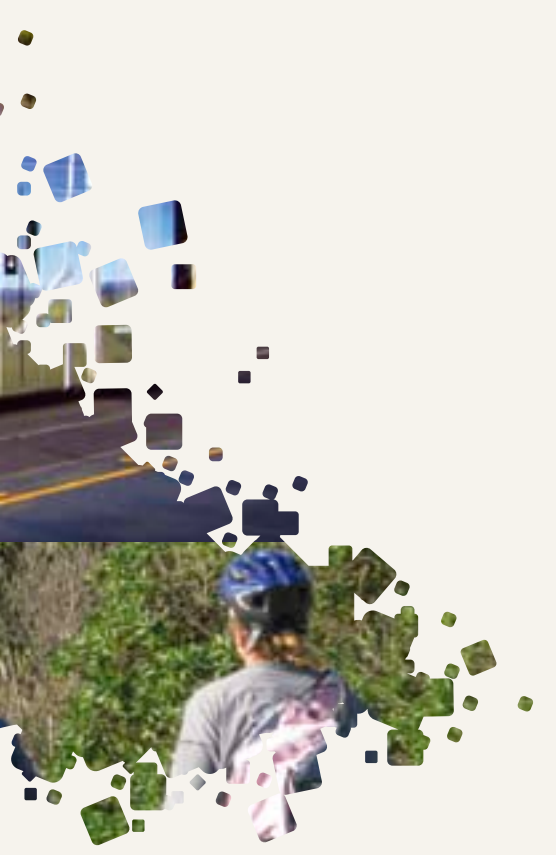


Living Well Within our Environment



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Key Findings

- The wellbeing of Victorians is ultimately dependent upon the health of the natural environment. The ecosystem services upon which we depend have been, and under business-as-usual scenarios will continue to be, compromised.
 - Social and economic systems are vulnerable; as a result, so is human wellbeing. Urgent and fundamental changes are needed and government must provide transparent, exemplary leadership.
 - Vulnerabilities are partly the inadvertent by-product of increasing efficiency, reducing the capacity of Victoria to adapt to looming sustainability challenges. Current vulnerabilities include the dependence on brown coal and petroleum and, globally, the ability to supply food under conditions of expected climate change and global population growth.
 - A vision of Victoria where wellbeing is decoupled from increasing environmental pressure must be articulated and realised. Several methods for measuring and tracking progress towards sustainability have been proposed. For these to have influence, they require refinement and ownership at the highest levels of government.
 - Victorians have proven talented and innovative, and, with government support, they are well equipped to deal with the challenges of moving into a post-carbon economy. Victorian industries want strong leadership and certainty from government as they adapt to this future.
 - While it is essential to ensure that *future* development is within sustainable limits, Victorian society is unsustainable now. Refocusing on current patterns is necessary and possible through use of the term *ecologically sustainable* use (ESU). ESU is applied in this discussion to make the point that present uses affect the state of the environment as much as do growth and change.
 - ESU becomes a reality when decoupling (a separation between an indicator of wellbeing and an indicator of environmental pressure) is demonstrated. Relative decoupling has commenced in many sectors, but ESU will only be realised when *absolute decoupling* is achieved.
 - *Resilience* is so fundamental to sustainability as to be almost invisible. Essential ecosystem services and liveability, valued by all Victorians, can only be maintained when resilience – the ability to adapt to system shocks – is re-established within ecological systems and in society.
 - In the context of the scale of the challenge, environmental governance is disparate and inconsistent. The current nature of environmental challenges means that governance must become strategic and future-focused. The technique of strategic *environmental assessment* should be used to address the long-term and wider implications of planning and policy.
 - Market based instruments – a way of rationally pricing the environmental impact of goods and services – are being used increasingly in Victoria. Provided that ecosystem services are adequately valued and are supported by legislation, MBIs are a valid way of internalising environmental pressures within the economic framework.
 - MBIs can only come into effect through regulatory action, while many activities and requirements will still need command and control approaches: carbon trading will only begin when government sets a cap and timetable. Appliance, liquid wastes and building construction standards depend on deliberate decisions being taken by government. The role of government continues to be critical.
 - Technology has a significant role to play in reducing environmental pressures.
- However, due to associated inherent risks such as the *rebound effect* and the *paradox of efficiency*, technology alone must not be seen as a 'silver bullet'. *The environment doesn't care how efficient our technologies are if overall pressures continue to increase.*
- Victorians recognise their ability to influence the environment through their actions as consumers. They will be further empowered to reduce their personal impact through government's fostering of ethical and informed decision-making, and establishment of frameworks that provide certainty, such as standardised eco-labels.
 - On a global scale, Victoria's level of responsibility for environmental problems is small in absolute terms. However, as a first world state with one of the highest levels of environmental intensity per capita, Victoria has an obligation to develop its role as an international environmental leader while also taking advantage of the huge business opportunities presented.

LW1 Introduction

The state of the environment

The preceding sections of the State of the Environment Report show that the natural environment is subject to ongoing pressures from humans. Part 3 shows how both the rate and the way in which we use the three fundamental resources of energy, water and materials are putting pressure on natural systems. Efficiency gains in industry and farming have led to some disconnection (decoupling) between population growth and the rate of environmental degradation, but steadily increasing local and global populations have meant these gains have both enabled the rebound effect (see Part 2: Driving Forces) and been overwhelmed by a strong increase in overall resource consumption, production of harmful substances and wastes, and pressure on the land. Absolute pressures continue to increase.

The ecological footprint section summarises this spatially by showing that each Victorian uses 6.8 global hectares (gha) to maintain his or her lifestyle, with Australia's additional food and fibre demand met by imports from the entire world. Our high levels of consumption, marked by elaborately transformed materials, in fact rely on supplementation from production in other parts of the world. In comparison to Australia, global average use of resources amounts to a footprint of 2.2 gha per person. However, even this represents an overshoot. The capacity of the Earth is estimated at 1.8 gha per person. Under business as usual scenarios, as developing nations seek to improve their standard of living, this overshoot will increase.

Part 4 describes in detail how this ecological overshoot is affecting Victoria's natural environment. There is little evidence to suggest that in the last fifty years there has been any measurable decrease in overall human pressure on the Victorian environment. A history of land clearance has meant that, outside Crown lands, most of the State is used for agriculture. This report demonstrates that land and biodiversity health, the foundation of essential ecosystem

services like clean water and air, is continuing to decline. This report finds that apart from individual and some sub-regional efforts, the massive investment in the Natural Heritage Trust and similar funding arrangements has led to little measurable improvement in overall land condition. Also, in this State, vegetation quality is divided between that found on public and private lands. The only high quality vegetation and stream condition is to be found in national parks, conservation areas and State forests. Moreover, this is not the result of active management but rather an artefact of forests' remoteness, their relatively large area, and other protective wilderness qualities.

Compounding these pressures, the State's greenhouse gas emissions have steadily increased and are on a trajectory to push the absolute level of emissions to ever higher levels. While not the cause of the majority of degradation to date, unless prompt action is taken, climate change impacts will both compound and overwhelm many of the existing pressures.

Major environmental improvements have been achieved in urban air quality and in water quality in certain metropolitan streams. Likewise, there have been significant shifts in liquid waste management through the sewerage system and hazardous solid waste through specialised disposal. At the time, these initiatives required considerable effort to establish. This effort should not be under-estimated, but rather considered indicative of the scale of possible future investment in environmental remediation.

In summary, the preceding chapters of this State of the Environment Report show that whilst there is some understanding of the nature and effect of environmental problems, our lifestyle continues to be maintained and enhanced through the gradual degradation of the natural environment. This in turn is now beginning to impact on our way of life due to the vulnerability of the systems upon which we depend. This means that:

We are forced to decide ... what we will be prepared to pay in terms of consumption of goods and services foregone to avoid uncertain prospects of possibly immensely unhappy outcomes. We are forced to decide what consumption of goods and services we will be prepared to forego to avoid loss of things that we value but are not accustomed to valuing in monetary terms'.

Key vulnerabilities include, but are not limited to, Victoria's dependence upon brown coal for electricity; our homogenised, oil-dependent road transport system; water scarcity; threats to coastal settlements; and geopolitical risks from regional implications of climate change. These vulnerabilities are detailed further in Parts 2, 3 and 4 of this report.

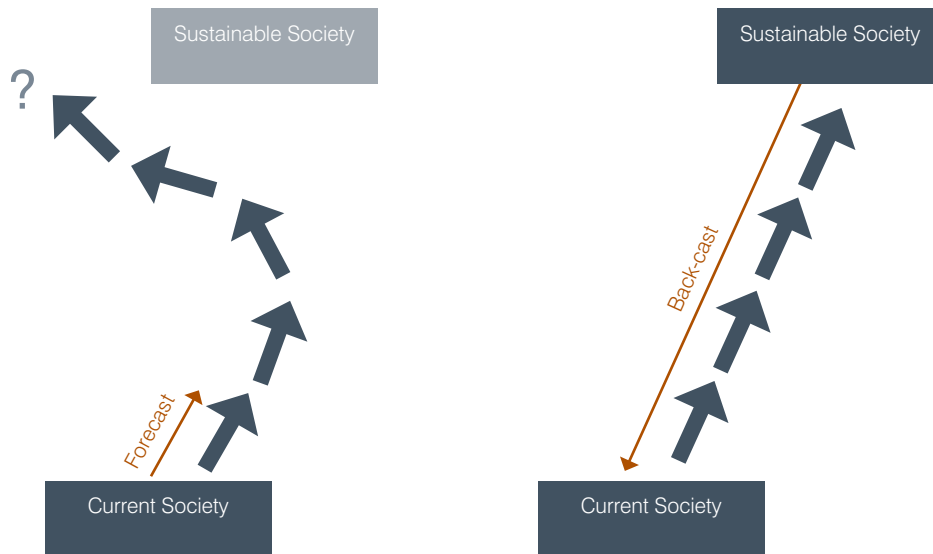
As a responsive State, Victoria is leading in a number of environmental management areas. For example, it was the first state to establish an Environment Protection Authority and to make rapid gains in urban air quality. It has also led the country in development of an emissions trading scheme (the Carbon Pollution Reduction Scheme – CPRS) and has been far ahead of the other states in the management of water resources (albeit under conditions of ongoing drought). Victoria has also taken a vigorous lead in urban water management, employing some outstanding public education programs in the process. The Environmental Sustainability Framework 2005 was a pioneering decision taken by Cabinet, while the review of the Biodiversity Strategy is providing a fresh look at how natural systems can gain full recognition in the economy. Together, these initiatives show that Victorians are innovative, willing and capable of tackling environmental problems.

As a first world state, the importance of Victoria's role in the global community should not be underestimated. In the global scale of environmental problems, Victoria is a small player, but Victoria has a comparatively large ecological footprint. As Professor Garnaut stated in regard to greenhouse gas emission reduction, taking international initiative for resolving environmental problems is:

partly a question of historical responsibility. It's partly a question of capacity, of capital and technology and incomes but most importantly, it's a practical necessity in getting others to take the next step and they need to follow quickly².

This section of the report, Part 5: Living Well in our Environment, explores the importance of clearly understanding and articulating future challenges, setting targets for the reduction of vulnerabilities and employing innovative strategies and proven approaches within a framework of strong government leadership. By doing each of these, Victoria will be able to tackle successfully the environmental challenges of the 21st century and take on an international leadership role in environmental sustainability.

LW2 The Commissioner's Approach

Figure LW1 Visioning and 'back-casting' enables a clearer path for future progress than does forecasting (after Junko Edahiro)

Victorians, and no doubt all others on the planet, understandably seek an improvement in their overall quality of life. The term *ecologically sustainable development* is used to describe how this desire for an improvement in quality of life should come without compromise to ecosystem values and services. The challenge is to ensure that our society and its economy continue to provide the services that we value while still maintaining ecosystems so that they too can continue to provide the services that we need, both now and into the future. Achieving a Victoria where this occurs requires creative re-imagining and visioning and then 'back-casting' to determine the steps needed to get to that future.

Several agencies have engaged in visioning, and each vision is different (see, for example, Box LW1). Nevertheless, there are a number of common elements that are essential if long-term sustainability is to be achieved.

Victoria, looking back from 2050

People

As the world population continues on its trajectory towards 9 billion people, national population policy has been modified. The stress in the 2000 decade on skilled migrant entry and temporary visas for labour market purposes was altered to emphasise economic and environmental refugees. This assisted the State Government by producing a marginal slowing in population growth in Victoria and the Melbourne metropolitan region to allow public transport infrastructure and other major health and education works to be supplied if not ahead of, at

least in step with, need. This ensured that wider measures of well-being were met through adequate service provision while continuing a successful and defensible rate of economic growth.

Rural adaptation: Valuing ecosystem services

With full acceptance that natural systems are the basis of the economy, Victorians brought ecosystem management increasingly to the centre of government. Society no longer discounts natural systems and the free services that they provide. Land-owners now have a fresh appreciation of the value of ecosystem services through the remuneration opportunities that provide additional income where services are protected. Clean water has become a valuable farm product alongside offering a financial return for carbon offsets and the protection and restoration of biodiversity. Supporting these markets, rigorous enforcement of regulations ensures that basic community obligations regarding ecosystems continue to be met.

As a result, autonomous and planned adaptation has occurred throughout rural areas in response to both climate change and the intensified global demand for food and fibre. This was enabled through the rebuilding of resilience in farm communities, enabling them to actively diversify cropping and pastoral patterns. State Government ensured, in cooperation with rural communities and industries, that this was not at the cost of water, soil quality and soil health.

This enabled Victorians to re-invigorate the landscape with the strategic expansion of remnant vegetation side by side with sustainable food, fibre and minerals production. The resultant corridors and riparian ecology now maximise species' survival and replacement capacity and are of sufficient scale to provide ecosystem services to surrounding agriculture. In addition, continued investment in pest plant and animal controls, restoration, and visitor management have ensured that ecosystem resilience is protected on public land.

Highly distributed production – a new paradigm

Melbourne has become a greater contributor to energy and water production through decentralised water sources (for example, rainwater tanks) and distributed energy generation (for example, domestic solar) rather than absorbing resources from hinterlands. Widespread application of industrial ecology principles have seen waste produced by Victoria's cities, including organic waste, become feedstock for manufacturing and agriculture. Urban food production supplies a much greater proportion of the food for the city, reducing pressure on Victoria's rural environments. Rather than being seen as a resource sink and as a burden on Victoria's natural environment, Melbourne is seen as actively contributing resources to improving the environment of Victoria.

Energy generation and emission reductions

Through a range of financial and complementary regulatory instruments, technologies and behaviour change, Victorians exceeded their obligations under the Carbon Pollution Reduction Scheme. Rather than deferring the necessary structural changes, Victorians captured and profited from the opportunities created by the new economic regime. Within its own operations, the Victorian Government adopted and achieved a carbon-neutral position. As well as the shifted paradigm of distributed generation, mandatory energy-efficient manufacturing processes were accepted as essential for rebuilding the resilience of vulnerable centralised systems. Efficiency gains are no longer harnessed for increased production unless it is demonstrated that there is no increase in absolute emissions. The reduced demand for energy is now met through a combination of new renewable resources. The remaining proportion of electricity generated from brown coal has become zero emission through carbon capture and storage. In reaching this position, succeeding governments in Victoria had to face up to making hard choices in relation to energy availability and price, and were able to assist established operators through a transition period. In return, this abundant energy, free of major greenhouse gas emissions, provided the basis for a flourishing electricity-based motor vehicle technology. Household and commercial design and fittings accompanied by national standard energy labelling should follow as a matter of course.

Water supply and the health of rivers

Victorians have abandoned the false assumption that activity can be planned around an historical view of a 'normal' rainfall year. Instead, it has become accepted that Victoria is a drying state with restricted water availability. Culturally accepted, sustainable patterns of use, rather than removal of water use restrictions, are now the objective.

Water resource debates between consumptive uses and environmental flows have been settled. From 2010, governments actively provided support for adjusting land use through an interim period. Now, governments no longer re-allocate environmental flows in order to offset any reluctance on the part of users who fail to adjust to the overall water availability regime. Water trading is now subject to prudent oversight to ensure that water banking and water migration do not put otherwise productive areas at risk. Agriculture on marginal soils has been retired. Throughout the Victorian portion of the Murray system, modern channel

technology, real time metering and cutting edge irrigation techniques now ensure that water for farming is secure and that water trading is backed by certainty.

The old paradigms of gravity-fed water supply and sewage systems based on vulnerable catchment input and sea discharge have been heavily modified into a distributed system that is more resilient to environmental shocks. Via the use of tanks, every house supplies a large proportion of its own water and the third pipe and black water recycling for selected purposes is standard. Intermediate 'water factories' recycle water for local and industrial uses at points along the system. At terminal treatment plants, both the recycling of water and the commercial use of effluent have turned these areas into production centres in their own right. Both increased efficiencies and increased demand management have ensured that demand matches available water. Drought tolerant plantings, water sensitive design in all urban developments and a proper understanding of ground and surface water interactions are standard.

Reliable environmental baselines, monitoring cumulative impacts

Research and development in a variety of institutions on biodiversity status, urban quality, sustainability measures (including National Environment Accounts) and broader indices of well-being are systematically supported by governments for the long term. Governments and the community hold sufficient information such that shifting baselines are no longer accepted. There is no longer the claim that a development will cause minimal environmental harm relative to present conditions while ignoring the cumulative reductions that have already occurred. Comprehensive environmental baselines have been established and are subject to full monitoring and reporting on a continuous basis. All development is justified on the grounds that it makes both local, short-term improvements and also contributes to global, longer-term improvements in environmental condition.

Leadership by example in the Victorian Government

Leading up to 2050, the Victorian Government was seen as a national leader in estate management, procurement, and vehicle fleet selection in its implementation of carbon neutrality and lifecycle approaches to environmental management. The State Government actively downsized its executive fleet to a minimum while the Commonwealth changed the favourable taxation arrangements that were associated with vehicle leasing in salary packages.

Government evolved its environmental management and Environmental Sustainability Framework systems to cover all government departments and agencies. In its own buildings, government now leads by example, even where buildings are built and owned by the private sector. The mark of government occupation is quality buildings, sympathetic to the street character, and at the highest possible environmental performance rating.

Planning, urban design and mobility

The Department of Transport initiated the creation of a proper, though dynamic, balance between road and public transport provision. Significant urban efficiencies, particularly transport efficiencies, were achieved through high density, mixed-use, transit-oriented activity centres, improved public transport, increased use of walking and cycling, and by keeping new dwellings within a robust urban growth boundary to the benefit of both agriculture and ecosystems, including native grasslands³. By providing high density housing in established areas and centres, development also took advantage of current water, sewerage and social infrastructure. These urban planning objectives did underpin the strategies outlined in Melbourne 20304, but Melbourne 2030 audit reports suggested that implementation was too slow. Melbourne 2050 and Growing Victoria Together, however, were planning strategies led by flagship case studies of world's best practice urban design and locality planning. They achieved better results in reconciling community planning objectives with environmental values. They also provided greater certainty to developers, communities and local authorities in decision making, especially in regard to rapidly altering conditions due to climate change. Both in the cities and rural areas, planning policies were broadly accepted and understood, and achieved greatly improved implementation.

Vehicle congestion was reduced through the use of road pricing, tolls and congestion charges, which were widely supported because of the rapidly expanded and integrated public transport network. Trams, trains and buses of the most advanced designs integrated seamlessly with walking and cycling, using intuitive timetabling and wayfinding. A new, more rational approach to individual mobility patterns evolved due to the increased expense of oil, but it was also fully supported by better urban design that induced further demand for these modes.

Victoria emerged as a leader in the adoption of new fuel technologies, engines and motive power, to ensure the movement of goods and services remained affordable in the face of oil and carbon prices. Government insisted that locally manufactured vehicles have the most fuel efficient engines, including the many alternatives to petrol combustion previously never seen as viable in this country.

Enabled by steadily improving public transport, Victorian regions under peri-urban influence became increasingly important in the metropolitan system. Key centres beyond this region (Portland, Warrnambool, Mildura, Bairnsdale and others) are now strongly linked into virtual networks, such that tele-commuting is as viable a means of business communication as is travel. Nevertheless, as manufacturing and tourist centres, they continue to thrive with competitive country freight and passenger rail services supported by all sectors. Beyond the major regional towns, sea change and tree change continue but are subject to stronger ecological standards and conditions, ensuring that dunes, estuaries, forests, wetlands and waterways remain in, or are restored to, excellent condition.

Waste a thing of the past

The internalisation of environmental costs has meant that the disposal of wastes to the environment is seen as unacceptable both because of the threat to ecosystem services and for the opportunity cost implied. Disposal of solid waste to landfill and liquid waste to the sea has reduced to zero. Manufacturers, packagers, distributors, enterprises and households all play a role in a system that contains major incentives for recycling and cost penalties for waste generation.

For materials, these systems now take the form of sophisticated regimes of package minimisation and producer responsibility, including 'smart' production, full resource recovery, and re-use. For energy and water, new fuel technologies and water recovery cycles that fully integrate environmental costs into the services provided by these utilities are well established.

This means that the characteristic 20th century practice of externalising wastes to the environment has been eliminated. Consequently negative environmental feedbacks requiring the rehabilitation of heavily contaminated sites and the prevention of leaching and methane escape no longer transfer costs from the producer of the wastes to governments, taxpayers and ratepayers.

Box LW1 Melbourne 2032: Looking back over the last 25 years - an exercise in visioning

Sometimes we need to be reminded just how profoundly different Melbourne is in 2032, in its structure, in its economic base and in the nature of daily life, from the city that it was at the turn of the century.

The years 2007-2015 are frequently identified as an era of significant structural change in the economy of Victoria (along with much of the rest of Australia) and historians rightly point to this period as a flowering of 'innovation for sustainability' across all sectors of society. Following a well understood pattern in technological and social development, it is clear that the shape of Melbourne over these past 25 years was affected by a 'disruptive paradigm' that was to fundamentally change ideas about the organisation of systems of production and consumption, life-styles and infrastructure. Many terms have been used to describe that change, but the term 'distributed' has been the most consistently used.

The new pattern of distributed development emerged as a response to growing concern over the implications and impacts of global warming, consumption and waste. Central to that concern were issues of security and resilience. Concern about deliberate attacks on life was greatly compounded by concerns about disruption caused by natural events, particularly from severe weather activity, new global diseases, sea level rise and so on. Every major climate incident increased the general sense of insecurity. Drought highlighted the vulnerability of past investment in water-hungry systems, from agriculture and food, to parks and home gardens, building systems, bathrooms, kitchens, laundry and sewage. Fires, cyclones, unusually high rainfall days, floods – even sudden and crippling cold spells – all added to the sense of insecurity. Big engineering solutions introduced new dependencies and vulnerabilities when supplies were disrupted through technical and other failures.

Zero carbon electricity systems developed around diverse renewable energy sources (solar, wind, biomass, CHP, micro-hydro, geothermal and wave/sea power), distributed across the country and connected to the grid. The old system of highly concentrated ('centralised') power generation, supplying dispersed users, was quickly outmoded. Distributed systems were more efficient and more

resilient to changing conditions. This transformation of the electricity system would not have generated a general sense of paradigm change were it not for the fact that essentially the same pattern of change in production and consumption was taking place in relation to water. Old systems of dams distributing water to distant users were replaced by 'water sensitive systems design' approaches, retaining rainwater where it fell for local use. Freshwater supply was complemented by treatment of wastewater at various local scales. Cities such as Melbourne were suddenly viewed as 'catchments'.

A general sense of distrust of existing systems was also evident from the beginning of the century in relation to food. A mixture of issues (health, environmental and ethical) brought food to the centre of controversy about the sustainability of modern life. The competition for land for bio-fuels became a major policy concern, as did the rising cost of food from increased fuel and water prices. The development of our extensive 'urban agriculture' (and the protection of peri-urban food production against urban sprawl) resulted from this period.

In the early years of the century there was much hype about new low-carbon technologies. Public interest and confidence was invested in the idea of new super-efficient technologies with low greenhouse gas production. In retrospect, the real force of the 'low-carbon' revolution lay elsewhere, in the (re)organisation of systems of production and consumption, involving new products and services and businesses, new infrastructure, new lifestyles and new consumption behaviours. Much of this has relied on exploiting existing technologies; innovation has resulted from the creative recombination of existing technologies to provide new ways to do old things, as well as old ways to do new things⁵.

By Chris Ryan; Victorian Eco - Innovation Lab University of Melbourne

Recommendation

LW1 The Victorian Government develop and use a single robust and clearly defined vision of an environmentally sustainable Victoria, incorporating environmentally sustainable use of natural resources, and use this to develop an update to Growing Victoria Together.

Services that enable us to live well

Degradation of the natural environment reduces Victorians' ability to live well. Some of these impacts, such as those on air quality, are observable, and actions have been or are being taken to alleviate them. Others, such as the way that climate change affects our way of life, have in the past not been well addressed by policy, although that is now changing (see Part 3.1: Energy and Part 4.1 Atmosphere, Climate Change).

Clean air and a temperate climate that enables Victorians to grow food are two examples of ecosystem services that enable Victorians to live well. Victoria's natural environment is valued for these important services. In 1997, the value of ecosystem services worldwide was estimated at US\$54 trillion per year, most of which is outside the economic system⁶. The United Nations is now undertaking the task of updating this figure, itemising it to particular services⁷. In Australia there is now a push to develop methods of environmental accounting systems⁸, which in turn will be used to develop economic solutions to sustainability challenges.

Just as the environment provides ecosystem services that enable Victorians to live well, it is also the foundation upon which Victoria's society and its economy is based. In turn, each of these provides services. The economy, itself a subset of society, provides money and wealth. The social structures that Victorians have built over the past 200 years, themselves made possible by the natural environment, also provide services. For example, personal health and safety, sophisticated medical care and a sense of community are services provided by society that enable us to live well, and are valued by all Victorians.

Living well can therefore be described as a condition in which valued services continue to be provided and in which needs are met, both now and for future generations. In order that future generations of Victorians are able to meet their needs, it is essential to protect:

- human life
- the capabilities that the natural environment has to maintain the living conditions for people and other species (for example, clean water and air, a suitable climate) as well as food and fibre, which are basic to human survival
- the aspects of the environment that produce renewable resources such as water, timber, fish, solar energy
- the functioning of society, despite non-renewable resource depletion
- the quality of life for all people – the liveability and beauty of the environment
- and proposed actions to increase the chance of living well in the future (cases below)⁹.

Therefore it is essential that the Victorian community shares the understanding that the maintenance of ecosystem services is basic to future prosperity and that in local, state regional and global forums, Victoria should seek the best strategies and programs to improve natural resource utilisation and ensure their sustainability into the future.

Recommendation

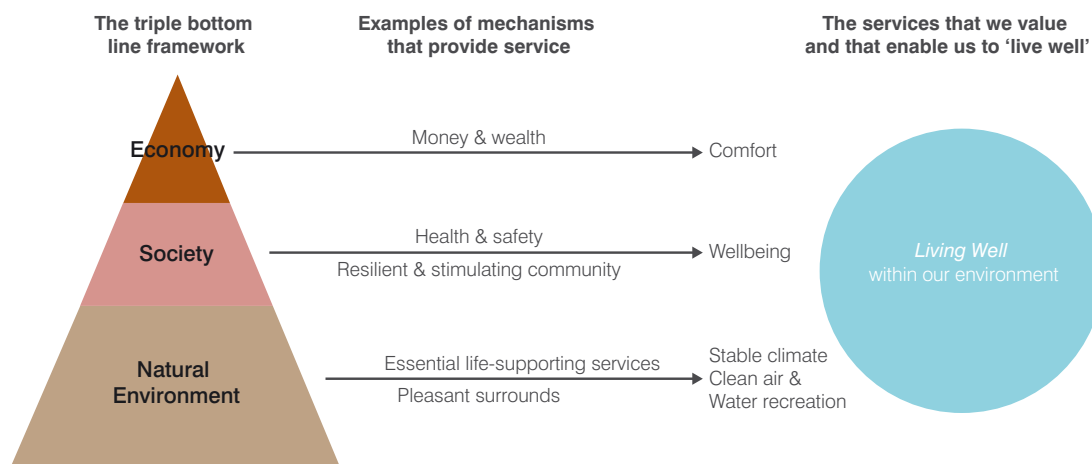
LW2 The Victorian Government should ensure that the value of ecosystem services is factored into economic decision-making, as water and climate are starting to be. Agencies should become as adept at valuing and accounting for ecosystem services as they are in regard to economic and social services.

We can't know if we are achieving sustainability unless progress toward that goal is measured. Are we living well? Are the economy and society providing the services that we value? There is no doubt that in many aspects of life they are. For the majority of Victorians, life expectancy is higher than at almost any time in history¹⁰. Further, Part 2: Driving Forces, shows that gross state product (GSP) is also increasing faster than population growth or resource use, indicating that Victorians are becoming more affluent.

In other areas of life, however, we are not living as well as we might. For example, while GSP continues to increase, there is evidence that the gap between rich and poor is also increasing¹¹. Similarly, in terms of health, the 2005 National Health Survey found that more adults are drinking alcohol at high risk levels and more adults are overweight or obese compared with results from the 2001 survey¹². The mental health of Victorians, particularly young people, also continues to be a significant social issue¹³.

Progress towards sustainable development can be tracked via the use of triple bottom line (TBL) reporting. The preceding sections of the State of the Environment Report have sets of verified, valid and statistically reliable indicators to evaluate numerous aspects of one component of sustainability: the environmental. In turn, summary analyses (for example, overall greenhouse gas emissions, extent of native vegetation cover) are used to provide the reader with information on the quality of major elements of the Victorian environment. At a still higher level, indices such as the Ecological Footprint provide a quick and effective comparison of Victoria against other states and countries.

Figure LW2 All services of value and that enable us to live well fundamentally originate from the natural environment



Triple bottom line reporting adds social and economic indicators to complement these environmental indicators in order to assess the degree to which we are living well within the environment and moving towards sustainability.

A number of organisations have developed sets of indicators for tracking sustainable development. For example, the UK Department of Environment, Food and Rural Affairs monitors progress via the use of 68 indicators that measure environmental, social and economic values of importance to that community¹⁴ while the United Nations has also developed a set of sustainability indicators. In addition to the more widely accepted indicators of environmental, social and economic development, this set also includes indicators of institutional adaptability¹⁵; that is, the level of resilience within social systems. The Commonwealth Department of the Environment, Water, Heritage and the Arts has also developed a set of 21 sustainability indicators that track important environmental, social and economic values¹⁶, while the ABS has developed the Measuring Australia's Progress (MAP) indicator set. Both of these projects use a suite of representative indicators from each of the domains – environment, society (and individuals) and the economy – and track progress within and between them to build a picture of sustainability.

Similarly, within Victoria, both Community Indicators Victoria and the State Government's ten-year vision, *Growing Victoria Together*, use sets of indicators that assess the environment, society and the economy¹⁷. Generally, these show that most economic and social values are improving steadily, while environmental values are being degraded.

By combining indicators of environmental, social and economic values into single indices, comparisons with traditional measures such as GDP can be made. The Index of Social Economic Welfare (ISEW)¹⁸ and the Genuine Progress Indicator (GPI) are two such indices. GPI was developed in the USA¹⁹ and has been applied to Victoria (see Figure LW3)²⁰.

In broad terms, the GPI makes adjustments to the GSP by valuing goods and services against their positive or negative contribution to sustainable well-being. For example, the GPI excludes expenditure on tobacco, as it is deemed to make no positive contribution to sustainable well-being, and includes the value of non-paid household labour using the net opportunity cost method. The GPI also factors a range of environmental costs into its calculation, including the cost of:

- non-renewable resource depletion
- lost agricultural land
- irrigation water use
- forest depletion
- air pollution
- urban waste-water pollution
- long term environmental damage
- natural capital services^{21,22}.

Comparing the result with GSP shows that while the economy is growing and developing, negative growth (degradation) of social and environmental values pulls the GPI back to leave it relatively static since 1986 (see Figure LW3).

The conclusion drawn from this comparison is that the high growth rates in the Victorian economy have

failed to translate effectively into increases in the sustainable well-being of the average Victorian (suggesting that) the extra benefits generated by high rates of growth were largely offset by the ever-increasing rise in social and environmental costs (p. 388)²⁴.

Despite the apparent strength of the GPI, due to the significant aggregation, there is a case for continued debate regarding whether it is possible for a single index to integrate the many elements of wellbeing and remain broadly valid. Nevertheless, there is one nation whose guiding principle incorporates broad sustainability indicators, explicitly decoupling wellbeing from economic growth. In the international sphere, Bhutan's Indicators of Gross National Happiness are now drawing attention for their progressive approach in defining sustainability²⁵.

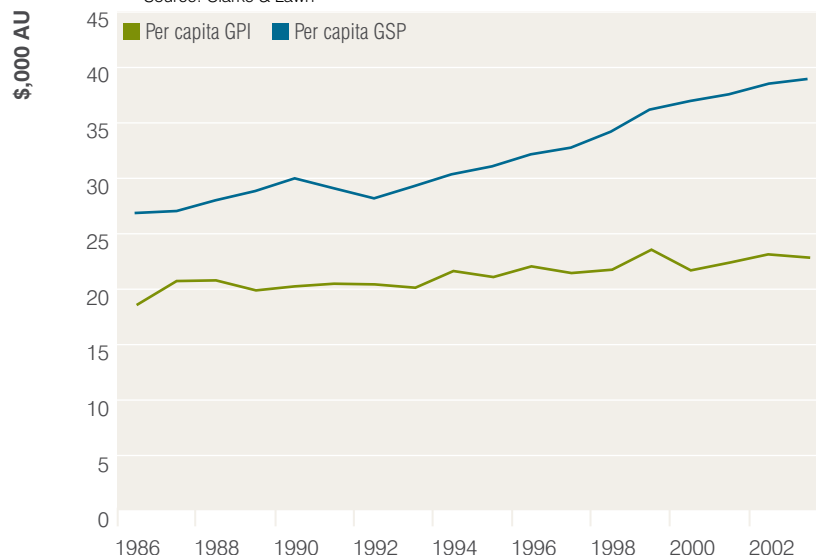
Recommendations

LW3 The Victorian government continue to develop Growing Victoria Together to monitor and report on holistic wellbeing using consistent, valid and statistically verified sustainability indicators that, as a set, comprehensively covers each of the environmental, social and economic values of importance to Victorians.

LW4 The Victorian Government develops an index of holistic sustainability (such as the GPI) for Victoria and report annually on progress towards sustainability.

Figure LW3 Genuine Progress Indicator (GPI) & Gross State Product (GSP), Victoria

Source: Clarke & Lawn²³



LW4 Essential Concepts

Four essential concepts that will be necessary for government and individuals to own and to integrate into all decision-making if the vision is to be achieved are explored:

1. Ecologically sustainable use
2. The importance of decoupling
3. Understanding shifting baselines & tipping points
4. The role that resilience and its elements must play

Ecologically sustainable use

Within the Triple Bottom Line (Environment, Society and Economy) framework, environmental values are theoretically accorded the same consideration as are economic and social values. However, historically and overall (rather than in all cases), it has been the environment that has been most often discounted. The Commissioner argues that the phrase 'ecologically sustainable development' can be, and continues to be, misinterpreted. The term 'development' has come both to mean, and to justify, economic growth in its simplest sense. As a result, 'development' is, for some, indistinguishable from environmental pressure. By this logic, any development changes existing environmental stocks, and experience shows us that these changes are usually detrimental. To others, 'development' fails to provide testable benchmarks or to stimulate monitoring and reporting. For many it allows claims that business as usual is sustainable because no real tests exist, while grab-bags of national targets measured in different ways accumulate to a claimed measure of sustainability which is often spurious and improbable. Development is seen as the source of the problem, and so the phrase 'ecologically sustainable development' itself is an oxymoron.

In fact this was not the implication of the word development as used by the Brundtland Commission. Rather, it was intended to describe a justifiable desire for improvements in health, wealth and happiness. Add to this 'ecologically sustainable development', and it is understood that the Commission was referring to advancement in the values that are important to humans and that enable us to live well (see Figure LW2) without an increase, and in fact explicitly with a decrease, in absolute environmental pressure (see Decoupling).

At the time of the Brundtland Commission, the objective was to confront the pressure for economic growth at the cost of further degradation of natural systems and to attempt to broker a resolution. The preceding sections of this State of the Environment Report, however, compel a reflection on present patterns of use. As well as focusing attention on the impacts of future development, it is current patterns that should be continuously tested for their sustainability.

This report points out that past development and present urban and rural uses have led to a continuing degradation of natural systems and that rectification is of urgent importance. Development, the commonly understood word for growth or expansion, speaks of works that add to present structures, while 'use' calls into review existing practices as well as future development actions. Therefore, *ecologically sustainable use* (ESU) is a vision of the use of natural resources in such a way that they maintain and grow production while the natural resource base is not reduced in viability or productive value.

A full environmental baseline must be established not only to facilitate more accurate decision-making but to provide for the incorporation of measures of quality of life (see Monitoring *Living Well*). This report does not take an ideological view concerning development, but throughout demonstrates the consequences of ecosystems' ability to cope with and be resilient to increasing natural resource consumption. Certainly the introduction of an altered concept such as ecologically sustainable use would act as a modifier of the assumption that a high rate of development is the sole goal of the economy.

Recommendation

LW5 When considering ecological sustainable development, the Victorian Government should take into account the present and short-term (as well as longer-term) impacts of the development process and use all available development opportunities to achieve reductions in absolute environmental pressures.

The importance of decoupling

The preceding sections of this report show that currently, strong causal relationships exist between economic growth and environmental pressure and degradation. Victoria remains a classic example of a high consumption society that has overshot efficiency gains because of increasing environmental pressure due to increasing population, affluence and consumption (the rebound effect). Efficiency gains traditionally flow through to increased productivity (economic growth), not back to the environment. The urgent challenge is to 'decouple' environmental impacts from growth, or, more specifically, from wellbeing. Decoupling is a necessary process if sustainability is to be achieved.

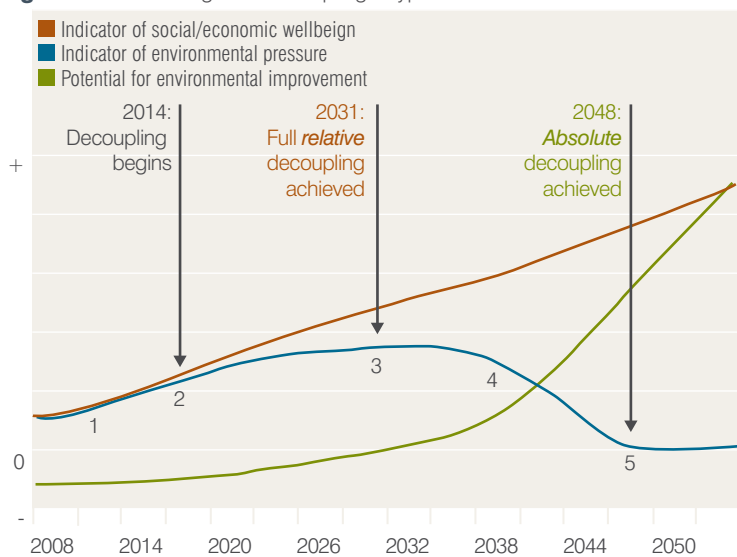
The importance of decoupling is applicable to many sectors. It is likely that to fully disassociate environmental degradation from wellbeing, decoupling will need to occur at many stages in the chain of environmental causes and consequences (see Part 1: Introduction, Figure I3). The greatest decoupling effort, however, should be made in attempting to break the causal links between wellbeing and anthropogenic pressures, rather than between pressures and environmental impacts. This is because attempting to ameliorate pressures and replacing ecosystem services (rather than reducing pressures) would be cost prohibitive²⁶, and simply because these will be the areas within which humans will have the greatest efficacy. To do this successfully will be a challenge in itself.

There are different levels of decoupling²⁷:

Relative: where the environmental intensity of an activity is reduced, yet it continues to exert pressure on the environment, and increases in degradation may continue to occur. Relative decoupling often occurs when an industry or sector becomes more efficient.

Absolute: where the environmental intensity of an activity is zero, or the activity actually improves the environment.

The following graph shows stages of decoupling in a hypothetical example. In this hypothetical example of decoupling, the indicator of environmental pressure is, at first, rising with wellbeing (1). The indicator of pressure begins to decouple from wellbeing around 2018 (2), due, for example, to environmental initiatives or eco-efficiency programs. After a time, relative decoupling is complete, wellbeing is no longer dependent upon environmental pressure being incurred (3), and the potential for improvement of the environmental attribute in question accelerates. Real world examples of

Figure LW4 The stages of decoupling - hypothetical

relative decoupling are shown in Part 2: Driving Forces, Figure DF9 and Part 3.1: Energy, Figure E15. With continued decoupling (4), environmental pressure decreases further and absolute decoupling is achieved by 2048 (5). While pressure itself cannot fall below zero, decoupling environmental pressure absolutely from wellbeing means that the potential for environmental improvement continues to increase and historic damage caused by the pressure may also be repaired^{i,28,29}.

Government at all levels plays a critical role in enabling decoupling by ensuring that the negative environmental implications of economic growth are reduced through effective strategic policy, legislation and strong regulation, planning, economic incentives or disincentives, investment in technological solutions, and the development of education initiatives. Because decoupling means change, resilience is also essential for enabling the transition. To ensure that the gains in efficiencies translate effectively to truly 'sustainable living'; that is, that they assist society towards absolute decoupling, innovative application of technological solutions and close monitoring of the effects of decoupling are also required. Market-based instruments (such as the Carbon Pollution Reduction Scheme – see Market Based Instruments, below) that fully integrate environmental costs into the economy and that are supported by robust regulation will challenge enterprises to make the quantum leaps necessary to introduce new and radically more efficient technology. In addition, changing consumer behaviour will also play an important role in enabling decoupling to occur (see LW5).

Recommendations

LW6 That decoupling of wellbeing from environmental pressures should be a major policy objective of the Victorian Government. Targeted policy, as well as public education programs, should be introduced to reduce the dependence of economic wellbeing on high consumption and its attributed environmental pressures.

LW7 That the Victorian Government comprehensively integrates decoupling, its stages and importance, into all Victorian Government decision-making at the strategic level.

Understanding shifting baselines and tipping points

Preceding sections of the State of the Environment Report describe many instances of steady and increasing pressure on natural systems. A degree of external pressure on natural and human systems is natural, and under such conditions, resilient systems are capable of internal adjustment such that they can continue to perform essentially the same function. However, for many natural systems, the rate of environmental change has been faster than that to which they can actively respond. Furthermore, the absence of consistent, long-term monitoring means that it is likely that they are also subject to the shifting baseline syndrome, whereby targets set for 'no further degradation', or even 'restoration', actually represent already degraded levels – levels at which the system may not be able to respond to additional external pressures. Examples from preceding

sections of this report include the Rock Lobster Fishery (Part 3.3: Materials), and coastal biodiversity (Part 4.4: Coasts, Estuaries and The Sea).

If unexpected, additional or compounding pressures are brought to bear on the system, it can reach a threshold or 'tipping point' sooner than expected if shifted baselines mask actual proximity to the threshold. At a tipping point, a major change of state occurs, and the eco- or human system will no longer function in the same way. Examples of thresholds are the change in state of potential acid sulfate soils to actual acid sulfate soils (see Part 4.4: Coasts, Estuaries and the Sea, Indicator CES8), tipping points at which vegetation cover provides insufficient habitat for woodland birds (see Part 4.2: Land and Biodiversity and wetland salinity thresholds for frogs (see Part 4.3: Inland Waters). For some systems crossing a threshold equates to collapse.

In regard to climate change phenomena, there are a number of potential tipping points that are now thought likely at the macro scale. These include increases in the rate of warming as absorption of carbon dioxide by the oceans reaches saturation, melting of parts of Antarctica and the Greenland ice sheet greatly raising sea level, and permanent alteration of the ocean thermohaline circulation currents (see Part 4.1: Atmosphere – Climate change). Australia 21ⁱⁱ states that

...at a global scale, carbon dioxide accumulation in the atmosphere is a slowly changing variable that will almost certainly lead to several threshold effects in terms of climate change, at various scales. It is a good example of what happens when slow changes go unnoticed or unacknowledged over a long time until they accumulate to a point that catches society unprepared for an effective response³⁰.

Furthermore, at a local scale, while not the cause of much of the environmental degradation to date in Victoria, climate change factors are likely to represent an additional stress on many natural systems that are already under pressure. This additional pressure will bring them closer to tipping points.

Understanding the likelihood of and risks associated with reaching ecological (and social) thresholds is of high importance in the development of policy to tackle environmental challenges. Rebuilding the resilience of systems (see Rebuilding resilience, below) to respond to environmental pressures enables them to avoid crossing dangerous thresholds.

ⁱ An example of decoupling creating opportunity for historic damage to be repaired is given by James Hansen of NASA: Greenhouse gas emission rates must be first stabilised (relative decoupling), then reduced to zero (absolute decoupling). Atmospheric CO₂ already emitted since the beginning of the industrial revolution should then be drawn down via bio-sequestration if the climate is to be re-stabilised.

ⁱⁱ Australia 21 is 'an independent research network that was formed in 2001 as a non-profit group to fill a national need for fresh and independent thinking about large and unsolved problems that confront us in the new century'. <http://www.australia21.org.au/>

Recommendations

LW8 That the Victorian Government, generally, employ better data collection, monitoring and reporting regimes, with a stress on long-term, consistent data sets.

LW9 That the Victorian Government, wherever possible, prevent the perpetuation of shifting baselines, particularly in regard to natural systems for which the crossing of thresholds are known to lead to ecosystem collapse.

LW10 That the Victorian Government factor in likely compounding pressures, such as the expected effects of climate change, when setting targets for ecological restoration.

Rebuilding resilience

Resilience is defined as:

the capacity of a system to absorb disturbance and re-organise so as to retain essentially the same function, structure and feedbacks, to have the same identity³¹.

The concept of resilience is equally applicable to both natural systems and human society. Societies that have high resilience are able to anticipate shocks that might be coming, prepare for a range of possible changes, respond to them in appropriate and timely ways, and have the adaptive capacity to deal with complete surprises, that is, to novel shocks that couldn't be anticipated³². Figure LW5 describes, in a hypothetical example,

how the level of resilience within societies determines their ability to adapt to a crisis, and the result of successful or failed adaptation.

In this hypothetical example, growth in wellbeing is used as the indicator of a functioning society. At a crisis (which could be economic in origin, such as the ramping up of a carbon price), a society that has a high level of resilience may suffer a temporary setback in wellbeing, but, longer term, will adapt and prosper. For example, prosperity in a future where carbon is rationally priced (see Economic solutions, below) can only be brought about by decoupling wellbeing from carbon-intensive industries (see Decoupling, above). In contrast, societies with poor resilience, unable to decouple wellbeing from carbon intensive industries, can suffer.

The crisis/resilience/adaptation model is applicable to many scales and systems. The climate changes that Australia will experience are likely to act as shocks to our ecological, agricultural and social systems, and whether we are able to absorb these shocks and keep society functioning as before will depend on whether the shocks push these systems across thresholds³³.

A similar case exists within Victorian ecology. The dichotomy that exists between the quality of biodiversity on public and private land has been discussed (see Part 4.2: Land and Biodiversity). National parks, other reserved areas and State forests have bulk and area. While many are heavily

modified by exotic plants, their size can assist resilience to external impacts. The opposite is true for small areas of reserved biodiversity. Edge effects are dramatic and in many instances the quality of the protected habitat is marginal and declining. Such areas are less resilient to change and more likely to collapse.

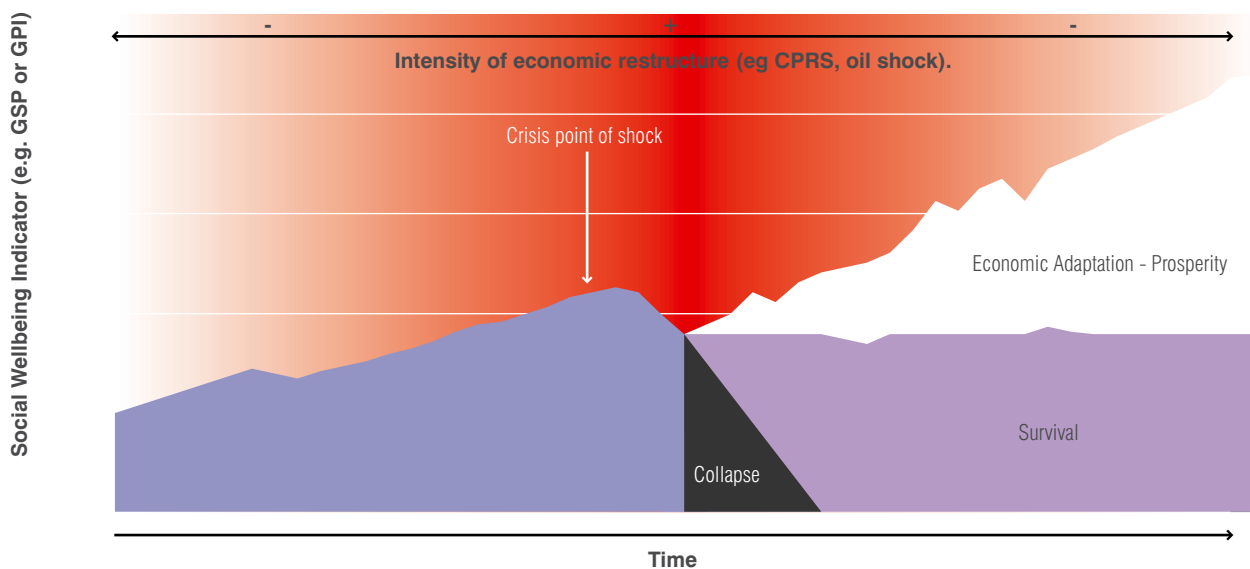
Some key questions for Victoria arising from resilience thinking are:

- What sorts of shocks is Australia likely to face?
- What big thresholds and variables could potentially de-stabilise our current way of living?
- Given that all systems function at multiple scales with cascading resilience effects, are there sets of interacting changes occurring at various scales in different kinds of variables that have the potential for significant consequences for Australia?
- How do current trends and government policies align with the ideas of resilience thinking?

Further, Australia 21 states that

Approaches to policy seldom acknowledge or deal with the possible existence of alternate states and threshold effects. They tend to assume that recovery from any disturbance is possible; that all disturbances can be managed after they have emerged and are established. Societies promote the persistence of currently favoured states and in general do not embrace change as a necessary component of progress³⁴.

Figure LW5 How societies with different levels of resilience adapt, or fail to adapt, to a crisis



This issue highlights the need for government to raise the profile of change as a fundamental component of resilience thinking and to encourage community participation in innovation and adaptation. The media, while playing an important role in raising awareness for people struggling to adapt to change, also often sensationalise issues such that resistance to essential change is fostered and resilience is reduced. As an example, the increasing price of oil, forecast by CSIRO to reach as much as \$8 per litre by 2018³⁵, creates significant social vulnerabilities. Rather than dwelling on the negative aspects of this likely change, there is a role for strong yet optimistic government leadership in building society's resilience and its ability to adapt to this impending scenario.

Breaking the concept of resilience down further enables better understanding of its elements. Australia 21³⁶ describes a number of factors believed to be essential to a resilient society. Amongst others, these include:

- both official, and unofficial, encouragement of diverse ideas, skills, and viewpoints
- modularity and decentralisation; for example, distributed energy, water and food supplies
- exploration and identification of challenges and opportunities
- use of subsidies that facilitate change rather than subsidies not to change
- investment in, and support for, innovation

- building the motivation and capacity of individuals to deal with social and economic problems

- trust and respect exemplified by transparent governance.

In short, diversity (in approaches, technologies and process), innovation, rebuilding capital (natural, social and financial), and the ability to embrace change within and across subsystems of society are essential qualities of a resilient society, and many of these are exhibited within the communities and subcultures of Melbourne and Victoria.

Also fundamental to resilience is an understanding of the limitations of increasing efficiency. While increasing the resource efficiency of society, especially energy intensive industries, is essential for sustainability, alone it is unlikely to be sufficient. One by-product of efficiency, 'the rebound effect', describes how increasing efficiency can actually increase environmental pressure (see Part 2: Driving Forces and Part 3.3: Materials).

Another perverse outcome of increasing the efficiency of a system is that it can make it more vulnerable to shocks and disturbances. A process that is highly tuned or optimised is more likely to collapse entirely when a single component gives way. In contrast, a system with a diversity of methods for performing the same function – for example, modularity – is more resilient overall, since what to a rationalist may seem to be built-in

redundancy actually enables adaptation³⁸. Redundancy should not be seen as a dirty word, and in fact is already integrated into environmental theory via the term, the precautionary principle³⁹. Incorporating resilience into environmental management regimes implies that natural resources should not be 'fully exploited' or managed for 'maximum sustainable yield'⁴⁰, but should be managed so that they are able to adapt to unknown, as well as known, pressures.

Resilience is an essential characteristic of a society that can respond to the challenges of environmental sustainability. The established discipline of risk management can be used to develop the methodologies and the metrics needed to track a society's resilience to environmental pressures and to build understanding of when urgent intervention is needed or might be too late. As the role of resilience and the importance of its elements (diversity, innovation and modularity) are realised, numerous business opportunities will emerge.

Box LW2 Permablitz – Community innovation for sustainable urban food production www.permablitz.net

Permablitz, based on the idea of 'Backyard Blitz', is a reciprocal volunteer network that retrofits areas of participants' backyards for food production. During a 'blitz', volunteers spend a day sharing skills (workshops on edible plants, pruning fruit trees, reducing household energy use, companion planting, propagation and preserving foods) to create an edible garden. After a volunteer has attended a few blitzes, organisers assist with designing his or her garden and coordinating a 'blitz'. Designs are based on permaculture, a design system that provides for human needs with minimal effort while improving the local environment.

Permablitz contributes to urban resilience by improving wellbeing through physical exercise, healthy organic food and creating community networks of gardeners. Distributed organic food production mitigates environmental impact and vulnerability to food shortage by minimising resources used to grow, package and transport produce. 'The ultimate aim of *Permablitz*', says organiser Dan Palmer, 'is to make the suburbs edible enough such that as food costs rise, we don't even notice'. Melbourne recently celebrated its 50th *Permablitz* since the network was established in 2006 with projects supported by the Dandenong Development Board and the Planning Minister³⁷.

Recommendations

LW11 The Victorian Government should develop indices of resilience within the natural systems of Victoria so that defensible management measures can be determined.

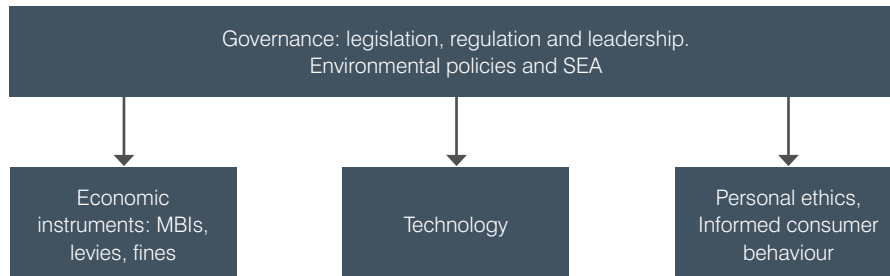
LW12 The Victorian Government should develop and monitor indices of social resilience, measuring all its elements (for example, innovation, diversity, distributed systems and the ability to embrace change).

LW13 The Victorian Government should investigate ways to build greater levels of resilience into the community by:

- providing social (financial) support for communities to adapt, rather than not to adapt
- encouraging diversity of employment patterns, lifestyles and cultures
- actively encouraging community-based social support networks
- promoting and supporting innovation at its most fundamental level
- building awareness of the limitations of increasing efficiency.

LW5 Mechanisms of Change

Figure LW6 Governance in the form of legislation and regulation are vital to supporting each of economic instruments, technology and consumer behaviour



Governance, economic solutions, technology and individual action are four elements that have been selected as key examples in which a change of direction would lead to a refreshed approach to natural resource management in Victoria. Generally, the first, governance and its elements (legislation, regulation and policy) are needed to support each of the other three.

Notwithstanding the central role of governance, it is the creative and sensitive use of these tools in combination (see Box LW5) that will be the markers of relief on the State's environmental resources.

Natural system governance, environment policy and SEA

Government and the community need a range of instruments to meet environmental objectives. It is critical, therefore, that environmental management is moved to the centre of government policy analysis and consideration.

Traditionally, the phrase 'natural resource management' was applied only to commercially exploitable natural features: fisheries, soil for farming, forests, minerals and fossil fuels, and water for consumptive use. Consequentially, departments such as Primary Industries saw themselves speaking for soil-based economic production and for conservation that supports this, and other economic departments for that part of natural resources used in their areas of policy responsibility. In this report it is argued that all natural resources, with or without attributed monetary value, require stewardship, and, where relevant, regulation or protection. This is not only for values claimed simply for 'the environment', but because of our rapidly emerging understanding of our dependence on ecosystem services for our way of life (see Figure LW2).

Governments do regulate certain direct pressures that potentially threaten diffusely distributed natural assets (discharges to the air, water and land, and protection

and management of native vegetation on private land). The Victorian EPA was the first body in Australia (1970) to regulate the discharge of liquid, gaseous and solid wastes to the environment. At the opposite end of the scale, governments protect large parts of landscapes via reservation in parks. Between these extremes there is also a large investment in planning and advisory activities, such as by the Victorian Coastal Council, the Victorian Catchment Management Council and Catchment Management Authorities, which are also service delivery bodies. There is also a powerful role that conventional local authority statutory and strategic planning plays in environmental management. Nevertheless, a history of multiple agencies presiding over discrete projects has made it difficult to develop holistic policy for environmental sustainability. In addition, governments in Australia have been historically divided between those departments responsible for economic outcomes, those dealing with social issues such as health and education, and a group often seen as oppositional in purpose, including departments responsible for environmental interests.

In fact, the most important 'environmental' legislation does not lie within the administration of the Minister for Environment and Climate Change. It is in the hands of the central agencies such as Premier & Cabinet, and Treasury, and, for metropolitan Melbourne, in the disparate hands of the Ministers for Planning, Public Transport and Roads & Ports, as well as others. Due to the interdependence of their portfolios with the natural environment, each of these ministers should consider him or herself an environment minister and their decisions should be made with due regard for natural systems.

Taxation policies also have direct environmental impacts, and so governance at the Commonwealth level has an important role in enabling or

preventing environmental management. For example, the Fringe Benefits Tax treatment of leased vehicles in the private and public sectors is a case of Commonwealth policy having perverse environmental effects, and runs totally counter to the objective of mitigating greenhouse gas emissions.

Victoria has more than 50 Acts and nearly 30 strategies that relate to environmental management. Despite this, this report argues that at best they can be seen as holding the line on environmental degradation. At worst they have slowed the rate of decline or made no difference. While there have been some excellent recent initiatives in holistic governance (for example, the establishment of Regional Management Forums⁴¹ in regional Victoria), the value of partnerships between agencies is not widely accepted as standard to the degree that they can sufficiently address the scale and interrelatedness of environmental problems.

In the built environment, urban form has been shown to be responsible for a significant impact and therefore has a role to play in reducing this impact^{42,43}. Part 2: Driving Forces shows that metropolitan Melbourne contains the dominant human concentration in Victoria. It is rapidly growing and expanding into contiguous rural areas. Oil and carbon prices stand as contra-indicators of this process and may lead to significant vulnerabilities. However, at this point, there is little to indicate that these looming crises have had an effect on urban growth patterns. When they do, the inertia of systems that have been optimised around non-renewable resources (oil and coal) will make managing these phenomena extremely challenging. Residential housing design and standards also largely fall outside the influence of 'environmental' managers, yet dwellings are an important component of achieving greater energy and water efficiency. Urban planners and architects

are therefore amongst the most critical groups who will influence environmental health in the State, and strategic urban governance for sustainability is urgent and vital.

These examples show the need for natural systems and sustainability governance to be considered in the development of policy and integrated into government decision-making at the highest level. Due to our understanding of the interdependencies that exist between the natural systems, and the current magnitude of our interactions with them, there is an urgent need for both a horizontal and a vertical alignment of national, state and local environmental governance.

Recommendations

LW14 Commonwealth, State, and local governments and their departments and agencies involved in overlapping and competing funding and policy areas (such as road provision, public transport and metropolitan planning, and primary industry and biodiversity planning) must demonstrate greater coordination to avoid perverse and conflicting policy outcomes. The creation of strategic statutory bodies that are capable of holistic and long-term sustainability decision-making should be thoroughly explored (cf. the new Department of Transport).

LW15 An examination of current policy should be made by the Victorian Government to identify and reconcile subsidies, grants and programs that are perverse to agreed environmental objectives.

Strategic environmental assessment for major policies and programs

Since the late 1960s, environmental impact assessment (EIA) has played a major role in dealing with environmental impacts. Generally speaking, this tool was the response from government to deal with environmental degradation at the project level. In Victoria, the Environment Effects Statement (EES) plays a similar role. EIA has been central to environmental protection and management; however, due to the complexity of current environmental problems it is out of date.

It has now been realised, if not always accepted, that due to the interdependencies that exist between economic and environmental systems, today's environmental problems have reached a point where they are less local and more regional, or indeed, global; where marginal human influences on the environment can become crucial; and where the Earth's capacity to recover from environmental degradation is constantly decreasing. Climate change is a prime example. This environmental problem is characterised by its large scale (a global phenomenon), its cumulative nature, the strong relationship with economic development, and its relevance to all sectors of the environment and society. These characteristics require a strategic environmental assessment, but there is no conventional site-based environmental impact tool available for this high level

purpose. It is under these circumstances that decision-making processes have to change. We need new strategic tools and techniques to cope with the new environmental challenges.

Strategic environmental assessment (SEA)⁴⁴ is a tool used in the European Union (see Box LW3, below) to better inform decision-makers on the environmental implications of a policy, plan or program. In contrast to EIA, which focuses on the project level (a minor element on the strategic scale), SEA targets the sources of environmental impacts rather than the symptoms. Unlike EIA, it is a proactive rather than a reactive tool. Under the climate change scenario, this characteristic is central, as it provides for multiple benefits: on one hand it serves as a mitigation measure as it helps to determine, proactively, the best policy, plan or program for the environment; on the other hand, the costs for adaptation are less, as these are correlated with the selected policy. SEA assesses the impacts that projects are likely to have on each other to ensure that the objectives of plans do not conflict. SEA also monitors plans' cumulative impacts and significant effects over time (impacts which may occur beyond the lifetime of a plan) in order to reduce the negative impacts and to enhance the potential environmental benefits of a policy. The SEA process can therefore help to unveil contradictions between policies, detect environmental impacts that spill over into other sectors and point to circularities.

Box LW3 European Union SEA Directive

The Strategic Environmental Assessment (SEA) Directive supplements the environmental impact assessment system for projects introduced by Directive **85/337/EEC** on the **assessment of the effects of certain public and private projects on the environment**, which introduced a system for prior assessment, by the Member States, of the possible effects of public and private projects on the environment. Directive **85/337/EEC** covers construction work and other installations or schemes, as well as other measures affecting the natural environment or landscape. The new Directive introduces a system of prior environmental assessment at the planning stage.

The Directive applies to plans and programs liable to have significant effects on the environment, as well as to their modifications, which are prepared and/or adopted by a competent authority or prepared by a competent authority

for adoption by means of a legislative procedure; and which are required by legislative, regulatory or administrative provisions. Environmental assessment is automatically required for plans and programs which are prepared for town and country planning, land use, transport, energy, waste management, water management, industry, telecommunications, agriculture, forestry, fisheries and tourism and which provide the framework for subsequent consent for specific projects listed in Annexes I and II to Directive **85/337/EEC**. The same applies to the adoption of plans and programs liable to affect **sites** protected by Directive **92/43/EEC** and for which an assessment is required under that Directive. Other plans and programs which set the framework for future development consent of projects will be subject to environmental assessment if an examination taking account of the criteria laid down in Annex II to the Directive shows that they are liable to have significant effects on the environment⁴⁵.

The implementation of SEA is of particular relevance for Victoria as the State responds to the pressures of population growth and climate change. Major developments sponsored by government and private capital investment are now capable of creating a far more complex reaction than had ever before been considered, and certainly well beyond the spatially-defined scope of the development. A case in point is the implications of the present channel deepening program. The impact of the dredging itself is outweighed by the wider and longer-term land-side impacts, outside the formal environmental assessment. The *East West Link Needs Assessment* was, in part, an attempt to manage the land-side impacts of channel deepening, but the scope of this, too, was limited, with the entire range of options, including improvements to interstate rail freight, not considered at the outset but incorporated as apparent reactions later in the process. Taken a step further, the induced material demand created by imports made cheaper by more efficient shipping, logistics and transport will have implications for waste management and for Victoria's materials resource efficiency.

Another example is the Victorian commitment to cut greenhouse emissions by 60% by 2050, decreasing water availability and the use of expensive, energy-intensive water infrastructure developments as current government responses to these pressures. When assessed strategically, contradictions between the objectives of these programs become apparent. SEA can be of great benefit at this point, as it can assist in determining whether the proposed temporal and sectoral solutions are the best options or whether there is a circularity effect between these responses that will demand even more expensive repair in the future.

The principal intergovernmental group in Australia, the Council of Australian Governments (COAG), has agreed to the Commonwealth conducting region-scale environmental assessments as a precursor to establishing acceptable classes of development (see Box LW4). Although primarily directed at attempting to minimise the political use of assessment tools in major resource development disputes (for example, in forestry), it is a nascent SEA tool.

Box LW4 Environmental Assessment and Approval Processes

Council of Australian Governments decision, July 3, 2008:

COAG has further agreed to the identification of opportunities for strategic assessments under the *Environment Protection and Biodiversity Conservation Act 1999* to avoid unnecessary delays in development approval processes. Strategic Assessments are conducted over an entire region and provide a mechanism to approve classes of development which have been assessed under this process, rather than conducting individual assessments and approvals. Strategic assessments provide certainty for development proponents and reduce duplication, while providing greater protection for the environment.

SEA therefore provides a basis to which existing policy decisions in Victoria can harness this wider form of environment assessment. The Environmental Sustainability Framework 2005 led to the Environmental Sustainability Action Statement 2006 (ESAS). The ESAS 16.2 initiative is a commitment to developing a process of environmental assessment of government's internal, day-to-day decision making, but which would also encompass all policies, strategies and programs⁴⁶.

Through a merger of the well-developed principles contained in the European SEA process and the ESF commitment, Victoria would be well on the way to achieving this objective⁴⁷. Once the SEA 'strategic gateway' is passed, if a project is approved, conventional EES-style examination would then be applied to the local impacts of major works associated with that project. By fulfilling all environmental obligations from strategic to specific in this way, Victoria could and should be the leader in government-directed environmental assessment in Australia.

Recommendation

LW16 The Victorian Government should institute as soon as possible a statutory-based assessment of the full natural resource impacts of all policies, programs and strategies brought before Cabinet. The essential elements of broader environmental assessment as used overseas (such as Strategic Environmental Assessment – SEA) should be used to support its existing ESF integration policy commitment. All pre-Cabinet processes will need to certify that a proper environmental assessment of all policies, strategies and programs has been conducted.

Climate legislation

The Victorian Government is developing a Green Paper which will outline its proposed approach to dealing with climate change. To ensure that Victoria's policy framework is effective a climate change mitigation and adaptation test should be built into all Cabinet and budget decisions relating to policy, infrastructure and expenditure.

The existing Victorian Climate Adaptation Program provides a basis for further developing a strong and ongoing adaptation research program. Key areas of focus should include long term planning for electricity infrastructure, and the resilience of agriculture and natural systems. There should be a clear commitment to business, local government and community engagement and delivery of public good outcomes in the protection of natural systems and resources.

Conducting regular risk assessment related to climate change, looking at risks to both the natural environment and infrastructure, would place the Victorian Government in a good position in its progress towards achieving its stated greenhouse gas emissions reduction and climate change adaptation goals.

Recommendation

LW17 Victoria's proposed Climate Change legislation should incorporate the elements of Recommendations A1.4, A1.5, A1.6, A1.7 and A1.8 and A1.10 as detailed in Part 3.1: Atmosphere, Climate Change section of this Report.

Government leading by example

The Victorian Government is one of, if not the biggest, purchaser of goods and services in Victoria. Public sector expenditure on goods and services was \$14.8 billion in 2005-2006⁴⁸. The Government should use its purchasing power to drive cleaner production and improved cost-effectiveness over the whole lifecycle of goods and services as well as the development of low emissions and energy efficient technology, including sustainable decision-making, sustainability accounting and reporting, and the management of built assets and fleets. Robust annual public greenhouse gas emissions and water consumption performance reporting is required at a whole of Victorian Government and individual Agency level.

Government should thoroughly reconsider its executive vehicle policy to the extent that eligibility should be seriously curtailed, and remove the perversely (Commonwealth) tax-funded incentive from salary packages upon which the policy is based. Government should also make it clear to local car manufacturers its requirement for small vehicles and alternative fuel systems.

The Government should be signalling to the community its vision for Victoria and enacting that vision within its own operations. To do so will raise public confidence in the Government's ability to take appropriate and well considered action for sustainability. Similarly, while strong leadership is essential, it must not occur without well controlled community consultation and transparent due processes.

Recommendations

LW18 The Victorian Government should continue and expand at the highest level its role of public leadership for sustainability by visibly and transparently demonstrating commitment to environmental sustainability (in each of the areas of energy, water and materials) in all Government operations – purchasing, decision-making, accounting, facilities and vehicle fleet management.

LW19 Ambitious stretch targets (including zero emissions) should be set and regularly reported against at a whole of government level in State budget papers. Detailed entity-by-entity listing of performance should also be publicly provided.

LW20 As part of this process, an examination of all policy, current and future, should be conducted by the Victorian Government to identify and reconcile subsidies, grants and programs that are perverse to agreed environmental objectives.

Economic solutions

As noted in Part 2: Driving Forces, ecosystem services are essential for life but traditionally have been uncosted or underpriced. The challenge is to adequately value ecosystem services and to integrate that information into the economic framework. Economic instruments at the Government's disposal include:

Rebates, which are useful in terms of encouraging consumer shift towards more sustainable appliances and technologies. For example, the Victorian Government currently provides rebates for installing water tanks in the home. Other examples include the Commonwealth Government rebate for installing solar hot water systems, water tanks, and LPG tanks in cars (which came about as the result of rising petrol prices).

Financial incentives, which encourage the development and use of environmentally sustainable technologies and industries. One such incentive is the provision of 'green home loans' from selected banks, which offer home buyers reduced interest rates on new sustainable houses, home renovations or environmentally-friendly household products.

Pollution taxes are another means of valuing environmental services and mitigating environmental degradation. For example, companies that generate pollution are required to bear the cost of that pollution as part of their production costs – ultimately, this cost is passed on to the consumers through their purchase of products. Fines, which are applied through a regulatory process, can also deter companies from polluting.

Market-based instruments are a means by which governments attempt to address a market failure that may have led to environmental degradation by putting a price on ecosystem services. Provided that the price fully reflects the value of ecosystem services, is applied to all sectors and is carried through all stages of the economy, MBIs have the potential to reduce the environmental pressures associated with consumption of resources. MBIs in effect integrate the ecological footprint, embodied water, embodied energy, etc. (see Part 3.3: Materials), entirely into the price of consumables, creating price-signal disincentives to the consumption of environmentally damaging products and services and incentives to invest in sustainable ones.

In short, each of the above mechanisms enables ecosystem services provided by natural systems to be valued and priced and allows them to be traded. In doing so, the risk of 'liquidating environmental capital' must be minimised. Until recently, implementation of market-based instruments has been difficult due to lack of clarity regarding property rights over natural resources⁴⁹. Following successful trials, the Victorian Government has now implemented a suite of market-based instruments that can achieve positive environmental outcomes at low cost.

Economic instruments are used in Victoria to achieve environmental outcomes. Price-based instruments include incentives, while quantity-based instruments include auctions and cap and trade systems⁵⁰. At the Victorian level, ecoMarkets is being implemented to improve environment integrity whilst providing financial reward to private land-holders. The use of auctions and offsetting mechanisms are the basis of this approach, which comprises three market-based systems: BushTender, EcoTender and BushBroker (see Part 4.2: Land and Biodiversity). This approach is proving to be very useful in protecting, managing and enhancing the Victorian environment.

At the national level, Australia's ratification of the Kyoto Protocol in 2008 is being implemented through the development of a national emissions trading scheme, the Carbon Pollution Reduction Scheme (CPRS), due to be implemented in 2010. The scheme establishes a carbon price and allows parties to buy and sell permits for emissions or credits for reductions. In effect, emissions trading will integrate the cost of the energy embodied (see Part 3.3: Materials – Embodied energy) into products during their manufacture and transport into the retail price of that product, thus providing a financial incentive to reduce consumption of energy-intensive products.

The CPRS is generally considered to be one of the most efficient ways of reducing greenhouse gases and is the principal policy instrument being implemented to enable Australia to achieve its greenhouse gas emissions reduction target. In the European Union this has been a cost-effective tool for cutting emissions. However, while the CPRS aims to address the climate impact of products, the environmental costs of water embodied into products and all the other impacts (for example, non-GHG pollutants) attributable to products are still to be fully integrated into the economic framework. Other economic solutions (rebates, levies, fines, etc.) address certain stages or impacts of certain products' value chain but there is potential for a full suite of MBIs that rationally price all the impacts attributable to products to be developed.

Realising the long-term value of good natural resource management and the potential to trade in services provided by healthy functioning ecosystems has been a turning point in how land, and particularly rural land in Victoria, is managed⁵¹. It has challenged farmers to be clear as to the value of agriculture in providing not only food but also ecosystem services. The recent trend in sharing both costs and benefits of good natural resource management has created new tradable property rights, providing a new income source for farmers, and has improved the natural environment for the whole community.

Despite this shared responsibility, some lobby groups have called for a legal right to compensation for restrictions they perceive on existing property rights. Further, critics challenge the transfer of financial resources from taxpayers to farmers, saying it would not necessarily result in increased productivity, improved environmental outcomes or more balanced rural communities⁵².

Nevertheless, where market failures are obvious, government should move to regulate necessary changes (for example, in construction standards). In addition, sectors of the community least able to bear the costs and that are vulnerable to price shocks brought about by the implementation of MBIs will need to be supported through the transition period. Victoria's approach to the use of market-based instruments was initially well received. However, some warn that it is too crude to be used as the only policy tool. It has been said that MBIs for vegetation management allow the loss of threatened ecosystems through the gain of common ecosystems⁵³, effectively a form of asset liquidation. There is therefore a need to proceed with caution, as although there have been some successes with market-based instruments, they cannot be relied on in all cases and must be part of a suite of policies.

Just as the term 'techno-optimism' has been used to critique the overly optimistic view that technology will solve environmental problems (see The role of technology, below), so too could the term 'econo-optimism' be applied to the belief that market-based instruments and other economic solutions alone will solve environmental problems.

As the true scarcity of resources becomes clear, the creation of markets for natural resources is helping in Victoria's task of protecting the environment. The Victorian Government has been a leader in Australia in developing, testing and implementing market-based instruments so that now similar models are being implemented across the country. This is generating a change in behaviour which in turn results in better environmental management. The Commissioner supports and promotes the use of a comprehensive framework for investigating the feasibility of market-based instruments that provide good value and efficient outcomes to the Victorian community as well as providing long-term environmental solutions.

Economic instruments are important for mitigating environmental change, but they have limitations. Economic tools and incentives are reliant upon encouraging and directing people into a particular course of action rather than challenging people's basic assumptions and value systems. For this reason, a systemic approach using a comprehensive framework of analysis capable of encompassing economic, political, social and psychological dimensions is also necessary. This integrated approach is essential if the global community is to establish a social structure capable of supporting the earth's ecosystems, both now and into the future.

Recommendations

LW21 That the Victorian Government continues to investigate and implement market-based instruments to achieve positive environmental outcomes, using prices set to account for the full value of ecosystem services. Any interventions should be by way of budget allocation and not through the creation of market distortions.

LW22 That the Victorian Government continues to support development and implementation of the Carbon Pollution Reduction Scheme, in a form that does not contain major distortions, by no later than 2010.

LW23 That monitoring of the on-ground outcomes of market-based instruments is conducted by the Victorian Government to enable a review of the effectiveness in terms of both monetary cost and environmental outcome.

LW24 That recognition should be accorded for the continued need for strong environmental regulation by the Victorian Government where a market-based approach demonstrably fails to achieve required outcomes.

The role of technology

The development of technology designed to achieve efficiency, and thereby reduce pressure on natural systems, is a major imperative of both government and business. As with new developments in the health or life sciences, depending upon their application, these can be seen as either a benefit or a handicap. A new technology can result in either a reduction in environmental pressure or in an increase in pressure, particularly if it enables enhanced exploitation; that is, if it is used to gain increased productivity from the efficiency gains achieved – the so-called 'rebound effect' (See Part 2: Driving Forces and Part 3.3: Materials).

Technology is fundamental to modern society and can assist in relieving environmental pressures, but it is inherently neutral. It is the way that technology is applied, and how we respond to its availability, that matters.

In terms of working towards sustainability, the types of technologies available can be classified into two categories: 1) Cleaning technologies, which are those technologies that are added to existing production processes to control and reduce pollution (end-of-pipe technologies and control devices); and 2) Clean technologies, which attempt to prevent pollution from occurring in the first place.

The Victorian Government is currently engaged in the development and uptake of a number of energy and waste minimisation systems. These include technologies that provide renewable energy, greenhouse gas abatement, waste minimisation, treatment and reuse energies, enviro-consultancy, and scientific and monitoring instrumentation⁵⁴. A major area of innovation in Victoria is the development of clean coal technologies aimed at helping to mitigate the effects of climate change through a reduction in greenhouse gas emissions. For example, Victorian scientists are working on drying brown coal through a process of mild heating and squeezing. By removing 70% of the water content, the coal is reduced to a state far more suitable as a feed for efficient power generation. Scientists believe that drying brown coal could cut greenhouse gas emissions within Victoria by a third⁵⁵ (see Part 3.1: Energy).

Other examples of technological solutions that can assist in abating the negative effects of increasing population and affluence range from large-scale, government-directed clean coal schemes through to water-saving shower heads and drip irrigation systems from private manufacturers. One particular area in which technology can be of great assistance is in the building sector, particularly for decreasing the consumption of energy and water in both commercial and residential buildings (see Part 3.1 Energy and Part 3.2: Water Resources). In these areas, technologies can be used to improve efficiencies in terms of resource consumption and peak energy demand smoothing. For example, solar heating systems and energy efficient appliances assist in reducing the energy consumption of households. These technological solutions can work at both the individual level, where home owners choose to retrofit their houses with energy- and water-saving technologies or commission architects to create a sustainable home from scratch, through to large-scale developments such as greenstar-rated office blocks in central Melbourne and 'sustainable' housing developments in the outer suburbs. Recent examples of such initiatives in Melbourne include Council House 2 (CH2) in the City of Melbourne, and the Aurora Development in Epping North. However, the effectiveness of these initiatives is highly dependent upon educating residents to adopt energy- and water-efficient behaviour.

Technological innovation often faces significant obstacles. Companies developing new technologies are often unable to capitalise on their efforts due to the difficulty of finding the funds to develop and commercialise, even when the benefits flow on to the wider community. Because of historic economic frameworks, sustainable technologies still have the potential to reduce company profitability, which is a strong disincentive for companies to innovate. While sustainable development is inevitably dependent upon a combination of these two broad groups of technologies, it is important for policy planning, legislative measures and economic incentives to reflect a commitment towards an economic framework that supports the development of technologies that only use renewable resources: 'clean' technologies. For example, under the Carbon Pollution Reduction Scheme, adequately priced carbon should lead to generators substituting new technologies to abate present emissions that become expensive in a permit-based system. At the same

time, improved wind, solar, geothermal, and wave technologies become more cost-effective, particularly if volume sales begin to fund ever-improving forms of these approaches to generation.

The Victorian Government offers feed-in tariffs for small scale solar generation and rebates for water tanks in the home (see also Economic solutions, above). The installation of solar hot water systems and water tanks is also currently supported by the State Government's five-star rating scheme for environmentally sound homes. As stated above, it is important to recognise that the efficient use of resources can encourage increased consumption. For this reason it is important that government support for sustainable technology programs is not undertaken in isolation, but in a policy context where support is clearly linked to the long-term, strategic goal of reducing environmental pressures.

Therefore, the widespread integration of sustainable technologies that enable society to actively change current systems will be facilitated by overall policy frameworks and by the Victorian Government supporting the innovation and knowledge economy (see Resilience, above). The provision of incentive schemes for both companies and the end consumer will also be integral. Economic support may take the form of tax breaks for developers and manufacturers of sustainable technologies.

Box LW5 Technology for environmental sustainability in *Our Environment, Our Future*⁵⁶

Action 12.5: Science and technology for environmental sustainability

Victoria's capabilities and needs in emerging technologies and innovation present opportunities to develop effective responses to environmental challenges that also increase jobs, private sector investment and export opportunities. Environmental sustainability will become a key consideration in science, technology and innovation across the spectrum of Victoria's capabilities. For example, Victoria will participate in, and promote the development and adoption of, exciting technological advances in areas such as nanotechnology and agricultural biotechnology to secure the environmental benefits that they are expected to yield.

Sustainable development requires the resolution of two contradictory dynamics; namely, a commitment to ongoing improvements in short-term wellbeing (which currently implies continued economic growth) and the need to protect the natural environment for the wellbeing of future generations and for other species. If development is to be sustainable it is imperative to find ways to decouple growth from environmental degradation (see Decoupling, above). Technology will be central to achieving this goal. Specifically, there is a role for technology to improve resource productivity (production processes) while simultaneously reducing the consumption of energy, water and materials (technological efficiencies). The development of these broad areas of technological innovation will not only assist in reducing the global ecological footprint, but will also ensure the continued growth and diversification of the global economy.

While technology will play a crucial role in reducing Victoria's ecological footprint, and while optimists may look to technology alone to solve environmental problems (techno-optimism), it is unlikely that single 'king-hit technologies', or indeed any combination of 'technological fixes', will restore ecosystem integrity in the absence of strong environmental governance, economic solutions and individual consumer ethics. In any case, reliance on single technologies (such as carbon capture and storage) also creates vulnerabilities (see Resilience, above). Research and development should continue urgently on such technologies but development of a diversity of technologies should also be supported.

It is reasonable to conclude that to date in Australia the technological improvements to resource efficiency have been translated into increased productivity. However, it is not a simple binary issue – in many cases increased efficiency can lead to increased profit through the better use of materials without an overall increase in production. In other cases where waste streams have been brought towards zero, the capture in increased production is acceptable. However, where the efficiency gains are unable to bring waste production close to zero, then capturing these improvements in a context of growth and expansion simply increases absolutes, although at a reduced rate.

Technology can therefore increase environmental pressures and mitigate against environmental degradation. Technology has improved resource productivity in production processes but technological advances have also driven increased consumption of resources through ongoing diversification of product development to grow markets. One example is the phenomenal increase in use and consumption of mobile phones and other electronic 'consumables'.

Recommendation

LW25 When investing in research and development for innovative technologies and approaches to production, the Victorian Government should ensure that the productivity gains and the contribution to the economy do not come at the cost of absolute increases in environmental pressures.

Consumer behaviour

Ultimately, when the dust disturbed by changes to governance by technology and by market-based instruments settles, it is individual behaviour that is the key to change.

In Australia today, material consumption is not only a mark of success, but is for many a substitute for more traditional satisfactions and happiness. The unsustainable pattern of consumption and production, particularly in industrialised countries, is a major cause of the continued deterioration of the global environment. As consumption patterns are part of the problem, they therefore have an essential role to play in the solutions to the challenges of environmental sustainability.

Yet consumption and production are not inherently environmental pressures; the reason that environmental pressures are generated is that current consumption and production patterns, in terms of both the impact per unit of product and in absolute amounts, are not sustainable. Part 3: Production, Consumption and Waste shows that it is now essential that manufacturers decouple production from environmental impacts and, if efficiency alone is insufficient to reduce absolute pressures, then a reduction in levels of consumption may be necessary.

Consumers' ethics, enacted via their buying power, can bring about product substitution,⁵⁷ thus encouraging greener products. Decoupling manufacturing from environmental pressures can be achieved through regulatory mechanisms, technology, and through market-based instruments. These are covered in the respective sub-sections of this chapter. Importantly, reducing environmental pressures can also be achieved through consumer demand. This is one of the two principal mechanisms covered in this section.

Because modern consumer society is so extremely complex, with numerous products vying for the consumer dollar, regulatory mechanisms and market-based instruments are essential to assist the consumer in informing his or her decisions when making environmentally ethical choices at the retail interface. Examples of these are eco-labels and the rational pricing of products respectively. Eco-labels interpret and simplify complex product lifecycle information so that the consumer can make educated choices according to environmental criteria (see Part 3.3: Materials). Rational pricing, a market-based instrument, puts a price on the environmental damage that a product or service incurs and incorporates that price into the consumer cost of the product. It works by effectively adjusting market conditions to ensure externalities are priced such that sustainable products have the same competitive advantages as 'unsustainable' ones. Both mechanisms then enable consumers to convey to manufacturers that sustainability is an important criterion for their choices.

The environmental potential of each of these mechanisms is strengthened when consumers are supported practically in shifting their behaviour and when they possess environmental understanding and an ethical framework against which to navigate a way through the choices presented. There is an expanding public awareness of the risks associated with degrading environmental systems and, most particularly, matters concerned with water and climate change. However, the task of translating this into changed human behaviour is major, and one too large for government alone. For many individuals, there will need to be some critical threshold, natural or economic, before change occurs; but, as has been demonstrated in the demand management campaigns for water savings, change can and does happen.

The current consumer-focused campaigns that encourage Victorians to make decisions to use less water and energy (the Save Water and the Black Balloons campaigns) are essential. Yet to be effective they must be visibly supported by both strategic government initiatives, sustainable technology and, most importantly, an ethical framework fostered by community and government. For example, a government campaign aimed at educating inner-city residents about the environmental and health benefits of riding a bike to work is most effective if the government also ensures the provision of safe bike paths and if potential users possess an ethical framework against which to make the decision to ride. Thus, such an example also highlights the cross-disciplinary approach necessary if public education campaigns are to be effective. Further, the relationship between attitude and behaviour is complex, and environment campaigns may sometimes succeed for a short period on a particular environmental issue of the day but suffer from campaign fatigue over time. Long-term behaviour change for sustainability requires more innovative communication approaches that are fully supported by legislation and regulation.

As described in Part 2: Driving Forces, the marketing and delivery of products with a sustainability or green 'edge' is on the increase. There is no doubt that this is in response to consumers' demand for sustainable products⁵⁸. Nevertheless, most individuals are rarely aware of the potential influence that consumers as a group can have on the design, manufacture, delivery and marketing of products. Those who do may engage in 'product boycotts' – deliberate embargos of certain products for environmental-ethical reasons. Such boycotts can be effective when the specific purposes are clear, and when there is an alternative, more ethical product available that can provide the same service⁵⁹. While modern technology may be an advantage for communication of boycotts, it is also likely that highly visible action of the kind possible within closely connected communities can enhance the effectiveness of a boycott.

Recommendations

LW26 The Victorian Government should accelerate the provision of programs (such as eco-labelling and public education campaigns) that raise awareness of the environmental impacts of all consumable services, particularly essential services.

LW27 The Victorian Government should continue to promote and fund a variety of community programs directed at resource conservation and environmental sustainability. There should be a thorough analysis of past and existing programs and the most effective approaches should be adopted in new programs as they develop. Continued government investment from income streams charged or levied against environmentally costly or harmful activities would constitute a suitable source of funds.

LW28 The Victorian Government should finalise its Learning to Live Sustainably education strategy and review this in five-yearly cycles.

As well as choosing the most environmentally sensitive product to perform a service, there is also an environmental imperative for consuming less in absolute terms, both as a nation and as individuals. While growth of the economy and rising consumption is widely assumed (including by governments) to be essential for wellbeing, it is worth considering the costs and benefits of attempting to decouple wellbeing from economic growth. To do so is simply to explore another of the options for breaking the link between our ever-improving lifestyle and a degrading environment (see Decoupling, above). The reasons for this are bound up in the concept of the 'rebound effect' in decoupling theory and are well described above and in Part 1: Introduction, Part 2: Driving Forces and Part 3: Production, Consumption & Waste. Essentially, building the profile of non-material 'products' will enable the services that consumption provides to be substituted, thus reducing absolute levels of material consumption and its associated environmental pressures.

In a society infiltrated so fundamentally by messages telling us that consumption itself is a goal that these messages themselves can almost cease to be noticed, how do we reframe values to help reduce levels of absolute consumption? Scientists have found that consumption activities such as eating and now shopping are rewarded by brain activity that has evolved to enable humans to survive. This reward is felt as happiness or a sense of satisfaction⁶⁰. In addition, pressure to consume also comes from peers and from the need to 'compete' within society and is driven by the dominant growth paradigm.

Until recently in human evolution, the limited availability of food and material possessions was the factor that prevented over-consumption. However, due to the technological advances of modern, especially first world, communities, there is a plethora of material goods and food available and therefore no natural exogenous limit stopping us from seeking these rewards. This means that consumption can get out of hand, and is characterised by the purchasing of items that are not only inessential, but for which people very often have limited practical use. Additionally, once essential material possessions are acquired, human relations and social interactions are more important for wellbeing. The exceedance of material desires without fulfilling interpersonal relationships, meaningful work and a hope for the future can leave a person feeling profoundly dissatisfied^{61,62}.

For people to modify their levels of consumption for sustainability requires a conscious redefinition of this sense of satisfaction, this 'reward-happiness'. As described above, 'product' substitution⁶³, in this case the substitution of excessive consumption with other activities that perform the same service (that is, creating happiness and satisfaction), is seen as a viable way of decoupling quality of life from consumption.

Consumers can review their consumption patterns, giving emphasis to holistic wellbeing. On a personal level, the enjoyment of social interactions, community, friends and family are all viable alternatives that could replace material goods in the pursuit of happiness. As a society, attractive and realistic alternatives to material consumption that are based on building social cohesion, academic achievement and practical skill-sharing are all important ways to re-focus the pursuit of happiness and should be encouraged by government.

In order to make the best of these alternatives, and because education plays a key role in influencing individual behaviour over the long term, environmental and philosophical education is essential. 'Sustainability' is best achieved through a systemic approach that addresses the various social and psychological dimensions driving individuals' behaviour. Research indicates that long-term attitudinal and behavioural change is best achieved through community-focused, personalised education. This may mean that government funding is best directed into education programs organised at the local government level, or within individual schools, as opposed to large-scale media campaigns, which, although useful in creating public awareness, are less effective in bringing about attitudinal and behavioural change. At a fundamental level, environmental ethics also have an important role to play in empowering people and providing a framework against which to make more informed consumer decisions that will both improve personal wellbeing and, ultimately, benefit the environment.

Recommendations

LW29 The Victorian Government expand the teaching of ethics and environmental science as integrated curriculum in primary and secondary schools.

LW30 The Victorian Government give due consideration to, and raise the profile of, community and social programs' in terms of their potential for reducing environmental pressures, particularly in funding schedules.

As well as encouraging government to raise the profile of the benefits of family and community over materialism, there is a need for every Victorian to think critically about how he or she can adjust current personal living and consumption patterns to make them more sustainable. There are many ways that this can be done and many are familiar. From ensuring that household food is not wasted, to taking shorter showers, to choosing tap water over bottled, to donating money to charities rather than buying the latest mobile phone, most Victorians have opportunities to reduce consumption in their everyday lives⁶⁴. As individuals, as a State, and as a nation, humans depend ultimately on a healthy environment for survival. Critically evaluating our consumption patterns will benefit not only us, but future generations of Victorians and the myriad other species with which we share the planet.

Box LW6 Applying the Four Mechanisms of Change to a real world problem - cigarette litter

Cigarette butt litter is a high profile environmental problem. Butts are not biodegradable, they are unsightly, they can leach toxins into waterways and they are harmful to freshwater and marine life if ingested. It is estimated that around 7.2 billion cigarette butts are littered in Australia each year, and that they comprise about 56% of total litter in Victoria⁶⁵. There is a range of initiatives available to both industry and individuals, supported by government, that have been developed to address this problem. Four are detailed here to illustrate how the Mechanisms of Change are applied to this environmental problem, and the ways that, as a set, they work together.

Governance, regulation, legislation

The *Environment Protection Act 1970*, sections 45E to 45J stipulate that litter (including cigarette butts) must not be thrown from vehicles. This is enforceable under certain circumstances by the Environment Protection Authority.

Economic solutions

Fines: One of the enforcement options available to the EPA, and to ordinary citizens, is the ability to report that litter has been thrown from a car. The EPA makes this option available via their website, hardcopy forms available from some local councils and by phone call. Litterers who are found guilty of littering in this way are fined \$227 (as at August 2008) for depositing a burning cigarette butt.

Mechanisms of change – Conclusion

The preceding sections show how each of governance, economic instruments, technology and consumer behaviour can play a role in mitigating environmental pressure. Above all, it is vital that these are implemented in coordination and that they support each other for the best environmental outcomes to be achieved. Box LW6 shows how each of these four broad approaches can be applied to a real world problem; in this case, cigarette butt litter.

Levy: The Butt Littering Trust has been established by British American Tobacco and other tobacco companies to provide a fund to which local government and community groups can apply for funding for anti-cigarette butt litter programs such as education campaigns, bins and locality-specific campaigns⁶⁶.

Rebate: As part of the Don't Be a Tosser campaign, rebates were offered to establishments for the installation of cigarette bins.

Technology

Biodegradable butts made of food grade starch that may decompose in as little as two months are being developed by Stanelco Pty Ltd. As is the case for biodegradable plastics, a microorganism-rich environment is required for butt decomposition. Nevertheless, once commercially viable, such an initiative has the potential to reduce cigarette butt litter, if applied appropriately⁶⁷.

Consumer behaviour and ethics

The Don't Be a Tosser campaign aims to educate consumers of cigarettes and has been developed to combat the expected increase in butt litter outside pubs and clubs following the introduction of the smoking ban in Victoria's licensed premises from 1 July 2007. The campaign uses a range of information (why butts are a problem, how much the fines are) delivered via a variety of media (stickers, fact-sheets, posters and billboards) to raise awareness of the problem of cigarette litter and to provide consumers with information to make the best, most ethical decision in disposing of their cigarette waste⁶⁸.