Towards Sustainability

Achieving Cleaner Production in Australia

Australia and New Zealand Environment and Conservation Council

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TOWARDS SUSTAINABILITY — ACHIEVING CLEANER PRODUCTION IN AUSTRALIA

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PREFACE

In 1987, the United Nations published a document that challenged the economic orthodoxy of the relationship between development and environmental degradation. Called *Our Common Future*[1], it emphasised the concept of 'sustainable development'. In theory, sustainable development simply means meeting the needs of the present generation, without compromising the needs of future generations. The true challenge of sustainable development lies in putting the theory into practice.

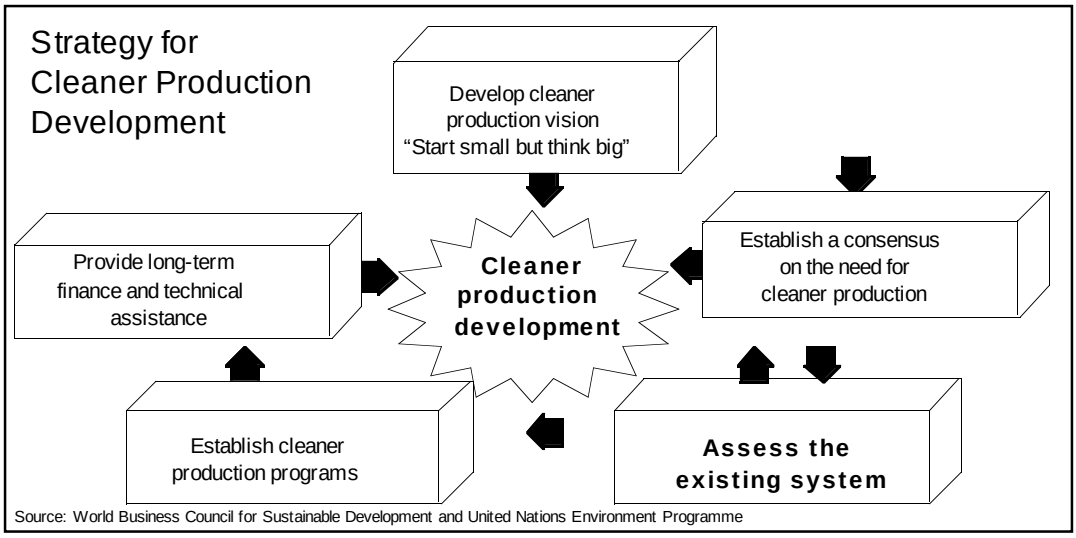
Cleaner production provides a practical way of moving towards sustainable development. Cleaner production allows the producers of goods and the providers of services to produce more with less — less raw material, less energy, less waste, and thus, less environmental impact and greater sustainability. Cleaner production is the step beyond waste management — it deals with the source of the problem, rather than the symptoms.

Cleaner production is not a new concept. It is a logical extension of our desire to conserve materials and reduce waste. It requires a person to examine what they are doing and look for better, more efficient ways to do it — ways that result in increased productivity, reduced resource inputs and reduced waste and most importantly reduced risk of environmental impact.

Cleaner production techniques are dynamic, and although industry has improved its environmental performance over the last two decades, there is continuing room for improvement. Improvement, which when implemented through cleaner production, leads both to improved economic efficiency and environmental protection.

Australian governments have worked with industry on promoting cleaner production for many years. In November 1996, the Australian and New Zealand Environment and Conservation Council (ANZECC) decided it was time for Australia to have a national strategy for cleaner production. The strategy would examine the extent to which cleaner production had been adopted by industry; assess the effectiveness of measures to encourage its adoption; consider how that adoption could be increased; and make recommendations to governments, industry and the community on how to increase the use of this powerful tool for sustainable development.

As the following diagram developed by the World Business Council for Sustainable Development (WBCSD) illustrates, encouraging cleaner production is a multi-faceted process. Australia has in varying degrees undertaken all the boxed tasks with the exception of "assessing the current system". This document aims to fill in the missing piece, to ensure that the development of cleaner production in Australia is a process of continual refinement and improvement.



Towards Sustainability — Achieving Cleaner Production in Australia draws on the collective wisdom of government, industry, academia and community groups. The first meeting of the ANZECC Cleaner Production Taskforce was held in March 1997. Over the next twenty months, the Taskforce and ANZECC Members examined the above issues, drawing on the Terms of Reference provided by ANZECC[2] to develop a strategy for increasing the adoption of cleaner production in Australia. This document is the result of that work.

EXECUTIVE SUMMARY

"Cleaner Production" — the continuous application of an integrated preventative environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment.

This document establishes a framework for the increased adoption of cleaner production in Australia, by examining the barriers to its uptake, and how to overcome them. It has been prepared for the Australian and New Zealand Environment and Conservation Council by a Taskforce consisting of representatives from Commonwealth, State and Territory Governments, industry associations, environmental organizations and academic institutions. It has also been modified after an eight week public consultation process held from March 1998.

This wide representation of stakeholders demonstrates the strength of commitment to cleaner production as a tool that is integral to Australia achieving ecologically sustainable development (ESD). Cleaner production, by focussing on the needs of business simultaneously with the needs of the environment, provides the much sought after 'win-win' for the environment and the economy.

In developing the document, the Taskforce agreed to broad Aims and Objectives that would lead to the increased adoption of cleaner production. There are many ways of achieving these Aims, and the approach taken recognizes that there may *not* be an optimal solution to overcoming each barrier, particularly when the individual circumstances of each State and Territory are considered. In such cases, the document proposes measures for further action that can be evaluated and implemented by stakeholders.

Towards Sustainability — Achieving Cleaner Production in Australia contains four chapters, each corresponding to the Taskforce's Terms of Reference.[3]

CHAPTER ONE

The *Introduction* provides a general background to cleaner production in Australia, from both an industrial and environmental point of view. The chapter explains the concept of cleaner production and places it in context as a tool which has widespread use throughout Australia — in all aspects of productive activity, including manufacturing, all forms of primary production, service provision, and government and community activity. It demonstrates that cleaner production helps organisations to reduce their environmental impacts and improve productivity and efficiency, and that leading innovative Australian firms are already using the concept.

CHAPTER TWO

The International Experience outlines activities being undertaken internationally to promote cleaner production, and discusses Australia's involvement in the main fora examining cleaner production: APEC, OECD and UNEP. This chapter demonstrates that cleaner production is widely recognised at an international level as a tool for promoting and enhancing ESD. This international involvement in and support for cleaner production provides both drive and direction for continued activity at a domestic level.

CHAPTER THREE

The Australian Experience examines Australia's activities in encouraging cleaner production. It reviews some of the programs that have been undertaken by government, academia, industry and community groups. The successes and failures of these activities are discussed, providing an understanding of the strengths and weaknesses of different approaches to promoting and implementing cleaner production. The Chapter concludes that there have been many successful cleaner production activities undertaken in Australia, and that the work currently being undertaken provides a direction for future programs.

CHAPTER FOUR

Measures for Cleaner Production presents a framework for continuing Australian activities, through discussing a series of Aims, Objectives and Measures. It draws on the lessons learnt from Chapter 3 to develop a national framework for the promotion and implementation of cleaner production in Australia. The Chapter details existing and new measures to be pursued by all parts of the Australian community. Four major themes are addressed:

- **Information** to enable industry, governments and the community to make appropriate decisions must be readily accessible, and effectively provided.

  Information recipients need data from diverse and credible sources, provided in a variety of formats. Information providers need to recognize that for cleaner production to be effective, all employees of an organisation need to understand and appreciate the concepts, and that therefore, multiple target audiences exist for information. Governments, industry associations and environmental organizations all have a role to play in providing information.

- **Adequate management and analysis tools and systems** must be readily available for industry to be able to adopt cleaner production. Effective cleaner production adoption requires integration of management information systems, technologies and comparative environmental data. Many of these tools and systems are still in their infancy or, if developed, are not available in an appropriate format to those implementing cleaner production. Governments and industry associations, as well as community groups, have clear responsibilities to develop and encourage their broader use.

- **Regulatory systems** must be designed to provide incentive structures for the adoption of cleaner production. To be truly effective, they should also acknowledge the role of industry self-regulation, as well as government enforcement.

  Government regulatory and industry self-regulatory systems provide both a coercive and technical framework for organizations to follow. Properly developed regulatory systems are neither costly to follow, nor costly to implement. The best systems combine both incentives and penalties to bring about behavioural change. Some Australian Governments have developed world class regulatory approaches, whilst others are currently up-grading their schemes. Self-regulation, where widespread industry coverage can be guaranteed, can provide particular benefits to industry and the community by reducing the cost of compliance. There are significant opportunities for governments to work with industry associations to develop voluntary agreements and codes of practice to increase cleaner production adoption.

- **The market for goods and services** must be strengthened by eliminating market-distorting practices or where this is not possible, compensating for them.

  Price signals are powerful incentives for changing consumption behaviour. Markets, through lack of information and other failures, do not adequately price environmental goods, such as water, air, and land, and therefore organizations are not given financial incentives to reduce their consumption of environmental goods. Governments have the capacity to alter market price signals through removing, altering or adding subsidies and changing the tax regime. Such changes, although powerful, are complex and have considerable environmental, social, and economic consequences. Government action in this arena, although essential, should be taken only after careful analysis. In the short term, governments can and have developed financial assistance programs that help compensate for some of the pricing distortions in the market. These short-term programs are valuable and should be further developed.

Appendix 1 contains a summary table of all the Aims, Objectives and Measures that address the four themes listed above.

Individual ANZECC members will take responsibility for implementing the Aims and Objectives of *Towards Sustainability — Achieving Cleaner Production in Australia*. To assist ANZECC in monitoring the progressive implementation, ANZECC members will report annually to ANZECC on their actions to achieve the aims of the framework.

ABOUT THE FRAMEWORK

The key objective of *Towards Sustainability — Achieving Cleaner Production in Australia* is to establish a framework that provides industry with the incentive, the information and the capacity to improve its environmental performance in the design, production and delivery of goods and services to the community.

Towards Sustainability — Achieving Cleaner Production in Australia examines both international and domestic experience in encouraging and implementing cleaner production, providing an understanding of the strengths and weaknesses of different approaches. A broad framework is developed across four key themes of: information and awareness; tools for cleaner production; regulatory and self-regulatory mechanisms; and strengthening the market. This framework is used to develop a list of objectives for the promotion and implementation of cleaner production in Australia.

The objectives based around these themes either provide an incentive to the adoption of cleaner production or are aimed at removing barriers to its uptake. A range of measures for addressing these objectives is provided for consideration by all parts of the Australian community. These measures are not intended to be definitive, but provide a mix of tools which can be used by stakeholders to encourage cleaner production. Which tools are used by stakeholders will be dependent on their existing and future policy directions, programs, resources and particular circumstances.

THE FRAMEWORK

Due to its broad ranging nature, cleaner production cannot be facilitated by just one approach, or indeed, just one sector of the community. The Aims and Objectives of the framework therefore cover a wide range of issues and target various sectors. Different groups should focus on those Objectives most appropriate and viable for their particular circumstances and capacities, and select measures based on those considerations. This will enable all stakeholders in cleaner production to play a recognised and valued role, and activities will be implemented by those who are best placed to address them.

STAKEHOLDERS

The framework presents Objectives and Measures for a wide range of stakeholders, including Commonwealth, State, Territory and Local governments, industry and industry associations, environmental groups, and the public. Where appropriate, particular groups have been targeted: for example, where that group is the only one who can implement a particular measure. It should be noted that most Objectives will require partnership and cooperation between the groups for effective implementation.

Whilst many stakeholders have an interest, clearly industry has the primary role in implementing cleaner production. Therefore, the success of this approach will ultimately be measured by the extent to which Australian business increases its adoption of cleaner production practices. The basic prerequisite for widespread adoption of cleaner production is: industry awareness of the potential for saving both on production and waste management costs while reducing environmental impacts; and awareness of the variety of ways available to plan and realise those savings.

Cleaner production can increase a business' competitiveness and an organisation's efficiency, while minimising the environmental impact of the organisation's activities. Increasing the efficiency of resource and energy use and reducing waste can reduce

operating costs. Firms practicing cleaner production may also be able to use marketing strategies to obtain price premiums for their goods and services. In pursuing the Objectives, stakeholders should select those Measures that most effectively achieve such 'win-win' outcomes.

Resources and Priorities

The wide range of Objectives and Measures listed provide stakeholders with a broad choice of tools to use in developing cleaner production priorities. Priorities are not identified in this document as individual stakeholders are in the best position to determine which actions to pursue, in line with their particular resourcing capacities and requirements.

Consultation

This document has been put together by a Taskforce made up of representatives from industry, environment and academic sectors, as well all levels of government (see appendix 5 for details). In addition, an eight-week period was set aside for public consultation. Over forty submissions were received from the public. This document incorporates the views of many of the respondents. Copies of public submissions can be obtained from *The Eco-efficiency and Cleaner Production Home Page* at: http://www.environment.gov.au/eecp.html

Implementing *Towards Sustainability — Achieving Cleaner Production in Australia*

The framework identifies 27 Objectives, for increasing the adoption of cleaner production in Australia. Each Objective either provides an incentive to the adoption of cleaner production or removes a barrier to the uptake of cleaner production.

Although every Objective implemented is a step towards sustainable environmental practice, no single Objective will ensure that cleaner production becomes a normal and accepted way of producing goods and services. Rather, the implementation of multiple objectives is necessary to increase industrial efficiency and environmental protection in Australia. Each stakeholder will choose when and how a particular objective should be implemented. This will ensure that optimum synergies will be achieved between cleaner production and other activities being undertaken by stakeholders. The framework recognises that the involvement and participation of a wide range of stakeholders will be necessary to its success. In developing the framework, ANZECC recognises that different groups have different priorities and resources for implementing the Measures and therefore identifying resources to select and implement Measures will be the responsibility of the relevant stakeholders. ANZECC also recognises that some of those tasked with undertaking a measure, may require government funding assistance.

Without regular feedback and evaluation of progress, ANZECC will be unable to adequately measure the success of the framework. For this reason, it is proposed that within twelve months of ANZECC endorsement, governments will report on their activities to further the five Aims of the framework. These reports will identify which Aims have been pursued, through what means, and the effectiveness of these means. At this time, governments will also identify any activities that will be pursued in the future.

Reports will also identify whether any of the Measures have been used to further the Objectives, or whether other methods have been found effective. This reporting will

provide a useful mechanism for governments to share information about the uptake of cleaner production.

A note on information sources:

Throughout *Towards Sustainability — Achieving Cleaner Production in Australia*, endnotes are used to reference some of the main written and electronic sources of information used. In addition to the material referenced, the Taskforce, through funding from Environment Australia, in 1997 commissioned five reports that collated and analysed material for the Taskforce. These reports have been utilised in the preparation of the document.

The reports are:

- *Barriers and Motivators to the Adoption of Cleaner Production Practices*, Neil Gunningham, Darren Sinclair and Patricia Burritt, Australian Centre for Environmental Law.
- *Evaluation of Cleaner Production Measures*, Allan McLay (RMIT), Raju Divakarla (Advanced EnviroSafe) and Arek Sinanian (Enproc).
- *Education and Training in Cleaner Production*, John Cumming, Infotech Research Pty Ltd.
- *A Benchmark of Current Cleaner Production Practices*, Peter Dempster, Charles Jubb, Laslo Nagy, Neill Stacey, Andrea Versteegen, Denis Lawrence, Aquatech Pty Ltd.
- *Environmental Financing and Economic Instruments for Cleaner Production*, Graham Rogers, Greg Barrett and Mark Wilson, University of Canberra.

With the exception of the 'Evaluation of Cleaner Production Measures' and 'Environmental Financing and Economic Instruments for Cleaner Production', these documents are available on The Eco-efficiency and Cleaner Production Home Page at: http://www.environment.gov.au/eecp.html

1. INTRODUCTION

A. DEFINITION OF CLEANER PRODUCTION

Towards Sustainability — Achieving Cleaner Production in Australia adopts the United Nations Environment Program (UNEP) definition of cleaner production:

- Cleaner Production means the continuous application of an integrated preventative environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment.
    - For production processes: cleaner production includes conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes before they leave a process.
    - For products: the strategy focuses on reducing impacts along the entire life cycle of the product, from raw materials extraction, to ultimate disposal of the product.
    - For services: cleaner production reduces the environmental impact of a service provided over the entire life cycle, from system design and use, to the consumption of resources required to provide the service.
- Cleaner production requires applying know-how, improving technology, and changing attitudes.

Many preventative terms — such as eco-efficiency, pollution prevention, waste minimisation, source reduction — are in use today. The term "cleaner production" was chosen by UNEP to encompass a comprehensive approach to production. Thus, cleaner production covers all processes, products and services, and their impacts, including design and the use of raw materials and energy. It covers all wastes, including hazardous or toxic wastes, whether emitted into the air, water or onto land.

The term acknowledges that continuous improvement is required not only in efficiency and material substitution, using tools such as technology and know-how, but also in managerial skills and policies. It also acknowledges the importance of design and use of products and services.

This definition has also been adopted for the Asia Pacific Economic Cooperation (APEC) Region Cleaner Production Strategy.

UNDER-PINNING PRINCIPLES

There are three key principles that provide the rationale for cleaner production.

PRECAUTIONARY PRINCIPLE

The precautionary principle moves the burden of proof for the safety and efficacy of a process from society to the person proposing the process. That is, it is up to the 'potential polluter' to prove that their activity does not cause harm rather than society having to prove that the activity causes harm. The precautionary principle is an inherent part of achieving sustainable development.

PREVENTATIVE APPROACH

It is cheaper and more effective to prevent environmental damage than attempt to manage or fix it. Prevention requires going upstream in the production process to prevent the source of the problem instead of attempting damage control downstream. Pollution prevention replaces pollution control.

INTEGRATED AND HOLISTIC APPROACH

Society needs to adopt an integrated approach to environment resource use and consumption to ensure that addressing one pollution problem does not simply create another. This can happen particularly when regulators and practitioners concentrate on one medium, for example air, and do not take account of the impacts on other media of fixing that pollution problem. For example, air pollution control techniques can transfer the pollution to solid waste or water. This may not be the best overall for the environment. By integrating decision making and taking a life-cycle assessment to product and service development and delivery, environmental impacts are minimised.

B. CLEANER PRODUCTION IN ACTION

(I) HOW IT WORKS

While cleaner production is often thought of only in the context of manufacturing sectors, it is also relevant to others, such as the service sector, agriculture, mining and government administration. For example, initiatives introduced by the Hotel Inter Continental in Sydney demonstrate a broad range of environmental and financial benefits, many of which are easily transferable to other industries. Savings were often achieved with little or no capital expenditure by merely changing management practices. This is one of the keys to cleaner production — it need not cost money and often requires little additional resources and time.

The Hotel Inter Continental Sydney[4]

The Hotel Inter Continental is a five star hotel that has 497 guest rooms and 500 staff. Food preparation, laundering and cleaning are constant activities. The Hotel was sensitive to environmental issues and examined the following initiatives:

- conserving natural resources and energy;
- improving efficient resource use;
- minimising waste production;
- using products and materials which have the least impact on the environment, both in use and origin;
- pursuing action programs to benefit the environment in the local community; and
- fostering the education of environmental awareness, both internally and externally.

The Hotel spent $84,000 on cleaner production techniques, resulting in financial benefits of $280,000 per year. The Hotel implemented the following initiatives:

Reduced cardboard collection frequency	Lowered laundry water temperature
Improved kitchen night light switching & exhausting	Installed air conditioning and picture lights time switching
Stopped air conditioning in unoccupied rooms	Reduced the globe wattage of lights
Installed timer switches on car park lights	Trained housekeeping staff
Removed unnecessary lights in service areas	Installed urinal sensor switching
Installed compact fluorescent lights	Installed guest room water restrictors
Lowered water temperatures	Reclaimed laundry water

Cleaner production processes are being increasingly adopted by primary industry. For example, in agriculture, many users of pesticides are converting to integrated pest management, whereby natural predators are encouraged to keep insect populations under control. The progressive introduction of Turtle Exclusion Devices (TEDS) within the prawn industry is ensuring that not only is a better environmental result being achieved (the reduction of by-catch of a non-target species) but also a TED may bring about improvements in occupational health and safety (reduced handling of large fish species), product quality (reduced damage to prawns), and profits (reduced operating costs associated with the handling and removal of non-target species).

(II) WHY PRACTICE CLEANER PRODUCTION?

ENVIRONMENTAL NGOS: THE GREEN PERSPECTIVE

The environmental value of cleaner production is that it encourages efficient resource use, by optimising the use of raw materials, minimising the waste generated from production processes, and reducing the risk of causing environmental harm through the activities undertaken by organisations. Cleaner production thus has benefits from both conservation and environment protection viewpoints. Recognising this, many environmental non-government organisations (NGOs) are encouraging the implementation of cleaner production practices and processes by industry:

> *"The transition to clean production will rely increasingly on smaller, more efficient and cleaner material, water and energy flows. The speed and volume of resources flowing through the production-consumption cycle can be reduced by improved product design that allows the reuse of components and recycling of materials.*[5]*"*

Environmental NGOs come in all sizes and from a wide range of backgrounds, from local Landcare groups, to large international groups such as Greenpeace. As such, they have broadly differing constituents, and therefore, the ability to reach a wide and diverse range of people within the community. In this capacity, NGOs provide information and education to the community, act as a rallying point for community concerns, and often represent the community at industrial, economic and environmental fora.

Pressure from communities, as expressed by environmental NGOs, can influence both government and industry to work towards improved environmental practices. As Greenpeace puts it:

> *"The hurdle is not a lack of physical or technical capability, but the lack of industrial and political will to implement cleaner production methods. Part of this inertia is due to the absence of public pressure. Governments and industry tend to act if they...feel some pressure from society*[6]*."*

Cleaner production provides a means by which environmental NGOs can enter into a cooperative and constructive dialogue with industry, and also, a means by which industry can respond to community concerns.

THE INDUSTRY PERSPECTIVE: WHY ADOPT CLEANER PRODUCTION?

Cleaner production is not just an environmental initiative. One of its most basic premises is that it improves efficiency and productivity for industry. These improvements are seen in lower expenditure on resources such as energy and water, increased efficiency in production, fewer risks associated with environmental impacts, and decreased waste generation that leads to savings in landfill fees and pollution licenses.

Incorporation of cleaner production practices also leads to greater employee involvement in, and commitment to, the production process that often leads to higher quality product.

The National Occupational Health and Safety Commission estimates that there are about 2,900 workplace fatalities per year. Eighty five percent are related to hazardous substances or working conditions[7]. The application of cleaner production principles reduces workplace hazards and the use of toxic materials. Furthermore, cleaner production creates more efficient work practices and processes, and improved working conditions; all of which can lead to significant increases in productivity.

Cleaner production also requires firms to become more aware of their environmental management and impacts at all steps of the production process. Such awareness requires some form of monitoring, no matter how rudimentary. The data collected enables firms to promote their environmental performance, leading to increased customer confidence, and also manage environmental risks which might cause negative client feedback.

> *"Since the company's cleaner production improvements, public relations have improved and so has the company's image and standing in the community".*[8]

In addition, monitoring can greatly assist industry in meeting regulatory requirements, including, for example, reporting on emission levels. A firm that is aware of its environmental impacts, and how to manage them effectively, is a firm that is strongly placed to adapt its performance in response to changing environmental regulation.

> *"...I can see a time coming when stricter environmental controls will be placed on businesses. I want my company to be in compliance before regulations come in. Therefore, cleaner production is a necessary part of doing business".*[9]

Benefits to Industry: Moore Business Systems

Moore Business Systems, Wodonga, participated in Environment Australia's Cleaner Production Demonstration Project.

The company specialises in the production of computer printout paper. The cleaner production project identified significant improvements to the production process that reduced the production of waste paper and used raw materials more efficiently. These changes were made with *no capital outlay*, and resulted in savings of roughly $350,000 per year.

Other benefits observed were greater staff involvement and commitment to the work, and improved efficiency in production processes, which led to significantly higher productivity and improved working conditions.

"This project has obviously assisted our company with its responsibility to the environment and our desire to improve our manufacturing process. ***Clearly there is a benefit with the concept of cleaner production for Australian industry...****"*

Terry Bevis, Human Resource Manager, Moore Business Systems

C. CLEANER PRODUCTION AND ECOLOGICALLY SUSTAINABLE DEVELOPMENT

A significant role for *Towards Sustainability — Achieving Cleaner Production in Australia* is to recognise and promote the contribution that cleaner production can make to implementing and promoting ecologically sustainable development (ESD) in Australia.

The goals of ESD and cleaner production are very similar. Both seek to develop ways to optimise the use of resources to maintain and, where possible, improve their quantity, variety and quality.

In 1992, the National Strategy for Ecologically Sustainable Development (NSESD) was prepared to coordinate Australia's approach to ESD. The NSESD examines the management of Australia's ecological and economic resources on a regional, national and international basis, and the significance of potential threats to our environment and economy if we do not take action.[10]

The following table indicates the links between the five principles of ESD developed in the NSESD and cleaner production.

ESD Principle	**Cleaner Production Approach**
1. Integrating economic and environmental goals in policies and activities.	Measuring and valuing *all* inputs, outputs and by-products from the production process.
2. Ensuring that environmental assets are properly valued.	Improved identification and costing of environmental inputs.
3. Providing for equity within and between generations.	Reducing consumption of inputs. Redesigning products and processes. Improved costing of resource inputs to ensure that they reflect the full cost of the input.
4. Dealing cautiously with risk and irreversibility.	Ensure that the long-term impacts of production are considered in decision-making.
5. Recognising the global dimension.	Identifying and improving upon the world's best practice in production processes.

Both the NSESD and this framework aim to encourage sustainability by embedding ESD principles in day-to-day productive activities.

Although not always the result of a conscious effort, cleaner production programs across Australia work in concert with NSESD goals. Cleaner production schemes such as grants, interest free loans, demonstration projects and education programs have all contributed to raising awareness of the importance of ESD.

2. THE INTERNATIONAL EXPERIENCE

A. CLEANER PRODUCTION IN THE INTERNATIONAL COMMUNITY

The international community has recognised the wide range of benefits that can arise from cleaner production. Cleaner production provides a means by which countries can protect both the environment and the community, without compromising sustainability of trade and economic development in the future.

In the short term, environmental measures may appear to compromise trade and industry. However, experience has shown that ultimately, environmental damage can lead to wide scale social disruption and damage to a country's production capacity. In the last few years, China has closed over 57,000 small factories, mainly small paper mills, tanneries, chemical, coking and electroplating workshops, that were causing pollution and affecting the freshwater supply of millions of people. Introducing cleaner production may have avoided this. Australia is not immune from pollution linked health problems. While the campaign to decrease lead in petrol has reduced blood lead levels in the general population, there are still industrial sites and localities where lead remains a health issue. Cleaner production provides a solution to such problems, by reconciling both industrial and environmental concerns.

Since 1989, cleaner production has been the main focus of the United Nation's Environment Program's international pollution work. UNEP aims to increase understanding of cleaner production and particularly, work with developing countries by establishing networks of organisations dedicated to promoting awareness, providing advice and guidance and demonstrating the benefits of cleaner production.

Though the concept of cleaner production is grounded in environmental protection, there are obvious synergies with trade and investment, industrial development, research and development of new technologies and the potential for developing countries to 'leap-frog' old polluting practices and avoid some of the costly environmental problems of the more industrialised countries. Many international groups have recognised these multiple benefits, and are conducting work to promote cleaner production.

B. UNITED NATIONS ENVIRONMENT PROGRAM (UNEP)

The 1992 United Nations Conference on Economic Development (UNCED) recognised and endorsed the role of cleaner production in sustainable development in Agenda 21. UNEP launched their Cleaner Production Program in 1990. The Program continues to be the major focus of its activities, and includes:

- fostering information exchange among countries;
- capacity building in developing countries through joint UNIDO/UNEP National Cleaner Production Centres; and
- undertaking demonstration projects in developing countries.

UNEP established the International Cleaner Production Information Clearinghouse (ICPIC) that gathered case studies from many nations, and has published several case studies on cleaner production[11], including one booklet drawing on material from the Asian region. ICPIC is available through the Internet (http://www.unepie.org/icpic/icpic.html).

A 1994 UNEP paper[12] outlines a number of policy instruments including legislation, financial instruments and information and education programs that may be applied

to encourage cleaner production. The research found that most countries favoured the use of grants, subsidies, research and development programs, and consultant support. Several countries had implemented a range of information and education programs, including demonstration programs. A strong emphasis was found on the development of new technology to 'fix' pollution problems (see appendix 3).

In 1996, UNEP held its fourth High Level Seminar on Cleaner Production. At this seminar, it was observed that while there had been considerable activity, critical mass has yet to be reached: cleaner production had been 'only a minor uprising rather than a major revolution'.[13] A recurring concern of many countries at the Seminar was that efforts focussing on demonstrations and information, coupled with assertions of the benefits of cleaner production, had not resulted in a rapid uptake. The Seminar concluded that a new focus on increasing the demand for cleaner production was needed.

C. United Nations Industrial Development Organisation (UNIDO)

The lead organisation for industrial development in the UN system, UNIDO promotes cleaner production as "the means by which industry can be environmentally responsible while remaining competitive and profitable."[14] At the policy level, UNIDO works with governments to devise industrial policies and strategies with a preventive focus. At the institutional level, UNIDO is designing and supporting programs of institutional strengthening which combine technical advice, training, study tours and the provision of equipment.

The UNIDO programs have found that change in companies requires a range of approaches other than new technology. This can include involving employees, delegating decision-making powers, rewarding "achievers", increasing emphasis on non-production issues, improving record-keeping and reporting, developing infrastructure facilities, providing effective supervision, and including environmental costs in economic analysis.

UNIDO and UNEP jointly support the program to establish cleaner production centres in developing countries to provide advice, assess information and develop guidelines and manuals for key industries. Some of these centres receive funding from the World Bank, which recognises the role of cleaner production in ensuring long-term survival of business enterprises.

D. Organisation for Economic Cooperation and Development (OECD)

The OECD represents 29 highly industrialised and developed nations. Many of these countries have recognised the need to reduce industrial impacts and optimise resource utilisation if high standards of living are to be maintained. The OECD incorporates cleaner production in its Sustainable Consumption and Production Program.

In 1990, the OECD initiated a three-year Technology and Environment Program, in collaboration with the UNEP Industry and Environment Program. The Program provided a foundation for further OECD work on cleaner production by identifying knowledge gaps, policy conflicts, and potential problems with technology development and transfer. Analytical tools for measuring and evaluating performance were identified, including indicators, economic statistics, pollutant inventories and life-cycle analysis. The Program attempted to clarify the responsibilities of governments and policy options available, and raise general awareness through conferences, workshops, case studies and networking.

Major goals for current and future OECD cleaner production efforts are to: develop methods for review and evaluation of policies aimed at cleaner production; identify barriers impeding cleaner technology adoption; improve the means for determining precisely and consistently the pollution burden; and promote capacity building in the area of life-cycle analysis, especially sustainable product policies.

In 1992, eight OECD countries collectively invested US$350 million to demonstrate and diffuse promising new technologies. However, the flow-on effect from such initiatives has not been as rapid as expected, particularly for smaller enterprises. This has lead to recognition that a more comprehensive and integrated mix of policy tools is needed to create a demand for cleaner technology. The OECD has found that factors influencing demand include: a strong policy framework; access to financing; environmental standards; and state of the environment monitoring. It is also important that technological innovation is not stifled by regulatory constraints.

Member communities have recognised the need to develop public awareness, engage industry in voluntary agreements, use economic instruments creatively, work with SMEs, and assist developing countries in cleaner production. Countries need a mix of economic, regulatory and information policies, and mechanisms to assess the resulting changes, in order to achieve effective pollution prevention.

The OECD is continuing to extend these concepts to create more sustainable consumption patterns and increase the focus on providing services rather than products.

E. World Business Council for Sustainable Development

The World Business Council for Sustainable Development (WBCSD), formed in 1995, is a coalition of 120 international companies that have a shared commitment to environmental protection. The WBCSD promotes cleaner production through participation in UNEP and other projects.

The WBCSD actively promotes cleaner production and its extension, "eco-efficiency", to its members, and is encouraging governments to develop policies to support these concepts. Rather than seeing environmental protection as a threat to business competitiveness, the WBCSD recognises the potential of cleaner production to improve business efficiency in the short term, and maintain economic viability in the long-term. The WBCSD promotes the benefits of resource conservation, life cycle analysis, open reporting and effective managerial systems and infrastructure.

F. Asia-Pacific Economic Cooperation (APEC)

All APEC member economies recognise the need to achieve sustainable development, and the potential role of cleaner production in maintaining economic growth and trade. In June 1997, Sustainable Development Ministers adopted a Cleaner Production Strategy for APEC that will be implemented through the work programs of all the APEC Working Groups. The APEC Strategy provides a structure for member economies to share cleaner production experience, cleaner technology, government policies and infrastructure. It will also promote cleaner production in key industrial sectors, through institutional, professional, public and private sector partnerships. This focus on cleaner production is expected to improve living conditions in some of the most densely populated and rapidly developing cities on earth.

3. THE AUSTRALIAN EXPERIENCE

Australian governments have been promoting cleaner production since 1989, either through specific cleaner production programs, or through other mechanisms that support the adoption of cleaner production. The following section examines many of these activities.

A. WORKING WITH INDUSTRY

(I) DEMONSTRATION PROJECTS

Industry is more likely to consider new approaches and technologies if their effectiveness has been proved through practical demonstration. With this in mind the Commonwealth, Victorian and South Australian Governments established demonstration programs to prove the environmental and economic benefits of cleaner production.

One of the greatest advantages of demonstration projects is their versatility in serving multiple aims and providing a wide range of information and promotional products. Demonstration projects have generated fact sheets, videos, brochures, manuals, seminars, and workshops. However, their main focus has been in the production of case studies, which can be used by other firms as a source of practical information on how to implement cleaner production. Governments have found this detailed information to be a strong motivator for industry to adopt cleaner production.

The South Australian EPA initiated several demonstration projects with industry associations including the Cleaning Industry Association, Wine and Brandy Association and the Foundry Council. The scheme has been successful in achieving its desired goal of nurturing, promoting and demonstrating cleaner production in diverse industry sectors.[15] The total cost of the scheme has been $800,000 and companies are currently saving $1.4 million a year, with an estimated total saving of $3 million since 1994.

The Victorian Government and the Australian Chamber of Manufactures jointly established a Victorian Cleaner Production Partnerships Program. The Program actively encourages small to medium enterprises to develop opportunities in cleaner production by providing funding for the preparation of environment management systems (EMS), management experience transfers, preparation of waste management plans, and interest free loans for the installation of no waste or low waste technology.

The Commonwealth Government has further found that industry is more responsive to endorsements by their own sector members. Several companies that participated in the National Cleaner Production Demonstration Project (NCPDP) are now speaking at conferences and industry association meetings promoting cleaner production. The NCPDP also found that many companies continued to research and implement cleaner production practices after their involvement with the project.

SMEs rarely have the resources available to research cleaner production options for their business. They also do not have the resources available to experiment with new techniques. Practical demonstrations are invaluable as they provide examples of specific cleaner production techniques that have been proven to minimise environmental impact and save money. This minimises the risk and research effort for SMEs that wish to implement specific cleaner production techniques.

(II) AVAILABILITY OF EXPERTISE

Consultants with experience in cleaner production are a valuable resource, as often, neither government nor NGOs have the capacity, expertise or resources to manage the technical details of demonstration programs, or to provide reports, seminars and training programs on cleaner production issues.

Yet while there is a wealth of Australian expertise and consultants in areas such as water and waste management, there remains a shortage of cleaner production experts. This may be due to the holistic nature of cleaner production, which encompasses the gamut of environmental issues and industry sectors. An 'expert' in cleaner production must therefore have a detailed understanding of a broad range of environmental issues, as well as the capacity to understand the technical and management details of a specific firm's production processes.

Australia's private sector expertise in cleaner production is steadily building with the availability of information and the realisation that cleaner production produces financial as well as environmental benefits. Implementation of the Objectives in this document will only increase the demand for such expertise.

B. PROVIDING INFORMATION

Experience with cleaner production programs has shown that many industries still view environment management as a financial drain. To change this view, both government and NGOs have been active in promoting the financial benefits of cleaner production through publications, and by speaking at conferences, seminars and workshops. Professionals must be aware of the benefits of cleaner production to ensure that initiatives are not put aside simply because of a lack of knowledge.

(I) PUBLICATIONS

Commonwealth, State, Territory and local governments have developed an extensive range of publications, including technical and training manuals, booklets, brochures and pamphlets, case studies, newsletters, media articles and videos. Publications have been developed to target a wide range of interested groups, for example, industries of a certain sector or size, the public, regulators, and local government.

(II) CONFERENCES

Cleaner production experts (government and non-government) are often invited to speak at environmental conferences. The Brisbane City Council organised a very successful local "Pollution Solutions Expo" in 1997 and have followed this up with plans for an Asia-Pacific trade exhibition to coincide with the Second Asia-Pacific Cleaner Production Roundtable in 1999.

Several regional seminar series have been sponsored by State and Commonwealth Governments to take the cleaner production message to local government and SMEs. In 1996, an international expert on cleaner production was sponsored by the Commonwealth, The Institute of Engineers, and the Australian Wastewater Association (AWWA) to run a series of seminars. This series involved 16 workshops in regional centres around Australia, and was attended by over 600 people.

(III) WORKSHOPS

It is difficult for companies, particularly SMEs, to be aware of product innovations and the product alternatives available in specialised areas. It is therefore useful to provide opportunities for industry to discuss their innovations and problems. Cross–sectoral and same sector industry workshops each have their advantages.

The Noarlunga City Council chemical awareness project, sponsored by the Commonwealth, found that same sector workshops allowed companies to discuss solutions to the common problems they experienced as a sector — it allowed companies to relate directly to the technology and approaches being used.

However, cross-sectoral workshops are also useful, as they allow cleaner production innovations in one sector to be applied to another. From a NCPDP workshop, Bonlac Foods, a dairy company, was able to improve the configuration of filter screens used to separate whey, by using a mining company's experience with filter configurations used in the separation of minerals from ore.

Local government can also use workshops to discuss ways to manage emissions, wastes and raw materials at a regional level. Local industries can examine opportunities to utilise each other's wastes. For example, NCPDP participant CSR Wood Panels identified the opportunity to sell its sawdust, previously sent to landfill, to a local nursery to be used in potting mix. This resulted in a profit for CSR, less waste to landfill and a new supply source for the nursery.

(IV) TRAINING

Governments recognise that training is the key to integrating environment into business decisions and that this must occur at all levels from senior management through the entire workforce.

A number of tertiary institutions include environment management, cleaner production, environmental economics and related courses at undergraduate and certificate level for engineers, chemists and environment managers. The Australian National Training Authority has developed draft protocols for the incorporation of environmental matters into industry training packages. The Commonwealth Government has also supported the development of training courses through unions for delivery to the existing workforce. A number of private providers deliver specialised training to firms on demand. The Queensland Cleaner Production Taskforce has also worked with various Queensland TAFEs and Universities to prepare cleaner production curricula.

(V) AUSTRALIAN CENTRE FOR CLEANER PRODUCTION (ACCP)

The ACCP is a non-profit organisation located at the Royal Melbourne Institute of Technology University (RMIT). The Centre was established in February 1995 to assist industry to achieve the dual goals of international competitiveness and environmental excellence through cleaner production. It has a charter to improve the adoption of systems and technologies that lead to environmental and economic benefits. The Centre is a focal point for cleaner production activities and has a major role promoting cleaner production in Victoria through coordination of EPA Victoria's *Cleaner Production Partnerships Program*. The Centre is closely involved in the delivery of tertiary training courses in cleaner production and provides training programs in cleaner production to industry and regulatory bodies.

C. POLICY AND REGULATORY INSTRUMENTS

(I) GOVERNMENT POLICIES AND STRATEGIES

Towards Sustainability — Achieving Cleaner Production in Australia will be implemented against a broad background of pre-existing government policy directions. Several of these policies, with particular relevance to cleaner production, are described below. It is worth noting that by implementing cleaner production a firm will often address the issues raised in other government policies and strategies. This arises because

cleaner production can be considered a comprehensive business approach that impacts all aspects of a firm's production processes.

AUSTRALIA'S NATIONAL GREENHOUSE STRATEGY

Australia became a signatory to the United Nations Framework Convention on Climate Change (FCCC) in June 1992. The Convention aims to achieve stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous human interference with the climate system. In December 1997, parties to the FCCC agreed to set targets for greenhouse gas emissions. Australia's target is to reduce its greenhouse gas emissions to 8 per cent above 1990 levels by 2008-2012.

The prime policy for greenhouse response in Australia is found in the National Greenhouse Strategy (NGS). The NGS is the mechanism through which our international commitments are met. It provides a comprehensive approach to tackling greenhouse issues.

Module 7 of the NGS refers to cleaner production in industrial processes and waste management. Cleaner production is an important means of reducing greenhouse gas emissions while generating a range of other environmental and economic benefits.

Greenhouse gas emissions arising from industrial processes will be addressed by:

- Developing and implementing environmental management systems, training, monitoring and reporting in key industries such as the aluminium, cement and coal mining industries.
- Examining the feasibility of systems that capture, use and/or dispose of CO_2 at specific site locations where major emissions occur.
- Encouraging industry to monitor its emissions of greenhouse gases and to report on emissions where arrangements exist for this purpose.

In addition, governments will work with industry to develop environmental management strategies for each of the synthetic gases included in the Kyoto Protocol — hydrofluorocarbons, perfluorocarbons, and sulphur hexaflouride.

Addressing methane emissions from landfill and wastewater is also a priority. In addition to promoting waste minimisation, action will be taken to encourage the capture and utilisation of landfill methane emissions.

Improving the energy efficiency of industry and products is also important for achieving greenhouse gas emission reduction. The NGS contains key measures concerned with energy supply, technology development and product manufacture which relate to cleaner production:

- Energy supply measures involve the development of minimum energy performance standards for new appliances and equipment, regulating or developing codes of practice to ensure their adoption and, where appropriate, labelling or rating appliances and equipment to help consumers in their selection.

- Energy performance codes and standards for housing and commercial buildings are to be enhanced. Standards for residential buildings may involve the development of a minimum energy performance requirement for new houses and major extensions.

- Energy efficiency benchmarking and best practice will be promoted through governments working with industry associations. As a priority under this initiative, action will be focussed on improving energy efficiency in the wholesale and retail sector, which has become the largest and fastest growing component of commercial sector energy use.

Further measures of the NGS that address these issues include:

- electric motors — improving energy efficiency and drive systems;
- development of energy efficiency technologies and services;
- consumer uptake of sustainable energy technologies;
- manufacture and marketing of low greenhouse gas emission water heaters; and
- life cycle energy analysis.

Improving vehicle fuel efficiency and fuel technologies are also important elements of cleaner production. Module 5 of the NGS contains existing and new measures that contribute to this.

These measures, will be implemented through The Environmental Strategy for the Motor Vehicle Industry to be developed in cooperation with various industry and consumer groups.

AUSTRALIA'S GREENHOUSE CHALLENGE

Greenhouse Challenge is the mechanism for Australian industry to voluntarily reduce greenhouse gas emissions through reducing industrial energy consumption, wastes, applying more efficient industrial processes, rationalising use of transport and enhancing of sinks.

The Challenge aims to reduce greenhouse gas emissions by demonstrating that improved actions such as energy efficiency and waste reduction can have financial benefits for industry. Under the Greenhouse Challenge, large firms or industry associations develop and sign voluntary, agreements with the Commonwealth Government. The agreements make a commitment to:

- develop an inventory of the firm's emissions;
- identify opportunities to reduce those emissions and develop an action plan;
- set goals for emission reductions;
- monitor performance against each year's action plan to assess progress and identify new opportunities for energy efficiency; and
- report publicly on the results of the process and accept the possibility for independent verification of results.

117 companies and industry associations have already signed cooperative agreements and another 153 organisations have joined the Challenge by submitting letters of intent to reduce their emissions.

Managing Energy for Profits, an element of the Greenhouse Challenge aimed at medium sized companies, commenced in late-1997. This phase seeks to engage firms who account for roughly 10% of industrial energy usage in Australia.

Greenhouse Allies, the newest element of the Greenhouse Challenge was launched in July 1998. This phase aims to help smaller businesses play their part in reducing greenhouse emissions while acknowledging that the majority simply do not have the capacity to fulfil the requirements of voluntary agreements.

Cleaner production can play an important role in assisting Australia to meet its greenhouse commitments. Through its emphasis on improving energy efficiency, cleaner production reduces greenhouse gas emissions that arise from the production and manufacture of products and from the energy consumed in use and disposal of products.

AUSTRALIA'S OZONE PROTECTION STRATEGY

Australia became a party to the *Montreal Protocol on Substances that Deplete the Ozone Layer* on 19 May 1989. The Protocol aims to protect the ozone layer by taking

precautionary measures to control total global emissions of ozone depleting substances, ultimately eliminating them from use and manufacture. To achieve this aim the Protocol sets mandatory targets for phasing out the production and consumption of ozone depleting substances.

Australia has adopted a cooperative approach to the phase out of ozone depleting substances, including industry, the community and all levels of government in its development. The approach is detailed in the *ANZECC Strategy for Ozone Protection in Australia*, agreed in July 1989, and revised in April 1994.

The National Water Quality Management Strategy (NWQMS)

While most water quality management is by State and Territory agencies, national and regional approaches, which often involve State, Territory and Commonwealth governments, are being developed. The NWQMS was introduced in 1992 as a response to growing community concern about the condition of the nation's water bodies and the need to manage them in an environmentally sustainable manner. It applies to all water systems, namely fresh, marine and estuarine waters. The main policy objective of the strategy flows from ESD principles, namely:

> *'to achieve sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development'.*

The NWQMS objectives are being achieved through attention to diffuse sources of pollution in the rural environment. This includes improving the quality of run-off of agricultural land through improved natural resource management and best management practices. Attention is also being given to point sources of pollution in the rural sector, such as dairy shed effluent, dairy processing waste, winery waste and other water intensive industries.

The Strategy envisages that both regulatory and market based approaches will be used in developing water quality management plans.

National Strategy for Agricultural and Veterinary Chemicals

Agricultural and veterinary chemicals are an integral part of modern agricultural production systems. They are the source of significant productivity increases both in terms of quality and quantity of food and fibre produced. Yet they are also a source of potential adverse impact on human health, animal health, the environment and trade.

Worldwide concern about the adverse impact of the use of agricultural and veterinary chemicals has been increasing and continues to do so. People want to know that the food and fibre they consume (or wear) does not contain harmful chemicals residues.

In response to these concerns, the Agriculture and Resources Management Council of Australia and New Zealand (ARMCANZ) recently developed a *National Strategy for Agricultural and Veterinary Chemicals*. The Strategy examines the issues raised above, and aims to ensure:

> *"The use of agricultural and veterinary chemicals in a way which:*
> - *best contributes to national prosperity;*
> - *ensures the long-term sustainability of agricultural productivity; and*
> - *minimises the risks to health, the environment and trade."*

Waste Minimisation Strategies

Three other national Strategies, the *National Kerbside Recycling Strategy* and the *National Waste Minimisation and Recycling Strategy*, and the *National Strategy for the*

Management of Scheduled Waste also have links with this framework. The first two aim to encourage more efficient use of resources through recycling and reduction of waste. The *National Waste Minimisation and Recycling Strategy* provides an important driver for the adoption of cleaner production by establishing a national target of a 50% reduction in waste going to landfill by the year 2000 from a base year of 1992. The *National Strategy for the Management of Scheduled Waste* ensures that certain chemicals which are highly resistant to degradation in the environment are properly disposed of.

(II) ECONOMIC INSTRUMENTS

While economic instruments have not, to date, been widely used for environmental purposes, there has been increasing support for their use over recent years. In part, this has been the result of broader policy initiatives based on international and national commitments, as well as an increasing realisation that economic instruments offer scope to achieve environmental objectives in more cost-effective ways than traditional regulatory mechanisms.

For example, many water utilities have increased the price of water, as a demand control mechanism, rather than implementing water restrictions. Many local governments have introduced landfill fees as a disincentive to indiscriminate dumping. At the State level, some governments have introduced pollution licensing fees that are set according to the quantity and quality of the pollutant discharged. Several States are trialing emission trading schemes, which give industry the incentive to cut their pollutant loads. Queensland and New South Wales require mining companies to take out environmental performance bonds that are forfeited if minesite rehabilitation is not adequately undertaken.

Further examples of the application of economic instruments can be found in Chapter 4.

(III) REGULATION

Australian experience has shown that government environmental regulation can act as both a strong motivator and a strong barrier to the adoption of cleaner production. Regulation can be a powerful driver of improved environmental performance from industry. Two Commonwealth Acts (*Hazardous Waste (Regulation of Exports and Imports) Act 1989* and the *Environment Protection (Sea Dumping) Act 1982)* have proven to be particularly effective in banning particular types of waste and waste disposal methods. This in turn has caused industry to modify its use of particular chemicals and processes. Yet paradoxically, the very regulation which leads to an *initial* improvement (which may often be achieved through end-of-pipe solutions) may inadvertently act as a barrier to *continuing* improvement.

For example, in the past, regulations which set minimum standards have driven industry to meet those standards, yet provided no incentive for further improvement beyond the regulatory requirement. Any such further improvement has often been seen by industry as unnecessary, resulting in an attitude of strictly minimal compliance.

Over recent years, there have been significant changes in State regulatory frameworks that address this problem. For example, several States have moved to load-based licensing for emissions to air, sewer or waters, and are introducing graded licensing systems that provide financial and reporting incentives for companies able to demonstrate good environmental management. Such schemes are based on recognition that environmental improvement is an incremental process, and that companies should be rewarded if they choose to take their environmental improvements a step further.

Cleaner production is also being encouraged through more stringent development conditions. Regulators require environment impact statements and other forms of assessment to be carried out *before* industrial development. This type of up-front planning provides industry with both the incentive and opportunity to incorporate clean technology and processes as an integral part of the production process.

(IV) STANDARDS

The introduction of ISO 14001 international standard for environmental management systems (EMS) has created a focus on environment performance and management in the business community. Applied appropriately, with a policy of improving performance, ISO 14001 is a valuable tool for providing the discipline and methodology for environmental improvements. Australia has been involved in the drafting process of ISO14001, and its associated guidance document ISO14004, as well as other standards in the series. Australia and New Zealand have established a Joint Accreditation System (JAS-ANZ) to accredit auditors that assess conformance with the ISO standard.

Increasing numbers of Australian firms have had their EMS certified to ISO14001. It is expected that this trend will increase steadily as larger firms become aware of the competitive advantages of a certified EMS. However, small to medium enterprises (SMEs) remain uncertain of the costs and benefits of implementing EMS, with or without the voluntary ISO 14001 standard.

4. *TOWARDS SUSTAINABILITY — ACHIEVING CLEANER PRODUCTION IN AUSTRALIA:* MEASURES FOR IMPLEMENTING CLEANER PRODUCTION

This chapter lists the many mechanisms available to increase the adoption of cleaner production. The mechanisms are divided into four broad themes:

- Information and Awareness
- Tools for Cleaner Production
- Regulation and Self-Regulation
- Strengthening the Market

A. INFORMATION AND AWARENESS

Aim:

To increase the uptake of cleaner production by developing and providing comprehensive and targeted cleaner production information to industry, community, and government.

A crucial barrier to cleaner production is the lack of awareness amongst industry, particularly small enterprise, about what the term 'cleaner production' means in practice, and the significant environmental and financial benefits it provides. Industry is often unsure where to seek technical assistance or information on cleaner production, and is naturally reluctant to invest in a concept of which they have limited knowledge. Education and training are the initial step towards overcoming this barrier.

Cleaner production can be encouraged through the provision of information, and raising the awareness of both industry and the community. All levels of government and several industry associations have experimented with such methods to encourage industry to adopt cleaner production. These methods and ways of improving them are discussed below.

(I) THE NEED FOR CLEANER PRODUCTION INFORMATION

Objective:

1. To ensure that all sectors of industry and the community have access to the cleaner production information they need.

It is vital to consider the target audience when deciding the content and means of disseminating information. The multi-disciplinary nature of cleaner production means that information must be tailored and targeted to ensure the most effective adoption of cleaner production. Currently, cleaner production is promoted by a variety of methods to reach a wide audience.

SMEs

SMEs in particular suffer from a lack of resources and expertise to devote to investigating best environmental practice in their industry. Often, SMEs have difficulty understanding the concepts and terminology associated with cleaner production. Managing large volumes of information on environmental policies and business strategies is a major problem even for large corporations, meaning that SMEs are likely to suffer from "information overload." To overcome this they need clear and simple independent guidance. Information targeted for SMEs is generally

provided through *EnviroNET Australia*, pamphlets, industry sector specific manuals, workshops, case studies, instructional videos and the work of dedicated training officers.

Large business

Many large firms already have environmental policies in place, and thus, have moved beyond the need for simple awareness of cleaner production. Large firms require more advanced information on broader issues, such as the development of international environmental standards like the ISO14000[16] series and the advantages they can offer. Information for big business is generally provided through conferences, manuals, case studies, newsletters, *EnviroNET Australia* and videos.

Tertiary institutions and industry training bodies

Tertiary institutions also require more advanced information, and materials that are suitable for training. Videos are in high demand by these organisations as a teaching tool. These organisations commonly utilise manuals, case studies, videos, brochures and *EnviroNET Australia* as teaching materials.

Community

The community has an important role to play in influencing companies and government agencies to consider environmental alternatives to current practices. Community awareness is generally gained through media promotions, *EnviroNET Australia*, good neighbour agreements with local industry, and general information on the benefits of cleaner production.

Professionals

A lack of communication and understanding in firms, for example, between engineers and accountants, can be a significant barrier to implementing cleaner production. Further, if management is not fully aware of the potential benefits of cleaner production, it is unlikely to be enthusiastic about its implementation. Professionals should be made aware of the potential of cleaner production to ensure that initiatives are not put aside simply because of a lack of knowledge, and thus, commitment. The Commonwealth, State and Territories have addressed this issue through providing general and industry sector specific manuals, *EnviroNET Australia*, case studies, conferences, and workshops. Furthermore, professional associations, such as the Environment Institute of Australia, can use their networks to improve communications between professionals.

Measures:
1a. Governments work in partnership with industry and professional associations to provide targeted cleaner production information and awareness packages.
1b. Government, industry and professional associations provide positive examples of cleaner production to the media, including regional media and industry newsletters, to raise general awareness in industry and the community.

EnviroNET Australia

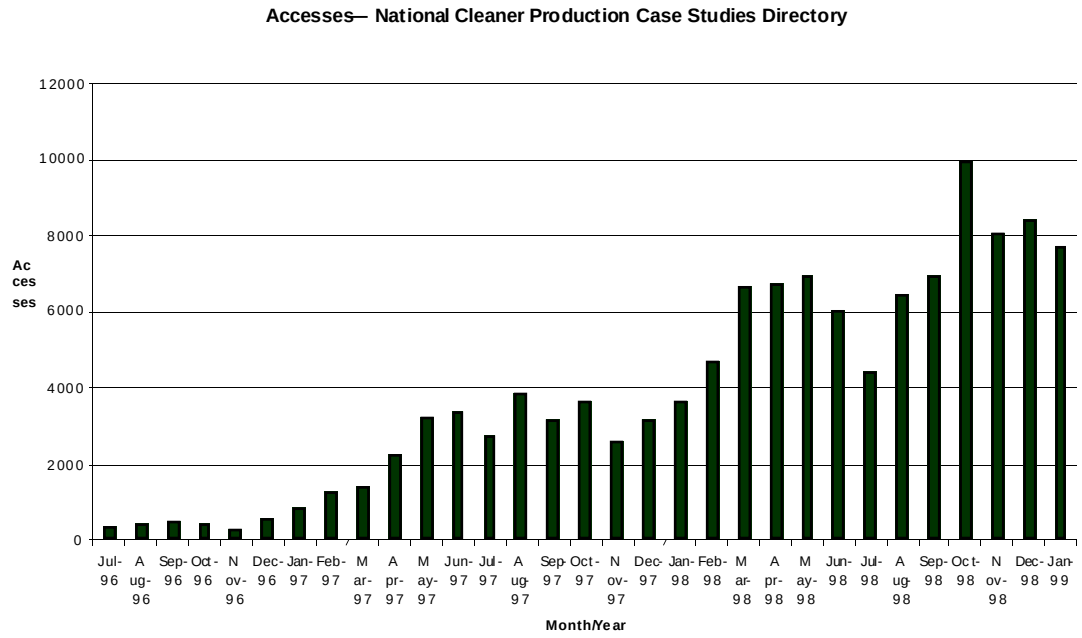
EnviroNET Australia is a network of databases, available on the Internet, which provide free environmental information. The network addresses the environment protection needs of the community at different levels: education; research and development; environmental technologies; integrated cleaner production solutions; and industry expertise. Through these databases and directories, people with environmental problems in Australia or overseas can find Australian solutions.

The Cleaner Production Case Studies Directory[17] on *EnviroNET Australia* assists small and large business to maintain a competitive edge by drawing on case study information about cleaner production methods. Case studies from over 100 companies highlight production processes that minimise harmful environmental

impacts. These case studies also detail the financial savings made as a result of implementing such processes.

EnviroNET Australia provides SMEs with cheap and immediate access to a technological database that would otherwise be inaccessible. The database information ranges from being an initial tool to discover cleaner production, to providing technical information on specific techniques. It also provides information on environmental education and training courses. The Environment Industries Expertise Database lists the Australian environmental expertise of over 1000 private and public sector organisations.

Environment Australia (EA) maintains and updates the network. EA has found it a cost effective and efficient means of conveying information. It is "self serve", so interested clients can directly access the information they require without contacting EA. *EnviroNET Australia* is also environmentally sound and efficient as there is no requirement for printing, postage or handling. The database also has the advantage of allowing immediate feedback from clients.



SUPPLY AND PURCHASING RELATIONSHIPS

One of the barriers to implementing cleaner production arises, in part, from its holistic nature. Businesses, whether large or small, often do not have knowledge of, or expertise in, activities that are outside their company's core activities. Cleaner production can demand expertise in areas that are outside a company's knowledge base. It is difficult for firms, particularly SMEs, to be aware of product innovations and the product alternatives available in specialised areas. Firms can encourage and influence each other to implement cleaner production, through their supply and purchasing relationships. This allows businesses to concentrate on their core business, while ensuring that the products they use are environmentally benign.

Purchasing Policies

Environmental awareness in one firm can have a domino effect: when one firm becomes concerned with its environmental impacts, it can encourage other companies to follow suit. The purchasing power of a larger company can allow it to influence its suppliers to provide environmentally sound products. For example, the Hotel

Inter Continental Sydney has a purchasing policy as a central element of its environmental programs. Suppliers are requested to reduce excess packaging, use biodegradable or recyclable products, and to provide environmentally preferred products wherever possible. Suppliers are also asked to respond to a supply questionnaire relating to their products and commitment to environmental responsibility.

Thus, business interactions between firms can promote environmental awareness, and spread the benefits of cleaner production. The use of purchasing policies is a market driven measure that promotes cleaner production down a chain of suppliers.

Measure:
1c. Governments and industry develop and implement purchasing policies that promote cleaner production.

Resource Substitution

It can also be difficult for business to remain current on what environmental alternatives are available for the raw materials and chemicals they use. Firms usually depend on the supplier for such detailed information and expertise. For example, some chemical suppliers provide their customers with free training on the effective use of chemicals. However, this training is not reviewed, and also, it is not generally in the interests of the chemical supplier to reduce a company's usage of chemicals. The chemical supplier may also have a financial incentive to promote a particular product range. Industry associations are in a position to be aware of the chemicals commonly used in their sector, and could thus encourage and review supplier-training programs, or provide training to their members.

Measure:
1d. Governments encourage industry associations to provide chemical training for members on the particular chemicals and chemical substitutes used in their industry sector.

When firms wish to modify their use of hazardous chemicals, they first need an information source that identifies what alternative chemicals exist. Currently, Australian firms wishing to substitute chemicals must rely on the United States EPA databases for such information.

Worksafe Australia currently provides Internet access to its database on hazardous chemicals. By combining this data with information on environmentally benign substitutes, a specific cleaner production information need would be met. However, the development of such a database would need to be carefully examined in regard to a number of issues.

Firstly, chemicals which are benign when used in a specific formulation for a specific process may not be benign when transferred to other processes. Determining the substitutability of chemicals would require stringent research to ensure that information provided was correct. The provision of incorrect information on chemicals could conceivably leave the developer of such a database open to liability claims. Secondly, the impacts of chemicals would have to be carefully considered for both environmental and human health aspects. Substitution of a chemical for environmental purposes would be inappropriate without adequate concern for potential health impacts of that chemical.

Substituting Hazardous Chemicals in the USA

The United States EPA through its 'Enviro$ense' Website[18] gives access to a range of databases that allow firms to identify less hazardous chemicals to substitute for hazardous ones. Seven databases can be accessed and are described by the US EPA below:

- Integrated Solvent Substitution Data System (ISSDS) facilitates access to solvent alternative information from multiple data systems through a single, easy to use command structure.
- Solvent Alternatives Guide (SAGE) is a logic tree system that evaluates the user's current operating scenario and then identifies possible surface cleaning alternative solvent chemistries and processes that best suits the defined operating and material requirements.
- Hazardous Solvent Substitution Data System (HSSDS) is an on-line, comprehensive system of information on alternatives to hazardous solvents and related subjects. The HSSDS contains product information, material safety data sheets, and other related information.
- Department of Defence Ozone Depleting Substance (DODODS) MILSPEC Database includes information on each ODS including identity of the ODS, how it is used, whether non-ODS alternatives are specified, potential substitutes for the ODS called out in the documents, and modification/cancellation information.
- Solvent Handbook Database System (SHDS) is a database providing access to environmental and safety information on solvents used in maintenance facilities and paint strippers. SHDS contains empirical data from laboratory testing.
- Solvents Database (SOLV-DB) provides data on solvents.
- Materials Compatibility Database (MATCOMPAT) provides laboratory test data to assist in the implementation of ODC-free alternative solvents that are compatible with materials used in electronic assemblies.

Measure:
1e. The Commonwealth Government investigate the feasibility of developing an Internet database to provide information to firms and consumers on the substitutability of chemicals.

Information Dissemination

To ensure that Australian industry receives the best environmental advice, Australia needs to stay at the forefront of cleaner production techniques and technologies. This will require awareness of the broad range of programs, policy developments and information currently being produced by a wide range of organisations. For example, cleaner production concepts, materials and policies are currently being developed by Commonwealth, State, Territory and Local governments, environment groups, industry associations, academic institutions and international organisations such as OECD, UNEP and APEC.

Full utilisation of such a volume of information requires effective management. There needs to be a central place where this information can be efficiently collected, collated and distributed. This could be done most effectively by establishing a central clearinghouse for cleaner production.

Measure:
1f. The Commonwealth, in consultation with other Governments, industry and environmental organisations, establish a Central Clearinghouse for cleaner production information.

Industry, researchers, and educational bodies also need to be aware of national and international cleaner production developments and how they can apply to Australian situations. The establishment of State-based Centres for Cleaner Production would provide access to this information. These Centres could be based at a regional level to allow business ease of access to information in their region, and to form a network of information sources on best environmental practice and technology in Australia. Regional centres would also be able to undertake research and development of cleaner technologies for particular environmental issues as well

as providing specific cleaner production advice and services required by industry in their region. The Centres could be regional nodes based around universities and integrated with TAFEs.

Measure:
1g. State and Territory governments, tertiary institutions and industry establish regional Centres for Cleaner Production with linkages to the Central Clearinghouse.

(II) THE DEMONSTRATION EFFECT

Objective:
2. To demonstrate, using clear and relevant examples, that cleaner production results in measurable, environmental, social and economic benefits, within all industry sectors and sizes, and that cleaner production techniques are transferable between industry sectors.

A significant barrier to the adoption of cleaner production is that industry either doubts, or is unaware of, cleaner production's economic and environmental benefits. This can be overcome by demonstrating that cleaner production works.

DEMONSTRATION PROJECTS

Cleaner production demonstration projects conducted by the Commonwealth, Victorian and South Australian Governments have proved that cleaner production has significant benefits for individual firms and the community. These projects have also provided industry with practical information and case studies on how to implement cleaner production. All of the programs required companies to share details of practices introduced, difficulties encountered and a cost-benefit analysis of the project. This information has been distributed in the form of case studies, facts sheets, videos, brochures, manuals, seminars, workshops, and through *EnviroNET Australia*.[19]

In particular, case studies, which provide specific examples of cleaner production initiatives and cost-benefit assessments, have been effective in encouraging other companies to consider cleaner production. It has been found that companies are most responsive to case studies which directly relate to their specific industry sector. Understandably, companies are reluctant to experiment with new techniques which are untested in their own sector. However, many cleaner production techniques are transferable, and thus, case studies drawn from demonstration projects in one sector can be useful for industry in another sector.

Some difficulties have been encountered with implementing and administering demonstration projects. Firstly, they require sufficient time to research and develop cleaner production techniques and then implement and monitor those techniques. The interest and commitment of participating companies must be maintained over that time, as well as project funding levels. Demonstration projects can therefore be expensive to administer.

Consistent commitment is also required from firms, at managerial, financial and technical levels, to ensure that cleaner production initiatives are supported, funded and implemented. However, firms are sometimes cautious about committing resources to an 'environmental' project. It is highly beneficial to have a person within the firm who has a strong commitment and can play a leadership role to ensure that the cleaner production goals are achieved.

Measures:
2a. Governments, industry and the community support the establishment of sectoral cleaner production demonstration projects as a means of conveying the benefits of cleaner production.
2b. The Commonwealth Government maintain, expand and promote the

EnviroNET Australia *Cleaner Production Case Studies Directory as a free source of cleaner production information.*

Companies can be reluctant to allow information about their production processes or cleaner production innovations to be made available for their competitors. Some firms are also wary of 'outsiders' examining their environment management practises. This can be particularly sensitive if a government environment authority or department administers the demonstration project.

Companies such as BHP, Shell, ICI and Boral have developed their own cleaner production programs in-house. This has environmental benefits, as well as financial benefits to the company involved. However, details of the processes used, practices implemented, and financial benefits realised from such projects are generally seen as part of the firm's competitive advantage, and thus, are not broadcast to other firms. In contrast, government funded programs provide a means of sharing such information with smaller businesses, thus spreading the benefit of the initial cost of the project over a wider range of stakeholders.

Measure:
2c. Governments and industry encourage the sharing of environmental innovations as a service to the community and as positive promotion for their industry sector.

BEST PRACTICE MANUALS

A valuable outcome of many demonstration programs has been technical and best practice manuals. These can be sector-specific or general manuals on how cleaner production can be implemented. They utilise the practical experience of demonstration projects to describe how cleaner production can be implemented, and how to overcome likely barriers to its implementation. As these manuals are based on practical experience they are more likely to be relevant and respected by industry.

Such manuals can be particularly useful to SMEs, who may not have the resources available to research and refine cleaner production techniques on their own. Best practice manuals provide examples, which SMEs can examine and evaluate, thus learning from the experience of others, how to implement new approaches.

Measure:
2d. Government and industry associations work together to develop sector based workshops and best practice manuals.

(III) PUBLIC AWARENESS PROGRAMS

Objective:
3. To assist the community to better understand the environmental impacts of industrial activity, and ways to reduce it.

It is important that the general public understands the environmental benefits of cleaner production: an informed community is aware of environmental issues in their region, and can thus encourage their local industry to adopt more environmentally sound practices. Well-informed and active public participation can be a powerful catalyst for the adoption of cleaner production methods.

- *THE NATIONAL POLLUTANT INVENTORY*

As environmental awareness increases, the community is demanding more information about pollution in their local environment. The public sees transparency of industry and government practices as a prerequisite for the right to undertake activities that have an impact on the local community. To address the public need for open access to information, the National Pollutant Inventory (NPI) has been developed by the Commonwealth, States and Territories.

The NPI provides information to the community on specific point source emissions to air, land, and water; promotes waste minimisation and cleaner production; and assist in planning and priority setting by governments. The NPI will offer industry a means of setting environmental priorities and documenting progress by identifying opportunities for pollution prevention. Such pollution prevention will offer substantial benefits to the local community and environment, and will also offer cost savings to the companies involved, as emissions are not just sources of pollution, but also sources of lost revenue.

Community and Industry Working Together

The community can be a powerful motivator for firms to improve their environmental performance, and thus, enhance their public image. There is a need to inform the community so they understand environmental issues in their region and are able to directly engage industry in a partnership role to discuss these issues.

Industry needs to be aware of community concern for environmental issues and possess an awareness themselves of environmental issues. As firms become more aware they realise the competitive advantages of becoming good corporate citizens. Many large companies are already aware of the benefits of being seen as environmentally aware and have the resources to promote themselves as 'green' companies. SMEs however do not have the resources to promote themselves on such a scale, nor often the need.

Good Neighbour Agreement - Huntsman Chemical Company

Huntsman Chemical Company Australia Pty Ltd manufactures styrene at its West Footscray site. The production process results in emissions of organic vapour, including benzene. The Community Liaison Committee (CLC) identified these emissions as a concern and their control was included as a high priority item in the site Environmental Improvement Plan endorsed by the CLC. Huntsman installed a Vapour Emission Control System at a cost of $1.5M to meet a CLC commitment to its neighbours to reduce emissions of organic chemicals to the air. Huntsman estimates that the project recovers 70 tonnes of benzene that is recycled back into production. It has resulted in a reduction of over 50% of organic chemical emissions to the air for the site and a 95% reduction in benzene emissions.[20]

Huntsman HS&E policy states that:

"we will operate safe, clean, efficient facilities in an environmentally and socially responsible manner to the mutual benefit of our employees and the community."

Good neighbour agreements can provide firms with a strong incentive to engage in cleaner production activities.

Measures:
3a. Local governments organise local community/industry liaison committees to discuss cleaner production opportunities in their region.
3b. Industry incorporate local and general community views in their environmental policies.

Green Consumers

There is considerable untapped potential for green consumers to influence industry to provide environmentally sound products. A recent study undertaken by the NSW EPA showed that 88% of respondents had a 'great deal, or 'a fair amount' of concern for the environment. 78% claim to deliberately choose products that are less environmentally damaging.[21]

Green Consumers, Green Energy

In NSW, around 95% of electricity is generated by coal-fired power stations which release millions of tonnes of greenhouse gases each year. NSW conducted research that showed

that many electricity consumers were interested in environmentally benign power generated by renewable energy sources such as solar, wind, biomass systems and hydropower (where new flooding of ecosystems was not required).

In response to the demand by consumers for green energy (currently over 21,000 consumers have signed up), all NSW power retailers now offer an environmentally sustainable alternative in their franchise area. It costs consumers more to have green energy, but some consumers are willing to pay a price premium to protect the environment. [22]

The demand for green power demonstrates that not only is the community aware of the environmental implications of coal-fire generated electricity, but they are also committed to improving the environment. The community's willingness to pay for a more environmentally sound alternative is a strong message for industry and government.

(IV) AWARD SCHEMES

Objective:
4. To recognise, reward and promote firms that have achieved superior environmental performance through the application of cleaner production.

Award schemes can provide firms with positive publicity for environmental action, and can also promote the benefits of cleaner production. Recipients of cleaner production awards, in promoting themselves, also promote cleaner production. The Victorian Government holds annual awards for best practice in cleaner production. This assists in the promotion of cleaner production, and recognises firms that have implemented best available technology and practice.

Some industry associations also sponsor annual environmental awards for their members. The Plastics and Chemical Industries Association (PACIA) has sponsored an environmental award since 1991. This award recognises the firm that has made the most significant contribution to improving the environmental performance of the chemical industry. The award serves as a demonstration of the commitment of the sector towards reducing environmental impacts. Presentation of the award at the annual industry convention provides encouragement and an example of best practice to all sector members.

A sector specific approach to awards is desirable, as opportunities for cleaner production, and the means by which it is implemented, vary from sector to sector. There is an opportunity for State and Territory governments to work with industry associations to recognise sector-specific best practice. This would eliminate duplication and motivate companies to achieve a Statewide award for cleaner production in their industry sector. Industry associations could promote the awards within their sector, and assist State governments in their administration and judging.

Such an approach to award schemes might also address a potential pitfall — the tendency of awards to become debased through overuse. An excess of environmental awards can result in less prestige for winning firms, and a dilution of the awards' impact. A coordinated approach between governments and industry could avoid this problem by ensuring that awards are not indiscriminately presented.

Measure:
4a. State, Territory and Local governments, industry associations and environment groups jointly develop award schemes for cleaner production.

High profile national and international awards can carry significant prestige for companies. They also provide government with an opportunity to promote the national benefits of cleaner production and best practice to industry and the

community. For example, the European Commission administers the prestigious and highly coveted European Better Environment Awards for industry.

Awards go beyond simply recognising an individual firm's efforts. National awards are an effective means to:

- provide encouragement to industry;
- provide case studies and working examples;
- demonstrate to industry that cleaner production initiatives work
- generate interest and awareness among industry and the community; and
- obtain significant media coverage to promote cleaner production.

The considerable potential of a National Award Scheme to promote cleaner production, and firms practising it, suggests a significant role for the Commonwealth to initiate a single, high profile national award for cleaner production best practice in Australia.

Measure:
4b. The Commonwealth sponsor an annual cleaner production award.

B. TOOLS FOR CLEANER PRODUCTION

Aim:
To improve and develop management and analysis tools and systems for cleaner production, and promote their use by industry, government and the community.

(I) ENVIRONMENT MANAGEMENT SYSTEMS (EMS) AND STANDARDS

Objectives:
5. To encourage industry and government and other organisations to examine and monitor their environmental performance and set targets for improvement, through the broad adoption and implementation of EMS.

An Environment Management System is a tool for managing the impacts of an organisation's activities on the environment. It provides a structured approach to planning and implementing environment protection measures. It can be the first step for organisations to take towards environmental improvement, as EMS enable organisations to benchmark their environmental performance, and then regularly evaluate their performance and improvement. To develop an EMS, an organisation has to assess its environmental impacts, set targets to reduce these impacts, and plan how to achieve the targets.

The benefits of an EMS which are similar to those of cleaner production are:

- minimising environmental risk liabilities;
- maximising the efficient use of resources;
- reducing waste;
- demonstrating a good corporate image;
- building awareness of environmental concern among employees;
- gaining a better understanding of the environmental impacts of business activities; and
- increasing profit, while improving environmental performance, through more efficient operations.

An EMS is *not* prescriptive, that is, it does not specify how environmental targets should be met. Rather, it requires organisations to take an active role in examining their practices, and then determining how their impacts should best be managed. This approach encourages creative and relevant solutions from the organisation itself.

As with cleaner production, an EMS can be a powerful tool for organisations to both improve their environmental performance, and enhance their business efficiency. The implementation of an EMS provides an ideal opportunity for organisations to implement cleaner production, as cleaner production provides a means by which organisations can improve both their environmental and economic performance. Thus, it is in the attainment of EMS targets that cleaner production is most often considered. The Queensland Chamber of Commerce and Industry considers EMS to be an important factor in the future of Australian industry:

> *'An increasing number of businesses no longer see 'the environment' as just a 'problem', with a list of costs attached; but, rather, as a catalyst which will accelerate the adoption of improved management techniques in their activities and thus operating efficiencies and a marketing edge through the adoption of 'green marketing' techniques. At the same time, they will generate environmental benefits. They are adopting the concept of "environmental management", a concept which will increasingly influence business thinking in Australia, as it is doing internationally.*[23] '

Although the implementation of an EMS is essentially a voluntary initiative, it can also become an effective tool for governments to protect the environment as it can assist regulation. For example, regulatory systems can encourage organisations to use EMS to meet standards, by providing incentives for strong environmental performance. Likewise, organisations can use EMS to ensure that their performance is within regulatory requirements, and to keep ahead of more stringent regulations which might be introduced in the future.

Measures:
5a. Governments adopt and promote EMS as a tool for managing their own environmental impacts.
5b. Industry associations develop model EMS to assist their members to adopt EMS.
5c. States and Territories consider the innovative role EMS can play in assisting regulation.

INTERNATIONAL ENVIRONMENTAL STANDARDS

Objective:
6. To ensure that Australia plays a role in the development of international environment standards that may impact on Australian industry.

Some organisations may wish to gain internationally recognised certification of their EMS. This can have competitive advantages, particularly for companies involved in international trade. The International Organisation for Standardisation (ISO) provides businesses with practical, strategic models for managing the environmental aspects of their operations.

The ISO is establishing international standards for environmental management with its ISO 14000 series of standards. These are voluntary standards, which provide both a model for streamlining environmental management and guidelines to ensure environmental issues are considered within core decision making processes. ISO 14001 (*Specification for an Environmental Management System*) is the first standard in the series.

ACTEW Corporation

ACTEW Corporation is Canberra's largest public corporation. Its core business is to supply energy and water services to the city and to manage its wastewater. ACTEW believed that their environmental improvement goals could be greatly assisted by developing an EMS.

In 1995 ACTEW commenced the task of covering their diverse activities under a corporate EMS. In 1996, the Corporation took the additional step of establishing specific EMS for operational areas of the organisation.

According to ACTEW's environmental strategist, an EMS is:

...an integral part of managing a company, it is a part of everyday business and management costs. Failure to have an EMS, means a failure to properly consider all the operational aspects of a business, particularly environmental issues and the long term consequences of inadequate duty of care.

ACTEW's philosophy towards EMS has simply been that it is a normal and everyday part of company operations — it is not an optional 'bolt-on'.

And, in the words of ACTEW's deputy CEO, Paul Perkins "*an EMS offers a management system which gives a systematic and integrated approach to improvement and environmental excellence in performance.*" [24]

The implementation of an ISO 14001 based EMS should not be made with unrealistic expectations about immediately observable benefits for the environment or the bottom line. The standard does not contain any specific environmental outcome

requirements. It is also likely that there will be wide ranging interpretations of environmental objectives and targets by different companies and countries. As such, adoption of ISO 14001 cannot, by itself, be expected to lead to environmental improvement.

However, the process of implementing an EMS based on ISO 14001, will encourage organisations to examine their environmental management, and consider means of improving their performance. As demonstrated by cleaner production, this process of evaluation often identifies not only the environmental, but also financial benefits of improved environmental performance. These potential financial benefits provide an incentive for firms to actually implement environmental improvements.

Cleaner production concepts harmonise with the goals of ISO 14001 as they require a shift from focussing on end-of-pipe solutions to one in which all phases of processing, service provision, and product life cycles are investigated.

BENEFITS OF INTERNATIONAL CERTIFICATION

The benefits of having ISO 14001 certification are mainly realised by large organisations, as SMEs have a smaller turnover and thus a correspondingly small return on the costs of certification.

Although a fully certified ISO EMS may not be suitable for smaller organisations, it does provide guidelines that assist organisations to consider all the relevant issues, and thus gain the most benefit from their EMS, even without certification. SMEs can therefore use ISO 14001 as a model for designing their own EMS.

However, larger organisations may find certification more valuable when considering the potential trade and market advantages of an internationally recognised and certified EMS. This was a significant factor for companies seeking certification under the ISO 9000 quality assurance standards, and is likely to be a factor in decisions regarding ISO 14001 certification. ISO 14001 certification has the benefits of:

- being a clear demonstration to clients and financial institutions of responsible environmental management;
- improving an organisations public image; and
- enabling organisations to assess and manage their environmental impacts effectively.

Measure:
6a. The Commonwealth monitor, and where necessary, engage in international discussions on the development of further standards in the ISO 14000 Environment Management series.

(II) ENVIRONMENTAL ACCOUNTING

Objective:
7. To develop effective management accounting systems which incorporate environmental costs into traditional business financial calculations.

A major barrier to the adoption of cleaner production is that firms often do not know the environmental costs of operating their business and therefore do not know the financial benefits that can arise by reducing their environmental impacts. Environmental costs have generally been defined narrowly — "Environment costs are those costs incurred in compliance with, or prevention of breach of, environmental laws, regulations and company policy."[25]

However, the true environmental costs to a firm can be far broader, including: costs of resources, both those directly related to production and those involved in general

business operations; waste treatment and disposal costs; the cost of poor environmental reputation; and the cost of paying an environmental risk premium.[26] Often, the costs of common natural resources such as air, water and energy are subsumed into a one line 'operating cost' or 'administrative cost' that is regarded by management as independent of production.

Firms have tended not to measure environmental costs because management accounting systems have focussed on clearly identifiable costs to the firm and not on the costs and benefits of alternative actions. An important lesson gained from the Commonwealth, Victorian and South Australian Cleaner Production Demonstration schemes was that significant savings would accrue to companies that adopted cleaner production. The ten companies involved in the Commonwealth programs collectively saved over $2.3m in a single year, simply by examining alternatives and implementing cleaner production.

It is apparent that current accounting frameworks do not provide the necessary information to managers:

> *[the] challenge of environmental accounting is to extend practices to include new accounting procedures for costing out...pollution control methods; comparing alternative materials to be used...and investigating possible recycling alternatives.*[27]

If current accounting systems do not consider these issues, then it is hardly surprising that managers are not aware of the potential of cleaner production to increase the profits of the firm.

Accounting professionals need to be trained in environmental accounting methods, and have appropriate guidelines to follow. The Australian Society of CPAs (ASCPA) has established a discussion group to identify the issues related to changing accounting standards in Australia to take into account environmental costs.

The range of benefits for a company that adopts environmental accounting is extensive. Wilmhurst[28] identifies seven benefits from adopting environmental accounting:

1) Provides better estimates of the true cost to the firm of producing a product. This improves pricing and hence profitability;
2) Allocates costs to the appropriate product, process, system or facility and thus reveals costs to the responsible managers;
3) Assists managers in targeting cost reduction, improving environmental quality and in reinforcing quality principles;
4) Motivates staff to search for creative ways to reduce environmental costs;
5) Encourages changes in processes to reduce waste, reduce resource use, recycle waste or identify markets for waste;
6) Increases employee awareness of occupational health and safety issues; and
7) Increases the likelihood of the company having a competitive advantage and greater customer acceptance of the firm's product or service.

From this list it can be seen that changing accounting systems to incorporate environmental costs may lead to increased adoption of cleaner production.

Any internal changes to accounting systems, to better incorporate environmental costs, must be done in conjunction with those staff who manage the shop-floor. It is those people who are in control of resource use and hence, they must become part of the management accounting loop to ensure full and effective adoption of cleaner production. This involvement may require additional staff training.

Measures:
7a. Governments, in consultation with industry, work with the ASCPA to develop draft accounting standards which identify environmental costs.
7b. Industry associations promote the use of environmental accounting to their members, and offer advice on its implementation and application.

In a study to determine the extent to which Chief Executive Officers and Chief Financial Officers used environmental accounting, Wilmhurst and Frost[29] surveyed the top 500 Australian companies. Despite a high number of respondents indicating that environment issues were important to their firm and were taken into account in decision-making, in reality, "few companies were actually incorporating environmental issues in a formal way that would allow clear identification and measurement of environmental performance."[30]

The survey did not identify why companies failed to incorporate environmental accounting formally, but it might be suggested that a lack of developed accounting standards and a lack of the awareness of the benefits of environmental accounting were among the reasons.

Measure:
7c. Government industry assistance programs, aimed at improving business efficiency, incorporate training for business on environmental accounting.

(III) Public Environmental Reporting

Objectives:
8. To encourage organisations to examine and monitor their environmental performance and set targets for improvement, and to provide the community with a thorough and accurate account of their environmental performance and goals.

Public environmental reporting is a process by which organisations, including governments, can examine their environmental performance and disseminate that information to a wide audience. It is a relatively new approach, yet its uptake, particularly by large public corporations, has been strong. For example, the *First European Environmental Reporting Award Scheme (1996/97)* cites international surveys that found that in 1993, 37% of companies surveyed mentioned environmental issues in their annual reports to shareholders, and 13% produced independent environmental reports. These figures increased in 1996 to 69% and 23% respectively.[31]

Public environmental reporting requires an organisation to examine its environmental performance over a specified reporting period. Results are published, either as a stand-alone document or as part of other publications, such as an annual report. In earlier stages of public environmental reporting, the 'green glossy' was used by organisations to present themselves in a positive environmental light. This usually did not provide any comprehensive analysis of the environmental impacts of their activities. However, the growth in public environmental reporting means that a body of good reports now exist which highlight the shortcomings of misleading documents. The inclusion of an independent verification can help to establish the credibility of a report.

Public environmental reporting can be a strong tool for the adoption of cleaner production. The evaluation of environmental performance, which should be included as an intrinsic part of a report, can highlight inefficiencies in the production process, leading to improved management systems. The information collected to create a report can determine areas where environmental improvements will produce savings. In addition, the publication of reports can lead to increased consumer confidence.

The use of reports to present data about environmental performance, and set targets for improvement, can provide firms with a means of regularly assessing their progress and evaluating their environmental strategies. This form of continual revision and improvement ultimately requires the adoption of cleaner production practices to maintain the process.

Environmental Reporting in Australia - Western Mining Corporation

Western Mining Corporation's (WMC) Public Environment Progress Report 1997 provides information about WMC and its activities, and explains its view of, and commitment to, sustainable development, as well as providing information about:

- Management Systems —the continuing development of an EMS consistent with ISO 14001, the review of accounting systems, and environmental site audits;
- Targets — reporting on resource use and emissions;
- Compliance issues — including breaches and levels of improvement from the previous year; and
- Initiatives — such as increased community consultation and the introduction of an environmental achievement award.

However, the adoption of cleaner production will only occur if an organisation *actually uses* the reporting mechanism as a means of devising and carrying out improvements in production processes and management systems. ACCA points out that improved public environmental reporting does not necessarily equate to improved environmental performance:

> *"...there are many examples of companies which exercise great care in their environmental reporting, yet which nevertheless, year on year, increase the absolute quantity of their emissions."* [32]

Public environmental reporting only has value if successive reports are used to benchmark an organisation's environmental progress. Ultimately, this has to be driven by an internal, voluntary decision.

One temporary barrier to the use of reporting is its relative newness as an environmental tool. As UNEP puts it, reporting is still 'very much at the experimental stage.[33] A variety of reporting guidelines have been developed.

However, large-scale adoption of public environmental reporting in the future, particularly by smaller firms, may well depend upon a standard set of guidelines being developed. Such guidelines must be developed in consultation with industry associations to ensure that the data being collected is both realistic and appropriate.

The involvement of industry associations in this way will also combat one other major problem which has been identified with public environmental reporting — the lack of participation from smaller enterprises. Smaller enterprises lack the resources to publish large reports or undertake the detailed investigations necessary to produce such reports. However, there are potential benefits of reporting for smaller firms.

The use of public environmental reporting can assist smaller businesses to monitor their environmental performance, thus making it easier to comply with and report against regulatory requirements. Data gathered, just as with larger enterprises, can also assist in identifying improvements which will result in increased efficiency. The reporting process for smaller business could be made less resource intensive through the assistance of industry associations. Industry associations could also encourage such reporting through sector specific reporting awards. The inclusion of specific small business awards in larger public environmental reporting award schemes should also be encouraged.

Measures:
8a. To encourage firms to examine and monitor their environmental impacts, Governments work with appropriate non-government organisations (NGOs), such as accounting associations, industry associations and environment groups, to develop award schemes for public environmental reporting.
8b Government agencies produce public environmental reports relating to their activities.
8c. ANZECC consider developing ANZECC Guidelines for Public Environmental Reporting.

One concern that is raised regarding public environmental reporting is that this release of information may lead to penalties for industry. For example, a report which disclosed information about breaches of discharge limits might lead to prosecution by relevant government licensing authorities. This concern can be a strong barrier to industry to undertake reporting. It could be addressed through relevant legislation which, where appropriate, exempted industry from prosecution following the voluntary disclosure of breaches in environmental reports. This would be dependent upon the report also containing adequate measures to address the problem in the future.

For example, under certain circumstances the Queensland *Environmental Protection Act 1994* provides that information arising from environmental audits cannot be used to incriminate a firm if the audit is being undertaken voluntarily.[34]

Auditing to avoid prosecution — the Queensland approach

The Queensland *Environmental Protection Act 1994* requires people and organisations to notify the regulator immediately that they become aware environmental damage is threatened or caused by their activities. The Act states that such information cannot be used to incriminate the informer. Indeed, to encourage auditing, the Act specifically protects voluntary environmental audits from being used against the firm. Under certain circumstances, the firm can be protected from prosecution for an environmental breach found by an assessment, if the firm produces an Environment Management Program (EMP) showing how and when the damage will be remedied.[35]

Measure:
8d. State and Territory governments examine their relevant environmental legislation to ensure that firms are not discouraged from undertaking public environmental reporting through the threat of prosecution.

Firms may also be reluctant to disclose full details of their environmental initiatives as this information may compromise confidentiality or lead to adverse client reactions. UNEP suggests that this reluctance could be addressed through industry sector reporting.[36] Industry associations can relieve pressure on members by producing annual reports of their sector's overall environmental performance, as PACIA currently does through its annual waste surveys. In this way, highly sensitive data can remain anonymous, yet is still reported and thus subject to pressure for improvement both by other members of the industry and by the public. This might also assist individual members to compare their performance against other firms.

Measure:
8e. Governments encourage industry associations to produce annual reports of their sector's overall environmental performance.

Objective:
9. To encourage the financial sector to consider public environmental reports in assessing investment risks.

Public environmental reporting can have a range of benefits both for the organisation reporting, and other groups. There are advantages for the financial sector, as public environmental reports can lead to improved evaluation by investors, lenders and insurers of the environmental risks that might affect their investment in an organisation.[37] This, in turn, may lead to benefits for organisations seeking financial investment or insurance. At the very least, a strong record of public environmental reporting indicates that an organisation is aware of the environmental risks and hazards it may encounter in its operations, and thus, is acting to manage and contain those risks.

Once the financial sector considers the value of public environmental reporting, firms may be brought under pressure to prepare documents that downplay environmental impacts. However, there is some scope for consumers and industry associations to discourage the ineffective use of reports in this way through negative feedback. 'Green glossies' could also be discouraged by a clear message from the financial sector that this lack of environmental improvement is viewed as both a risk factor, and as evidence of poor managerial efficiency. Also, award schemes for reporting should include criteria relating to progress made by the organisation's on the initiatives and targets set out in its previous report.

Measures:
9a. Governments, industry and the financial services sector, including the Australian Stock Exchange, determine how public environmental reporting can be used as a risk assessment resource for financial activities.
9b. Governments encourage the financial services sector to use public environmental reporting as a risk assessment mechanism, and reflect that assessment in their financial activities with industry.

(IV) ENVIRONMENTAL LABELLING

Objective:
10. To assist consumers, both organisations and individuals, to make environmentally responsible product choices, by informing them of the environmental impacts of products and providing a standardised means of comparing products.

There is considerable potential for environmentally aware consumers[38] and governments to influence industry to provide environmentally sound products. The challenge for policy makers is how to tap this potential.

One method used extensively overseas, and trialed in Australia[39] from 1992 to 1994, is the labelling, or 'eco-labelling', of consumer products which have environmental benefits, or at least a lower impact than their alternatives. The Australian scheme, *Environmental Choice Australia*, did not gain wide industry support.

Eco-labels aim to provide information to consumers about the environmental impacts of the product or service carrying the label. This allows consumers to express their environmental preferences through their choice of products.

There are three general kinds of eco-labels:

- Comprehensive labelling schemes attempt to evaluate the total environmental impact of a product or service against a set of comprehensive pre-established criteria. International examples include: *Environmental Choice Canada*, *The Blue Angel* (Germany) and the *Nordic Swan*.
- Specific labelling schemes take one part of a product's life cycle and evaluate it against specific criteria. Well-known Australian schemes include the 'energy stars' and water conservation labels for whitegoods.
- Production labelling schemes have, to date, generally related to food items, for example, the labelling of organically grown produce. These schemes appear to be

well supported by consumers, though this does not always translate into increased market share if a significant price premium is involved.

The OECD recently evaluated the successes of the comprehensive labelling schemes operating in the OECD,[40] and concluded that:

- anecdotal evidence suggests that sales have increased when an eco-label is obtained;
- eco-labelling schemes are more successful in countries which have high environmental awareness (eg Sweden);
- some eco-labels have had startling success, obtaining up to 30 percent of the market share for a particular product category. In such cases, eco-labels become the *de facto* product standard.[41] Care should be taken to ensure that eco-labels do not stifle innovation;
- eco-labels have had an important role when linked with government procurement; and
- manufacturers have considered eco-labels to be a valuable tool for communicating the qualities of their product and the firm's concern for the environment.

Eco-labelling can assist firms to adopt cleaner production by allowing them to choose more environmentally benign products, and ensure that the inputs to their production processes have not been environmentally damaging in their own production. The International Organisation for Standardisation (ISO) is currently developing standards for eco-labelling. This standard, ISO 14023,[42] will attempt to codify an internationally accepted way of labelling products and services. It is important that Australia participates in the development of ISO 14023, as it has the potential to provide considerable environmental benefits by ensuring that consumers are properly informed.

Measure:
10a. The Commonwealth maintain its involvement in the development of ISO 14023, in conjunction with all spheres of government, industry and the community.

It has been suggested that there may be scope for a cleaner production process label to be developed which would help identify products made using cleaner production techniques. Given that cleaner production covers such a range of processes, it may be difficult to identify criteria to make the label meaningful.

National Energy Labelling Rating Scheme for Appliances

Energy labelling for major appliances in Australia was introduced in 1986. A joint Commonwealth and State/Territory government programs, the energy labelling is now recognised as a key initiative to reduce greenhouse gas emissions.

The mandatory energy labelling programs covers refrigerators, freezers, room air-conditioners, dishwashers, clothes washers and clothes dryers. The programs require that these household appliances display an energy star rating label (1 to 6 stars (6 best)). The label allows consumers to make comparisons between appliances of their energy performance and thus purchase more energy efficient appliances. It also provides an incentive for manufacturers to improve the energy performance of appliances. Major manufacturers and importers recognise the commercial value of energy labelling, and are generally very supportive of the programs.

The Australian energy labelling programs is widely regarded as among the most informative and salient in the world. Recent studies have revealed that label recognition and use is very high among recent and prospective appliance purchasers.

MINIMUM ENERGY PERFORMANCE STANDARDS

While energy labelling has been successful in stimulating demand for more energy efficient models, it has been less successful in eliminating the least efficient models from the market. To address this issue governments decided in March 1995 to introduce minimum energy performance standards (MEPS) for refrigerators, freezers and certain electric water heaters (above 80 litres capacity). MEPS works by setting the lowest threshold energy efficiency level at which a product may be put up for sale in Australia. The MEPS levels will take effect in October 1999 for these products. The levels are relatively moderate, and the effect will be to complement the energy labelling programs rather than to transform the market. The MEPS will be expanded to include electric motors, fluorescent lighting ballast and commercial scale packaged air conditioning systems.

The NSW Energy Star Program

The goal of the Sustainable Energy Development Authority's (SEDA) Energy Star Program is to remove the sale of energy inefficient office equipment from NSW by 1998.

The US EPA created Energy Star in 1992. Today, in the US, 95% of monitors, 80% of computers, 50% of faxes, 99% of laser printers and 90% of copiers comply with US EPA Energy Star standards.

SEDA is using the Energy Star specifications because Energy Star is now recognised as the predominant energy efficient labelling program worldwide.

Energy use for office equipment in the NSW commercial sector consumes around 210000 tonnes of black coal and generates around 450 000 tonnes of greenhouse gas each year. This is equivalent to the emissions from 100 000 average Australian cars over a year.

It is estimated that, if current equipment met Energy Star requirements, half of the costs associated with office equipment could be saved. If energy usage, greenhouse emissions and electricity costs from the commercial use of office equipment in NSW could be halved, results would be equivalent to:

- saving around $25 million per annum;
- cutting greenhouse gas emissions by around 227,000t pa of CO_2 equivalent; and
- saving 105,000t of coal for power generation.[43]

ENERGY STAR PROGRAM

The Australian and New Zealand Minerals and Energy Council (ANZMEC) have agreed that Energy Star programs which SEDA has adopted be developed as a national programs. Commonwealth, State and Territories will work together and build on the work already undertaken by SEDA to implement the programs nationally. The programs will initially concentrate on office equipment but could extend to home entertainment equipment such as televisions, videocassette recorders and stereos and other household appliances that operate on standby mode.

Measures:
10b. Governments and industry identify other products that could participate in the Energy Star programs.

(V) LIFE CYCLE ASSESSMENT

Objective:
11. To identify and minimise all the environmental impacts associated with a product, production process or service throughout its lifecycle.

Sometimes referred to as "cradle to grave" assessment, life cycle assessment (LCA) provides a systematic approach to measuring resource consumption and environmental releases (to air, water and soil) associated with products, processes and services.[44] LCA can be a powerful tool for making decisions about alternative products and technologies used for cleaner production.

Regulatory and market trends are requiring companies to be more aware of the environmental impacts of their products, processes and services, and to act to reduce these impacts. Policy makers, manufacturers and the public recognise the need to manage environmental impacts caused throughout a product's life cycle, from raw material acquisition to final disposal.[45] LCA does this, by measuring, and thus comparing, the environmental impacts of products or services relative to each other.

Most LCA measurements are made by summing the "units of energy consumed" in the extraction of raw materials, transport, manufacture, distribution and final disposal of a product or service. Additional summations are made of emissions to air, land or water resulting from the creation and disposal of the product or service.

LCA has a number of drawbacks. It requires specific and well researched information to establish baseline environmental impact data for even basic raw materials, and can thus be extremely resource intensive. Also, the environmental impacts of raw material extraction and production processes may vary from country to country, and even from region to region. For example, the impacts of extracting one tonne of coal in Australia differ from those in the USA, because of different mining and transport techniques and technologies, and a different environment.

Another drawback is that subjective assessments need to be made regarding the relative weightings that emissions should be given. Again, international data is not directly transferable to Australia. For example, sulphur dioxide emissions in Germany may have a greater impact on an already over exploited airshed than would sulphur dioxide emissions in Australia. A database of Australian baseline LCA information would need to be established if government and industry were to implement LCA effectively.

It will not be possible to have a complete LCA of all Australian products and services for some time. However, there remains a strong need for Australian government and industry to progress towards this goal. Using the LCA approach, an organisation can:

- improve its understanding of products and processes;
- establish a comprehensive baseline of data on a system's performance;
- compare environmental impacts and economic costs of alternative products, technologies or practises;
- reduce greenhouse gas emissions;
- identify points within a system's life cycle where the greatest reduction in resource requirements and emissions can be achieved;
- evaluate waste management options to reduce pollution and waste management costs, and guide the development of new products with lower environmental impacts and cost benefits[46]; and
- redesign products to reduce their material intensity.

The ISO is currently developing a standard on LCA. This standard is ISO10041 and meshes with the broader ISO14000 environmental standard.

Measure:
11a. Commonwealth, State and Territory Governments further support the development of LCA in Australia.

(VI) CLEANER PRODUCTION TRAINING

Objective:
12. To ensure cleaner production training is available, relevant and consistent across all sectors and levels of industry, for all levels of staff.

Recent surveys of education providers and industry have shown that there is a significant need for education and training to provide industry with the skills and knowledge it needs to adopt cleaner production. Currently, universities and TAFEs provide environment management courses, as well as a small number of courses being provided by industry associations, private trainers, and local government. Only a small number of tertiary institutions provide specific cleaner production training. There is a need for more specific and tailored courses that address cleaner production practices and principles.

Cleaner production does not fit neatly into any one educational discipline — it is a concept that requires a 'big picture' examination of the interaction between production, consumption and the environment. This may result in a perception that it cannot easily be incorporated into any course structure other than a "cleaner production" course itself. Because most environmental courses are compartmentalised, cleaner production is often excluded from courses: only 17% of environmental management courses contain some cleaner production content. Also, few non-environmental courses contain any cleaner production principles.

However, the broad-ranging nature of cleaner production can actually be an advantage in training, as it is relevant to nearly all areas of study. The development of cleaner production units, designed to be incorporated into larger courses, will allow the spread of cleaner production principles and practises into education and training for business related activities.

Some institutions are already attempting to do this. For example, Monash University has made efforts to develop accounting practises that involve cleaner production principles. The University has formed an association with accounting bodies to pass the principles through the accounting associations, as well as develop specific environmental accounting course modules.

Measure:
12a. Training providers work with industry and professional associations to incorporate cleaner production training into academic, professional and vocational courses.

The Australian National Training Authority (ANTA) recently developed draft environmental protocols to establish and maintain links between environment training needs in the vocational education training sector. The protocols are to be used as a resource by developers of training packages.

TRAINING BUSINESS MANAGERS

Management is the target for most of the non-tertiary cleaner production courses currently available. This makes good sense, as management is one of the most critical groups influencing the uptake and implementation of cleaner production in industry. Implementing cleaner production requires a fundamental shift in management attitudes and practises. In making this shift, it is important for managers to feel that training materials and information are based on practical experience. To this end, joint training projects run by industry and environmental organisations have an important role to play.

For example, the Australian Conservation Foundation (ACF) and 3M have developed the *Forsite* Corporate Environmental Training Program that targets senior business managers. The programs is designed to assist managers to understand the short and long term implications of sustainable development, and to enhance the "in–house" capabilities of firms for exploiting the potential of cleaner production. The program is grounded in business principles, giving strong emphasis to strategy planning and opportunities for cost savings. Particular attention is paid to changing business culture and overcoming organisational constraints.

There is scope for this type of program to be expanded to increase the number of training sessions, the number of participating firms and the number of sponsored positions.

Measure:
12b. Governments encourage industry associations to work with environment groups and other interested organisations to conduct workshops and seminars for business managers.

Reaching Other Staff

While management needs to understand how cleaner production fits into overall directions, philosophies and management systems, it is also important that staff at operational levels be aware of the basic principles and practices involved. It is only when all employees in a firm have a clear grasp of cleaner production and its advantages, that cultural change will start to take place. While management can provide a firm's commitment to cleaner production, it is often the shop-floor staff who have a greater familiarity with processes and materials, and can thus provide important input into how production can be improved. On-the-job training can target shop-floor staff, and is an essential part of ensuring that cleaner production becomes part of a firm's ethos. When all employees are trained and committed to the principles of cleaner production, communication and input between different levels of staff is easier, and thus, cleaner production strategies are more effectively designed, supported and implemented.

Measure:
12c. Training providers cater for the need for on-site, cost effective training of cleaner production.

Industry training needs

The critical factors in the delivery of education and training to industry are the perceived costs and benefits and the time effectiveness of any programs. Industry also requires courses that are tailored to the needs of the individual industry being serviced. These factors become more crucial as the size of the company diminishes. Small firms do not undertake a great deal of training, and have to see demonstrable benefits before they will commit their limited resources.

Small firms may have greater education and training needs than large firms. They require implementation skills, technical knowledge, and may benefit from demonstrations of how other firms in their industry have tackled issues and make progress in cleaner production. Large firms often have many of the skills in–house; their needs are more sophisticated, they have in–house trainers who require "train–the–trainer" programs in cleaner production.

For SMEs, self-help may be the option that best fits their initial needs. Self-help manuals, pamphlets and case studies introduce the cleaner production concept to SMEs, without requiring an investment in formal training. This type of information guides SMEs on how to establish a cleaner production programs and provides encouragement to seek further training and advice.

However, for both small and large firms, the desired delivery mechanisms are similar: both require on–site training and time efficient programs that are flexible and minimally disrupt production systems. Industry associations and local governments are well placed to provide such training. Experience from South Australia's Pollution Prevention Workshops has also shown that State governments are able to provide this training at a higher level, where industry knowledge and expertise is not available to local governments.

Measures:
12d. Training providers consider the different needs of small and large industry when designing cleaner production courses.
12e. Industry associations, local governments, unions, and, where appropriate, State and Territory governments, facilitate cleaner production training for SMEs.

(VII) MEASURING CLEANER PRODUCTION

Objective:
13. To develop adequate data sets that allow measurement of this framework's success in increasing the adoption of cleaner production, and to develop baselines for cleaner production practice in industry, by which industry can measure its own performance and improvement.

If stakeholders are to evaluate the success of this framework in encouraging cleaner production, or measure the performance of industry, it will be necessary to develop some means of measuring and comparing current and future levels of cleaner production. As a part of developing this document, the Taskforce attempted to measure Australia's cleaner production performance, by determining the current base level of cleaner production practice across industry, both generally, and within three specific industries (pulp, paper and paperboard manufacturing; motor vehicle manufacturing; and plastics and chemicals sub-sectors). In the course of this research, it was found that there is little public information on levels of cleaner production currently available on an economy wide basis.

While official statistics from the Australian Bureau of Statistics (ABS) are not collected on cleaner production adoption by industry *per se*, some relevant information on cleaner production is available from the ABS. Since 1990-91, the ABS has been collecting and publishing data on the expenditures by a range of industries on cleaner production technologies. This information is collected as part of a wider survey on environmental protection expenditures and incomes in agricultural, manufacturing, mining, and service sectors.

Capital expenditure on cleaner production in particular is collected from manufacturing and mining respondents and published on an industry-by-industry basis. [47] Some relevant information is also available in ABS publications on individual industry sectors. For example, a publication on the Australian Mining Industry contains statistics on the use, by different mining industries, of environmental technologies related to activities such as monitoring air and water quality, biological monitoring, rehabilitation design and waste disposal.[48]

ABS data can be used as a proxy for aggregate cleaner production adoption, however, this data has neither been collected long enough, nor can it be disaggregated enough, to provide any reliable measure of cleaner production adoption. Confidentiality requirements prevent the ABS from publishing data at a level of detail sufficient to enable adequate benchmarking of the adoption and use of cleaner production in each industry. For example, it is not possible from these aggregate figures to determine the type of production technologies being adopted, or the relative efficiencies of individual cleaner production technologies.

A further difficulty is that, unlike many other industrialised nations, Australian industry generally does not collect adequate data regarding environmental performance in particular sectors. While some industry associations collect and publish information on their members' expenditure on environmental protection, industry was generally unwilling to release what information it had to the Taskforce.

Government agencies too have significant impacts on the environment through their own activities, and these should be measured and reported.

Measure:
13a. Industry associations encourage members to collect environmental data on their performance, and make this information publicly available.
13b Government agencies collect data on their environmental performance and make this information publicly available.

There are a number of initiatives currently underway that are expected to produce measures, in the medium to long term, by which the adoption of cleaner production practices might be assessed. One of these is State of the Environment (SoE) Reporting. ANZECC has established a 'State of the Environment Reporting' Taskforce, which is developing environmental indicators for State of the Environment Reports. Some of the indicators will allow a degree of measurement of cleaner production adoption, by providing measures of water quality, emissions to air, and so forth. It is expected that the indicators will be devised by mid-1999.

Any such indicators developed must be relational and not simply absolute measures of resource inputs. For example, some of the cleaner production indicators could be:

- raw material use per tonne of production;
- energy consumed per tonne of production;
- quantity of hazardous materials released to the environment as reported in the NPI; and
- turnover in the environment management industry.

Measure:
13c. ANZECC, through the ANZECC State of Environment Reporting Taskforce, ensure that suitable cleaner production indicators are developed for State of the Environment Reporting.

Indicators for measuring cleaner production in the medium term are also expected to emerge from work currently being undertaken by the ABS on compiling a series of physical resource accounts. These accounts aim to measure in physical terms the extraction, use for economic production, and discharge back to the environment, of key natural resources, including water, energy, forests, fish, minerals, wastes, land use/cover and biodiversity.

Once developed, these accounts will be potentially very useful for evaluating cleaner production in Australia, providing indicators of eco-efficiency by measuring the quantities of specific resources used by individual industry sectors, the amounts of pollution or wastes generated from use of those resources, and how these quantities change over time. These physical indicators could be combined with the monetary data published on environmental protection expenditures to analyse the environmental efficiency of individual industries and the economy as a whole. However, limitations in the availability of data for the resource accounts mean that it will probably be at least 2 years before all of these accounts are available for measuring the adoption of cleaner production[49].

There is also currently work at the international level that may assist Australia with measuring the adoption of cleaner production by industry. For example, the United Nations Commission on Sustainable Development has established a process to

develop sustainability indicators. Efforts to develop indicators for measuring "eco-efficiency" in industry are also underway by the WBCSD and by both Canada[50] and the USA. These initiatives have the potential to provide a set of tools for measuring cleaner production in Australian industry in the future.

However, the present lack of baseline data will make it difficult to measure the success of the framework implementation into the future. While SoE reporting and environmental accounting work are expected to provide indicators for measuring the adoption of cleaner production in the medium term, it is essential to develop better information in the short term on current practice, and the supply of cleaner production goods and services, if the effectiveness of the framework is to be monitored and evaluated.

Measure:
13d. The Australian Bureau of Statistics develop a methodology for measuring cleaner production by industry, and collect and publish more detailed information on implementation of cleaner production by industry.

In addition to information about the adoption of cleaner production, there is a need for national statistical data on the environmental management industry that is responsible for supplying data on cleaner production goods and services to industry. No supply-side database currently exists which could be used to determine the extent to which the cleaner production needs of industry are being met by the Australian environment industry. Statistical data on the environmental industry could provide both government and industry decision-makers with information on:

- the size of domestic market for environmental (including cleaner production) goods and services by type;
- operational and capital expenditures on environmental (including cleaner production) solutions;
- the share of the Australian market for environmental and cleaner production goods and services filled by imports; and
- current R&D on environmental and cleaner production solutions.

This data could be combined with other information to describe the size and growth of the industry; export share of production; environmental revenue and employment; and the sectoral distribution of customers. The Australian Bureau of Statistics would be best placed to compile this data, through a survey of the Australian environment industry. Such data would assist governments to assess the effectiveness of this document, as well as being of interest to industry and investors to benchmark policy performance.

Measure:
13e. The Australian Bureau of Statistics undertake a survey of the Australian environment industry to provide benchmarks of the supply of cleaner production technologies to industry.

(VII) PERFORMANCE BASED CONTRACTING

Objective
14. To encourage the development of performance based contracting to assist firms to adopt cleaner production.

Performance based contracting (PBC) is a technique that has been mainly utilised in the energy industry, but has great potential for being applied to many parts of business activity. Under PBC, a third party contractor takes responsibility for the management of a specific part of the business. The contractor adopts the risk for managing that part of the business but also gains financial rewards for making it

more efficient. The efficiency gains are shared between the contractor and the owner of the business.

In the energy industry one way that PBC can work is that Performance Based Contractors approach firms with proposals to improve their energy efficiency over a period of time, at no cost to the firms. The savings made by the energy efficiency improvements are used to pay the contractor and also are returned to the firm. It is clear that such an approach can be used for many aspects of a firms inputs and outputs — water, transport, waste, chemicals etc.

Holden's Engine Company and PBC

Holden's Engine Company (HEC) recognised that their core business and expertise was making engines, not managing chemicals. Through a tendering process HEC appointed Castrol Plus as its chemical manager. Castrol is now paid a set amount to supply chemicals and management resources. Castrol has the expertise and now has a vested interest in minimising chemical usage.

"What chemical management does is it puts the onus back on us, on Castrol, to reduce the usage of chemicals and the more we do that the more profitable it becomes." - Ross McFarlane, Chemical Manager for HEC, Castrol Plus.

The HEC chemical management programs was able to reduce coolant and biocide usage by 46, 800 litres each year representing an annual savings of $124, 000. This also resulted in a reduction in trade waste disposal of over 163, 800 litres, saving the company a further $19,650 pa.

Next year HEC and Castrol expect to add another $155, 350 to these annual savings by expanding the cleaner production chemical initiatives throughout the factory.[51]

"Suddenly our goals, Holden's goals and the environmental goals all come together." Ross McFarlane.

PBC is a particularly useful tool for firms that do not have ready access to capital, or the necessary expertise to implement cleaner production. In such cases, the contractor will organise the capital required for the changes to be made, with the cost of the capital being paid for by the efficiency improvements achieved by the firm.

Measure:
14a. Governments and industry associations encourage industry to use PBC for implementing cleaner production.

(VIII) DESIGN FOR THE ENVIRONMENT

Objective
15. To encourage product manufacturers to redesign products to reduce their environmental impact.

Cleaner production does not only focus upon the production 'process' but also upon the products themselves. Recent approaches to product design have shown that there are significant financial and environmental savings to be made by redesigning products to minimize their environmental impact.

Known as 'design for the environment' (DFE), or 'ecodesign' this approach examines a product's entire lifecycle and proposes changes to how the product is designed to minimize its environmental impact during its lifetime. These impacts are reduced by adopting the following strategies:

- **Raw materials**
- Design for resource conservation
- Design for low impact materials

- **Manufacturing**
- Design for cleaner production

- **Use**

- Design for energy efficiency
- Design for water conservation
- Design for minimal consumption
- Design for low-impact use
- Design for service and repair
- Design for durability

- **Distribution**

- Design for efficient distribution

- **End of life**

- Design for re-use
- Design for re-manufacture
- Design for disassembly
- Design for recycling
- Design for safe disposal.[52]

Greening the Kitchen

The Dishlex Global range of dishwashers which arose out of the EcoReDesign™ process represents a new benchmark in energy and water efficiency. The key environmental improvements include:

- six-star energy rating – the highest rating ever achieved by an Australian designed and manufactured dishwasher in Australia. The six-star rating is based on energy consumption of 256kWh;
- AAA water rating – each machine uses less than a sink and a half of water for each wash, ie. less than 18 litres for a full load;
- waste avoidance through greater material efficiencies. The new dishwashers are on average 700 grams lighter than previous models;
- plastic components coded to enable easier identification during disassembly and recycling, making end-of-life recycling potentially more cost-effective;
- major components designed for easier disassembly making end-of-life recycling potentially more cost effective;
- material consolidation, or fewer material types, making end-of-life recycling potentially more cost effective; and
- wash programs include provision for enzyme-based detergents, making low temperature cycles highly efficient at cleaning while using minimal energy.[53]

It is clear that DFE delivers cost savings to manufacturers by ensuring that raw material inputs and process inputs are minimised.

Measure:
15a. Governments provide support for further research and promotion of eco-design principles to manufacturers.

C. REGULATION AND SELF-REGULATION

Aims:

To ensure that regulation is performance based, fosters industry responsibility for environmental impacts, targets continuous environmental improvement, and encourages the adoption of cleaner production rather than end-of-pipe solutions.

To ensure that regulatory mechanisms recognise the important role of industry self-regulation and voluntary measures, involve industry in developing solutions to environmental problems, and foster industry responsibility for environmental impacts.

Regulation is a major means by which governments can ensure strong environmental performance from industry. It is seen by some as the only 'fail-safe' mechanism for environment protection. Regulation is a powerful industry motivator, and provides legal recourse for government and the community against polluting industries. However, regulation should be carefully formulated to ensure that it doesn't inadvertently discourage continuous environmental improvement or industrial innovation.

Regulation has a number of costs. It can have a high cost to government (and thus, the taxpayer) through the resources required to draft, pass and apply regulatory legislation. The drafting process can be protracted due to the need and desire to consult all key stakeholders. Attempting to satisfy all stakeholders can, in a worst-case scenario, lead to 'lowest common denominator' standards and the very nature of a regulatory approach can create in some cases an adversarial relationship between government and private enterprise.

Further, the considerable resources required to monitor regulatory compliance means that it is possible for smaller businesses to slip through. Large corporations are obvious targets for monitoring, as their larger outputs make it likely that they will both use more resources and create greater emissions. A review of the Victorian EPA's Industrial Waste Strategy found that approximately 50% of prescribed industrial waste generated in Victoria in 1995 was generated by only 30 companies. Yet the combined effects of many smaller businesses with smaller emissions can have an equivalent environmental impact, which may not be as well regulated because of a lack of government resources.

Many governments, recognising the problems inherent in relying solely on regulation, are also encouraging companies to play a more participative and responsible role in protecting the environment, through voluntary self-regulation agreements. A strong *internal* industry commitment to environmental best practice is likely to provide better environmental outcomes than if industry is driven solely by external government forces to meet minimum environmental standards. Thus, best practice regulation should always be complemented by a range of non-regulatory tools that encourage voluntary participation.

Cleaner production provides a means by which this change of focus, from regulation to self-regulation, can be achieved, as it improves efficiency and productivity for industry while protecting the environment. Savings identified and realised through improved production processes provide a solid, financial incentive for industry to internally incorporate cleaner production as a productivity tool. Industry may also recognise other benefits, including such difficult to quantify advantages as employee commitment and involvement, and increased customer satisfaction through environmental reporting. These combined benefits mean that voluntary self-regulation, such as through industry codes-of-practice, will become more effective in promoting environmental management for industry.

While self-regulation does not necessarily automatically deliver 'beyond compliance' improvements to the environment, it does create this opportunity. For this

opportunity to be realised, any self-regulatory approach needs to have the aim of continuous improvement, ensure there is a mechanism for covering all participants in the industry and that there is an open and honest reporting system set up on compliance. Regulators should work with industry and other stakeholders to achieve these ends, thereby creating an environment of trust between all stakeholders. In this way voluntary approaches to environment improvement will move industry 'beyond compliance'. While regulatory back-up will still be required to ensure minimum standards are met, self-regulatory approaches that continuously improve environmental performance and are transparent will achieve governments' aims and the economic bottom-line for industry.

Whilst self-regulation can promote industry to perform beyond compliance, the 'safety net' of regulation, can also drive industrial change. For example, the US State of Massachusetts required firms to: reduce toxic waste generation by 50% by 1997 (base year 1987) and establish toxics use reduction as preferred means for achieving compliance. A review of the programs undertaken after six years of operation, showed total use of toxic chemicals had dropped by 24%. By-products produced had fallen by 34% and total releases of toxic materials had fallen by 73%. In the process, firms reduced their costs by US$91,000,000[54]

(I) ENVIRONMENTAL PLANNING

Objective:
16. To maximise the potential environmental and economic benefits of cleaner production for industry, by ensuring that cleaner production principles and practices are incorporated at the very beginning of production planning and processes.

Cleaner production provides a holistic view of industrial activity by covering all stages of production processes. While cleaner production can be implemented by evaluating currently existing processes and practices, greater efficiency and environmental protection can be ensured by incorporating cleaner production before production begins. Governments can, through regulation, ensure that cleaner production is an integral part not only of production but also planning processes.

Cleaner production should be considered in planning stages, to ensure that developments are placed in the best possible sites. The actual design of new plants should also incorporate cleaner production processes so as to optimise environmental protection and potential cost savings. Cleaner production should also be taken into account when considering the inputs to a production process. By including cleaner production as an integral part of industrial planning, industry can maximise its potential profits.

"GEOGRAPHIC" PLANNING

Cleaner production can be incorporated at the beginning of industrial activity, rather than being added afterwards, through thoughtful land-use planning and the design of individual plants.

Land use planning can be applied to ensure that industrial developments are placed in areas where they will have a minimal environmental and community impact. Zoning laws can also be designed to encourage symbiotic or complementary industries, to be sited in the same areas. This type of development, also known as "industrial ecology parks," can facilitate improved recycling of outputs from one industry by other industries, rather than those outputs simply being treated as waste and sent to landfill. Such recycling reduces waste and increases profits, not only for the creator of outputs, but also the buyer. This design also reduces transport costs and the environmental effects of transport.

The environmental impacts of transport and specifically road transport in metropolitan areas are particularly high. It has been calculated that on arterial roads, diesel vehicles account for 52.5% of nitrogen oxide emissions and 82.5% of particulates in exhaust emissions, despite only accounting for 14% of vehicle trips on these roads.[55] Any improvements in land planning which reduces the need for transporting materials will lead to reduced air pollution in metropolitan airsheds.

The Potential of Land-use Planning: Breweries

Gunter Pauli, Director of the Zero Emissions Research Initiative, Japan, gives the following example for recycling brewery waste products, which shows that zoning and land-use laws can be effectively designed to encourage recycling and reduction of waste:

"...when a brewery wishes to dispose of its spent grain, it has to transport this residue over miles and miles at a high cost. If mushroom farming could be established next to the beer brewery, then we would have a most efficient production facility... But the zoning laws...prohibit farming activities in an industrial zone."

"...when one realises that four tons of spent grain is enough to generate one ton of mushrooms, then it is clear to anyone that if you are a beer brewer, you are actually in the mushroom business as well. And the residual waste of one ton of mushrooms is sufficient to feed 100 pigs per year and pork is sold on the market for US$3 a kilogram...The dung from the pigs is equivalent to the energy of 3 gallons of gasoline per day, that is, some 5 000 litres of petroleum per year, free of charge...the waste residue is then dropped through gravity forces in algae ponds and from thereon in fish ponds which are flooded with nutrients so that 50% of the pond is covered with floating gardens, growing some two tons of rice per year"[56]

Stricter planning in the original development of individual industrial sites can also encourage the incorporation of cleaner production practices. Better initial plant design can promote energy efficiency, for example, in using heat from one process for other processes. Such planning should be required for significant developments, through environment impact statements that consider and incorporate cleaner production design principles.

For example, businesses applying for works approval under the Victorian *Environment Protection Act 1970* must provide a waste management plan, which identifies waste minimisation options at the design stage, before they build their facilities. Works approval applications must also demonstrate that at the very least, commonly available technologies are being used to minimise wastes, and, where priority or hazardous wastes are being generated, that best available technology will be applied.

Measures:
16a. State, Territory and Local governments review land-use and zoning laws to allow for development of 'symbiotic' industrial areas with complementary by-products.
16b. Governments include the consideration of cleaner production principles in guidance documents for development proposals and environmental impact assessment requirements.

(II) Regulation and Inputs to Production

Objective:
17. To develop regulatory systems that provide mechanisms for reducing the environmental impact of inputs and that take cleaner production principles into account.

Governments can also use legislation to protect the environment from hazardous or toxic materials. For example, under Australia's ozone protection strategy, ozone-

depleting substances have either been banned or are being phased out of use. Any legislation banning or phasing out hazardous chemicals must be carefully formulated to maintain Australia's industrial capacity, while providing protection for both the community and the environment. While the ozone strategy is phasing out the use of methyl bromide in agriculture, research is also being carried out to identify and develop less harmful substitutes.

A number of National regulatory bodies for chemical use exist. The Commonwealth/State National Registration Scheme for agricultural and veterinary chemicals assesses, registers and monitors the use of these chemicals up to the point of sale. The statutory assessment process includes an evaluation of the potential environmental impact of chemicals, which forms an input into the setting of approved directions for their use. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) was established by the *Industrial Chemicals (Notification and Assessment) Act 1989* to aid in the protection of the Australian people and the environment, by determining the risks posed by industrial chemicals to occupational health, public health, and the environment.

REGULATING FOR CLEANER PRODUCTION

Requiring firms to adopt cleaner production using legislation is a difficult undertaking that needs careful implementation to avoid sending the wrong signal to industry. Cleaner production is generally considered a voluntary mechanism for firms to adopt and therefore if legislated for, may be perceived as a 'penalty' for poor performance. This may therefore act as a disincentive to firms to voluntarily undertake cleaner production activities.

Queensland, through its *Environment Protection (Waste Management) Policy* is proposing to introduce a novel legislative approach to encourage a more flexible, responsive and effective adoption of cleaner production practices. The proposed Policy provides for the preparation of cleaner production improvement plans and life cycle assessments to encourage firms to consider modifying their production process or product design to reduce its impact on the environment. The implementation of this approach will be monitored and evaluated to ensure that it does not act as a general disincentive to firms to adopt 'voluntary' cleaner production activities.

An alternative to requiring mandatory cleaner production adoption is for governments, when reviewing and formulating legislation relating to environment and production issues, to include cleaner production within the 'objectives' or 'guiding principles' of the legislation. This would provide assistance in interpreting legislation and ensuring that cleaner production is considered a mainstream activity.

Measure
17a. Governments when formulating and reviewing relevant legislation incorporate cleaner production principles within the objectives and guiding principles of the legislation.

(III) ENVIRONMENTAL LICENSING SCHEMES

Objective:
18. To make licensing schemes more strongly performance based and incorporate the 'polluter-pays' principle to ensure that they encourage and support the application of cleaner production principles.

Pollution licensing schemes identify and license premises, of a certain size or significant risk, that produce air, noise or water emissions. Licensing such premises

enables government environment agencies to monitor and control the level of emissions and police breaches of licences.

Such schemes have a number of strengths. This form of government regulation is often seen as the most effective method of ensuring that industry incorporates pollution control measures into its activities. Government regulation is also more likely to be trusted by environmental groups and the community, as it sends a clear message that government considers the problem of pollution serious enough to warrant legislative attention.

Pollution licensing also has advantages for industry. It provides certainty to business by setting clear guidelines and goals for emission levels, and clear penalties for non-compliance. Indeed, industry itself has identified regulation, either existing or threatened, as a major driver in improving its environmental performance.

However, traditional licensing schemes could be used more effectively to encourage industry to adopt cleaner production. The exclusive focus of many existing schemes on a maximum emission level can inadvertently act as a disincentive for continued improvement beyond regulatory standards.

Load-based licensing

To address the problem of minimum compliance, many Australian governments are developing innovative new schemes. Load-based licensing uses a scaled approach to setting licence fees, which promotes the polluter-pays principle. While maximum allowable emissions are still set and enforced by government, companies with lower emissions pay lower licensing fees, while companies with higher emissions are penalised by higher fees. Such schemes provide regulatory protection for both the community and the environment, but also encourage improved industry performance through the promise of lower licensing fees.

Load-based licensing for improved environmental performance:

Load-based licensing can encourage the uptake of cleaner production by providing financial incentives for improved environmental performance. Under such schemes, a company's licensing fees directly reflect the amount of harmful emissions it creates — the lower the amount or toxicity of emissions, the lower the fee. There is often a limit to how well 'end-of-pipe' technologies can reduce emissions and hence, to continue to reduce emissions it is necessary for firms to adopt cleaner production processes. Load-based licensing schemes have been operating in Victoria since 1991 and are being initiated in NSW.

Load-based Licensing - The Commonwealth Experience

Environment Australia administers a load-based licensing system under the *Ozone Protection Act 1989.* Under this Act, 'controlled substances licences' are required for the import, export and manufacture of hydrochlorofluorocarbons (HCFCs) and methyl bromide. Controlled substances licences are subject to the payment of a quarterly 'activity fee', calculated at $2000 per ozone depleting potential (ODP) tonne for HCFCs, or $90 per ODP tonne for methyl bromide. Consequently, to minimise operation costs, licensees have the incentive to utilise substances with the lowest possible impact on the ozone layer, and quickly adapt their practices to take advantage of substitute substances and appropriate technology and devices as they become available.

Measure

18a. Governments implement load-based licensing schemes to encourage industry to improve its environmental performance beyond regulated requirements.

FACILITY-WIDE PERMITS

Another innovative approach to licensing is the introduction of facility-wide permits.[57] These promote an integrated approach to environment management by providing one licence for all emissions from a facility, rather than separate licences for emissions to different environmental media (eg air, water, noise). Although facility-wide permits may be difficult to monitor over large facilities, they can encourage industry to view environmental management as an integral part of the production process, rather than simply an add-on. Facility-wide permits have been operating effectively in Victoria for some time. Under Queensland's legislation activities may be licensed for multiple sites. In Queensland the licensee must demonstrate how management of activities is integrated under an environment management system for a multiple site licence to be issued.

Measure

18b. State, Territory and Local governments develop facility-wide licences or permits, covering multiple activities or sites, to encourage companies to consider environment management as an integral part of the production process.

ACCREDITED LICENSING SCHEMES

The key to the effectiveness of regulation in encouraging cleaner production is in changing its emphasis from meeting environmental standards to avoid penalties, to performing well environmentally to gain regulatory benefits. Accredited licensing schemes provide an example of innovative regulation that uses this changed emphasis. Under such schemes, governments can reward 'good performers' by decreasing the regulatory burden placed upon them. For example, a company that has gained accredited licensing status might be given a faster licensing process, or be permitted to report less often. In one case, a Victorian licensee had 39 pages of prescriptive conditions, contained in 5 licenses, reduced to one 6 page, non-prescriptive accredited license.

Accredited Licensing: The Victorian Experience

The Victorian EPA has in place an accredited licensing scheme designed to promote environmental commitment and continuing improvement from industry. "Good performers" are released from their normal regulatory load by a less prescriptive licence, and exempted from works approvals unless there will be substantial change to a process or emissions. Licensing fees may also be discounted, to reflect administrative savings by government in the costs of monitoring and enforcing compliance.

To gain accredited status, companies must demonstrate a strong track record in environmental management. They must also prepare an environmental improvement plan, conduct periodic environmental audits, and implement an approved EMS.

Western Australia is currently developing a similar scheme.

For a business to be eligible for an accredited license, it must be able to show a strong track record in environmental performance, and a strong commitment to future improvement. This can be demonstrated, for example, by the development of an environment improvement plan. Other requirements might include periodic environmental audits, implementation of an approved EMS, public reporting and community consultation.

Accreditation would have a number of advantages for participating businesses. Easier processes for new works approvals lead to lower administrative costs and fewer delays in industrial developments. Savings may be made through discounted pollution licensing fees that reflect the regulator's lower administrative costs. Also, reduced government intervention allows more freedom to determine the best means of initiating improvements, as opposed to a prescriptive approach being imposed by government.

The accredited licensing approach can also have benefits for government. Fewer resources are required to monitor a company with an accredited licence, as the accreditation process has already established the company's environmental credentials. The cooperative nature of accredited licensing schemes also engenders a greater sense of partnership and trust between government and industry, and therefore, more open communication.

Small Enterprises and Pollution Licensing

One criticism often levelled at licensing schemes is that they are not designed to regulate small enterprises with low level emissions. Most government licences are only issued to premises that emit pollutants over a certain level. Yet the combined environmental effect of a number of small premises can be quite significant.

One obvious solution to this problem might be for governments to introduce licences specifically targeting small business. Yet such licensing would place a high regulatory burden on small businesses, which may be unable to cope with this additional load and remain competitive. It would also require regulatory bodies to commit substantial resources.

However, it should be pointed out that while small businesses are not necessarily required to be licensed under pollution legislation, they are still subject to prosecution for breaches of environmental legislation. Other tools available include 'clean-up' orders that direct the polluter to cease the polluting activity or face prosecution. This being the case, it is more efficient to rely on information that demonstrates the benefits of cleaner production to small businesses, both in reducing emissions and through the savings it provides. The threat of enforcement for breaching environmental legislation remains as a punitive backup if firms fail to act.

Brisbane City Council: The Green Certificate

Brisbane City Council has developed an innovative accredited licensing scheme that encourages environmental improvement for smaller businesses. Under the scheme, businesses can show their commitment to environmental performance and improvement through the development of a company-specific EMS. This provides an environmental risk management plan appropriate to the scale of the company in question. A thorough initial on-site investigation is also carried out to confirm the company's environmental practices.

In return, Council awards the business with a 'green certificate'. This certificate can be displayed in offices as a promotional tool. Council also carries out some promotion of the business' environmental performance. Licensing fees are discounted, reflecting the fact that Council only needs to carry out on-site inspections every two years for accredited companies, as opposed to annually for other companies.

The majority of applications for the green certificate have been made by small businesses. To date, approximately 70 green licenses have been issued.

Measure:
18c. State and Territory and where appropriate, Local governments develop licensing systems that acknowledge strong performance with decreased regulatory intervention.

(IV) VOLUNTARY AGREEMENTS, CODES OF PRACTICE AND OTHER SELF-REGULATORY APPROACHES

Objective:
19. To encourage industry to take responsibility for minimising its environmental impacts, and devise appropriate and relevant environmental strategies, through self-regulation.

Under voluntary schemes, industry, often with the agreement and cooperation of government, undertakes to regulate its own environmental behaviour. Industry is thus able to set realistic targets, and to determine the most effective means of reaching those targets. This process allows industry concerns to be voiced and recognised, increasing industry's 'ownership' of the initiative, and thus improving the likelihood of compliance.

Voluntary industry initiatives have been criticised as 'lacking teeth', as industry associations often have no authority to ensure that individual members follow recommended practices. It is also rare for every member of a particular industry to be a member of its industry association. However, this does not mean that such measures are ineffective. Voluntary initiatives are developed through a consultative process that often results in a strong industry commitment to complying. Industry associations may choose to refuse or terminate membership to those firms that do not comply. In addition, compliance may be further strengthened through 'peer pressure' from industries with strong environmental records, as poor performance from similar firms can give the entire industry a bad reputation. Voluntary initiatives can also be developed into agreements with regulatory bodies.

A number of innovative schemes remedy the problem of non-compliance with voluntary industry standards. 'Good neighbour agreements' provide communities with the opportunity to influence industry's performance by involving them in the development of environment management strategies for industry.

For example, the Victorian Environment Improvement Plan Program (EIP), encourages firms to make a public commitment to improve their environmental performance. An EIP contains timelines for improvements and details of ongoing monitoring. A company executive, community and local government representatives,

and the chair of the Victorian EPA sign the EIPs. There are over 20 EIPs in place, and more are being developed.

Measure:
19a. Governments and industry work with the community to develop 'good neighbour' agreements.

Voluntary action can take a number of forms:

- *Voluntary agreements* are negotiated between government, the community and industry, to achieve specified environmental targets. The key to such agreements is that industry enters these negotiations voluntarily, rather than having objectives imposed by legislation.

- *Codes of practice* and *best practice guidelines* are often developed through industry associations and their members. Government consultation is also important, to ensure that codes comply with foreshadowed and existing regulations.

- Industry specific *environmental accreditation* can be administered by industry associations and encourages improvement through acknowledging industry members who demonstrate strong environmental performance and improvement.

These different forms of voluntary self-regulation should not be seen as exclusive measures. Generally, a voluntary environmental initiative will contain some, if not all of these aspects.

***Industry Self-Regulation under the* Ozone Protection Act 1989**

While the *Ozone Protection Act 1989* sets an annual maximum limit on the quantity of HCFCs that can be imported or manufactured in Australia, the HCFC industry is self-regulating so long as it remains collectively within the industry limit.

The peak industry body, the Association of Fluorocarbon Consumers and Manufacturers monitors activity in the industry, and liaises with its member companies and government to assist fluorocarbon importers to remain below the limit set by the Act. Importers must report quarterly to Environment Australia on licence activity. In the event that the national industry limit is exceeded, an agreed quota system under the *Ozone Protection Act* would be triggered and Environment Australia would then set individual import quotas for licensees.

Measure:
19b. Industry associations encourage members to participate in voluntary agreements.

The Greenhouse Challenge

The Greenhouse Challenge (GC) involves voluntary agreements between the Commonwealth and industry, either individually or through industry to reduce the emission of greenhouse gases by industry, with a particular focus on improvements in energy efficiency. The GC provides an opportunity to promote cleaner production to industry, as a means of meeting their targets.

The overlap between the enhanced greenhouse effect and ozone depletion has led to the extension of industry codes of practice relating to chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs). The codes cover the design, development and manufacture of products which use these substances.

Measure:
19c. Governments work with industry associations to develop voluntary

environmental agreements, for example, extending voluntary agreements made under Australia's National Greenhouse Strategy.

CODES OF PRACTICE

Codes of practice are generally sector-based, and provide guidance to industry on a range of issues, such as resource usage, emissions, waste generation and disposal, occupational or health hazards, and regulatory standards. The aim of such codes is to facilitate industry improvement by providing relevant information and suggesting practices and processes which individual companies can adopt.

Codes of practice can also have a demonstration effect, and can provide information and advice to firms about how to implement environmental improvements. Best practice guidelines demonstrate best practice in the industry for firms considering improvements, and can also provide a benchmark for measuring industry progress.

Responsible Care: Improving the Chemical Industry's Performance

The Plastics and Chemicals Industry Association (PACIA) represents Australia's second largest manufacturing sector, with a turnover in excess of $28 billion pa. Adherence to the Responsible Care Program is a condition of PACIA membership.

Responsible Care provides codes that cover best practice requirements for the management of hazards of chemical operations and products. The codes complement existing regulation, and contain management practices that show how companies can improve their performance in health, safety and the environment. The Codes of Practice are grouped under:

Community Right to Know;	Research and Development;
Manufacturing;	Emergency Response and Community Awareness;
Waste Management;	Warehousing and Storage;
Transportation; and	Product Stewardship.

All participating sites have Responsible Care coordinators who oversee the implementation of the Codes.

Responsible Care was introduced in 1989. Companies involved have reported a 32 percent decrease in employee lost time due to injuries, and a 35 percent decrease in transport incidents. 70 percent of sites now have waste reduction plans including greenhouse gases and emissions to sewers and landfills, and 80 percent have an emergency response plan in place.[58]

Codes of practice may also provide a means by which regulatory bodies can work with smaller industry. Sector-based codes of practice can be developed into regulatory standards with cooperation between industry and government. For example, State and Territory environment departments are responsible for controlling the sale, purchase and use of ozone depleting substances, complementing Commonwealth legislation which controls the import, export and manufacture of such substances. Through their legislation, States and Territories require people who service equipment containing ozone depleting substances to be accredited, and to have completed training on how to handle the substances safely and how to prevent emissions.

Best Practice Environmental Management in Mining

Environment Australia has worked with the mining industry in Australia to develop and publish a series of best practice modules, written by expert industry members, for environmental management in mining.

The project was undertaken in close consultation with the Australian mining industry, government agencies, professional, and conservation groups. The project has been well received, both in Australia, and by the international mining industry. To date, 11 modules have been developed, ranging from tailings containment to site rehabilitation. The

booklets provide best practice examples to companies wishing to improve their own environmental performance[59].

The fluorocarbon industry has established codes of practice for commercial, industrial and domestic refrigerators and air conditioning systems, which complement this legislation. The codes cover design, development, manufacture, training of personnel, installation, servicing, maintenance, retrofitting, recovery, recycling and disposal of refrigerants, handling and storage of refrigerants and alternative refrigerants and lubricants. Through this collaborative approach, government and industry manage end-use of refrigerants to minimise emissions of ozone depleting substances and greenhouse gases.

Measure:
19d. Governments work with and encourage industry associations to develop and promote codes of practice and best practice guidelines.

INDUSTRY SPECIFIC ENVIRONMENTAL ACCREDITATION

Industry associations can play a strong role in encouraging the voluntary uptake of cleaner production through self-regulation schemes such as environmental accreditation. Under such schemes, individual association members can apply for accreditation by the industry body. Accreditation is based on a firm's environmental impacts and practices. Accreditation can then be used by the firm as a promotional tool. The industry as a whole also gains an enhanced reputation for environmental responsibility.

The Ecotourism Association of Australia has initiated such a scheme. Participating firms assess themselves against a comprehensive range of criteria, including water, waste and energy usage. The scheme has an accreditation panel that conducts random audits on applicants. Once approved for assessment, firms receive either basic or advanced accredited status. With this status comes the right to use the Ecotourism Association's Accreditation symbol as a promotional tool to show that the firm is environmentally responsible. While this type of initiative is particularly relevant to 'environmental' industries, such as ecotourism, there is scope for broader application, particularly with the involvement of industry associations.

An important aspect of any accreditation scheme is the credibility of the scheme. A scheme must be comprehensive, rigorous and results must be able to be validated. Credibility can be increased through the involvement of environmental and community NGOs and governments. If the scheme is perceived by consumers to be little more than 'green marketing' with no substantive measurable environmental improvements, then the scheme will not only fail, but also bring other accreditation schemes into question.

Measure:
19e. Governments encourage industry associations to develop industry specific environmental accreditation schemes to encourage continuous environmental improvement from their members and to raise the profile and image of their sector.

D. STRENGTHENING THE MARKET

Aim:

To strengthen the market for goods and services by eliminating or compensating for market-distorting practices.

The use of economic instruments to increase environment protection is of increasing interest to policy-makers. Two recent publications[60] have concluded that the optimal solution for environmental problems can only be found through a mix of complementary economic, regulatory and suasive measures. This section examines some of the economic policy instruments that governments can apply to improve the efficiency of the market. Price incentives for adopting cleaner production will better reflect the economic and social costs of environmental damage if market-distorting practices are removed or compensated for.

(I) SUBSIDIES & OTHER FORMS OF ASSISTANCE

Objectives:

20. To eliminate subsidies that encourage resource waste.

21. To provide targeted support to firms for cleaner production implementation.

Subsidies to industry are a double-edged sword. The following section examines the role of subsidies, both as a barrier to the adoption of cleaner production, and as a method of compensating for market distortions where the barriers cannot be easily overcome. It should be noted that subsidies are generally economically inefficient mechanisms for providing assistance, and when wrongly applied can increase environmental damage. For these reasons, it is generally better to apply other mechanisms to increase the adoption of cleaner production.

SUBSIDIES AS BARRIERS:

Australian industry generally requires short payback periods for investments in capital equipment. Firms are unlikely to make an investment if they cannot earn the cost back in a short time, typically 2-3 years, although this payback period can vary depending on the type of industry and company size. These stringent expectations influence the investment cycle and generally mean that Australian companies make capital investments during upturns in the consumer market, whereas companies prepared to consider five, ten or even twenty year payback periods take advantage of downturns to position themselves for the future with improved technologies.

To encourage industry to adopt cleaner production, especially where capital outlay or major changes in management and materials are required, industry needs to feel that it is cheaper to make the change than to continue operating in a 'business-as-usual' fashion. There are many cost variables that determine the decision to change. One of the variables affecting payback periods is the extent to which resources (such as water or forests) and infrastructure use (such as roads) are subsidised by governments. For example, governments do not charge road transport operators the real cost of road maintenance. If road registration fees were set at a higher level and were passed onto the end consumer, consumers might look for alternatives and thus increase the use of more environmentally benign transport.

Indirect subsidies also have significant effects in influencing business decisions, and can discourage the change to more efficient practices. For example, many local governments do not charge the full cost of providing a solid waste disposal system. The Industry Commission found that 62 percent of local governments made no provision for site rehabilitation after a landfill closure, nor for the cost of replacing the full landfill.[61] This means that heavy landfill users and waste producers are subsidised by local ratepayers. The 1996 DEST report into environmental and

financial subsidies estimated that in 1994, this subsidy equalled $5.50 per tonne of solid waste.[62] If waste producers were required to pay the full costs of disposal, economic projections would change, making technologies that produce less waste become relatively more affordable. Thus, resource pricing that reflects environmental values could provide the incentive for firms to invest in more efficient technologies.

Sand recycling and tip fees — stopping cleaner production

A Brisbane-based foundry wanted to install a sand recycler. Landfill costs for used sand were $30 per tonne and new sand cost $40 per tonne. The foundry estimated that recycling sand could save approximately $12,000 per month. Unfortunately the cost of the recycling equipment meant a payback period of six years and hence for the company, the investment was not viable. If dumping fees accurately reflected the cost of landfill to the environment and community, and extraction costs reflected environmental costs, then the company may have made the investment. This would have meant a reduction of approximately 6000 tonnes of waste sand per year and a reduction in 6000 tonnes of sand per year being extracted.[63]

The emission of pollutants during production is also subsidised by the community and the environment, as is the extraction of non-renewable natural resources. While the monetary value of this subsidy is extremely difficult to assess, a 1995 estimate puts it in the order of $7.0 - $8.0 billion.[64] It is apparent that the removal of both financial and environmental subsidies by governments would have an effect on payback periods and thus, industry's investment in cleaner production.

Measures:
20a. Governments assess the effectiveness and benefits of subsidies at the time of their review, and remove inappropriate ones.
20b. Governments ensure that subsidies, that are considered effective and of a wide benefit, are transparent.

PROVIDING ASSISTANCE:

Governments have at times provided subsidies and other types of assistance to encourage aspects of cleaner production and to balance the underpricing of environmental resources. Such assistance can increase investment in cleaner production by reducing the payback period. Examples of such assistance are:

- the South Australian Government provides assistance to local recycling schemes.
- the Victorian Government's EcoRecycle grants programs is funded by a $3 per tonne landfill levy. This levy also funds cleaner production activities.
- support for the Cooperative Research Centres Program, including Centres on Renewable Energy, and Waste Management and Pollution Control;
- the Commonwealth Renewable Energy Industry Program; and
- the AusIndustry *Environmental Management: A Business Approach* Program.

It is not necessary for subsidies to be provided indefinitely, or even for extended periods of time. In some cases, the temporary provision of subsidies may suffice to establish a permanent market for a particular product or service, or provide enough incentive to engender permanent behavioural change.

Measure:
21a. Governments identify opportunities where provision of assistance will encourage cleaner production, for example, by establishing markets for materials which previously were discarded as waste, and promoting development and trials of environmentally efficient technologies.

(II) TAXES, CHARGES, TAX DEDUCTIONS AND DEPRECIATION ALLOWANCES

Objective:
22. To modify tax regimes to compensate for market distortions which act as disincentives to cleaner production.

Taxes, charges, tax deductions and depreciation allowances are all economic tools that can be applied by governments to alter industry and consumer behaviour. By altering the cost of a particular good or service, governments can encourage consumers to make environmentally sound product choices, and provide increased incentives for industry to replace old items with newer, more efficient technology.

The use of economic tools is not new in Australia. They have been used by all levels of government at various times, for various purposes. One of the best known uses of environmental taxes to change consumer behaviour was the introduction of the excise differential on leaded petrol in 1994. The 2¢ per litre tax on leaded fuel led to 500,000 motorists switching to unleaded fuel.[65] Other environmental charges that have successfully changed community behaviour are consumption charges levied by water utilities, and landfill levies imposed by local governments. For example, in 1994 the ACT Government introduced a levy on all waste going to landfill. Combined with increased recycling opportunities, this levy led to a 39% reduction in waste going to landfill and a corresponding rise in materials being recycled.[66]

Tax deductions for depreciation allowances deal with the reality that equipment wears out and must eventually be replaced. The Australian Tax Office (ATO) allows the cost of equipment used in a business to be depreciated[67] over a period of time, and deducted from a business' taxable income. Capital equipment is expected to last a long time, and its replacement offers an opportunity to install more environmentally efficient equipment and processes. Tax deductions for accelerated depreciation can be incentives to invest in new capital sooner than would otherwise be the case. These economic tools are discussed in more detail below.

TAXES:

The application of environmental taxes can provide long term economic, social and environmental gains, and increase the incentive for industry to adopt cleaner production. It has been argued that employment can be created, resource use optimised and pollution reduced by shifting the tax impost away from labour and onto resource use.[68] This model relies on returning taxes, raised on material and energy inputs, to the community, by lowering labour taxes or taxes on other productive inputs. For example a recent Australian study estimated a net employment gain of 100,000 - 150,000 jobs, by applying widespread environmental taxes and returning them to the community by abolishing payroll taxes (among other measures).[69]

> *"If the double challenge of unemployment and pollution is to be addressed, a swap can be envisaged between reducing labour costs through increased pollution charges."*[70]

European countries have been applying environmental taxes for many years and have identified significant economic and environmental benefits from doing so. The OECD has identified three applications of environmental tax, all of which can have an impact on the adoption of cleaner production.

- Emission taxes can be levied on measurable emission levels, such as emissions to air, water and land, or the generation of noise. They are usually only suitable for application to stationary sources of emissions because of the high monitoring and administrative costs.

- Consumption or product taxes are levied on particular products that are generally considered damaging to the environment. The Australian unleaded fuel tax is a good example.
- Tax differentiation relates to variations in existing indirect taxes such as excise duties, sales taxes or value added taxes for environmental ends, for example, the reduction in the excise on unleaded petrol.

Objections to the use of environmental taxes

There are three broad objections to the use of environmental taxes. Firstly, it is difficult to set taxes at a level that accurately reflects the real environmental costs of economic activity. Secondly, where prices are inflexible, for example, due to a lack of alternative products for consumers to substitute, costs may be transferred to final consumers with no real environmental benefit. Thirdly, if taxes or charges represent only a small portion of outlays on a particular product or service, their effects may not be sufficient to alter behaviour. Taxes may also appear to legitimise or condone environmental damage by those able to pay the price, and may therefore be seen as inferior to banning such activity outright.

Measures:
22a. Governments investigate the potential for eco-taxes to improve the adoption of cleaner production.
22b. Governments consider applying eco-taxes, where appropriate.
Environmental charges.

Environmental charges are generally prices for government produced or publicly owned goods and services, whilst taxes are government levies on privately produced or owned goods and services. Charges are often more directly targeted at users of environmental resources than are environmental taxes. For example, most local governments charge a fee for dumping material at a landfill, which has a direct financial impact on firms producing waste.

Care should be taken to ensure that pollution charges do not simply transfer the pollution. For example, the Commonwealth charges a 'noise levy' on all aircraft movements into Sydney,[71] to fund amelioration of airport noise for residents. As the levy only applies to Sydney, carriers have simply rescheduled Boeing 727[72] planes to other routes, meaning that the noise pollution has been transferred from the residents of Sydney airport to other Australians.

South Australia has a solid waste levy that has been operating since 1979. In itself, the levy did not have a big impact on waste reduction, however the funds were used to set up the SA Waste Management Commission (now part of SA EPA) which promotes domestic recycling schemes and has had a significant positive impact.

The national strategic framework for water reform, agreed to by COAG in 1994, establishes a structured program of reform measures for efficient and sustainable water use. The framework covers both rural and urban areas and includes measures relating to full cost recovery water pricing, and environmental, agricultural, industrial and domestic requirements. Many government owned utilities are already making the move to such environmental pricing schemes, which provide a strong incentive for consumers to conserve natural resources.

Water charges dampen demand

In 1982 the Hunter District Water Board introduced a two-part tariff for its customers. The first consisted of a fixed charge, independent of consumption, based upon the service capacity provided. This covered the fixed costs of providing the service. The second part consisted of a variable charge based on a charge per kilolitre of water consumed. After imposition of the user-pays tariff, average consumption declined 10 percent in the first year

and another ten percent in the next year. Nine years after its introduction, consumption was reduced by 30 percent against the pre-charge trend.[73]

Measures:
22c. Regulators of utilities ensure that pricing mechanisms reflect 'full-cost' of service provision and resource use.
22d. Local governments explore opportunities for applying charges for services that consume environmental resources.

TAX DEDUCTIONS, INCLUDING DEPRECIATION ALLOWANCES

It is not always necessary to raise new or additional taxes to provide incentives for cleaner production. The provision of tax deductions or accelerated depreciation provides an incentive to change behaviour in a similar way that taxes do — it changes the relative economic price of taking a particular action.

Many countries provide some form of tax relief for environmental technology. The most common form is accelerated depreciation on certain plant or equipment, but many countries also provide investment tax credits for certain types of investment, such as pollution control equipment or research and development.

The Australian Tax Office currently allows a range of deductions for environmental expenditure. These are:

- deductions for environmental costs where such costs are a normal part of non-capital business activities — the entire cost may be deducted for the financial year;
- depreciation for plant and equipment related to environmental protection is allowable over the life of the plant;
- deductions for the cost of environmental impact studies can be claimed over a ten year period — ten percent of the cost deductible each year;
- deductions or depreciation for expenditure on 'preventing, combating and rectifying pollution' and expenditure on the 'treatment, clean-up, removal or storage of waste'. The expenditure is deductible in the year it was incurred, unless it was on a 'building, structure, or plant and equipment', in which case it can be depreciated; and
- some of the 125% tax rebate for research and development assists development of new cleaner production technologies.

Currently, it appears that these tax concessions do not provide a specific incentive for investing in cleaner production as they allow depreciation allowances for environmental plant and equipment only at the same rate as for investments in 'normal' plant and equipment. However, it must be noted that these existing concessions have not been widely promoted and so their effectiveness has not been fully tested. To increase the incentive for enterprises to adopt cleaner production, some European countries have introduced accelerated depreciation allowances for environmentally clean technologies. An alternative approach is to allow increased tax deductibility for environmental expenditure on plant and equipment, such as is allowed for industrial research and development.

Measure:
22e. The Commonwealth promote the use of existing depreciation allowances and tax deductions to increase investment in environmental technologies.

(III) COSTS OF CLEANER PRODUCTION AND TECHNOLOGY ASSESSMENT

Objective:
23. To minimise the up-front costs to firms of investing in cleaner production.

Despite the extensive evidence demonstrating that cleaner production leads to long-term cost reductions for industry, there is a need to address the short-term costs of cleaner production adoption, particularly for SMEs. Consultations with industry have indicated that they perceive there are three costs involved with the broader adoption of cleaner production: firstly, environmental assessments are considered too costly for most SMEs; secondly, the cost of new clean technology is unaffordable; and thirdly, assessing technology can be difficult and time-consuming, causing uncertainty for firms as to whether they have chosen the right technology to invest in.

Environmental Assessments

Before a firm can fully implement cleaner production, it needs to undertake an environmental assessment. Assessments are designed to identify all the environmental impacts made by the firm, so that changes to processes and practices can be evaluated and implemented. The cost of an assessment can be significant.

Some State governments provide limited assistance to firms, to subsidise environmental assessments. Given the limited funds available from government, it is important to identify priority sectors for these funds. In addition, providers of funds should consider the use of no interest loans rather than grants.

Measures:
23a. Governments should consider when providing funds for assessments that they could improve the effectiveness of assessments by identifying priority sectors for expenditure.
23b. Where governments contribute to environmental assessments, they should consider innovative financing schemes, including the use of revolving loans.

THE COST OF NEW TECHNOLOGY

In a range of consultations, industry has stated that the cost of new technology is an important barrier to the adoption of cleaner production. In particular, it has been argued that cleaner production solutions cost more than end-of-pipe technologies. However, this argument may reflect perceptions rather than reality. Experience has shown that cleaner production is not always expensive or difficult to implement. It has been estimated that 30 percent of both environmental and economic savings come simply from better housekeeping and staff training. A further 30 percent can be made through minimal capital investment, with a short payback period.[74] It is only the remainder of improvements that require more expensive technological investment.

Clearly, there comes a point for a firm when the majority of simple and cheap cleaner production changes have been made, and any further improvements will come at a greater marginal cost. At this stage, the cost of new technology may become an issue. However, even this can be ameliorated by ensuring technology changes occur as part of normal process upgrades.

Innovative technology generally is more expensive than older technology as developers need to recoup research and development (R&D) costs, and new technology manufacture often doesn't have the benefit of economies of scale. To assist technology developers to keep costs down, the Commonwealth Government provides a 125% tax deduction for R&D.

TECHNOLOGY ASSESSMENT

Expense can also be incurred through the labour and financial cost of technology evaluation prior to purchasing. Where cleaner production initiatives involve the installation of new equipment or substantial changes in the production process, production time can be lost while adjustments are made to ensure optimum performance. This is not always the case in end-of-pipe technologies, as production lines can sometimes continue to operate whilst fine-tuning is taking place. Firms may therefore be wary of investing in new or untried technologies in spite of the potential long-term benefits.

Australian governments have addressed this lack of certainty by providing information to industry about new environmental technologies. *EnviroNET Australia* provides extensive information about technology systems, through both its Cleaner Production Case Studies Directory and the Technology Case Studies Directory (TCSD). The TCSD lists over forty innovative Australian environment technologies. There is scope to continue to update and broaden this resource.

Measures:
23c. Industry associations advise members of new environmental technologies and processes applicable in their industry.
23d. The Commonwealth Government continue to provide information about new Australian environmental technologies through suitable mechanisms including the Technology Case Studies Directory.

(III) FINANCIAL INCENTIVES

Objectives:
24. To accelerate the adoption of cleaner production by SMEs through the use of financial incentives.
25. To encourage the financial services sector to take an active role in encouraging cleaner production.

In addition to the use of subsidies, rebates and tax deductions, governments can also use direct financial incentives such as grants, concessional loans or equity investments to change business behaviour, where market failure exists or where governments seek to pursue other policy objectives. As long as markets fail to properly cost environmental externalities, or information failure produces sub-optimal outcomes, the use of direct financial incentives will be appropriate where they yield net benefits, and are the most effective measures available.

Direct financial support is likely to be more cost-effective than tax expenditures or subsidies where targeting is difficult, and it is necessary to ensure that the support is spent on the purpose for which it has been provided. A grant, concessional loan or equity investment allows every claim to be examined. Direct financial support is also appropriate in those circumstances where governments want to be certain about the budgetary impact of the programs.

The type and degree of assistance provided through direct financial support should depend on the extent to which benefits flow directly to the recipient. For example, the collection of marketing information, which is made available to all firms in an industry, might attract a higher level of assistance than would support for increasing the operational efficiency of a firm where the benefits are captured exclusively by the firm. Where firms can exclusively capture the benefits, the use of concessional loans or equity investments is more equitable than grants.

Where up front investment costs and risks are high, the use of grants or equity investments may be more appropriate than concessional loans. This is particularly the case where organisations have a low cash flow and little capacity to repay capital or interest.

Both the South Australian Cleaner Industries Demonstration Scheme (SACIDS) and the Victorian Cleaner Production Program use grantees as demonstration sites for other industry. Both states also currently provide no interest loans to industry for cleaner production.

Grants, concessional loans and equity investment each have different budgetary impacts. Loans and equity investments have lower budgetary impacts than grants, as capital and interest repayments are made on loans. Such considerations are important where governments are seeking to limit budget outlays. For example, extrapolating the grant funds used by the SACIDS scheme to Australia as a whole suggests that over $200 million would be required to provide grants to only 10,000 firms. Governments are not able to easily find such resources.

Although the financial sector will continue to have the principle role in providing funding support for firms investing in cleaner production, the availability of funds may be inadequate, and their cost too high, because the financial sector has little or no information on the actual default-loss level. In these circumstances, governments could increase the supply of investment funds by underwriting loans. This would lower the default-loss risk faced by the financial sector and lower the interest rates faced by firms.

Measures:
24a. Governments consider expanding the availability of low interest loan schemes to encourage SMEs to adopt cleaner production.
24b. Loan schemes 'revolve' the funds so that all interest payments are used to increase the pool of funds available for distribution.
25a. Governments work with the financial services sector to identify options for developing innovative financing strategies for cleaner production.

(IV) RISK ASSESSMENT IN THE INVESTMENT PROCESS

Objective:
26. To improve the information available to financial institutions, thus allowing environmental risk to be incorporated into decision-making.

Firms that practice cleaner production are likely to have a lower environmental risk[75] profile than their competitors. This provides an incentive for financial institutions, including insurance providers, to encourage cleaner production by their clients. With reduced emissions to air, water and land, reduced use of hazardous materials and increased efficiency, firms practising cleaner production are less likely to:

- contaminate land and thus be liable for remediation costs;
- breach environmental legislation, and thus face the risk of prosecution;
- be required to shut down operations;
- face worker's compensation claims for hazardous material related injuries; and
- face large 'end-of-pipe' environment expenditures when environmental emission standards are tightened.

To recognise this improved risk profile, financial institutions should provide cleaner production firms with reduced interest rates and insurance premiums *vis-a-vis* non-cleaner production practising competitors.

There is little evidence to suggest that cleaner production is taken into account as a normal part of risk assessment by financial institutions. However, it is apparent that there is a growing awareness in the financial sector of the potential of environmental risks to impact on investments. By 1993, in response to concerns about contaminated land, two thirds of banks had started taking into account contaminated land risks when lending.[76] Insurance companies too, are developing specific environmental liability insurance.[77]

Financial institutions can only evaluate risk if they have adequate information about an industry sector and/or an individual firm's environmental performance. Many of the information tools recommended in this document will directly assist financial institutions to evaluate industry environmental performance. The National Pollutant Inventory (NPI)[78] will further assist financial institutions in rating firms' environmental risk profile.

Measure:
26a. Governments to assist in the provision of aggregate environmental data to allow financial institutions to make adequate risk analyses of industry sectors.

The financial services sector possesses considerable capacity to influence industry and can thus play a critical role in achieving sustainable development. Through its lending and investment practices, this sector can ensure that environmental considerations are integrated into business decision-making, both in terms of liability management and the acceptance of environmental responsibility. It also has the potential to ensure that existing flows of capital are directed towards development projects that minimise potential environmental damage, and to direct capital specifically to sustainable development.

In both the United States and Europe, a significant trend is developing in the finance sector's approach to the environment. This trend can be seen as a change in attitude, from viewing environmental issues as negative (cost and risk avoidance) to positive (opportunity for gain), and a recognition of the link between environment and financial performance.

UNEP has worked with banks and insurers to draft the "UNEP Statement by Banks on Sustainable Development" and the "UNEP Statement of Environmental Commitment by the Insurance Industry" which sets out environmental principles for banks to follow. Westpac is currently the only Australian Bank to have signed.

Measures:
26b. ANZECC organise a Roundtable between governments and the financial services sector to foster a more active role for the sector in promoting environmental performance.
26c. Governments and the financial services sector identify the information needs of the sector, to allow it to take a more active role in encouraging cleaner production.

(v) Capacity of the Environment Management Industry

Objective:
27. To develop Australia's capacity to deliver cleaner production goods and services to domestic and international markets.

The global environmental market for environmental goods and services is estimated to be worth around US$300 billion per annum and is growing rapidly, with annual growth until the year 2000 being estimated at somewhere between 4 to 8 percent.[79] Australia's neighbouring Asian market is estimated to be worth $100 billion and growing at around 10 percent each year. The East and South-East Asia market alone is expected to grow to US$12 billion by 2000, with a 30-40 percent increase in the demand for water and wastewater technologies, and a 30 percent increase in the demand for environmental monitoring expertise.[80] These Asian markets currently show trade deficits with much of the equipment, technology and expertise being imported.[81]

The environmental goods and services sector has been targeted by APEC members as one of the first for trade liberalisation. The US, Canada, Japan and Chinese Taipei have proposed that trade in these products and services be liberalised early. Rapid economic growth in the Asian region is likely to place pressures on environments in these countries. It is therefore important that these economies have the best possible access to environmental and cleaner production goods and services.

Australia's environment industries currently have a gross annual turnover in the order of $3.5 billion, and employ over 120,000 people. The industry has a strong research base, extensive experience in designing, building and operating advanced environment management systems, particularly for tropical and arid regions. Australia is also internationally competitive in water treatment and wastewater technologies, and in a range of cleaner production technologies such as metals processing and clean coal technologies. In addition, renewable energy technology is an emerging area of expertise.

Australia would therefore appear well-placed to capitalise on the growing demand for environmental and cleaner production goods and services which is likely to emerge domestically and, particularly, in Asian markets as they grow rapidly and as barriers to trade decline.

However, there are some problems facing the industry in responding effectively to these emerging opportunities. The industry is highly fragmented and small firms dominate. While it has generally been able, with government support, to research and develop technologies, it would appear to have performed less well in commercialising this R&D. The skills and financial resources required to successfully

commercialise technologies and access markets, particularly export markets, appear to be scarce.

Measure:
27a. Governments work with the environment management industry to identify and address future international and domestic market challenges and opportunities.

APPENDIX 1 — SUMMARY CHART: MEASURES

ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOs
MEASURES:							
INFORMATION AND AWARENESS: ***Aim:*** **To increase the uptake of cleaner production by developing and providing comprehensive and targeted cleaner production information to industry, community, and government.**							
Objective: 1. To ensure that all sectors of industry and the community have access to the CP information they need.							
1a. Governments work with industry associations to provide targeted cleaner production information and awareness packages.	✓	✓	✓	✓			
1b. Government, industry and professional associations provide positive examples of cleaner production to the media, including regional media and industry newsletters, to raise general awareness in industry and the community.	✓	✓	✓	✓			
1c. Governments and industry develop and implement purchasing policies that promote cleaner production.	✓	✓	✓	✓			
1d. Governments encourage industry associations to provide chemical training for members on the particular chemicals and chemical substitutes used in their industry sector.	✓	✓	✓	✓			
1e. The Commonwealth Government investigate the feasibility of developing an internet database to provide information to firms and consumers on the substitutability of chemicals.	✓						
1f. The Commonwealth, in consultation with other Governments, industry and environmental organisations, establish a Central Clearing House for cleaner production information.	✓	✓	✓	✓			✓
ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOs
1g. State and Territory governments, tertiary institutions and industry		✓		✓		✓	

establish regional Centres for Cleaner Production with linkages to the Central Clearinghouse.							
Objective: 2. To demonstrate, using clear and relevant examples, that cleaner production results in measurable, environmental, social and economic benefits, within all industry sectors and sizes, and that cleaner production techniques are transferable between industry sectors.							
2a. Governments, Industry and the community support the establishment of sectoral cleaner production demonstration projects as a means of conveying the benefits of cleaner production.	✓	✓	✓	✓			✓
2b. The Commonwealth Government maintain, expand and promote the *EnviroNET Australia* Cleaner Production Case Studies Directory as a free source of cleaner production information.	✓						
2c. Governments and industry encourage the sharing of environmental innovations as a service to the community and as positive promotion for their industry sector.	✓	✓	✓	✓			
2d. Government and industry associations work together to develop sector based workshops and best practice manuals.	✓	✓	✓	✓			
Objective: 3. To assist the community to better understand the environmental impacts of industrial activity, and ways to reduce it.							
3a. Local governments organise local community/industry liaison committees to discuss cleaner production opportunities in their region.			✓	✓			
3b. Industry incorporate local and general community views in their environmental policies.			✓	✓			
Objective: 4. To recognise, reward and promote firms that have achieved superior environmental performance through the application of cleaner production.							
ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOs
4a. State, Territory and Local governments, industry associations and environment groups jointly develop award schemes for cleaner production.		✓	✓	✓			✓
4b. The Commonwealth sponsor an annual cleaner production award.	✓						

TOOLS FOR CLEANER PRODUCTION:

Aim:
To improve and develop management and analysis tools and systems for cleaner production, and promote their use by industry, government and the community.

Objectives:
5. To encourage industry and government and other organisations to examine and monitor their environmental performance and set targets for improvement, through the broad adoption and implementation of EMS.
6. To ensure that Australia plays a role in the development of international environment standards that may impact on Australian industry.

ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOS
5a. Governments adopt and promote EMS as a tool for managing their own environmental impacts.	✓	✓	✓				
5b. Industry associations develop model EMS to assist their members to adopt EMS.				✓			
5c. States and Territories consider the innovative role EMS can play in assisting regulation.		✓					
6a. The Commonwealth monitor, and where necessary, engage in international discussions on the development of further standards in the ISO 14000 Environment Management series.	✓						
Objective: 7. To develop effective management accounting systems which incorporate environmental costs into traditional business financial calculations.							
7a. Governments, in consultation with industry, work with the ASCPA to develop draft accounting standards which identify environmental costs.	✓	✓		✓	✓		
7b. Industry associations promote the use of environmental accounting to their members, and offer advice on its implementation and application.				✓			
7c. Government industry assistance programs, aimed at improving business efficiency, incorporate training for business on environmental accounting.	✓	✓					

Objectives:
8. To encourage organisations to examine and monitor their environmental performance and set targets for improvement, and to provide the community with a thorough and accurate account of their environmental performance and goals.

9. To encourage the financial sector to consider public environmental reports in assessing investment risks.

8a. Governments work with appropriate non-government organisations (NGOs), such as accounting associations, industry associations and environment groups, to develop award schemes for public environmental reporting.	✓	✓	✓	✓	✓		✓
8b. Government agencies produce public environmental reports relating to their activities.	✓	✓	✓				
8c. ANZECC consider developing ANZECC Guidelines for Public Environmental Reporting.	✓	✓					
8d. State and Territory governments examine their relevant environmental legislation to ensure that firms are not discouraged from undertaking public environmental reporting through the threat of prosecution.		✓					
8e. Governments encourage industry associations to produce annual reports of their sector's overall environmental performance.	✓	✓	✓				
9a. Governments, industry and the financial services sector, including the Australian stock exchange, determine how public environmental reporting can be used as a risk assessment resource for financial activities.	✓	✓	✓	✓	✓		✓
9b. Governments encourage the financial services sector to use public environmental reporting as a risk assessment mechanism, and reflect that assessment in their financial activities with industry.	✓	✓	✓	✓			
ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOS
Objective: 10. To assist consumers, to make environmentally responsible product choices, by informing them of the environmental impacts of products and providing a standardised means of comparing products.							
10a. The Commonwealth maintain its involvement in the development of ISO 14023, in conjunction government, industry and the community.	✓						
10b. Governments and industry identify other products that could participate in the Energy Star programs.	✓	✓		✓			
Objective: 11. To identify and minimise all the environmental impacts associated with a product, production process or service throughout its lifecycle.							
11a. Commonwealth, State and Territory governments further support	✓	✓					

the development of LCA.							
Objective: 12. To ensure cleaner production training is available, relevant and consistent across all sectors and levels of industry, for all levels of staff.							
12a. Training providers work with industry and professional associations to incorporate cleaner production training into academic, professional and vocational courses.				✓		✓	
12b. Governments encourage industry associations to work with environment groups and other interested organisations to conduct workshops and seminars for business managers.	✓	✓		✓			✓
12c. Training providers cater for the need for on-site, cost effective training of cleaner production.				✓		✓	
12d. Training providers consider the different needs of small and large industry when designing cleaner production courses.				✓		✓	
12e. Industry associations, local governments, unions, and, where appropriate, State and Territory governments, facilitate cleaner production training for SMEs.		✓	✓	✓			
ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOS
Objective: 13. To develop adequate data sets that allow measurement of this framework's success in increasing the adoption of cleaner production, and to develop baselines for cleaner production practice in industry, by which industry can measure its own performance and improvement							
13a. Industry associations encourage members to collect environmental data on their performance, and make this information publicly available.				✓			
13b. Government agencies collect data on their environmental performance and make this information publicly available.	✓	✓	✓				
13c. ANZECC, through the ANZECC State of Environment Reporting Taskforce, ensure that suitable cleaner production indicators are developed for State of the Environment Reporting.	✓	✓					
13d. The Australian Bureau of Statistics develop a methodology for measuring cleaner production by industry, and collect and publish more detailed information on implementation of cleaner production	✓						

by industry.							
13e. The Australian Bureau of Statistics undertake a survey of the Australian environment industry to provide benchmarks of the supply of cleaner production technologies to industry.	✓						
Objective 14. To encourage the development of performance based contracting to assist firms to adopt cleaner production.							
14a. Governments and industry associations encourage industry to use PBC for implementing cleaner production	✓	✓	✓	✓			
Objective 15. To encourage product manufacturers to redesign products to reduce their environmental impact.							
15a. Governments provide support for further research and promotion of eco-design principles to manufacturers.	✓	✓	✓				

ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOs
REGULATION AND SELF-REGULATION: *Aims:* *- To ensure that regulation is performance based, fosters industry responsibility for environmental impacts, targets continuous environmental improvement, and encourages the adoption of cleaner production rather than end-of-pipe solutions.* *- To ensure that regulatory mechanisms recognise the important role of industry self-regulation and voluntary measures, involve industry in developing solutions to environmental problems, and foster industry responsibility for environmental impacts.*							
Objective: 16. To maximise the potential environmental and economic benefits of cleaner production for industry, by ensuring that cleaner production principles and practices are incorporated at the very beginning of production planning and processes.							
16a. State and Local governments review land-use and zoning laws to allow for development of 'symbiotic' industrial areas with complementary by-products.		✓	✓				
16b. Governments include the consideration of cleaner production principles in guidance documents for development proposals and environmental impact assessment requirements.		✓	✓				
Objective: 17. To develop regulatory systems that provide mechanisms for reducing the environmental impact of inputs and that take cleaner production principles into account.							

17a Governments when formulating and reviewing relevant legislation incorporate cleaner production principles within the objectives and guiding principles of the legislation.	✓	✓	✓				
Objective: 18. To make licensing schemes more strongly performance based and incorporate the 'polluter-pays' principle to ensure that they encourage and support the application of cleaner production principles.							
18a. Governments implement load-based licensing schemes to encourage industry to improve its environmental performance beyond regulated requirements.	✓	✓	✓				

ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOS
18b. Governments develop facility-wide licences or permits, covering multiple activities or sites, to encourage companies to consider environment management as an integral part of production.	✓	✓	✓				
18c. State and Territory and where appropriate, Local governments develop licensing systems that acknowledge strong performance with decreased regulation.	✓	✓	✓				
Objective: 19. To encourage industry to take responsibility for minimising its environmental impacts, and devise appropriate and relevant environmental strategies, through self-regulation.							
19a. Governments and industry work with the community to develop 'good neighbour' agreements.		✓	✓	✓			
19b. Industry associations encourage members to participate in voluntary agreements.				✓			✓
19c. Governments work with industry associations to develop voluntary environmental agreements.	✓	✓		✓			
19d. Governments work with and encourage industry associations to develop and promote codes of practice and best practice guidelines.	✓	✓		✓			
19e. Governments encourage industry associations to develop environmental accreditation schemes to encourage continuous environmental improvement from their members and to raise the profile and image of their sector.	✓	✓		✓			

STRENGTHENING THE MARKET:

Aim:
To strengthen the market by eliminating or compensating for market-distorting practices.

Objectives:
20. To eliminate subsidies that encourage resource waste.
21. To provide targeted support to firms for cleaner production implementation.

20a. Governments assess the effectiveness and benefits of subsidies at the time of their review and remove inappropriate ones.	✓	✓	✓				
ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOs
20b. Governments ensure that subsidies, that are considered effective and of a wide benefit are transparent.	✓	✓	✓				
21a. Governments identify opportunities where provision of assistance will encourage cleaner production, for example, by establishing markets for materials which previously were discarded as waste and promoting development and trials of environmentally efficient technologies.	✓	✓					
Objective: 22. To modify tax regimes to compensate for market distortions which act as disincentives to cleaner production.							
22a. Governments investigate the potential for eco-taxes to improve the adoption of cleaner production.	✓	✓					
22b. Governments consider apply eco-taxes where appropriate.	✓	✓	✓				
22c. Regulators of utilities ensure that pricing mechanisms reflect 'full-cost' of service provision and resource use.		✓	✓				
22d. Local governments explore opportunities for applying charges for services that consume environmental resources.			✓				
22e. The Commonwealth promote the use of existing depreciation allowances and tax deductions to increase investment in environmental technologies.	✓						
Objective: 23. To minimise the up-front costs to firms of investing in cleaner production.							
23a. Governments should consider when providing funds for assessments they could improve effectiveness of assessments by identifying priority	✓	✓					

sectors for expenditure.							
23b. Where Governments contribute to Environmental assessments they should consider innovative financing schemes including revolving loans.	✓	✓					
ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOS
23c. Industry associations consider advising members of applicable environmental technologies and processes.				✓			
23d. The Commonwealth Government to provide information about environmental technologies through EnviroNET Australia.	✓						
Objectives: 24. To accelerate the adoption of cleaner production by SMEs through the use of financial incentives. 25. To encourage the financial services sector to take an active role in encouraging cleaner production.							
24a. Governments consider expanding the availability of low interest loan schemes to encourage SMEs to adopt cleaner production.	✓	✓	✓				
24b. Loan schemes 'revolve' the funds so that all interest payments are used to increase the pool of funds available for distribution.		✓					
25a. Governments work with the financial services sector to identify options for developing innovative financing strategies for CP.	✓	✓			✓		
Objective: 26. To improve the information available to financial institutions, thus allowing environmental risk to be incorporated into decision-making.							
26a. Governments to assist in the provision of aggregate environmental data to allow financial institutions to make adequate risk analyses of industry sectors.	✓	✓			✓		
24b. ANZECC organise a Roundtable of government and the financial services sector to foster a more active role for the sector in promoting environmental performance.	✓	✓			✓		
26c. Governments and the financial services sector identify the information needs of the sector, to allow it to take a more active role in encouraging CP..	✓	✓			✓		
Objective: 27. To develop Australia's capacity to deliver cleaner production goods and services to domestic and international markets.							

ORGANISATION:	GOVERNMENT			NON-GOVERNMENT			
	C'WEALTH	STATE & TERRITORY	LOCAL	INDUSTRY	FINANCE SECTOR	EDUCATION SECTOR	ENVIRONMENT NGOS
27a. Governments work with the environment management industry to identify and address future international and domestic market challenges and opportunities.	✓	✓		✓			

APPENDIX 2 — TERMS OF REFERENCE

Towards Sustainability — Achieving Cleaner Production in Australia addresses the ANZECC Terms of Reference for the framework:

(a) Benchmark the current state of adoption of cleaner production by industry;

(b) Identify the barriers to its adoption;

(c) Assess the efficacy of measures being adopted or trialed in Australia to encourage cleaner production;

(d) Review international experience;

(e) Propose measures for adoption by ANZECC to facilitate the 'mainstreaming' of cleaner production; and

(f) In devising these measures, consideration should include but not be limited to:

- voluntary agreements;
- the role of regulatory systems;
- incentives;
- information, publicity and award schemes; and
- the influence of world best practice in achieving industry competitiveness.

APPENDIX 3 — CP POLICY INSTRUMENTS IN THE EUROPEAN UNION & UNITED STATES

Cleaner production policy instruments in the European Union & United States

Legislation	NL	DK	SP	UK	FR	BE	GR	IT	EI	USA
Approval scheme including cleaner production	✓	✓	✧	✓	✧	✧	✧	✧	✦	✓
Voluntary agreements	✓	✓	✧	✧	✧	✧	✧	✧	✧	✓
Financial instruments										
Tax, duties and fees	✓	✓	✧	✧	✓	✦	✧	✧	✧	✓
Grants and subsidies	✓	✓	✓	✓	✓	✓	✓	✦	✧	✓
Information and education										
Demonstration projects & processes	✓	✓	✧	✓	✦	✓	✧	✧	✧	✓
Demonstration projects & products	✓	✓	✧	✧	✧	✓	✧	✧	✧	✧
Consultant support	✓	✓	✓	✓	✓	✓	✧	✓	✓	✓
Centres of expertise	✓	✧	✧	✓	✧	✓	✧	✓	✓	✓
Newsletters	✓	✓	✧	✓	✧	✓	✧	✧	✓	✓
General manuals	✓	✓	✦	✓	✧	✓	✧	✧	✧	✓
Industry specific manuals	✓	✓	✧	✦	✧	✧	✧	✧	✧	✓
Databases	✓	✓	✓	✓	✓	✓	✧	✧	✧	✓
Videos	✓	✓	✧	✧	✧	✧	✧	✧	✧	✓
Conferences and seminars	✓	✓	✧	✧	✧	✓	✧	✧	✓	✓
R&D programs	✓	✓	✧	✧	✧	✓	✓	✓	✓	✓

Source: "Government Strategies and Policies for Cleaner Production", UNEP, 1994

✓ Yes ✦ Under preparation ✧ No activities or no information

NL - Netherlands DK - Denmark SP - Spain UK - United Kingdom
FR - France BE - Belgium GR - Greece IT - Italy
EI - Ireland USA - United States of America

APPENDIX 4 — ACRONYMS USED IN THE TEXT

ACCA	Association of Chartered Certified Accountants (UK)
ACCP	Australian Centre for Cleaner Production
ACF	Australian Conservation Foundation
ACTEW	Australian Capital Territory Electricity and Water (Corporation)
ALGA	Australian Local Governments Association
ANZECC	Australian and New Zealand Environment Conservation Council
ANZMEC	Australia and New Zealand Minerals and Energy Council
APEC	Asia-Pacific Economic Cooperation
APEC VC	Asia-Pacific Economic Cooperation Virtual Centre (for environmental technology exchange)
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
ASCPA	Australian Society of Certified Practicing Accountants
ATO	Australian Tax Office
AWWA	Australian Water and Wastewater Association
BCC	Brisbane City Council
BP	Best practice
BEP	Best environmental practice
BAT	Best available technology
BAU	Business-as-usual
CEO	Chief Executive Officer
CFC	Chloroflurocarbon
CFO	Chief Financial Officer
CLC	Community Liaison Committee
COAG	Council of Australian Governments
CP	Cleaner Production
CPA	Certified Practising Accountant
DEETYA	Department of Employment, Education, Training and Youth Affairs (Federal)
DEST	Department of Environment, Sport and Territories (Federal)
EA	Environment Australia
EIDN	Environment Industries Development Network
EIP	Environment Improvement Plan
EMIAA	Environment Management Industry Association of Australia
EMP	Environment Management Program (or Plan)
EMS	Environment Management System
EPA	Environment Protection Agency (or Authority)
EPP	Environment Protection Policy
ESD	Ecologically Sustainable Development
FCCC	Framework Convention on Climate Change (UN)
GC	Greenhouse Challenge
GDP	Gross Domestic Product
GIS	Geographic Information System
HCFC	Hydrochloroflurocarbons
HEC	Holden's Engine Company
HFC	Hydroflurocarbon
HS&E	Health, Safety and Environment
ICPIC	International Cleaner Production Information Clearinghouse
ISO	International Organisation for Standardisation
JAS-ANZ	Joint Accreditation System for Australia and New Zealand
LCA	Life Cycle Assessment (Analysis)
LCI	Life Cycle Inventory
MEPS	Minimum Energy Performance Standards
NCPDP	National Cleaner Production Demonstration Project

NGO	Non-government organisation
NGS	National Greenhouse Strategy
NSESD	National Strategy for Ecologically Sustainable Development
NWQMS	National Water Quality Management Strategy
ODP	Ozone Depleting Potential
OECD	Organisation for Economic Cooperation and Development
LCA	Life cycle assessment
NPI	National Pollutant Inventory
PACIA	Plastics and Chemicals Industries Association
PIM	Printing Industry of Minnesota
PIMESC	Printing Industry of Minnesota Environmental Services Corporation
R&D	Research and development
RMIT	Royal Melbourne Institute of Technology (University)
SACIDS	South Australian Cleaner Industry Demonstration Scheme
SEDA	Sustainable Energy Development Authority
SME(s)	Small to medium enterprise(s)
TAFE	Technical and Further Education (Colleges)
TCSD	Technology Case Studies Directory (*EnviroNET Australia*)
UN	United Nations
UNEP	United Nations Environment Program
UNCED	United Nations Conference on Economic Development
UNIDO	United Nations Industrial Development Organisation
VECS	Vapour Emission Control System
WBCSD	World Business Council for Sustainable Development
WMC	Western Mining Corporation Ltd

APPENDIX 5 — MEMBERSHIP OF THE ANZECC CLEANER PRODUCTION TASKFORCE

Di Gayler (Chair)	Environment Australia (Jan - May 1997)
Kay Abel (Chair)	Environment Australia (From June 1997 - October 1997)
Mark Tucker (Chair)	Environment Australia (From November 1997)
Ian Booth	Australian Chamber of Commerce and Industry
Dr John Cole	Environment Management Industry Association of Australia
Drew Collins	NSW Environment Protection Authority
Jim Clements	VIC Environment Protection Authority
Darryl Cook	TAS Department of Environment and Land Management
Ron Davison	Royal Melbourne Institute of Technology
Di Dibley	Australian Conservation Foundation
Andrew Doig	Australian Chamber of Manufactures (Alternate)
Stefan Frodsham	WA Department of Environmental Protection
Tony Hodgson	ACT Department of Urban Services
Tor Hundloe	QLD Cleaner Production Taskforce
Grant Kellam	Australian Conservation Foundation (Alternate)
Martin Mills	Business Council of Australia
Allan McLay	Royal Melbourne Institute of Technology (Alternate)
David Miles	QLD Department of Environment
Heather Neil	Australian Local Government Association (From May 1997)
John Newton	Australian Chamber of Manufactures (From May 1997)
Craig Pennifold	C'wealth Dept of Industry, Science and Tourism (From May 1997)
Alistair Pilbeam	QLD Department of Environment (Alternate)
Tim Phillips	NT Department of Lands, Planning and Environment (Corresponding member)
Liz Quinlan	NSW Environment Protection Authority (Alternate)
Graham Rodgers	University of Canberra
Anita Roper	Australian Chamber of Manufactures (Jan - Apr 1997)
Matt Ruchel	Greenpeace Australia Ltd
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APPENDIX 6 — PUBLIC SUBMISSIONS

Public submissions were received from:
Adrienne Bailey, Waste Boards of NSW (Southern Sydney), Botany, NSW
Jo Barker, Curtin University, WA
David Bell, Pacific Power, Sydney, NSW
Linda Botterill, MTIA, Canberra, ACT
Sue Brand, Central TAFE, Leederville, WA
Drew Collins, Environment Protection Authority, Chatswood, NSW
Robert Davies, Tasmania Development and Resources, Hobart, Tas
Alan Deeney, Dames and Moore Pty Ltd, Melbourne, Vic
Ian Fraser, Consil Global Environment Group, Coburg, Vic
Bob Fung, Fungs Business Services, Eastwood, NSW
David Gathercole, Randwick City Council, Randwick, NSW
Tonya Giobbi, Brisbane City Council, Brisbane, Qld
Anthony Gurr, Matrec Recylers, Nurrioopta, SA
Jim Horne, Hervey Bay City Council, Hervey Bay, Qld
Michael Howes, Ecopolitics Association of Australasia, Bathurst, NSW
Tony Lamond, Business Planning Group, Canberra, ACT
Tony Laws, Water and Rivers Commission, East Perth, WA
Ian Lewis, Department of Tourism, Small Business & Industry, Brisbane, Qld
Greg Longmur, Inner Sydney Waste Planning and Management Board, Sydney, NSW
Ronald McCullough, Mt Isa City Council, Qld
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John Martin, Australian Chamber of Commerce and Industry, Canberra, ACT
Rebecca Mather, Redland Shire Council, Cleveland, Qld
Henry Maustrauser, Nonrev Pty Ltd, Melbourne, Vic
Frank Miller, Friends of the Earth, Sydney, NSW
Agnes Misztal, Belmont, WA
Carol O'Donnell, Sydney, NSW
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Keith Richmond, ACTEW Corporation Ltd, Canberra, ACT
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Matt Ruchel, Greenpeace Australia Ltd, Melbourne, Vic
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Marisa Sebastiano, Highbury, SA
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Leesa Swan, Futureworld Pty Ltd, Wollongong East, NSW
Fernando Tamariz, Mexico
Rob Thomas, Environment Protection Authority, Adelaide, SA
Tom Tolhurst, Department of Environment, Brisbane, Qld
Koenraad Van Landeghem, Calwell, ACT
Alan Viney, Australian Technology Export Pty Ltd, French's Forest, NSW
Harley Wright, Kimberly Clark Australia Pty Ltd, Milson's Point, NSW

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