for sustainability. Further, the Victorian Government runs education and behaviour change programs such as Sustainability Victoria's Black Balloons campaign, designed to raise community awareness of climate change and reduce greenhouse gas emissions from energy use.

Concerns about the environment have become part of the mainstream as awareness of the issues is extensive and the need for action is now well accepted. Due to acceptance that the climate is changing and of the long-term reduction in rainfall, environmental awareness has increased dramatically over the time this report was being developed. All Victorians are now so aware of the need to conserve water that per capita consumption has dropped dramatically.

Environmental governance

The governance structure established to monitor, manage and improve the environment is complex and has elements at global, national, state, regional and local levels. The scale of many environmental issues presents real challenges to environmental management and governance arrangements. Issues such as climate change or habitat loss that are not confined by national or state boundaries necessitate high levels of co-operation across a range of jurisdictions. Management of environmental issues is a challenge, as the systems themselves are so complex.

In 1992 the governments of the Commonwealth, states and territories joined the Australian Local Government Association in signing the *Intergovernmental Agreement on the Environment* (IGAE)¹⁹. The Agreement specifically recognises that:

environmental concerns and impacts respect neither physical nor political boundaries and are increasingly taking on inter-jurisdictional, international and global significance in a way that was not contemplated by those who framed the Australian Constitution²⁰.

The agreement articulates the roles and responsibilities of the Commonwealth and the states, recognises the need to develop co-operative arrangements to protect Australia's environment, and sets out principles of environmental policy, including reference to ecologically sustainable development (ESD).

Table 1.1 Selected overarching environmental instruments

Instrument	Responsible authority and response type	Key features
Growing Victoria Together	Victorian Government Key State policy	A ten-year vision that articulates what is important to Victorians, and the priorities the Government has set to build a better society so that by 2010 Victoria will be a state with a thriving economy; quality health and education; a healthy environment; caring communities; and a vibrant democracy. This document was under review at the time of writing.
Our Environment Our Future	Department of Sustainability and Environment Key State environment policy	The <i>Our Environment, Our Future – Sustainability Action Statement 2006</i> is a package of 150 priority sustainability initiatives to secure a sustainable State for future generations of Victorians, based on the directions articulated in <i>Victoria's Environmental Sustainability Framework 2006</i> . It includes responding to the challenge of climate change; maintaining and restoring our natural assets; using our resources more efficiently; reducing our everyday environmental impacts; and government leadership. A suite of objectives and targets is included.
Land and Biodiversity in a Time of Climate Change	Department of Sustainability and Environment Draft policy for natural resource management	The White Paper, due for release in 2009, will set the direction for Victorian Government policy and investment priorities in natural resource management, land health, and biodiversity for the next 20-50 years; consider how environment and natural resource management activity at the regional, catchment, local and farm scale and on public land is contributing to Victoria's overall environmental health; and make sure Victorian Government policy and investment is responsive to new threats and opportunities.
Our Water Our Future	Department of Sustainability and Environment Policy for water management	In 2004 the Victorian Government put in place a long-term plan for water conservation aimed at every sector of the community, seeking to provide water to sustain growth over the next 50 years. The next stage of the plan, released in 2007, provides long-term solutions to secure water supplies.
Victoria's Climate Change Strategy	Department of Premier and Cabinet Draft policy for climate change responses	Following the Climate Change Summit held in 2008, the Victorian Government is developing its climate change strategy to be released later this year. Upon release of a Green Paper, a broad public consultation program will be conducted before finalising the Climate Change White Paper in mid-2009.
<i>Planning and Environment Act 1987</i>	Minister for Planning Victorian legislation	The purpose of this Act is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians.
<i>Catchment and Land Protection Act 1994</i>	Minister for Environment and Climate Change Victorian legislation	This Act sets up a framework for integrated management and protection of catchments through establishment of Catchment Management Authorities; encourages community participation in land and water management; and sets up a system for control of noxious weeds and pest animals.
<i>Environment Protection Act 1970</i>	Minister for Environment and Climate Change Victorian legislation	The purpose of this Act is to create a legislative framework for the protection of the environment in Victoria having regard to the principles of environment protection. It enables the EPA to work with the community to protect, care for and improve our environment.
<i>Environment Protection and Biodiversity Conservation Act 1999 (Cwth)</i>	Commonwealth Minister for Environment Commonwealth legislation	The Commonwealth Government's central piece of environmental legislation, which provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places - defined in the Act as matters of national environmental significance.

International governance

Debate and action around environmental issues at the international level has played a significant role in shaping environmental governance and action at the national, state and local levels in Australia. Since the early 1970s, the United Nations (UN) has been responsible for ensuring that environmental issues have received global attention. The UN Environment Program (UNEP) has played a key role in driving research, debate and action amongst its member states around environmental issues. UNEP delivers a broad range of programs and includes scientific advisory groups such as the Intergovernmental Panel on Climate Change and partnerships such as the Commission on Sustainable Development.

The Kyoto Protocol is an international treaty made under the *UN Framework Convention on Climate Change* to limit global greenhouse gas emissions. Australia ratified the Protocol in 2007, agreeing to be engaged with the treaty-making process²¹. The Protocol has been legally binding for countries that have ratified it since 16 February 2005. The first phase of the Protocol requires developed nations to cut their emissions by a total of 5.2% of 1990 levels by 2012²². However, Australia's internationally agreed target is to limit emissions to 108% of 1990 levels between 2008 and 2012.

A new international agreement to reduce global greenhouse gas emissions and respond to the threats of human-induced climate change from 2013 onwards is being developed, and is expected to be finalised in Copenhagen at the end of 2009.

Australian national governance

The Australian Constitution established a federal system and a division of powers between the Commonwealth and the states. The Commonwealth does not have a direct power to legislate on environmental matters so relies on its trade and commerce and external affairs powers. The *Environmental Protection and Biodiversity Conservation Act 1999* provides protection for environmental issues of national significance including international conventions for which the Australian Government has responsibility.

State responsibilities

The states are responsible for all other matters not specifically retained for the Commonwealth under the Constitution. This includes matters relating to the environment, which, when the Constitution was drafted in 1900, had not been a consideration. Whilst Victoria has a highly developed set of formal government structures for environmental management, many environmental issues are managed through collaboration between jurisdictions and agencies. The Victorian Department of Sustainability and Environment (DSE) is responsible for sustainable management of water resources, climate change, bushfires, public land, forests and ecosystems. The Victorian Government has responded to the jurisdictional complexities around the issue of climate change by creating an Office of Climate Change within the Department of Premier and Cabinet. It is responsible for whole-of-government policy and strategy focusing on longer-term issues and the economic, environmental and social impacts of climate change.

A number of separate statutory authorities are responsible for delivering specific services, including the Environment Protection Authority (EPA), Sustainability Victoria, Parks Victoria, and ten Catchment Management Authorities (CMAs) that deliver integrated catchment management as a means of achieving sustainable land, water and biodiversity management.

Further, there are a number of bodies that provide advice to the Victorian Government, including the Victorian Environmental Assessment Council, the Victorian Catchment Management Council, the Victorian Coastal Council and the Commissioner for Environmental Sustainability.

Since the 1990s there has been an increasing trend in Victoria to deliver some public services through private rather than public mechanisms. The privatisation of utilities such as gas and electricity has created a regulatory and governance context that presents new challenges for the management of environmental resources. This is particularly challenging in the area of water management, where the goals of the CMAs (to manage environmental flows) and the water authority (to manage extraction) may be at odds.

The role of local governments

The 'Think Global, Act Local' campaign has manifested strongly at the local government level in Victoria. There are 79 local authorities across the State. Local government powers are authorised by State legislation to provide works and services for land use planning, environment protection, public health, traffic and parking, and animal management²³. This level of government has a very immediate role in shaping the local environment through urban planning, open space design and maintenance, and waste management. The International Council for Local Environmental Initiatives (ICLEI) works to assist local governments to develop programs that promote sustainable practices. The Oceania secretariat for ICLEI is based in Melbourne. Initiatives such as the United Nation's Agenda 21 and ICLEI's Cities for Climate Protection are implemented by local governments in response to global environmental challenges.

The role of the Indigenous community

The Commissioner acknowledges the connection of Victoria's Indigenous community to the land. A number of practical arrangements are in place to ensure that members of Victoria's Indigenous community can participate in natural resource management.

Indigenous land management facilitators act as a practical two-way link between Indigenous land managers, other individuals and organisations involved in promoting sustainable land management and nature conservation. They assist in the representation and promotion of Indigenous values, aspirations and capacity-building in land management through local and regional meetings, including through Natural Resource Management (NRM) regional and State planning bodies.

In March 2008 the Victorian Traditional Owner Land Justice Group (VTOLJG) was asked by the Government to provide a new policy framework for native title and land justice. The group's representatives will advocate for the strongest possible outcomes for Traditional Owners in a number of areas, including:

- ownership and management of land and waters.
- relationship between alternative settlements and cultural heritage.
- exercise of traditional activities in public land and waters.
- effective participation of Traditional Owners in relation to planning and development.

The VTOLJG will report to the Government by the end of 2008.

Victoria's Indigenous community is being consulted by DSE as part of the development of the White Paper on *Land and Biodiversity in a Time of Climate Change*, to ensure that their views can be incorporated into the strategy for the next 20 to 50 years.

The role of the non-government sector

Despite such complex formal governance arrangements there is always the potential for some areas to remain contested. Formal non-government organisations (NGOs) play a significant role in campaigning, educating the community and lobbying governments. International environmental NGOs are represented at the State level, for example WWF. In Victoria, environmental NGOs such as the Australian Conservation Foundation, Environment Victoria, the Wilderness Society, the Victorian National Parks Association and the Victoria Naturally Alliance run environmental campaigns and lobby governments and industry in relation to environmental concerns.

At a local level community-based groups, such as Landcare and issue-based groups participate in activities to improve the local environment. The activities of some of these groups are explored in Part 4.2: Land and Biodiversity.

Bodies such as the Victorian Employers Chamber of Commerce and Industry (VECCI), the Australian Industry Group (AIG) and the Victorian Farmers Federation (VFF) represent industry and agricultural interests. Some organisations such as the Environment Business Association and the Business Council for Sustainable Energy have emerged to promote business opportunities in emerging environmental markets, and strongly support market-based approaches to creating incentives to adopt more efficient and more environmentally responsible practices.

In short, environmental issues are vigorously debated throughout the community.

Environmental reporting

Governments and NGOs throughout the world are recognising that access to environmental information and a better understanding of both ecosystems and the inter-relationships between environmental factors is crucial to achieving sustainable development.

State of Environment (SoE) reports communicate key information about the condition of the environment (and pressures acting upon it) to the public, government, industry and non-government organisations. The purpose is to raise awareness and understanding of the environment and to assist decision-making by highlighting the cumulative environmental impacts of natural events and human activities, identifying trends, and highlighting the actions needed to improve the management of our environment.

Environmental reporting takes place at both national and state levels in Australia and is being adopted by some local governments. The first Australian report was published in 1996, largely as a result of international obligations articulated in the National Strategy for Ecologically Sustainable Development. The Australian Government is now obliged to report every five years, whilst the states report every three to five years. Some local governments prepare reports on the state of the local environment. Unlike in New South Wales, where authorities are required to report in a consistent and regular manner, environmental reporting is at the discretion of each authority and is often a reflection of the commitment to environmental management against a range of competing priorities.

SoE reports were previously published in Victoria in 1988 and 1991, with a focus on inland waters and agriculture respectively. SoE reporting has now been formalised by the Victorian Government through the *Commissioner for Environmental Sustainability Act 2003*. This report is the first all-encompassing report on the State of the Environment for Victoria. The Commissioner is required to prepare and make publicly available the SoE Report at intervals not exceeding five years. The SoE Report makes recommendations to the Victorian Government on possible responses for the future management of the environment. The Minister must table a copy of this report in Parliament and must also table a response to the recommendations within 12 months. The Commissioner's reports are independent from Government and are not required to be approved by Cabinet.

This State of the Environment Report is just one source of information on Victoria's environment. The Victorian Government also provides information on a range of specific environmental issues through reports on parks, catchment condition, forests, water, regional issues and waste. In addition, the Commissioner reports on the Victorian Government's own operational environmental performance and integration of environmental considerations into government decision-making processes. These Strategic Audit Reports can be found at www.ces.vic.gov.au.

15 Victoria's Report on the State of the Environment

The reporting framework

A framework for preparing the State of the Environment Report was produced through broad community, industry and government consultation. This was approved by the Minister, who tabled the document in Parliament in 2005. The framework has guided preparation of the Commissioner's first report.

The framework for preparing the SoE report is based on the Driving force – Pressure – State – Implication – Response (DPSIR) model as shown in Figure 1.2. This provides information on *driving forces*, which are the underlying causes of activities that affect the environment; pressures affecting the natural environment; the *state* (or condition) of the environment and the functioning of natural processes; the *implication* of the state and trends in environmental quality on the functioning of ecosystems and human health; and societal *responses* implemented to address the pressures and environmental issues. This information is reported through the use of indicators.

The DPSIR framework represents a comprehensive approach to assessing the state of the environment through the inclusion of causes and consequences of environmental change. Within this framework, the status of an indicator will shift, depending upon the way that the issue is framed. For example, estuarine turbidity is an *implication* of soil erosion rates (*state*), which in turn are caused in part by increased fire regimes (*pressure*) (see Figure I3 (A)). When looking at the issue of climate change, however, fire regimes are reframed as an *implication*; anomalies in temperature indicate the state and greenhouse gas emission rates are the *pressure* (Figure I3 (B)).

Figure I3 shows the interdependent nature of environmental issues in a simplified and linear form. This level of interdependence means that an issue may be referred to repeatedly in different sections of the report; it may be mentioned in one section but fully explored in another.

No single model is capable of capturing the full complexity of the natural environment and its relationship with human activities. The chosen model, however, does provide a comprehensive framework through which to navigate the multiple causal relationships, linkages and cross-sectoral issues which emerge in such a complex system.

Figure I2 Application of the DPSIR model across the report sections

	Driving force	Pressure	State	Implication	Response
	A description of key drivers of environmental change	A discussion of direct pressures on the environment from production, consumption and waste of key resources	Description of the current state of environmental issues	Description of some pressures that are specific to the issues and their implications for the current state	A brief overview of management responses implemented to address the issue
Part 1	Part 2	Part 3	Part 4	Part 5	
Introduction	Driving Forces	Production, Consumption and Waste	State of the Environment	Living Well Within Our Environment	
		3.1 Energy	4.1 Atmosphere		
		3.2 Water Resources	4.2 Land and Biodiversity		
		3.3 Materials	4.3 Inland Waters		
			4.4 Coasts, Estuaries and the Sea		

Issues and indicators

Using the results of the public consultation as a starting point, the SoE team scoped each section of the report to determine the breadth of issues to consider for inclusion. Authors established Expert Reference Groups to assist in the development process. These groups included government policy and service delivery agencies, environmental non-government organisations, academics and industry peak bodies. Authors met with the groups to fine tune the scope of the report, identify indicators and source data sets.

A multi-criteria analysis was applied to lists of potential issues and indicators to assist authors in deciding on the final list. The criteria were used to assess whether the indicator was:

- representative of the issue/system being assessed.
- able to show trends over time and sensitive to change.
- supported by data that is scientifically credible and statistically verifiable.
- supported by data that is accessible.

Objectives, responses and recommendations

The report includes a set of objectives developed by the Commissioner for each environmental issue to illustrate the preferred state of an issue. In some cases the objectives also indicate broadly how that state might be attained. For example, in the section covering climate change the preferred state is a stable climate and, in order to achieve that, concentrations of greenhouse gases should be declining. Whilst the objectives are consistent in nature with the general objectives and targets set in the Victorian Government's Environmental Sustainability Framework 2005 (ESF), they have been framed by the Commissioner and aligned against the more specific issues detailed in the report. Like the ESF they are focused on environmental outcomes. However, this Office has not had the resource capacity (nor arguably the role) to evaluate the full socio-economic cost benefit assessment necessary to determine the Government's final public policy positions.

The analysis includes a high-level assessment of the effectiveness of the key policy response to the issues in achieving the stated objectives. The policy responses reported and analysed were selected as representative policy responses in consultation with government representatives. This report does not attempt an in-depth analysis of the effectiveness of all current policies; rather, it provides information on key responses and how they contribute overall to achieving the objectives.

The recommendations to address the environmental issues reported were developed by the Commissioner in consultation with key stakeholders. The Commissioner expects that the government response would provide information on which recommendations are accepted and how those recommendations are to be implemented to enable an improvement in the state of Victoria's environment.

Driving Forces Influencing Environmental Change

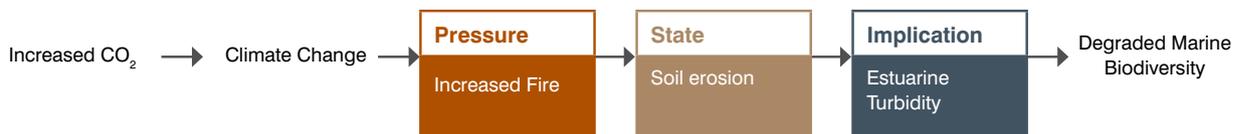
This section of the report recognises that environmental conditions, trends and problems are often deeply embedded in the socio-economic structures of our societies, while at the same time our wellbeing depends upon the natural environment. It explores a range of factors driving environmental change, including climate change, population and settlements, and economic growth and consumption.

Production, Consumption and Waste

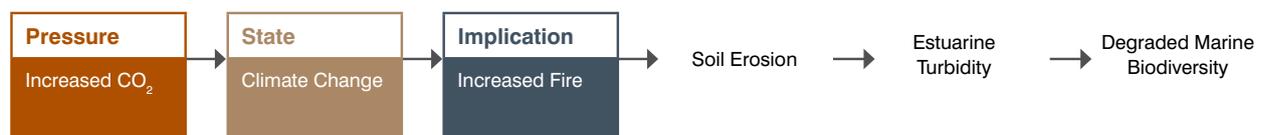
This section represents Victoria as an integrated system, having inputs of energy, water resources and materials, and outputs of goods and services, pollution and waste. This resource consumption analysis identifies the natural resource stocks available in Victoria and describes broad consumption patterns. The processes of extracting, processing and consuming resources are examined and the resulting pressures on the environment are described. The implications of the pressures resulting from resource use and consumption on different aspects of the natural environment are explored in the next part of the report.

Figure 13 Application of the DPSIR model (simplified)

A.



B.



The State of Victoria's Environment

This part of the report evaluates the condition and trends of Victoria's natural environment through the use of indicators within the following broad themes: atmosphere; land and biodiversity; inland waters; and coasts, estuaries and the sea. The impacts of the direct pressures on the environment, some of which result from the processes of production, consumption and waste, are reported. The implications of the current condition of the environment are discussed, along with societal responses.

The *Atmosphere* section considers the science behind climate change, reports on climate trends, as well as considering the short- and long-term impacts of climate predictions. It discusses the trends in stratospheric ozone and air quality.

The *Land and Biodiversity* section identifies the importance of ecosystem services provided by land. The condition of the land and soil and processes that lead to change are described. Trends in the condition of terrestrial biodiversity are included.

The *Inland Waters* section reports on the condition and quality of rivers, groundwater and wetlands. This includes a description of the implications of state and trends in the health of aquatic systems and water quality.

The *Coasts, Estuaries and the Sea* section describes the condition of marine, coastal and estuarine environments. The impacts of climate change on coastal communities and the impact of 'sea change' development on coastal environments are discussed.

Living Well within Our Environment

The final part of the report draws on the key findings, considers how the state of the environment influences our quality of life, examines progress towards achieving environmental sustainability and provides recommendations for future directions. It considers what changes Victorians could make to achieve short-term improvements in the state of the environment. It considers how as a society we might address some of the driving forces that are having negative impacts on the natural environment, as well as encouraging those that have a positive impact.

Critical environmental issues for Victoria

The critical issue of climate change is considered throughout this report from a range of perspectives. The primary source of Victoria's greenhouse gas emissions is reported in Part 3.1: Energy; the climate science and the state of Victoria's climate are presented in Part 4.1: Atmosphere – Climate Change. The implications for climate change on the environment are considered in subsequent sections within Part 4. In order to gain an understanding of this complex issue readers should view Part 3.1: Energy and Part 4.1: Atmosphere – Climate Change, together.

Water security is also a critical issue for Victoria. Part 3.2: Water Resources covers the stocks, supply and use of water. Part 4.3: Inland Waters covers the state of ecosystem health of Victoria's rivers, wetlands and groundwater. Readers who wish to gain a full understanding of the complexities of managing water security and ecosystem health should read both sections.

Data limitations of this report

A repeating theme amongst the findings, and hence the recommendations, is lack of suitable data to enable sufficient reporting. Problems with access to suitable data encountered during development of this report included:

- lack of long-term and consistent data sets.
- uncertainty over indicators, which prevents focused data collection.
- collection of data for project specific purposes rather than for strategic or integrated environmental assessment.

The result of these limitations has been that some ideal indicators could not be used. In such cases other sources of information have been used to provide a snapshot of the issue, with a recommendation that data be collected for future reporting.

Recommendations

I1 That a strategic review of environmental data collection, monitoring and access be conducted to assess the needs for government environmental reporting requirements.

I2 That better data collection, monitoring and reporting regimes be implemented to enable more accurate, integrated and long-term reporting and an up-to-date understanding of environmental health and pressures.

Future reports

The Commissioner is required to report on the state of Victoria's environment at least once every five years, with the next report due by 2013. That report will include an assessment of environmental performance over the intervening period.

Acknowledgments

This report has been developed by the Office of the Commissioner for Environmental Sustainability. A small team of authors was responsible for scoping, research, analysis and writing the report. They were assisted and advised by Expert Reference Groups, which included many people from government, academia, environmental NGOs and industry peak bodies.

The SoE team members who primarily contributed to the development of this report were:

Hamish Walker (Director), Jane Tovey (Program Manager), Dr Susie Moloney, Cristina Davey, Geoff Browne, Dr Amanda Ellery, Bruce Greenop, Claire Maries, and Dr James Fitzsimons (Victorian Environment Assessment Council).

In addition, the following people also contributed to the development of this report: Ryan Bath (DSE), Kim Bege, Derek Benjamin, Anne Dansey, Tom Garrish, Lee Knaggsi, Dr Carlos Rodriguez, Sylvia Webb and Lynette Wilks (Sustainability Victoria).

The Commissioner thanks the Department of Sustainability and Environment for its support and assistance during the project, particularly provision of expert advice and access to data, as well as technical support from the Spatial Information Infrastructure group, who provided the maps used throughout the report; the Victorian Environment Assessment Council for providing expert assistance for the biodiversity elements of the report; the EPA for its support and expert assistance, particularly in relation to preparation of the Ecological Footprint and sections on air and water quality; CSIRO for its assistance in preparing the section on stratospheric ozone and providing modelled information used in the materials section; the Bureau of Meteorology for provision of advice and data; and other agencies who provided expertise, support and data, including the Department of Primary Industries and the Department of Transport.

The Commissioner thanks members of the SoE Inter Agency Committee for their advice and assistance. The Committee was chaired by Bruce Thompson (DSE) and included representatives from most departments and environmental agencies who provided advice throughout development of the report. The members also assisted by nominating expert contacts in their agency.

Expert Reference Groups (ERGs) were established for each section of the report. These included members from the government department responsible for policy, an agency responsible for service delivery, an environmental NGO, an academic and, where relevant, an industry peak body. These groups were used in developing each section up to the point of developing the draft for peer review, including provision of advice on management responses and recommendations. The Commissioner is grateful to members of these groups for their assistance.

Sections of the report were reviewed by the experts listed in Table I2.

In addition, members of the Commissioner’s Reference Group provided advice during development and production of this report. At the time of writing the members were: Alex Arbuthnot AM (Landcare Australia), Dan Atkins (Sustainable Business Practices Pty Ltd), Cheryl Batagol (Melbourne Water), Dr Sarah Bekessy (RMIT), Patricia Caswell, Catherine Dale (Booroondara City Council), Robert Gell (Victorian Coastal Council), Russell Higgins (Victorian Employers Chamber of Commerce and Industry), Mick Murphy (Victorian Catchment Management Council), Kelly O’Shanassy (Environment Victoria), Dr Gillian Sparkes (Australian Sustainable Industry Research Centre Ltd), Kate Vinot (South East Water), and Dr Terry Walshe (Melbourne University). The Commissioner also thanks past members of the Reference Group, Christine Forster, Greg Bourne, Mike Hill, Dr Russell Reicheldt, Professor John Lovering and Marcus Godinho for their assistance.

This final report was prepared in light of a wide range of advice received from all reviewers including members of Expert Reference Groups, peer reviewers, government agencies, members of the Reference Group and other key stakeholders. While the Commissioner is grateful for the input of all of these people, this report presents the views of the Commissioner and not necessarily those of the experts, advisors or Reference Group and others engaged as part of the consultation and review process. Following consideration of all advice received, the Commissioner has made his recommendations as to the actions required to improve the state of Victoria’s environment.

Table I2 External Peer Reviewers for the State of the Environment Report

Report section	Reviewer	Organisation	Expertise
Driving Forces	Professor Peter Newton	Swinburne University	Sustainability
	Professor David Yencken	Melbourne University	Sustainability
	Mike Waller	Sustainability Victoria	Environmental economics
Energy	Professor Graham Currie	Monash University	Transport
	Adjunct Professor Alan Pears	RMIT	Energy policy
	Brad Page	Energy Supply Association	Energy supply
Water Resources	Professor Sam Lake	Monash University	Aquatic ecology
	Cheryl Batagol	Melbourne Water	Water supply
	Christine Forster	Victorian Catchment Management Council	Catchment and water management
Materials	Professor Peter Newton	Swinburne University	Sustainability
	Dr Ralph Horne	RMIT	Sustainability and life cycle analysis
Climate Change	Professor David Karoly	Melbourne University	Climatology
	Dr Graeme Pearman	Monash University and GP Consulting Pty Ltd	Climate change and impacts
Land & Biodiversity	Professor Robert White	Melbourne University	Soil science
	Dr Barbara Wilson	WA Department of Environment	Biodiversity
	Associate Professor Jann Wilson	University of Tasmania	Landscape ecology
	Dr Peter Bridgewater	Joint Nature Conservation Committee (UK)	Land and biodiversity
Inland Waters	Professor Barry Hart	Monash University	Water science
	Professor Sam Lake	Monash University	Aquatic ecology
	Professor Ian Rutherford	Melbourne University	Fluvial geomorphology and water resource management
	Christine Forster	Victorian Catchment Management Council	Catchment and water management
Coasts, Estuaries & the Sea	Dr Dustin Marshall	University of Queensland	Marine biodiversity
	Professor Geoff Westcott	Deakin University	Marine and coastal science
	Dr David McDonald	CSIRO	Ecological modelling