



BEYOND THE TRIPLE BOTTOM LINE

MEASURING AND REPORTING ON SUSTAINABILITY



AUDITOR GENERAL
VICTORIA

Auditing in the Public Interest

Occasional Paper



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FOREWORD

Sceptics might say that triple bottom line reporting is just the latest management fad. I see it rather as the tip of an iceberg. Beneath the calls for triple bottom line reporting is a groundswell of support for the larger idea of sustainability. What is this idea? What is driving it? What are its implications for the Victorian public sector? And how should we respond? This paper sets out my Office's views on these questions and connects readers to the research we conducted to develop our views.

We all find it easiest to work with concepts that are clearly defined, stable and easy to measure. Sustainability has few such attributes. It has no universal definition, and has changed shape over time in tune with community demands. It is multifaceted, and the relationships between its components are as important as the components themselves.

Clearly, sustainability is difficult territory, both for public sector managers and for auditors. However, it could also be a powerful stimulant for public sector performance. This paper exhorts public sector agencies to re-examine and improve their current performance measurement and reporting practices. It also provides an insight into how my Office will approach auditing sustainability initiatives in the Victorian public sector.

The paper pays particular attention to measuring and reporting, for two reasons. First, they feature heavily in the sustainability arena where they are used to drive performance improvements and pursue accountability. Second, it is my Office's role to audit the effectiveness of Victorian public sector programs and assure the accuracy of their public reports. We therefore have a special interest in measuring and reporting.

I hope this paper helps you understand my Office's efforts to fulfil its responsibilities and to play its own part in creating a more accountable as well as a more sustainable State.



JW CAMERON
Auditor-General

15 June 2004

MEASURING AND REPORTING ON SUSTAINABILITY

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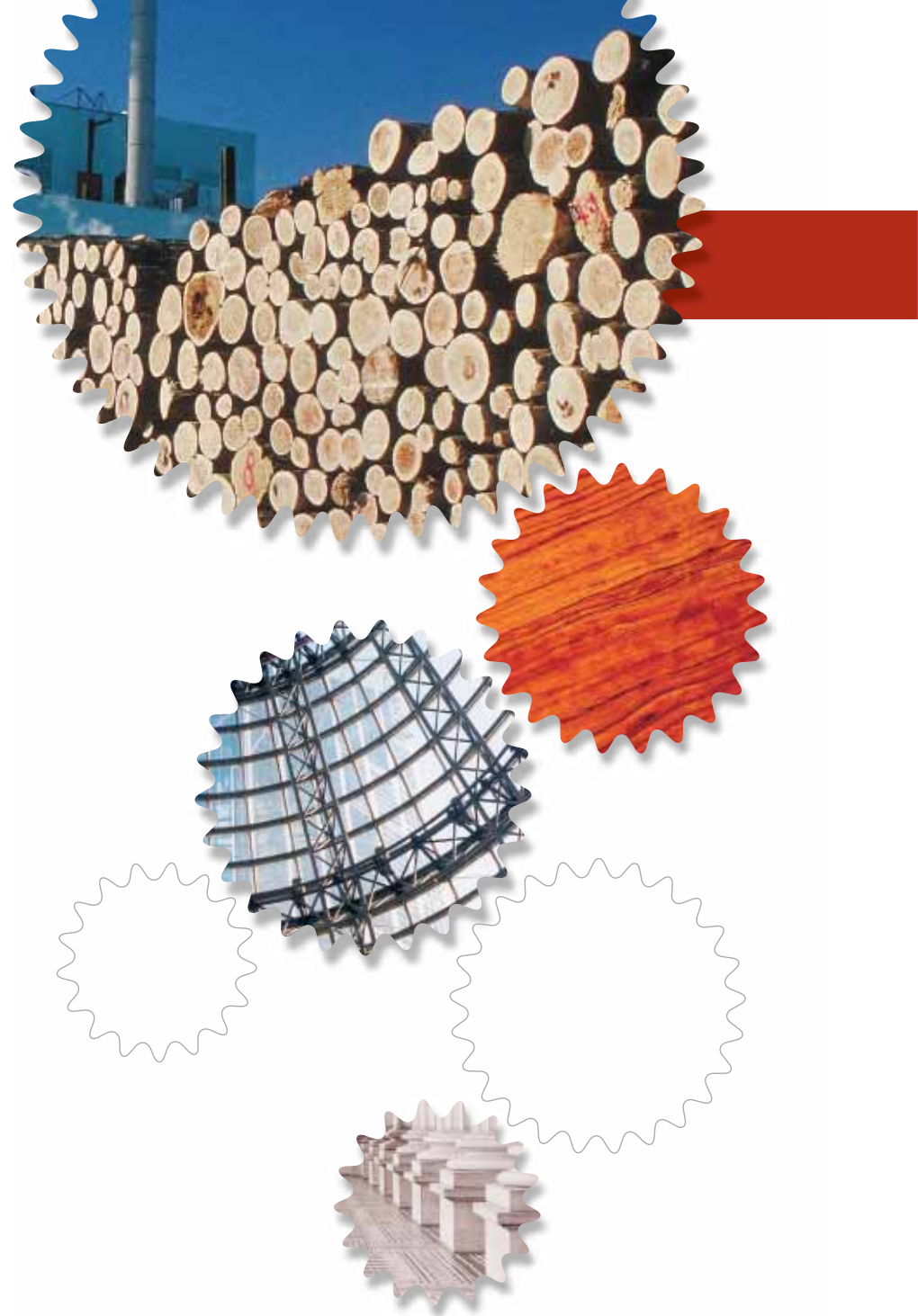
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The concept of sustainability has broader applicability than the environmental arena. In fact, like good governance, sustainability is fast becoming a cornerstone of public sector management.



PART A: INTRODUCTION

PURPOSE

This Occasional Paper is designed to stimulate further debate about measuring and reporting on sustainability and to contribute to improvements in measurement and reporting practices. It:

- introduces the concept of sustainability
- identifies six broad principles and illustrates how public sector organisations have responded to them
- proposes approaches to measuring sustainability, for internal monitoring and external reporting purposes.

The paper's objective is to acquaint readers, such as members of Parliament and chief executive officers of executive government agencies and governing bodies, with the sustainability concept. It aims to assist Victorian public sector agencies to measure and report on their sustainability initiatives. The paper also foreshadows our Office's approach to auditing sustainability initiatives in the future.

SUSTAINABILITY AND THE VICTORIAN AUDITOR-GENERAL'S OFFICE

The Victorian Auditor-General's Office conducts financial audits, performance audits, special reviews and investigations at both the State and local government levels.¹ We also audit the performance indicators that government organisations publish in their annual reports. These audits are designed to improve performance and accountability in the Victorian public sector.

This paper grew out of the Office's performance audit of the recent reductions in logging in state forests. The performance audit was reported in *Managing Logging in State Forests*, available from our Office or its website (www.audit.vic.gov.au).

During the audit, it became clear that the concept of sustainability had broader applicability than the environmental arena. In fact, like good governance, sustainability is fast becoming a cornerstone of public sector management. However, while good governance is essential to *accountability*, sustainability has the potential to improve the actual *performance* of government organisations. Applied in good faith, it will increase the effectiveness of government organisations, both now, and in the longer term.

This paper complements our Office's earlier work on performance measurement, contained in reports such as *Performance Management and Reporting: Progress Report and a Case Study* (www.audit.vic.gov.au).

TERMINOLOGY IN THIS PAPER

The terms 'sustainable development' and 'sustainability' are used in various ways, sometimes interchangeably. In this paper, sustainable development refers to economic development that is environmentally and socially sustainable (as defined in the 1987 Brundtland report²). Sustainability refers to the broader concept of balancing the environmental, social and economic concerns relating to any issue. This wider scope means that the concept has a broader applicability in the public sector, particularly in the strategic planning area.

ABOUT SUSTAINABILITY

INTERNATIONAL POLICIES AND AGREEMENTS

At the global level, efforts have been made for more than 30 years to integrate economic development with social and environmental concerns (Figure 1). Today's concept of sustainable development can be traced back to the 1987 World Commission on Environment and Development, and its influential Brundtland report. Nations attending the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, including Australia, pledged to implement the recommendations of the Brundtland report. In doing so, they signed the Rio Declaration³ and Agenda 21.⁴ The Commission for Sustainable Development is monitoring their progress.

As well as these international agreements, governments have signed several hundred multilateral treaties and conventions, forming a body of international law. The Kyoto Protocol to the United Nations Framework Convention on Climate Change is probably the best known of these agreements. Australia has signed but not yet ratified the Protocol.

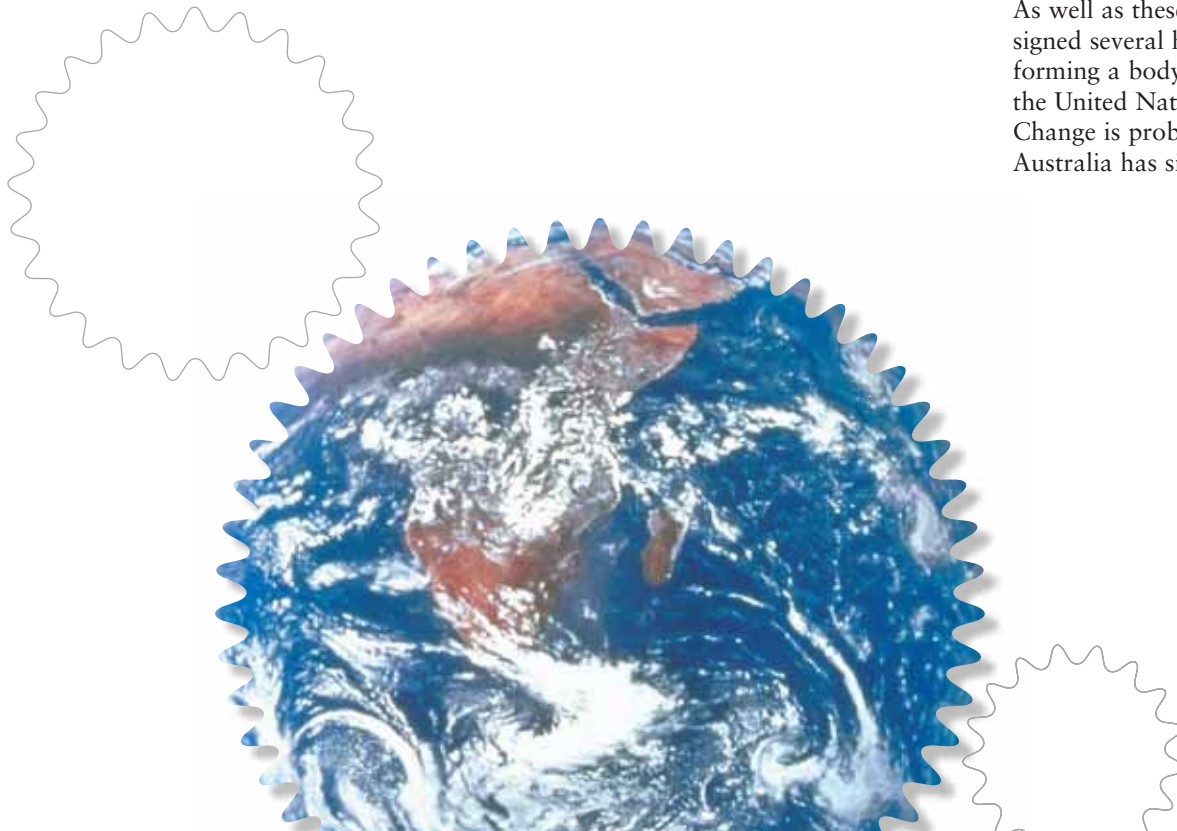


FIGURE 1: INTERNATIONAL EVENTS AND INITIATIVES

INTERNATIONAL EVENT	SOME KEY INITIATIVES
<p>1972</p> <p>United Nations Stockholm Conference on the Human Environment: 113 nations, including Australia, attend.</p>	<p>1972</p> <p>Nation-states attending the conference sign the Declaration of the United Nations Conference on the Human Environment. Signatories agreed on 26 principles for human development, but not on how to implement them.</p>
<p>1987</p> <p>The World Commission on Environment and Development releases the 'Our Common Future' report (the 'Brundtland' report): highlighted the need to move toward economic development that could be sustained without depleting natural resources or harming the environment.</p>	<p>1980</p> <p>The United Nations Environment Program releases the World Conservation Strategy. The main aim of the strategy is to explain how development and conservation of the environment can work together.</p>
<p>1992</p> <p>United Nations Conference on Environment and Development in Rio de Janeiro ('Earth Summit'): 172 nations, including Australia, attend.</p>	<p>1992</p> <ul style="list-style-type: none"> • Nation-states attending the Conference sign the Rio Declaration and Agenda 21 to implement the Brundtland Report. • United Nations establishes the Commission for Sustainable Development to monitor the progress and reconfirms a commitment to implementing Agenda 21.
<p>2000</p> <p>First Global Ministerial Environment Forum held in Malmö. Environmental Ministers from around the world discuss global environment issues and potential policy responses.</p>	<p>2000</p> <p>Nation-states attending the Malmö Forum sign the Malmö Ministerial Declarations, which raises concern at the rate of progress and reconfirms a commitment to implementing Agenda 21.</p>
<p>2002</p> <p>United Nations Conference World Summit on Sustainable Development in Johannesburg to adopt concrete steps and identify quantifiable targets for better implementing Agenda 21.</p>	<p>2002</p> <ul style="list-style-type: none"> • Nation-states attending the Conference sign the Johannesburg Declaration on sustainable development and the Johannesburg Plan on Implementation. • Nations report on headline indicators for sustainable development.

Source: Victorian Auditor-General's Office.

AUSTRALIAN POLICIES AND AGREEMENTS

The main Commonwealth policy is the 1992 *National Strategy for Ecologically Sustainable Development*.⁵ The strategy was both Australia's response to the Brundtland report, and its plan for fulfilling its commitment to the Rio Declaration. While recognising the need to balance environmental, social and economic development, the National Strategy has a strong focus on the environmental aspects of sustainable development.⁶

Overlapping jurisdictional responsibilities complicate environmental management in Australia. The Murray-Darling Basin is a case in point. In 1992, the Commonwealth and all states and territories agreed to cooperate in implementing the National Strategy. They formalised this through the *Intergovernmental Agreement on the Environment*.⁷

There are a number of other agreements and structures, which aim to create cooperation across States and Territories, including the National Environment Protection Council.⁸

VICTORIAN GOVERNMENT POLICY

The State government is acting on its sustainability commitments in various ways, including by enacting legislation,⁹ reforming the charters of government organisations, establishing advisory committees to government and through government policy. For example, *Growing Victoria Together, Innovative State, Caring Communities*¹⁰ identifies that the:

Government will continue to promote a better quality of life for current and future generations, by ensuring our economy, our society and our environment develop in a balanced way.

Other State government policies set out more specific sustainability commitments, which complement *Growing Victoria Together*.

Machinery of government changes include establishing the Department of Sustainability and Environment,¹¹ the Department for Victorian Communities¹² and appointing the Commissioner for Environmental Sustainability.¹³

The Department of Sustainability and Environment is responsible for leading Victoria's effort to use the state's natural resources in a sustainable manner and to improve productivity, that is, do more with less. It will also address the sustainability of natural systems in Victoria.¹⁴

The objectives of the Commissioner for Environmental Sustainability are to:

- report on matters relating to the condition of the natural environment of Victoria
- encourage decision-making that facilitates ecologically sustainable development
- enhance knowledge and understanding of issues relating to ecologically sustainable development and the environment
- encourage sound environmental practices and procedures to be adopted by the government of Victoria and local government as a basis for ecologically sustainable development.¹⁵

LOCAL GOVERNMENT RESPONSES

All Victorian municipal councils have committed to sustainability. As part of putting these commitments into action, the Municipal Association of Victoria and the Victorian Local Governance Association are collaborating in a number of sustainability projects with councils. Thirty-four councils are also members of the International Council for Local Environmental Initiatives, which is renowned for its Cities of Climate Protection Program.¹⁶ Most recently, the *Local Government (Democratic Reform) Act 2003* requires Councils to consider environmental, social and economic objectives.



DEFINITIONS OF SUSTAINABILITY

The movement for sustainable development grew out of concerns that economic development was creating environmental and social problems.¹⁷ The first international policies aimed to balance economic growth with nature conservation and social equity. In other words, while economic development was primary, it was recognised that it should be tempered by environmental and social considerations. As these goals were previously regarded as mutually exclusive, this was a major shift in thinking. Accordingly, the 1987 Brundtland report defined sustainable development as:

Development seeking to meet the needs of the present generation without compromising the ability of future generations to meet their own needs.

Over the last ten years, concerns about *sustainable development* have been subsumed into a broader concern about *sustainability*. This considers the environmental, social and economic impacts of any issue, not just the environmental impacts.

The precise definition of sustainability is still subject to debate. It has no single or universally enforceable definition. Like truth and justice, it is not easily captured in a concise definition, and means different things to different people.¹⁸ For government and government entities, this means that their definition of sustainability will arise from their policy development process, rather than precede it.

While a universal definition of sustainability does not exist, there is a common understanding about the broad principles of sustainability. These are discussed in the next part.



Commonly accepted principles of sustainability are:

1. Sustainability comprises at least three pillars: environmental, social and economic
2. The three pillars are interrelated
3. Sustainability strives for equity within generations
4. Sustainability strives for equity between generations
5. Sustainability uses the precautionary principle
6. Sustainability conserves biological diversity.¹⁹



PART B: PRINCIPLES OF SUSTAINABILITY

SIX PRINCIPLES OF SUSTAINABILITY

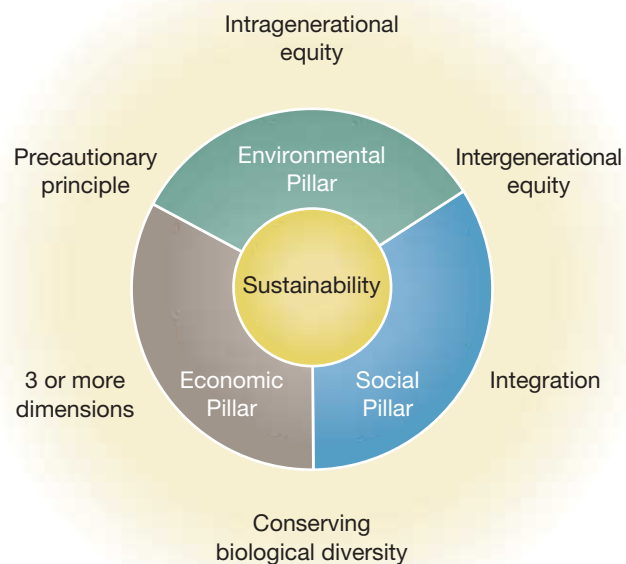
PRINCIPLE 1: SUSTAINABILITY COMPRISES AT LEAST THREE PILLARS

Sustainability has at least three dimensions, or pillars. These are the environmental, social and economic pillars (Figure 2):

- The **environmental** pillar refers to the natural resources and ecosystem processes on which humankind depends.
- The **economic** pillar concerns the systems of production, consumption and management of resources. It concentrates on efforts to increase the stock of human-made and knowledge capital.
- The **social** pillar relates to human society and its members, including their access to social services, employment, health and decision-making.²⁰

Some organisations recognise and use additional pillars of sustainability. The City of Port Phillip,²¹ for example, recognises a **cultural** pillar. This pillar covers a 'set of values, history, traditions and behaviour which link specific groups of people together.'²² Other organisations integrate the cultural dimension into the social pillar.

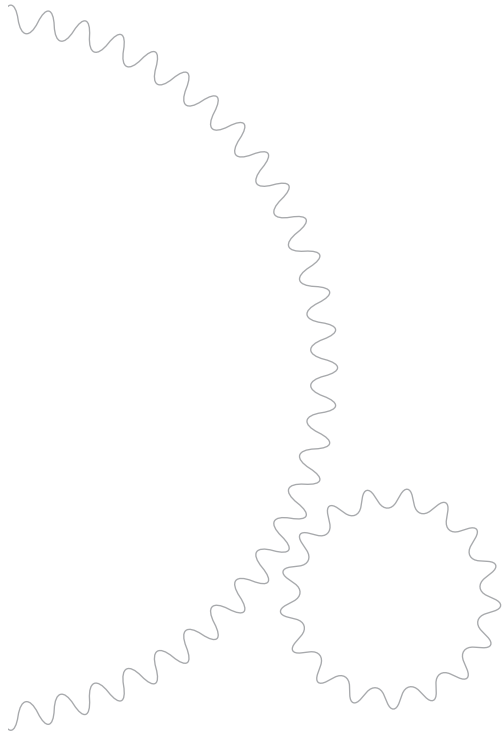
FIGURE 2: PILLARS AND PRINCIPLES OF SUSTAINABILITY



Source: Victorian Auditor-General's Office.

Multilateral organisations such as the World Bank,²³ the United Nations,²⁴ the Organisation for Economic Cooperation and Development²⁵ and the International Labour Organisation²⁶ recognise institutional and governance pillars.

The **institutional** pillar covers the ‘formal and informal civic, political and legal arrangements that make up market activity and civic life.’²⁷ The **governance** pillar covers efforts to achieve an ‘informed, pluralistic and involved society but with shared basic norms, standards and aspirations.’²⁸ Some agencies treat these two dimensions as processes for pursuing the three main pillars.



RESPONSES TO PRINCIPLE 1

Different organisations have responded to Principle 1 differently, depending on the level at which they operate.

Multilateral or central government organisations may apply the three pillars of sustainability on a national or statewide scale. The Victorian government, for example, has identified a wide range of ‘macro-level’ environmental, social and economic issues facing the state of Victoria. *Growing Victoria Together* discusses these issues and how the government will address them (Figure 3).

FIGURE 3: THE THREE PILLARS OF SUSTAINABILITY FOR THE STATE OF VICTORIA, FROM GROWING VICTORIA TOGETHER

Environmental	Social	Economic
<i>Strategic issues:</i>	<i>Strategic issues:</i>	<i>Strategic issues:</i>
<ul style="list-style-type: none"> Promoting (environmentally) sustainable development Protecting the environment for future generations. 	<ul style="list-style-type: none"> Valuing and investing in lifelong education High quality, accessible health and community services Safe streets, homes and workplaces Building cohesive communities and reducing inequalities Promoting rights and respecting diversity Government that listens and leads. 	<ul style="list-style-type: none"> Sound financial management Growing and linking all of Victoria More jobs and thriving, innovative industries across Victoria.

Source: Victorian Auditor-General’s Office’s analysis of *Growing Victoria Together, Innovative State, Caring Communities*, Department of Premier and Cabinet, Victoria.

Line agencies, on the other hand, may be responsible for one component of statewide sustainability. The Department of Sustainability and Environment, for example, regulates logging in State forests. It has identified the environmental, social and economic issues relating to this one activity. *Our Forests, Our Future: Balancing Communities, Jobs and the Environment*, discusses these issues and how the Department will address them. Figure 4 shows one strategy from *Our Forests, Our Future*, and its environmental, social and economic dimensions.²⁹

FIGURE 4: THE THREE PILLARS OF SUSTAINABILITY FOR STATE FORESTS, FROM OUR FORESTS, OUR FUTURE

Environmental	Social	Economic
<i>Policy commitments:</i>	<i>Policy commitments:</i>	<i>Policy commitments:</i>
<ul style="list-style-type: none"> • Reduce sawlog supply levels by around 31% across the state • Timber is harvested at or below the rate at which it grows. 	<ul style="list-style-type: none"> • Manage the renegotiation of supply allocations to mitigate, as far as possible, impacts on industry, employees and affected communities. 	<ul style="list-style-type: none"> • Ensure a fair return to government for resources supplied to the timber industry, including sawlogs.

Source: Victorian Auditor-General's Office's analysis of *Our Forests, Our Future, Balancing Communities, Jobs and the Environment*, Department of Sustainability and Environment.

Organisations will also vary the way they apply Principle 1 according to their priorities among the pillars. In Victoria, these priorities are determined by government policy. *Growing Victoria Together*, for example, discusses 'valuing equally our economic, social and environmental goals.'



PRINCIPLE 2: THE PILLARS ARE INTERRELATED

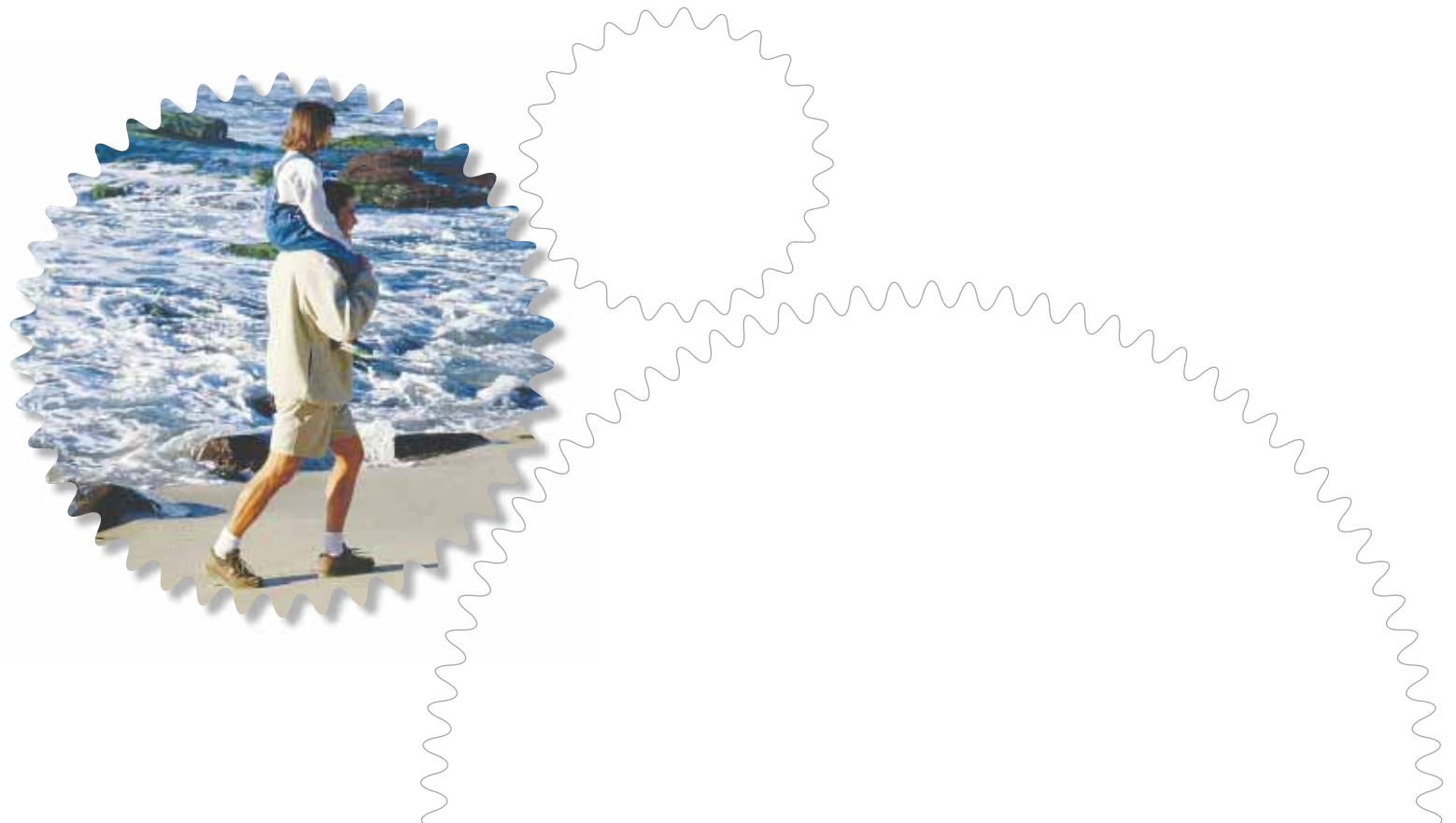
There is a growing realisation that sustainability is a holistic concept. Macquarie dictionary defines holistic as:

The philosophical theory that wholes (which are more than the mere sums of their parts) are fundamental aspects of the real.³⁰

In holistic concepts, the relationships between the parts are as important as the parts themselves. Therefore, we cannot achieve sustainability by breaking it down into disconnected parts and managing the parts individually (the 'silo' approach).

RESPONSES TO PRINCIPLE 2

Applying Principle 2 means recognising that actions in one pillar of sustainability will affect conditions in other pillars and in some cases may even be contradictory to their aims. This can then be taken into account in all aspects of business, from policy development to program delivery and governance arrangements. At a policy level, for example, the commitment to 'joined up government' — departments working together and using resources in a coordinated and integrated way to achieve government policy objectives — addresses the interrelationship between the pillars of sustainability.



PRINCIPLE 3: SUSTAINABILITY STRIVES FOR EQUITY *WITHIN* GENERATIONS (INTRAGENERATIONAL EQUITY)

At its simplest, equity can be defined as ‘that which is fair and just’.³¹ In practice, it is a complex notion, involving rights, obligations and ethics, as well as fairness and justice. The 1994 Fenner Conference on the Environment defined it as follows:

*Equity derives from a concept of social justice. It represents a belief that there are some things that all people should have, that there are some basic needs that should be fulfilled, that burdens and rewards should not be spread too divergently across the community, and that policy should be directed with impartiality, fairness and justice towards these ends.*³²

RESPONSES TO PRINCIPLE 3

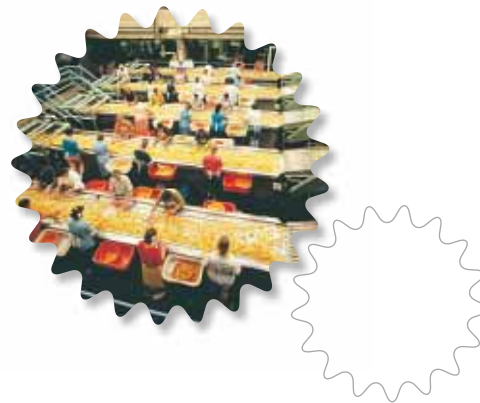
Intragenerational equity, then, concerns fairness among the world’s inhabitants. The concept is often applied differently at the global and domestic levels.

At the **global** level, intragenerational equity focuses on the rights of developing countries to progress to a level comparable to that of the industrialised world. In very simplified terms, discussions centre on the production and consumption of resources by developed and developing countries. They highlight a fundamental tension between sustainable development aims. That is, the economic development of nations (which is desirable) accelerates the consumption of natural resources (which is undesirable). To date, the official policy response to this dilemma has been that new technologies will enable nations to grow without consuming so many natural resources.³³

Many international sustainability agreements also recognise the principle of intragenerational equity through the ‘principle of common but differentiated responsibilities’. These include the Rio Declaration and the Framework Convention on Climate Change. In these instances, developed nations acknowledge that they have greater responsibility in the pursuit of sustainability because their societies place more pressure on the global environment and they have more financial resources and technology at their command.³⁴

At the **domestic** level, particularly in developed countries, intragenerational equity is treated as a social rather than economic issue. In the 1970s, it tended to concentrate on ‘the gap between rich and poor’. The Henderson Poverty Line,³⁵ for example, was used to measure the number of people living below minimum wage levels. While equity discussions still cover poverty, they have broadened to consider a more comprehensive concept of wellbeing. They have also diversified to include more groups than the rich and the poor, including women, people from culturally and linguistically diverse backgrounds, people with disabilities and indigenous people.

At this level, the principle is applied through policies that aim to promote, for example, equity in wealth distribution, in access to the environment, or the distribution of waste. As equity has broadened as a concept, it has often been confused with equality.³⁶



PRINCIPLE 4: SUSTAINABILITY STRIVES FOR EQUITY *BETWEEN* GENERATIONS (INTERGENERATIONAL EQUITY)

Intergenerational equity refers to the right of future generations to enjoy a quality of life as good as, or better than, that enjoyed by current generations. Essentially, it is the same concept as intragenerational equity, with the added dimension of maintaining equity over the long term. Intergenerational equity often appears as an emotive plea to protect the environment because 'we owe it to our children and grandchildren'.³⁷

RESPONSES TO PRINCIPLE 4

As we have not achieved equity in current generations and are uncertain of the needs of future generations, this principle is difficult to apply. To date, policy responses have therefore tended to be vague. Many policies limit their aims to conserving a pool of essential natural resources for future use, or simply to avoiding long-term environmental damage. For example, the Commonwealth's Oceans Policy states that:

*Intergenerational equity is sought through avoidance of actions that are not potentially reversible on a time scale of a human generation, consideration of long term consequences in decision making, and restitution of degraded aspects of the physical and biological environment.*³⁸

At a broader level, the idea of equity stretching across generations is linked to planning for the longer term. Intergenerational equity considerations can be applied through, for example, long term approaches to workforce planning, knowledge management and asset management.



PRINCIPLE 5: SUSTAINABILITY USES THE PRECAUTIONARY PRINCIPLE

There is now virtually global agreement that the current rate of extraction and consumption of the earth's carbon resources (fossil and renewable) is not sustainable, but in many cases there is disagreement or scientific uncertainty about what is and what is not sustainable resource use.³⁹

The precautionary principle seeks to address this scientific uncertainty. It was initially recognised in the 1982 World Charter for Nature and rose to prominence in the 1992 Rio Declaration. The Declaration states:

*In order to protect the environment, the precautionary approach shall be widely applied by states according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*⁴⁰



RESPONSES TO PRINCIPLE 5

The precautionary principle is widely recognised in sustainability policies, both in Australia and internationally. The principle can be used to address existing as well as new or proposed activities. The principle is often implemented through regulatory arrangements such as requiring proponents of developments to conduct environmental impact assessments and consider alternatives before having their projects approved.⁴¹ In recent years, the principle has also been applied in the form of risk analysis, for example, in relation to the release of genetically modified organisms.

An early interpretation of the precautionary principle was to require those who propose a development to prove that it *would not harm* the environment. Formerly, those who opposed a development had to convince decision-makers that the proposal *would harm* the environment. This was often impossible, due to scientific uncertainty.⁴²

In current practice, the precautionary principle takes two forms:

- The strict form, requiring inaction when action might pose a risk (for example, the 1982 World Charter for Nature).
- The active form, which chooses less risky alternatives when they are available and takes responsibility for potential risks. This is a more flexible application of the precautionary principle. It allows trade-offs between competing interests and the management rather than complete avoidance of risks. Since 1992, this active form has been applied more often than the strict form.⁴³

PRINCIPLE 6: SUSTAINABILITY CONSERVES BIOLOGICAL DIVERSITY

In the 1996 National Strategy for the Conservation of Australia's Biological Diversity, biological diversity was defined as:

The variety of all life forms – the different plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part. It is not static, but constantly changing; it is increased by genetic change and evolutionary processes and reduced by processes such as habitat degradation, population decline, and extinction. The concept emphasises the interrelatedness of the biological world. It covers the terrestrial, marine and other aquatic environments.⁴⁴

The National Strategy and other sources recognise that biodiversity and healthy ecosystems are essential to our way of life, since they provide clean water and air, regulate climate, absorb wastes and control pests.

In Australia, scientists have detected massive changes in natural biodiversity during the past 200 years, and threatening processes are continuing in the form of land-clearing, invasive species, salinity, hydrological changes, inappropriate and over grazing, altered fire regimes and climate change.⁴⁵

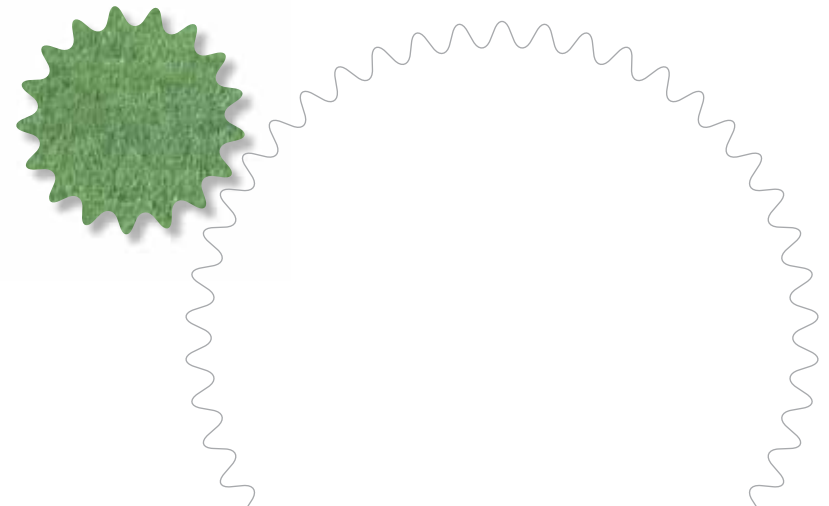
The fact that the extinction of a species is irreversible adds urgency to the principle. It also links the conservation of biological diversity to both the precautionary principle and the principle of intergenerational equity.

RESPONSES TO PRINCIPLE 6

Australia has in place legislation, policies and strategies at all levels of government to preserve biological diversity. The traditional approach has been to protect areas in parks and reserves, such as the Marine National Parks on Victoria's coasts.

More recently biodiversity issues have been integrated into virtually all land-use planning and management policies. In 1997, the Australian Government set up the Natural Heritage Trust to fund community groups' restoration and conservation projects across the nation. The Victorian government has also put in place a range of programs to maintain and preserve biodiversity on private land, for example, BushTender and Landcare.

The Commonwealth monitors and reports on biodiversity in its five-yearly *State of the Environment* report.⁴⁶ Most Australian states produce their own report. Victoria will do so through the recently appointed Commissioner for Environmental Sustainability.





Applying the sustainability principles means going beyond traditional financial reporting to measure and report on at least the environmental, social and economic dimensions of performance.



PART C: MEASURING AND REPORTING ON SUSTAINABILITY

APPLYING THE SUSTAINABILITY PRINCIPLES TO MEASURING AND REPORTING

Adopting the sustainability principles impacts on all aspects of an organisation's business, from planning to operations to governance arrangements. This part of the paper concentrates on the implications of the sustainability principles for measuring and reporting on organisational performance. This is important to our Office since it is our role to measure the effectiveness of Victorian public sector's programs and the accuracy of its public reports.

First and foremost, applying the sustainability principles means going beyond traditional financial reporting to measure and report on at least the environmental, social and economic dimensions of performance. There are several models for this, including the triple bottom line reporting framework⁴⁷ and the four capitals model.⁴⁸

However, as critics of these models have pointed out, they use a reductionist approach to measuring and reporting on sustainability. That is, they:

- Break sustainability down into three or more pillars
- Break each pillar down into a series of topics
- Break each topic down to a series of performance indicators
- Measure each indicator separately
- Use 'scientific approaches' to measure each indicator.⁴⁹

The reductionist approach is inconsistent with the concept of sustainability, and its principles, for two main reasons.

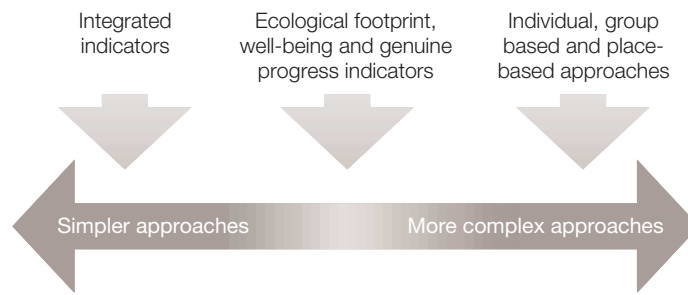
Firstly, sustainability is not a single thing. It is multidimensional. Therefore, treating sustainability as a single thing is inconsistent with Principle 1: that sustainability has at least three pillars.

Secondly, sustainability is a vision of wholeness. Breaking it down into disconnected parts and then studying the parts individually will not help us understand the relationships between the parts that make up the whole. Instead, taking the reductionist approach can lead us to oversimplify the complex nature of sustainability. Using a reductionist approach is inconsistent with Principle 2: that the pillars of sustainability are interrelated.

HOLISTIC APPROACHES TO MEASURING AND REPORTING

Applying sustainability principles means going beyond the reductionist approach to more holistic approaches to measuring and reporting. These are still evolving. Current models range from simple modifications to existing performance indicator methods through to complex applications of systems thinking (Figure 5).

FIGURE 5: HOLISTIC APPROACHES TO SUSTAINABILITY MEASURING AND REPORTING



Source: Victorian Auditor-General's Office

INTEGRATED INDICATORS

One simple way of taking a more holistic approach to measuring and reporting on sustainability is to devise integrated indicators. These take into account more than one pillar of sustainability when assessing a particular aspect of performance. For example, the Global Reporting Initiative⁵⁰ recommends two types of integrated indicators:

- systemic indicators, which relate an organisation's performance to its broader economic, environmental or social context (for example, the organisation's number of workplace accidents as a percentage of the number of accidents in its industry sector)
- cross-cutting indicators, which relate two or more dimensions of an organisation's economic, environmental and social performance, as a ratio (for example, the amount of emissions per unit of output).

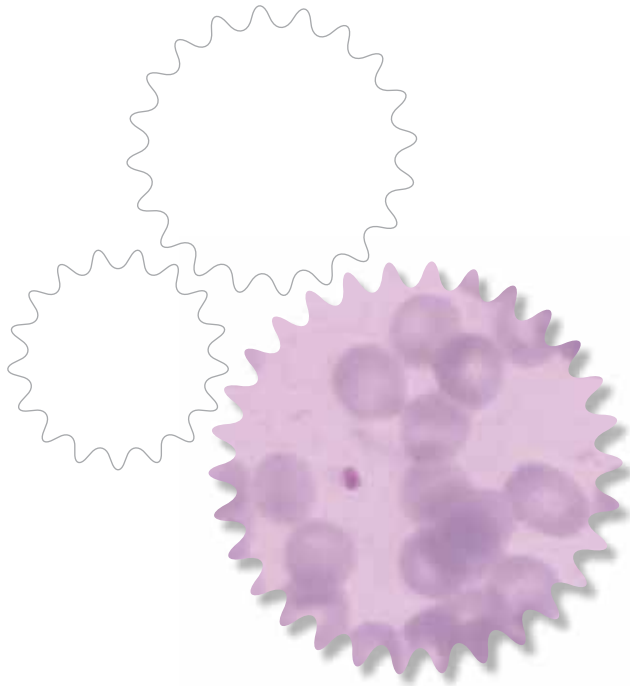


SYSTEMS THINKING

In addition to integrated indicators, authors working within various disciplines have devised other holistic models for measuring and reporting on sustainability. These models reach beyond the pillar in which they are anchored to take into account one or two other dimensions of performance. They are discussed in each of the following sections, under the relevant pillar.

At their most sophisticated, holistic models apply systems thinking. Senge describes this as thinking which recognises that:

*Relationships are ... more fundamental than things, and that wholes are primordial to parts.*⁵¹



A system may be a physical entity (such as the carbon cycle), a social entity (such as a political constitution) or an abstract idea (such as the idea of sustainability). In the sustainable development context, using systems thinking means:

- paying attention to the relationships between the parts that cause them to come together into a whole, as well as the parts themselves
- accepting and encouraging multiple views of reality
- understanding that the observer has constructed the system and is therefore part of it, not independent of it
- recognising the scientist's view as one among many, and as not prevailing over lay people's views.⁵²

It is not necessary to apply all of these models to every measurement and reporting task. Model selection will be guided by the organisation's sustainability objectives, operational focus, expertise and resourcing and its audience's information needs.

MEASURING AND REPORTING ON THE ENVIRONMENTAL PILLAR

Efforts to measure and report on the environmental pillar commonly draw on two disciplines:

- environmental sciences
- environmental economics and accounting.

ENVIRONMENTAL SCIENCES

Environmental problems such as pollution, salinity and acidification are often measured and reported using the scientific approach. This uses techniques from the natural sciences, such as chemistry and biology. Environmental science has combined several natural sciences into a discipline, to study how 'environments affect systems and how systems affect environments.'⁵³

Critics have identified two weaknesses in the scientific approach. First, its difficult language excludes lay people from discussions and reduces transparency in decision-making.⁵⁴ Government commitments to increased citizen participation in decision-making seek to address this issue.⁵⁵ Second, there is considerable scientific uncertainty about whether or not current patterns of change to the environment are sustainable. Principle 5 of sustainability, the precautionary principle, seeks to address uncertainty.

Despite these criticisms, environmental science remains a dominant tool for measuring and reporting on environmental sustainability.

ENVIRONMENTAL ECONOMICS AND ACCOUNTING

Organisations reporting on resource-based industries such as mining, forestry and fishing typically draw on the economics and accounting disciplines to measure their environmental performance. In the main, only those components of the environment that are traded in markets are recognised, and valued and measured in monetary terms. The hallmark of this approach is describing the environment in economic language, for example, as natural resources, sub-soil assets and externalities.

HOLISTIC APPROACHES

Critics of the environmental economics and accounting approach maintain that it does not recognise and account for some crucial aspects of the environment that are not traded in markets, such as clean air and a functioning eco-system.⁵⁶ Over the years, environmental economists and environmental accountants have addressed this criticism through theories that try to 'internalise the externalities',⁵⁷ use polluter-pays schemes,⁵⁸ real-cost accounting⁵⁹ and life-cycle analysis.⁶⁰ These were the first steps towards a more holistic approach to measuring and reporting on environmental performance.

In 1994, Rees and Wackernagel took another step. They developed the concept of the ecological footprint to demonstrate that worldwide consumption of goods and services is unequal.⁶¹ This method calculates the amount of land a community requires to support its consumption. In doing so, it integrates environmental and economic dimensions.

Several cities and states have assessed their ecological footprint. Figure 6 provides one example.

FIGURE 6: SONOMA COUNTY, USA, ECOLOGICAL FOOTPRINT PROJECT

In 2001, Sonoma County, USA conducted an ecological footprint project to measure the impact of human activity on the natural environment. The project had several broad aims, the most important of which were to:

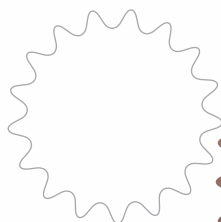
- calculate the per capita size of Sonoma County's ecological footprint
- encourage community members to calculate and reduce their personal and the community's ecological footprint
- serve as a model for other communities.

The project assessed the community's consumption of natural resources, to determine what needed to be done to protect these resources at a local, regional and global level. Using 250 national and local indicators, it analysed five categories of consumption (food, household, transportation, goods and services). The project used this data to establish the number of acres each form of consumption requires, according to six categories (energy land, crop land, pasture, forest, built area and sea), as shown in the table below.

	Energy Land	Crop Land	Pasture	Forest	Built Area	Sea	Total
Food	1.7	2.2	0.8	0.0	0.0	0.7	5.4
Housing	2.7	0.0	0.0	1.5	0.2	0.0	4.4
Transportation	3.7	0.0	0.0	0.0	0.3	0.0	4.0
Goods	3.8	0.4	0.1	1.2	0.1	0.0	5.6
Services	2.1	0.0	0.0	0.9	0.1	0.0	3.1
Total (acres)	14.0	2.6	0.9	3.6	0.7	0.7	22.5

In summary, the project found that Sonoma County requires 22.5 acres per person to support its current levels of consumption. The project also calculated that, if Sonoma County residents were to live only on what Sonoma County could supply, each resident would have a footprint of 5 acres instead of 22.5. To put this in another context, the USA National Footprint project established that the USA uses 24 acres per person to support its consumption. Australia's footprint has been assessed as 17 acres per person, and Italy's as 10 acres per person.⁶²

Source: Victorian Auditor-General's Office analysis of Sonoma Ecological Footprint published at <http://www.sustainablesonoma.org/projects/scefootprint.html>.



MEASURING AND REPORTING ON THE SOCIAL PILLAR

Approaches to measuring and reporting on the social pillar of sustainability typically take a subject-based approach. They focus, for example, on education, health, housing or crime. All draw on the social and political sciences and their research traditions, including quantitative and qualitative analysis.

SOCIAL CAPITAL

The social pillar has recently expanded to include the subject of social capital.⁶³ The World Bank's definition of social capital is:

*The institutions, relationships and norms that shape the quality and quantity of a society's social interactions... it is not just the sum of the institutions [that] underpin a society – it is the glue that holds them together.*⁶⁴

The Victorian Government has recognised the importance of equity and social capital by identifying 'building cohesive communities and reducing inequalities' as one of its important issues in *Growing Victoria Together*. This focus on social capital reflects a growing body of research linking high levels of social capital with:

- high levels of, and growth in, gross domestic product
- more efficiently functioning labour markets
- higher educational attainment
- lower levels of crime
- better health
- more effective government institutions.

Methods for measuring and reporting on social capital are still evolving. In *Growing Victoria Together*, the government has identified some 'demonstrating progress measures' relevant to social capital, including:

- the extent and diversity of participation in community, cultural and recreational organisations
- the number of people Victorians can turn to for support in a crisis.

SOCIAL EQUITY

Measuring and reporting on equity in the social pillar uses comparative social science methods to compare people's access to goods and services such as education, housing and health services. It frequently focuses on access for particular groups such as women, people with disabilities, people from culturally and linguistically diverse backgrounds and indigenous people.

Measuring and reporting on equity over several generations is problematic. Generally, it focuses on the consistent achievement of shorter-term policy goals over time. The Commonwealth's *Report Against Headline Sustainability Indicators* demonstrates the difficulty of coming to grips with intergenerational equity:

*This Report includes no specific indicators of inter-generational equity. It treats sustainability and inter-generational equity as virtually synonymous. The indicator set, as a whole, is designed to tell us over time whether we are maintaining biodiversity and ecological processes, all aspects of human well-being, and an equitable distribution of these within the current population; therefore the set as a whole and over time will tell us whether we are ensuring inter-generational equity.*⁶⁵



HOLISTIC APPROACHES

Critics claim that the subject-based approach ignores the interrelated nature of social problems. For example, the reasons for homelessness may simultaneously include family breakdown, drug use, mental health issues and unemployment. The critics therefore see this approach as reflecting and reinforcing silo approaches to solving social problems by government agencies.

More recent and holistic sustainability measuring and reporting approaches view government organisations' performance from the perspective of an individual, group or place. Taking this perspective can show the environmental, social and economic impacts on an individual, community or geographic area.

Investigating an individual's perspective calls for case-study methods, pioneered by authors such as Stake.⁶⁶ Group and place-based approaches have been attempted by many governments. The Boston Indicators Project⁶⁷ (Figure 7) is one example. Others include the Sustainable Seattle Project⁶⁸ and the European Common Indicators, adopted by 148 European towns and cities.⁶⁹

Measuring and reporting on equity can also be applied holistically, so that it integrates measuring and reporting on environmental, social and economic issues for particular groups of people.

CASE STUDY

FIGURE 7: THE BOSTON INDICATORS PROJECT

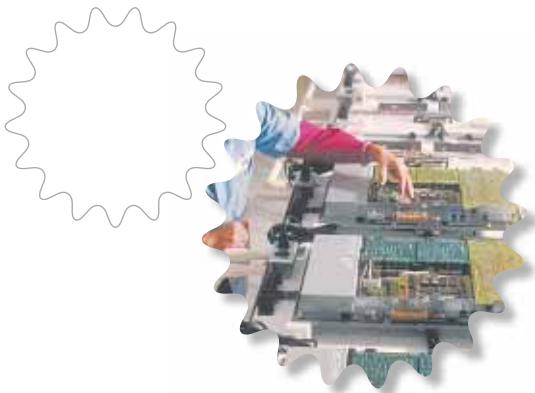
In 1997, the Boston Foundation, the City of Boston/Boston Redevelopment Authority and the Metropolitan Area Planning Authority collaborated to develop the Boston performance indicators. These monitor change, inform opportunities, promote collaboration and evaluate impacts in the city.

The project established performance indicators covering the subjects of civic health, housing, cultural life and the arts, public health, the economy, public safety, education, technology, the environment and transportation. A 'crosscut filter' function on the internet database enables viewers to select and view indicators from across the categories, for example, for neighbourhoods/groups (such as children and youth), and by topic (such as competition, race/ethnicity and sustainable development). Using the crosscut filter for sustainable development, 32 indicators can be chosen.

Examples of the sustainable development indicators are:

- The ecological footprint: per capita consumption of the earth's resources
- Housing units within a 10-minute walk of public transit nodes in Boston
- Income disparities between top and bottom quintile of population (the GINI Index)
- Household recycling rates and solid waste generated — Boston compared to other cities in Massachusetts
- Housing density and services within a quarter mile of transit nodes in metropolitan Boston
- Smart growth measured by trends in development and effects on Boston and the region
- Local, national and global trends in climate change
- Public health stresses on children by neighbourhood
- Safety, education, technology, the environment and transportation.

Source: Victorian Auditor-General's Office analysis of the Boston Indicators Project published at <http://www.tbf.org/indicators/summary/index.asp>



MEASURING AND REPORTING ON THE ECONOMIC PILLAR

The economic pillar of sustainability covers the production, distribution and consumption of goods and services. To measure these, organisations typically draw on economics, and particularly on econometrics, with its quantitative analysis and statistical modelling tools.

GLOBAL EQUITY

At the global level, equity is often considered an economic issue. Several international organisations monitor and report on global equity. For example, in 1998 the United Nations developed a core set of nation-wide indicators for measuring changing consumption and production patterns.⁷⁰ This is part of an international work program on indicators for sustainable development. The 17 core indicators are grouped into ‘core resources’ (such as energy, water and land) and ‘consumption clusters’ (such as mobility, retail sales and recreation).

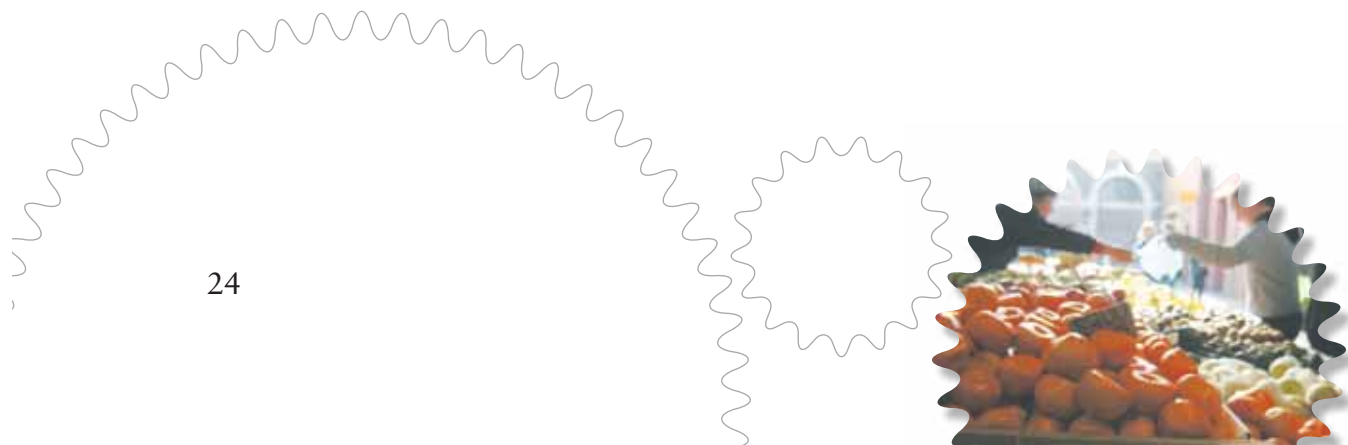
THE CAPITAL MODEL

The ‘capital model’ was originally developed by Ekins in 1992,⁷¹ as a way to broaden traditional macroeconomic measures to take account of other factors important to the development of society. The capital model has been widely adopted to measure sustainability and assesses ‘natural capital’, ‘social capital’, ‘economic capital’ and ‘human capital’, as shown in Figure 8. However, it still considers each ‘capital’ separately.

FIGURE 8: THE CAPITAL MODEL

Natural capital	Economic capital
The renewable and non-renewable natural resources which enter the production process and satisfy consumption needs, as well as environmental assets that have amenity and productive use, and are essential for the life support system.	The produced means of production like machinery, equipment and structures, also non-production related infrastructures, non-tangible assets, and the financial assets that provide command over current and future output streams.
Social capital	Human capital
The networks of shared norms, values and understanding that facilitate co-operation within and between groups.	The knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well being.

Source: Victorian Auditor-General’s Office analysis of OECD documents.⁷²



HOLISTIC APPROACHES

Industrialised countries like Australia are increasingly recognising that economic wealth alone is not an adequate measure of a society's development.⁷³ In response to this shortcoming, several measuring and reporting projects augmented the concept of economic development with environmental and social considerations.

The Australian Bureau of Statistics, for example, used well-being indicators in their 2002 report *Measuring Australia's Progress*⁷⁴. Their aim was to answer the question: has life in our country got better? The project used headline indicators, covering topics such as health, education, biodiversity and wealth. However, it stopped short of answering its own question because 'we all have our own views about what is most important to individual and national life.'⁷⁵

Genuine progress indicators are a more fundamental re-thinking of a society's development. First developed in the early 1970s,⁷⁶ these indicators start from the same accounting framework as gross domestic product, add the economic contributions of household and volunteer work, and subtract factors such as crime, pollution and family breakdown.⁷⁷ In addition to Australian organisations,⁷⁸ governments in Nova Scotia,⁷⁹ Alberta⁸⁰ and Minnesota⁸¹ have developed genuine progress indicators.

CASE STUDY

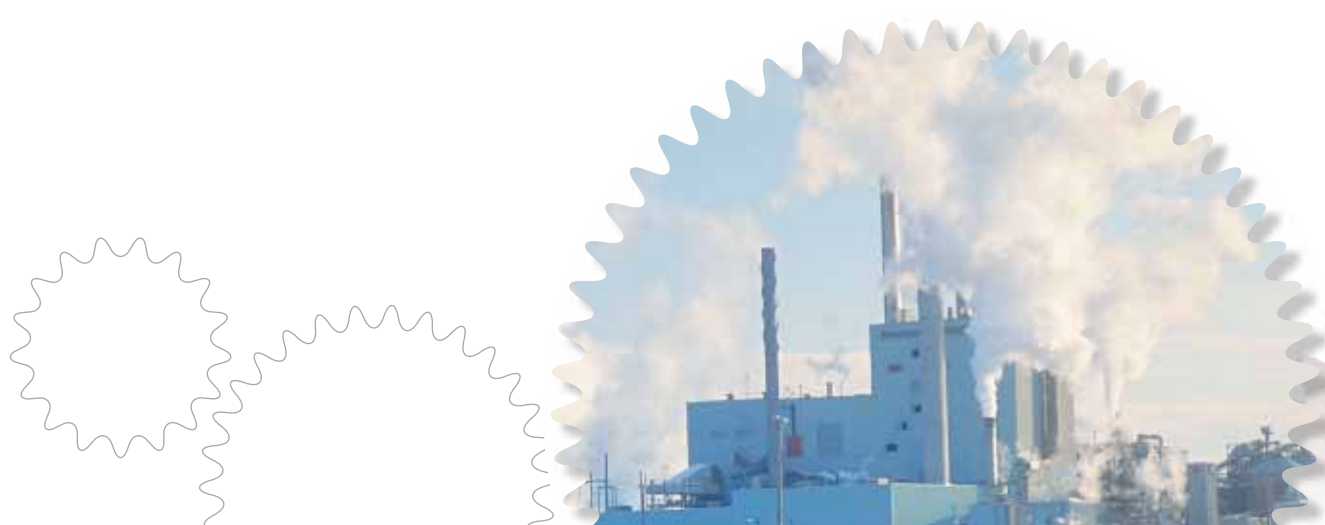
FIGURE 9: THE NOVA SCOTIA GENUINE PROGRESS INDICATORS

In 1997, GPI Atlantic, funded by the Nova Scotia Department of Economic Development and Tourism, began development of an advanced economic accounting system for Nova Scotia. The system had to be 'capable of providing more accurate information to assist policy makers and business leaders in responding creatively to the demands of the new economy'. The Genuine Progress Indicators have 22 social, economic, and environmental components, which are reported on annually. The indicators are grouped under the following topics:

- Time use (for example, value of leisure time)
- Natural Capital (for example, soils and agriculture)
- Environmental Quality (for example, air quality)
- Socio-economic (for example, income distribution)
- Social Capital (for example, cost of crime).

The indicators attempt to measure what Nova Scotia as a society values. Since the beginning of the project, GPI Atlantic has used the indicators to produce more than 50 reports on issues like population health, farm viability and the value of unpaid work.

Source: Victorian Auditor-General's Office analysis of GPI Atlantic information published at <http://www.gpiatlantic.org>



CONCLUSION

This paper commenced with the premise that the concept of sustainability has much to offer the Victorian public sector. Applying sustainability principles has the potential to improve performance, in the short and long terms. For this reason, governments in many countries have adopted sustainability policies, resulting in an explosion of sustainability initiatives.

This paper identifies six principles for sustainability. Applying these principles is not a simple task. The interrelated nature of sustainability complicates all aspects of organisational life, from planning to operations to measurement and reporting.

The implications of the sustainability principles for measuring and reporting are of particular interest to our Office because our role is to measure the effectiveness of the Victorian public sector's programs and the accuracy of its public reports. The currently available measurement and reporting tools apply some of the principles well. However, approaches that capture the relationships between the pillars are still evolving. Approaches to measuring and reporting on intergenerational equity are even more rudimentary.

Researchers around the world and across the disciplines are wrestling with these methodological issues. This paper discusses some of the most useful developments so far.

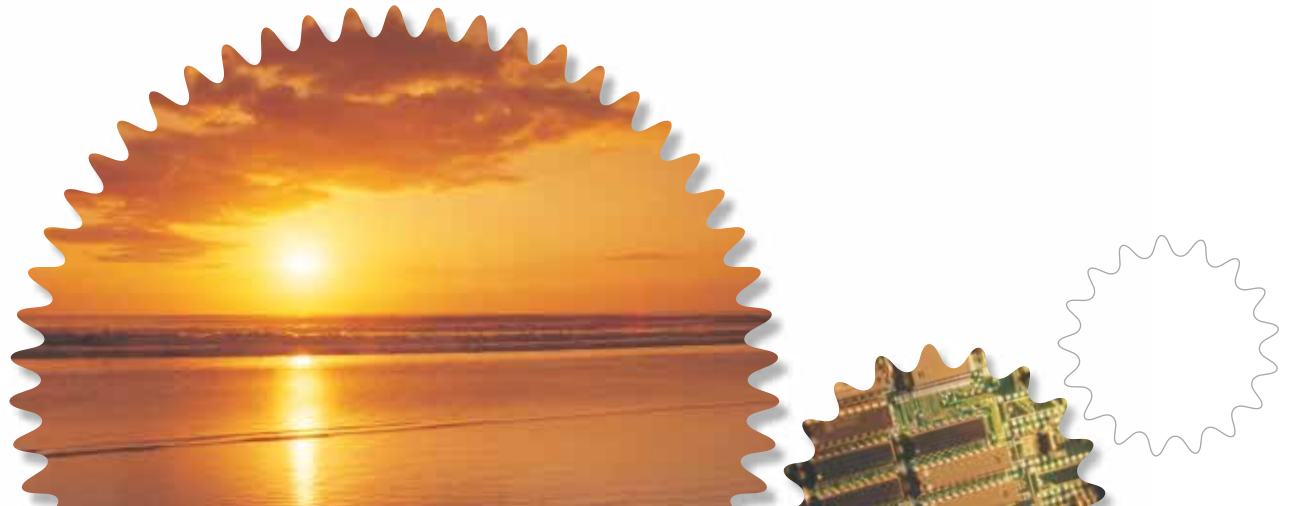
Our Office is currently undertaking two projects that will develop more specific methods for applying these approaches:

- Revision of our performance audit methodology
- Development of our methodology for auditing performance indicators.

We will also be testing the approaches discussed in this paper during our future performance audit of the implementation of the Government's sustainable forest management policy. We will then apply our learning progressively.

I encourage public sector agencies to anticipate these developments by re-examining their current performance measurement and reporting practices. This paper provides guidance on ways to improve these practices. As this paper highlights, the greatest potential improvements will arise when agencies move beyond solely financial measures to report on broader outputs and outcomes in a more holistic fashion.

In these ways, our measurement and reporting efforts, and ultimately public sector performance and accountability, can only improve.



NOTES

- ¹ The Victorian Auditor-General's Office audits the activities of approximately 600 public sector organisations across the State including the Parliament of Victoria, government departments, government business enterprises, public bodies, universities and other educational institutions, public hospitals and ambulance services, municipal councils, and water authorities.
- ² Brundtland, G. (ed) 1987, *Our Common Future*, The World Commission on Environment and Development, Oxford University Press, Oxford.
- ³ United Nations Environment Programme, 2003, Rio Declaration on Environment and Development 1992, United Nations, Geneva, viewed on 5 February 2004, <<http://www.unep.org/Documents/Default.asp?DocumentID=78>>
- ⁴ United Nations Environment Programme, 2003, Agenda 21, United Nations, Geneva, viewed on 5 February 2004, <http://www.un.org/esa/sustdev/documents/agenda21/index.htm>
- ⁵ <<http://www.deh.gov.au/esd/national/nsesd/#read>>
- ⁶ Department of the Environment and Heritage, 1992, *An Overview of the National Strategy for Ecologically Sustainable Development*, Department of the Environment and Heritage, Canberra, viewed 5 December 2003 <<http://www.deh.gov.au/esd/national/nsesd/overview/>>
- ⁷ <<http://www.deh.gov.au/esd/national/igae/>>
- ⁸ In addition, the *Commonwealth Environment Protection and Biodiversity Act 1999* provides opportunity for further standardisation between jurisdictions, particularly where impacts of a proposal are of national environmental significance.
- ⁹ For example, the Commissioner for Environmental Sustainability Act 2003, Environment Protection Act 1970, Planning and Environment Act 1987, Environmental Effects Act 1978, and the Flora and Fauna Guarantee Act 1988.
- ¹⁰ Department of Premier and Cabinet, 2001, *Growing Victoria Together. Innovative State. Caring Communities*, Department of Premier and Cabinet, Victoria. <<http://www.dpc.vic.gov.au/CA256D8000265E1A/page/Growing+Victoria+Together!OpenDocument&1=30-Growing+Victoria+Together~&2=-&3=-~>>>
- ¹¹ <<http://www.dse.vic.gov.au/dse/index.htm>>
- ¹² <<http://www.dvc.vic.gov.au/>>
- ¹³ <http://www.dpi.vic.gov.au/web/root/domino/cm_da/nreccc.nsf/3d08e37a810f38b94a256789000ee6bb/551c94e9c7c20d65ca256d2400207120?OpenDocument>
- ¹⁴ DSE Corporate Plan 2003-2006, viewed on 4 May 2004. www.dse.vic.gov.au
- ¹⁵ http://www.austlii.edu.au/au/legis/vic/consol_act/cfesa2003513/s7.html
- ¹⁶ International Council for Local Environmental Initiatives, 2004, *Cities for Climate Protection Homepage*, ICLEI World Secretariat, Toronto, viewed 29 March 2004. <http://www.iclei.org/co2/>
- ¹⁷ Bell, S. & Morse, S 2000, *Sustainability Indicators: Measuring the Immeasurable*, Earthscan Publications, London, p6. For further discussions of the concept please see: Kidd, CV 1992, 'The Evolution of Sustainability', *Journal of Agricultural and Environmental Ethics*, vol. 5, no. 1, pp1-26
- Moffatt, I 1992, 'The evolution of the sustainable development concept: a perspective from Australia', *Australian Geographical Studies*, vol. 30, pp 27-42
- ¹⁸ Schaller, N 1993, 'The concept of agricultural sustainability', *Agriculture, Ecosystems and Environment*, vol. 46, pp89-97 in Bell S. & Morse S. 2000, *Sustainability Indicators: Measuring the Immeasurable*, Earthscan Publications, London, p9.
- ¹⁹ The principles of sustainability were derived from: Harding, R & Young, M & Fisher, E 1994 *Sustainability – Principles to Practice*, Background Paper to the Fenner Conference on the Environment, Institute of Environmental Studies, University of NSW, Sydney; *Commissioner for Environmental Sustainability Act 2003*, Section 4: What is ecologically sustainable development? See also a listing of other adopted principles at: Smart Communities Network, 2003, *Sustainable Development Principles*, Energy Efficiency and Renewable Energy Network, Washington. Viewed on 23 March 2004. <http://www.sustainable.doe.gov/overview/principles.shtml>
- ²⁰ Australian Government. The Treasury 2003, *Sustainable development – to what end?* Australian Government. The Treasury, viewed on 15 January 2004. <http://www.treasury.gov.au/documents/445/HTML/docshell.asp?URL=3.asp>
- ²¹ City of Port Phillip, Victoria, Australia: <http://www.portphillip.vic.gov.au/scpi_snapshot.html>
- ²² Statistics New Zealand 2004, *Sustainable Development Appendix*, Statistics New Zealand, Wellington, viewed 5 February 2004, <<http://www.stats.govt.nz/domino/external/web/nzstories.nsf/htmldocs/Sustainable+Development:+Appendix>>
- ²³ <www.worldbank.org>
- ²⁴ <www.un.org>
- ²⁵ <www.oecd.org>
- ²⁶ <www.ilo.org>
- ²⁷ Statistics New Zealand 2004, *Sustainable Development Appendix*, Statistics New Zealand, Wellington, viewed 5 February 2004. <<http://www.stats.govt.nz/domino/external/web/nzstories.nsf/htmldocs/Sustainable+Development:+Appendix>>
- ²⁸ N.V. Lam, 2002, *A Perspective on Good Governance* Socio-economic Trends Analysis Section, Development, Research and Policy Analysis Division, ESCAP (United Nations Economic and Social Commission for Asia and the Pacific) <<http://www.unescap.org/pdd/publications/bulletin2002/ch4.pdf>>
- ²⁹ *Our Forests, Our Future* also contains other commitments and strategies, including industry restructuring, regional development and community participation in decision-making about forests.
- ³⁰ The Macquarie Library, 1998, *The Macquarie Dictionary, 3rd Edition*, The Macquarie Library Pty Ltd, Sydney.
- ³¹ The Macquarie Library, 1998, *The Macquarie Dictionary, 3rd Edition*, The Macquarie Library Pty Ltd, Sydney.
- ³² Harding, R & Young, M & Fisher, E 1994 *Sustainability – Principles to Practice*, Background Paper to the Fenner Conference on the Environment, Institute of Environmental Studies, University of NSW, Sydney, p. 6
- ³³ For example, Principle 9 of the Rio declaration: 'States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies.' United Nations Environment Programme, 2003, *Rio Declaration on Environment and Development 1992*, United Nations, Geneva, viewed on 5 February 2004, <<http://www.unep.org/Documents/Default.asp?DocumentID=78>>
- ³⁴ For more details on the principle, see: The Centre for International Sustainable Development Law (CISDL) 2002 *The Principle of Common But Differentiated Responsibilities: Origins and Scope, a CISDL Legal Brief*, McGill University Faculty of Law, Montreal, viewed 11 March 2004: http://www.cisd.org/pdf/brief_common.pdf
- ³⁵ Commission of Inquiry into Poverty, 1975, *Poverty in Australia: first main report*, April 1975, Government printer, Canberra
- ³⁶ James Cook University makes the following distinction between the two concepts: 'Equality refers to the same treatment in dealings, quantities or values. Equity refers to *fairness*, which may require different treatment, or special measures, for some persons or groups.'
- ³⁷ In a 1994 EPA NSW survey, 49 per cent of respondents believed that the main reason for protecting the environment was because we owed it to our children and to future generations. (See: http://www.epa.nsw.gov.au/soe/95/15_2s1.htm viewed 11 March 2004)
- ³⁸ National Oceans Office 2004 *Technical Summary*, Australian Government, Canberra, viewed 11 March 2004 http://www.oceans.gov.au/issues_paper_1/page_002.jsp
- ³⁹ State of the Environment Australia, *State of the Environment Report, 1996*, Department of the Environment and Heritage, Canberra, viewed on 5 February 2004 <<http://www.deh.gov.au/soe/soe96/>>
- ⁴⁰ United Nations Environment Programme, 2003, *Rio Declaration on Environment and Development 1992*, United Nations, Geneva, viewed on 5 February 2004, <http://www.unep.org/Documents/Default.asp?DocumentID=78>. Another widely quoted definition of the precautionary principle is the January 1998 Wingspread Statement on the precautionary principle: 'When an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.'

- ⁴¹ For example, the Environmental Effects Act 1978.
- ⁴² Guildberg, H 2003, *Challenging the precautionary principle*, Spiked Online, London, viewed on 5 February 2004, < <http://www.spiked-online.com/Articles/0000006DE2F.htm>>
- ⁴³ For example, the Stewart Report into the health effects from exposure to radiofrequency radiation from mobile phone technologies in the United Kingdom recommended that, a 'precautionary approach to the use of mobile phone technologies be adopted until much more detailed and scientifically robust information on any health effects becomes available.' From Independent Expert Group on Mobile Phones, 28 April 2002, *A Precautionary Approach, Mobile Phones and Health*.
- ⁴⁴ Department of the Environment, Sport and Territories, 1996 *National Strategy for the Conservation of Australia's Biological Diversity*, Australian Government, Canberra, viewed 12 March 2004, <http://www.deh.gov.au/biodiversity/publications/strategy/cover.html>
- ⁴⁵ The Council for Biodiversity Conservation, 2004, *Threats to Biodiversity in Australia*, Australian Government, Canberra, viewed 12 March 2004, <http://www.deh.gov.au/biodiversity/toolbox/about-biodiversity.html>
- ⁴⁶ Department of Environment and Heritage, 2003, *State of the Environment Australia*, Australian Government, Canberra, viewed 30 March 2004, <http://www.deh.gov.au/soe/>
- ⁴⁷ SustainAbility, 2004, *What is the triple bottom line?*, SustainAbility, London, viewed December 3 2003, <<http://www.sustainability.com/philosophy/triple-bottom/tbl-intro.asp>>
Sustainability Industries: Financial Services Industries, *Triple Bottom Line Reporting in Australia: A Guide to Reporting Against Environmental Indicators*, Department of the Environment and Heritage, viewed 20 January 2004, <<http://www.deh.gov.au/industry/finance/publications/indicators/chapter1.html>>
- ⁴⁸ Ekins, P Hillman, M and Hutchison, R 1992, *Wealth Beyond Measure: an Atlas of New Economics*, Gaia Books, London.
- ⁴⁹ Commentators explain the 'scientific approach' as one that holds that the: universe can be studied empirically, and is therefore measurable, knowable and predictable; scientist stands apart from the thing being measured, takes an objective view and seeks the truth; view of the scientist should be privileged over the views of lay people. See, for example, Bell, S & Morse, S 2000, *Sustainability Indicators: Measuring the Immeasurable*, Earthscan Publications, London, p86. Others have pointed out that there is a growing appreciation that the complexity of our biophysical systems requires a 'systems science' perspective, ie an understanding of the interaction between a range of ecological processes and their economic impacts on production systems. These insights underpin the new generation of integrated systems models that are being developed to predict the multiple impacts of alternative patterns of development.
- ⁵⁰ <http://www.globalreporting.org/>
- ⁵¹ Senge, P, Ross, R, Roberts, C, Smith, B & Kleiner, A 1994, *The Fifth Discipline Fieldbook: Strategies and Tools for Building a Learning Organisation*, Nicholas Brealey, London, p5. Cited in Bell, S and Morse, S 2000, *Sustainability Indicators: Measuring the Immeasurable*, Earthscan Publications, London, p85.
- ⁵² Bell, S & Morse, S 2000, *Sustainability Indicators: Measuring the Immeasurable*, Earthscan Publications, London, p86.
- ⁵³ University of Chicago, 1995, *Ask A Scientist - Environmental Science Archive: Environmental Science Defined*, University of Chicago, viewed on 5 February 2004, <<http://www.newton.dep.anl.gov/newton/askasci/1995/environ/ENV001.HTM> >
- ⁵⁴ Robertson, D P 1999, *Ideas of Nature in Environmental Decision Making: Toward a Public Ecology of Environmental Science and Management*, National Centre for Environmental Decision-making Research: Abstracts at a glance, Tennessee, viewed on 5 February 2004 <http://www.ncedr.org/conference/1999_review/abstracts/tue_830_1.htm>
- ⁵⁵ For example, community water quality monitoring, the national pollutant inventory and community management of the Wombat Forest.
- ⁵⁶ Walker, B 2002, Draft: *Measuring and Modelling Sustainable Development in Australia*, CSIRO Sustainable Ecosystems, Australia, viewed 5 February 2004, <http://www.cse.csiro.au/people/brianwalker/publications/Meas_and_mod_sust_dvlpt_Australia_1.pdf>
- ⁵⁷ See for example: <<http://www1.oecd.org/agr/mf/doc/usa-revised.pdf>>
- ⁵⁸ See for example: <<http://www.acpa.org.au/docs/Legislation%20and%20Policy/Montondo.PDF>>
- ⁵⁹ See for example: http://www.ensource.com/services_totalcost.htm
- ⁶⁰ See for example: <http://www.uneptie.org/pc/sustain/icitinitiative/training.htm>
- ⁶¹ Wackernagel, M. and Rees, W., *Our Ecological Footprint - Reducing Human Impact on the Earth*, Canada, 1996
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