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COMMISSION

ENVIRONMENTAL WASTE MANAGEMENT EQUIPMENT, SYSTEMS AND SERVICES

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17 September 1993

Honourable George Gear MP
Assistant Treasurer
Parliament House
CANBERRA ACT 2600

Dear Assistant Treasurer

In accordance with Section 7 of the *Industry Commission Act 1989*, we have pleasure in submitting to you the report on Environmental Waste Management Equipment, Systems and Services.

Yours sincerely

Tor Hundloe
Presiding Commissioner

John Ware
Associate Commissioner

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ABBREVIATIONS

Main abbreviations used in this report are listed below:

ABS	Australian Bureau of Statistics
ADB	Asian Development Bank
AIDAB	Australian International Development Assistance Bureau
AMTG	Advanced Manufacturing Technology Grants Scheme
ANZECC	Australia-New Zealand Environment and Conservation Council
AUSTEMEX	Australian Environment Management Export Corporation
AUSTRADE	Australian Trade Commission
AWWA	Australia Water & Wastewater Association
CEPA	Commonwealth Environment Protection Agency
CRC	Co-operative Research Centre
CSIRO	Commonwealth Scienfific and Industrial Research Organisation
DIFF	Development Import and Finance Facility
EFIC	Export Finance and Insurance Corporation
EMIAA	Environment Management Industry Association of Australia
ESD	Ecologically Sustainable Development
ETPC	Environmental Technology Commercialisation Program
EWMESS	Environmental Waste Management Equipment, Systems and Services
GIRD	Grants for Industry Research and Development
IC	Industry Commission
IGAE	Intergovernmental Agreement on the Environment
NEPA	National Environmental Protection Avency
NIES	National Industry Extension Service
NPDP	National Procurement Development Program
OECD	Organisation for Economic Co-operation and Development
PDF	Pooled Development Fund
R&D	Research and Development
RRA	Registered Research Agency
SOE	State of the Environment
WSD	Water, Sewerage and Drainage

TERMS OF REFERENCE

I, JOHN SYDNEY DAWKINS, under section 7 of the Industry Commission Act 1989:

1. refer, as an Industry Development Reference, the production of environmental waste management equipment, systems and services for inquiry and report within twelve months of receiving this reference:

2. specify that in making its recommendations the Commission aim to improve the overall economic performance of the Australian economy:

3. request that the Commission report on:

   (a) emerging trends in local and global markets for the industry;

   (b) the current structure and competitiveness of the industry (including cost structure and potential cost savings);

   (c) the potential for further development of the industry - including strengths and weaknesses, export potential and import replacement potential - and the time frame for likely development under current circumstances;

   (d) any measures which could be undertaken to remove impediments or overcome constraints to the efficiency, growth or export development of the industry, in ways that are consistent with the principles of ecologically sustainable development and efficient resources use in the economy (covering such issues as regulation, market structure, workforce skill, property rights, or economic, budgetary, industrial, environmental, technology, social, or other factors); and

   (e) the effects on the industry, and the economy in general, of any measures recommended by the Commission;

4. request that, where appropriate and without disclosing material provided in confidence, the Commission report on examples of past success and failure in the industry, both in Australia and elsewhere, by way of case study or other means;

5. request that the Commission quantify the extent of any assistance provided to the industry, identify if it is offered in a discriminatory manner within the industry and report on ways in which:

   (a) that assistance could be better used to promote the long term development of the industry and economy; and

   (b) the costs of adjusting to lower levels of assistance can be minimised; and

6. specify that the Commission have regard to the established economic, social and environmental objectives of governments.

JOHN DAWKINS

18 September 1992

OVERVIEW

This report is about the growth prospects of the Australian environmental waste management industry. It is about its potential in Australia and as an export industry.

The environmental waste management equipment, systems and services (EWMESS) industry includes firms and individuals producing goods and services which reduce the production of solid, liquid and gaseous wastes or dispose of wastes. This encompasses an extremely diverse array of activities ranging from the development of highly sophisticated waste monitoring technologies, to the production of basic equipment (eg plastic garbage bins), to the provision of services such as those provided by landfill operators and consultancy firms.

The heterogeneous nature of the industry has significant implications for this inquiry. First, it reduces the amount and consistency of data available on the industry and its markets and, second, it severely constrains the Commission's capacity to comment meaningfully on the industry's general characteristics and impediments to growth. The diversity also makes it difficult to respond to specific issues raised by the reference (eg identifying the industry's strengths and weaknesses) and to formulate policy proposals which are applicable to all segments of the EWMESS industry.

How significant is the EWMESS industry and its markets?

At the global level, it is a large industry. It is growing rapidly and strong growth in demand is anticipated for the remainder of the decade.

The practical ability to manage wastes comes, in part, from the ability to generate a surplus from everyday economic activity. In other words, there is a very strong correlation between a country's level of income and its expenditure on waste management. This means that the rapidly developing countries — a number of which are close neighbours to Australia — must present opportunities for the Australian industry. In many of those countries, governments are only now starting to tackle the major environmental problems created by rapid population growth, industrialisation and urbanisation of recent years.

The world market is at least $A280 billion per annum. Some assessments put it considerably higher. This implies that the international EWMESS industry is similar in size to the world plastics industry and the world aerospace industry, and approaching half that of the world chemicals industry.

At present the Australian market represents about 1 per cent of world demand, with the lowest estimate being about $A2.8 billion per annum.

What are the emerging trends?

Using the most conservative estimate, the average annual growth rate for the global market to the year 2000 is 5.5 per cent. This means that from 1990 to 2000 the market will have increased by 50 per cent. Other studies suggest a higher rate of growth, with the market virtually doubling in that period.

The OECD forecasts that the average annual growth rate of the Australian market will be 4.4 per cent to the year 2000. This is marginally lower than the world average.

Strong growth in demand is forecast in a number of rapidly advancing developing countries — including some south east Asian nations. This will provide opportunities for the Australian industry.

Which segments are growing fastest?

Growth rates for the various market segments will vary. While strong growth is anticipated in all major industry sectors, world demand for general environmental services (eg engineering and general consultancy services) is expected to increase most rapidly (over 7 per cent annually).

Actual market demand cannot be correlated to the *need* to address environmental matters. However, two indicators point to major problem areas relating to human health and affecting economic productivity where the focus and market potential will be for a long time. These indicators are access to safe drinking water and sanitation. Of a world population of 5.3 billion in 1991 — of which 4.2 billion were in developing countries — 1.3 billion were without access to safe drinking water and 2 billion were without access to sanitation.

In the industrialised countries and more advanced developing nations, it is possible to generalise and predict that: demand for site remediation and hazardous waste treatment will grow relatively strongly until existing problems have been solved; spending on cleaner production technologies will grow at an increasing rate well into the next century; and demand for water and effluent treatment and air pollution control equipment will grow more slowly (due to the fact that in many countries these sectors are already well developed).

Are local EWMESS firms competitive?

Many of Australia's strengths in the EWMESS industry are linked to its internationally competitive agricultural, mining and tourism sectors — areas where the local industry has particular expertise relevant to Asian countries — or areas where there are opportunities for firms to take advantage of Australia's scientific skills and relatively low engineering and consultancy costs.

The local industry is competitive in at least four distinct segments of the EWMESS market:

- rehabilitation/remediation of mining and industrial sites;
- waste water and sewage treatment;
- monitoring and sensing equipment; and
- environmental consultancy services.

Australian consultants have been particularly successful in the Asian market. By and large, they have achieved this by marketing their relatively low-cost but highly-regarded technical skills and making the effort to understand the local problems, culture and business environment. Their success has been achieved in a highly competitive market and with limited assistance.

Maintenance of these advantages and the development of others in existing and emerging markets will depend in large measure on: the industry's success in identifying market opportunities; its ability to contain costs and meet the price, quality and service requirements of domestic and overseas customers; its success in demonstrating its capabilities to those customers; and, for export sales, its willingness to meet the specific economic, environmental and cultural demands of the rapidly growing Asian market.

The optimal strategy for Australian firms will vary depending on the circumstances of individual firms. There is no doubting the technical ability and motivation of most people in this industry. For some, the difficulties are in taking a good idea or an invention through to the commercialisation stage. Joint ventures or other collaborative arrangements may overcome some of these difficulties. Some firms with world class products or services have difficulty gaining entry into foreign markets. This could be because they are too small — again, joint venturing is a solution some have used successfully. Alternatively, greater emphasis may need to be placed on developing marketing strategies which explicitly recognise the needs of foreign customers and established business practices in other countries.

What should Australian governments do?

Governments at all levels in Australia have a pervasive impact on the fortunes of the local EWMESS industry. Government environmental policy instruments and enforcement procedures, while targeted at the achievement of environmental objectives, also have significant repercussions on demand for waste management equipment, systems and services (eg more stringent environmental regulations will generally stimulate demand). Governments are also a major purchaser of the industry's products and services. Consequently, future growth will be partly contingent on actions by governments in meeting environmental objectives and in ensuring that other government policies (eg procurement policies) and functions (eg the operation of regulatory authorities) are efficiently based. In particular, governments need to:

Meet environmental objectives more efficiently by:

- continuing to rationalise government agencies responsible for environmental functions;
- continuing to rationalise government environmental controls to reduce the complexity and overlaps which currently exist;
- placing greater reliance on outcome-oriented regulations;
- using economic instruments where practical to achieve environmental objectives; and
- paying greater attention to effective monitoring and enforcement.

Promote the more efficient operation and use of landfills by:

- requiring publicly owned landfill operations to fully recover all costs;
- introducing charges based upon usage; and
- examining the potential for reducing costs through amalgamating small, local waste management landfill services.

Facilitate participation in government tenders by:

- requiring that details of successful tenderers be made publicly available;
- using, wherever possible, tender documents which specify requirements in terms of performance;
- improving the skills of employees engaged in government tendering processes; and
- requiring all public agencies to base assessments on whole-of-life costing rather than just tender prices.

Facilitate the access to capital by waste management firms by:

- clarifying lenders' liability for environmental damage.

Consider the efficacy of improving coordination between industry and government by:

- establishing an Environment Industries Council.

Details of the specific findings and recommendations are outlined below.

FINDINGS AND RECOMMENDATIONS

1. The parties to the Intergovernmental Agreement on the Environment should establish and adhere to a detailed timetable for implementing the specific processes and measures set out in the Agreement (Section 6.2).

2. Environmental standards should be developed on a case-by-case basis. In developing standards, governments and regulators should assess the costs and benefits of different standards in light of the characteristics of particular regions (Section 6.3).

3. Where regulation is appropriate, greater reliance should be placed on outcome-oriented regulations (Section 6.4).

4. Governments should direct environmental agencies to collect and publish information on monitoring and enforcement programs. This could be done as part of the process of producing State of the Environment reports. The information should be collected on a uniform basis, both within and between states (Section 6.5).

5. Poorly structured charges for solid waste disposal at public landfills and low levels of cost recovery have adverse efficiency and equity implications for the wider community (Section 7.1).

6. Public authorities operating landfill services should examine the case for implementing charging structures linked to use of those services (Section 7.1).

7. Local councils and waste management authorities should pursue full cost recovery on the provision of their waste disposal to landfill services including, where possible, environmental damage costs and a commercial rate of return on the community's investment in those assets. Changes in pricing practices should be phased in (Section 7.1).

8. Governments should examine the cost savings available through greater regionalisation of their waste management and landfill activities (Section 7.1).

9. All public agencies subject to government tendering requirements should be required to notify details of successful tenderers (including the bid price) in the print media, soon after the signing of contracts (Section 8.1).

10. All public agencies should specify in their tender documents the required performance (or outcome) of the equipment, system or services to be supplied, rather than particular processes and/or technologies (Section 8.1).

11. All public authorities should adopt whole-of-life costing for major capital equipment purchases (Section 8.1).

12. It is important that government and industry cooperate to clarify lenders' liability. Until this occurs, EWMESS firms (and others) which engage in environmentally sensitive activities may be restricted in their access to capital (Section 10.1).

13. With the exception of lenders' liability and difficulties that financial institutions may experience in assessing risks associated with new technologies, there is little evidence to suggest that EWMESS firms experience greater difficulties in gaining access to capital than small businesses elsewhere in the economy (Section 10.3).

14. While initiatives currently in train will help redress existing information deficiencies, there is a need for the industry and the Australian Bureau of Statistics to collaborate to improve the availability of relevant data about both the industry and its products (Section 12.3).

15. If it is decided to form an Environment Industries Council, the likelihood of its success would be enhanced if: membership is related to the functions of the Council and restricted in size; non-ministerial membership is based on expertise, not organisational affiliation; Council members are appointed for a set period; government funding is limited to that needed to finance the immediate operations of the Council and its secretariat; the Council has a sunset clause whereby, after three years of operations, it is subject to an independent review of its effectiveness, including an assessment of whether an industry/government Council is still the best way to achieve future objectives; and the Council reports publicly on its activities by submitting an annual report to Parliament (Section 13.3).

16. It is not possible to quantify the level of assistance provided to the industry. However, there are some disparities in the assistance provided to locally produced goods and services, and also between the assistance provided to goods sold domestically and those exported. The current program of phased tariff reductions will substantially reduce these disparities. The five-year period over which reductions are occurring should minimise the costs of adjusting to lower levels of assistance (Appendix F).

1 THE INQUIRY

Proper management of society's waste products is essential for economic, health and environmental reasons.

To meet increasing community demands for a cleaner environment, governments in Australia and overseas have introduced more stringent regulations covering the disposal of waste products. As a result, firms, government bodies and individuals are increasingly looking to reduce waste through the adoption of cleaner technology or recycling.

Against this background, the waste management industry has been identified both internationally and within Australia as having significant growth prospects for the 1990s and beyond.

The aim of this inquiry is to explore growth opportunities for the Australian waste management industry in both domestic and overseas markets and to identify impediments which may prevent those opportunities being realised. The terms of reference for the inquiry are set out in the box at the front of this report.

The inquiry is one of the first of the Commission's industry development inquiries. In this new type of inquiry, the Commission will be focussing on specific industries where, prima facie, Australia should be competitive. The Treasurer has said that these inquiries are designed to allow the Commission to make a "positive contribution to industry development in a low tariff environment" (Dawkins 1992).

1.1 Scope of the inquiry

The reference defines the scope of the inquiry in terms of "the production of environmental waste management equipment, systems and services" (EWMESS). This raises two definitional questions. First, what is the meaning of the term 'waste' and, second, what activities fall within the scope of the reference?

Most people in Australia have a personal view of what waste is, and that view is probably not at odds with the dictionary definition, for example "refuse", "no longer serving a purpose", "left over after use", "spoiled", "valueless", "useless by-products of manufacture or of physiological process" (selected from the Concise Oxford Dictionary, Seventh Edition, 1982). However, for the purposes of this inquiry, waste is probably more accurately defined by reference to what is termed "residual material" in proposed new waste management legislation in

Germany. Residual material is deemed to be all substances which arise in production plants where the principle objective is not to manufacture these substances. As residual material also includes all products at the end of their useful life, it can also be interpreted to include household (final consumption) waste. It also encompasses those materials which can be recycled or reused.

This definition of waste has implications for determining the scope of global markets. For example, what is considered valueless or residual material in a modern industrialised society is not necessarily thought of in those terms in an undeveloped society, where cultural and economic imperatives are different.

Nonetheless, this definition makes the task at hand more manageable than if waste minimisation per se was the prime focus. Everyone attempts to minimise waste — business firms may focus, for example, on minimising energy and fuel use; households might target heating and water use, or the amount of perishable food purchased each week. However, to also consider products and services which address these "conservation" goals would broaden the inquiry so that it touched upon virtually all aspects of human behaviour and endeavour.

It needs to be recognised that the definition adopted by the Commission does not correspond closely with the focus of the membership of the major industry association involved in the inquiry — the Environmental Management Industry Association of Australia (EMIAA). The EMIAA views its membership as encompassing firms and individuals providing solutions to all "adverse changes to the environment that may be brought about by human activity". Only some of these environmental activities — those relating to waste management — are considered in this report. Consequently, environmental equipment, systems and services relating to matters such as the management of national parks and soil degradation are beyond the scope of this report.

A related question arises as to whether the inquiry should cover the activities of users, as well as the providers of waste management equipment, systems and services. The answer is not clear-cut — it appears sensible to include some types of users, but to exclude others. For example, there is a strong case for including those parts of the water and waste water industry which are engaged in water treatment because, while they are users of waste management equipment, they also perform waste management functions (eg removing pollutants from water). On the other hand, some users — for example, building constructors who dispose of waste materials in landfill facilities — do not act in this dual capacity and it would not, therefore, seem sensible for them to be included in the activities covered by the reference. Of course, landfill operators who collect and/or dispose of waste are included.

The very nature of the 'industry' causes problems in its own right. Typically, an industry is characterised as having broadly similar production processes and

fairly homogeneous outputs. However, in the case of the EWMESS industry, the processes employed are extremely diverse, as are the goods and services produced. Consequently, under the current statistical convention, production of environmental waste management equipment, systems and services is subsumed under a wide variety of industry classifications which cover industries mainly engaged in such diverse activities as engineering, construction, design, scientific instrumentation and consultancy services. The one common factor is the purpose for which the outputs are used (ie to manage waste).

These difficulties associated with the definition of the EWMESS industry result in two significant problems. First, they limit the amount and consistency of data available on the industry and its markets, and consequently the Commission's capacity to comment meaningfully on certain matters relevant to the industry (eg the current structure, growth trends and patterns of production and trade). Second, and perhaps more importantly, the amphorous nature of the industry makes it extremely difficult to pinpoint the precise nature of the problems facing the industry, its strengths and weaknesses, and its growth prospects. Put simply, the likelihood of there being significant uniformity in the problems or prospects of firms engaged in diverse activities such as manufacturing high technology waste monitoring devices, producing plastic recycling bins, operating landfills and providing consultancy services is remote. A strength for one sector of the industry may represent a weakness for another, while factors perceived as impeding the development of firms producing, say, waste management equipment may be totally irrelevant to firms providing consultancy services.

The diversity of the industry and the consequent difficulties it causes for compiling relevant data and undertaking analysis of industry trends is not unique to Australia. In a broad ranging discussion of the global waste management industry, the OECD (1992a) stated:

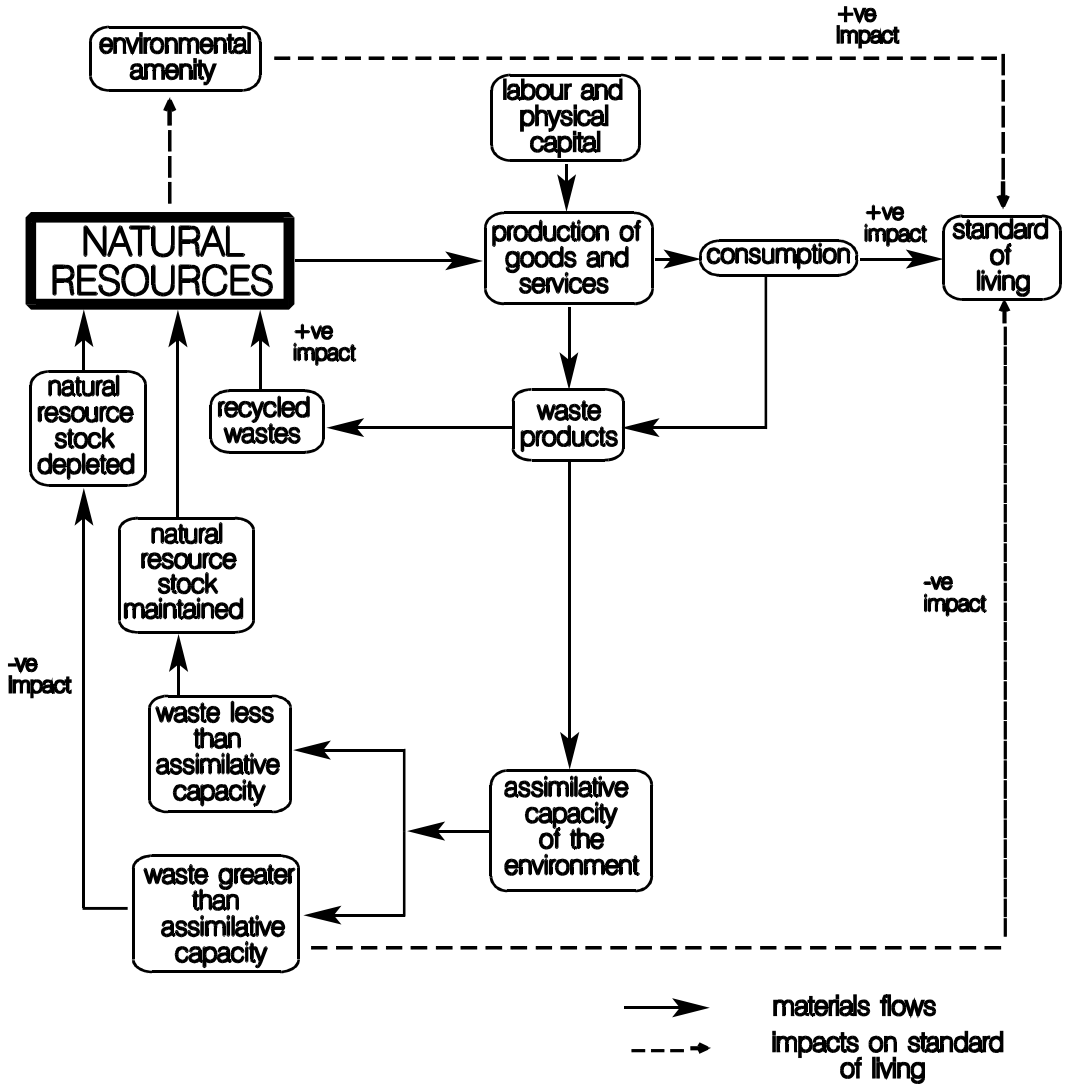
> The lack of a precise definition of the environment industry or statistical classification of its products hinders the description and analysis of production, trade and market trends as well as policy formulation in regard to this sector.

1.2 The nature of the industry

An industry involved in waste management plays a crucial role in society's attempt to achieve ecologically sustainable development (ESD). While subject to a range of definitions, in part, ESD is about ensuring that human activity does not reduce the quality of natural resources such as water, the atmosphere and soil available to future generations. As illustrated in Figure 1.1, a central requirement for ESD is that the community's production of waste does not exceed the assimilative capacity of the environment. The EWMESS industry

can therefore be regarded as comprising firms which assist the community to achieve this objective through the supply of equipment, systems or services directed at: the storage, collection, transport, treatment and disposal of waste (solid, liquid or gaseous — produced by industrial, commercial and agricultural enterprises or by households); reusing and/or recycling materials; monitoring and measuring wastes.

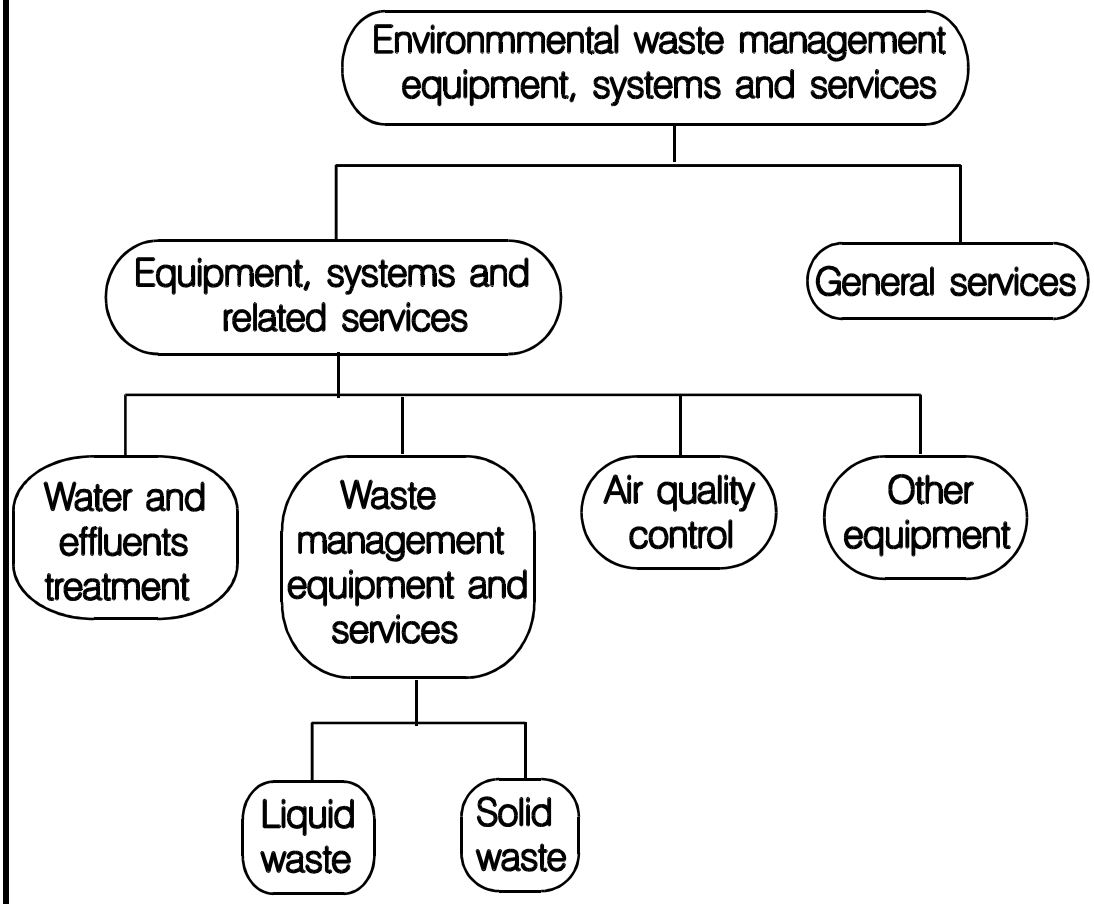
Figure 1.1: **Waste and the natural resource cycle**



Source: Adapted from Pearce & Turner 1990.

The industry can be segmented in a number of ways. For the purposes of this report, the segmentation adopted is based on that used by the OECD (1992a). A schematic representation of the major market segments is shown in Figure 1.2.

Figure 1.2: **Major segments of the EWMESS market**



Note: See Box 1.1 for a description of the distinction between 'water and effluents treatment' and 'liquid waste'.

The major sector of the industry is that engaged in producing equipment, systems and related services. This is what is usually called the 'end-of-pipe' pollution abatement part of the industry. The products in this sector can be categorised according to end use (eg waste disposal and air quality control equipment). Environmental technologies which are incorporated in industrial processes ('clean technologies') are not included in this category, but are incorporated in the 'general services' sector. A more detailed description of the equipment, systems and related services segments and the types of goods and services included in each segment is presented in Box 1.1.

Box 1.1: Major segments of the equipment, systems and related services sector

Water and effluents treatment

This segment encompasses activities and equipment designed to remove or reduce pollutants prior to discharge or future use. Included is equipment for *primary* treatment to remove solids (eg filters); *secondary* treatment equipment to remove bacteria (eg chlorination); and *tertiary* treatment equipment to remove chemicals and trace elements. Water treatment equipment utilises mechanical means (such as screens and gravity separators); physio-chemical techniques (such as centrifuging and absorption); aerobic methods; ion exchange; and membrane technologies. Monitoring equipment to determine water quality is included in this category, as is a range of auxiliary products such as pumps, pipes, tanks and civil construction.

Waste management equipment and services

This category encompasses products and services used to collect, transport, treat and dispose of solid and liquid wastes, including household and industrial garbage, sludge and toxic or hazardous wastes. Relevant equipment includes compactor trucks, recycling equipment, incinerators and a range of new technologies for the treatment of hazardous wastes. Auxiliary equipment includes such things as shredders, screening devices and handling equipment. Landfills are a significant component within this category.

Air quality control

This segment mainly covers the manufacture of equipment used to remove, or convert to a less noxious form, pollutants released to the atmosphere, such as particulates, gases (eg nitrous oxides and sulphur dioxide) and fumes. Common types of equipment include fabric filters, electrostatic precipitators, scrubbers and techniques such as oxidation and carbon absorption. Auxiliary products include fans, ducts, stacks, handling equipment and pollution measurement devices.

Other equipment

The major components of this sector include noise abatement and land reclamation. Products used for soundproofing and buffering of industrial noises are typical of those employed to reduce noise. Land reclamation includes equipment for the remediation or reclamation of contaminated land, as well as for the evacuation, transportation and storage of the soil. The treatment of contaminated soil can entail various techniques such as ‘washing’, thermal and chemical treatment, and biological processes.

The other major component of the industry is the ‘general services’ sector, which aims to solve waste management problems through engineering and consultant services (eg providing advice on ‘clean technologies’). There are three major types of environmental services. The first is in the engineering field

(eg process design and project management). The second is consulting, such as the preparation of environmental impact assessments, environmental audits, risk assessment and monitoring. The third is the provision of management services, such as advising industry on the best available technologies and testing products and/or processes for 'environmental friendliness'.

1.3 Conduct of the inquiry

In preparing this report, the Commission has drawn on information from a variety of sources. It released an issues paper early in the inquiry and received responses in submissions and at an initial round of public hearings conducted in December 1992. Further hearings were held in June and July 1993 to consider the draft report. During the course of the inquiry, the Commission also had informal discussions with government agencies (Commonwealth, state and local), the EMIAA and other industry representatives, water authorities and other users of the EWMESS industry's products and services, and environmental interests (see Appendix A). It has also drawn on a range of published material on the Australian and overseas industry.

After the release of the draft report, the Commission visited a number of south east Asian countries, principally to obtain first hand information on the market prospects for Australian EWMESS suppliers. It also visited some European countries to discuss with regulatory agencies the impacts of waste management regulation and alternative policy instruments.

1.4 The Commission's approach

As noted above, this industry development reference requires the Commission to investigate opportunities for growth in the EWMESS industry. In common with other industry development references, the Commission has also been requested to expose any impediments to growth. From this perspective, such inquiries complement the Commission's broader, issues-based inquiries into factors that lead to inefficient or unsustainable resource use. In particular, they are intended to provide the Commission with the opportunity to examine how specific factors affect individual industries.

The terms of reference for this inquiry also ask the Commission to report on:

- emerging trends in local and global markets for EWMESS products and services;
- the current structure and competitiveness of the local industry (including its cost structures and any potential cost savings); and
- the potential for further development — including the industry's strengths and weaknesses, and its export and import replacement potential.

The success of the Australian EWMESS industry in realising growth opportunities will, of course, depend on a wide range of factors. Some of these are largely, or totally, beyond the control of industry or governments in Australia. For example, changes in the policies of overseas governments are largely beyond Australia's influence.

One factor which Australia can influence, and one which is extremely important to the industry's future development, is the action of governments in Australia. Governments at all levels have a pervasive impact on the fortunes of the local EWMESS industry. Through pricing policies for resources and waste disposal, and environmental and waste management regulations and policies, governments set the broad parameters within which the Australian industry operates. Governments are also the major purchaser of many of the industry's products and services. Through purchasing practices, policies protecting intellectual property rights and support for research and development, governments exert considerable influence over the development and commercialisation of new technologies in Australia.

Given the important role played by government, inappropriate government actions or policies will have direct repercussions for the EWMESS industry, as well as the community at large. In this regard, it is crucial to divorce the requirement to achieve appropriate environmental quality objectives from the desire to promote the EWMESS (or any other) industry.

In assessing government policies affecting the local EWMESS industry, the Commission has taken an economy-wide view. This is a requirement of the legislation under which the Commission operates and is consistent with paragraph 2 of the reference which specifies that, when making recommendations, "...the Commission aim to improve the overall economic performance of the Australian economy". As a result, where possible the Commission has considered the impact of alternative policy options from the perspective of the economy as a whole rather than simply that of the EWMESS industry.

The requirement to adopt an economy-wide perspective is particularly relevant to the assessment of requests for government support to help overcome

problems which some participants consider are impeding development. Special treatment for the industry would clearly boost its growth prospects, in the short term at least. However, given a concern to improve the well-being of the community as a whole, such intervention would usually only be warranted if it is apparent that government action can result in the community at large — and not just the EWMESS industry — being better off. Further, the adoption of an economy-wide approach means that, unless any 'market-failures' are specific to a particular industry, policy responses should be broadly based.

It is important to note here that many environmental problems are a result of market failure (for example, pollution of the atmosphere and water resources occurs because polluters do not have to pay to use the environment or to clean it up). It follows that some form of government involvement (eg regulating emissions) is necessary. Of course, there is no intrinsic reason why the Australian EWMESS industry should provide all the solutions (in terms of equipment, system or services). One consequence of government involvement will be greater demand for EWMESS products, but better quality and less expensive items might be available from overseas EWMESS firms.

In responding to the Commission's draft report, some participants argued that the EWMESS industry has special characteristics which warrant it being afforded different treatment to other industries.

The Department of Environment, Sport and Territories (DEST) put the argument thus:

> ...the EWMESS industry is in fact a special case. In the case of EWMESS industries, environmental and economic performance need to be jointly considered, not just economic considerations divorced from the government commitment to environmental improvement.
>
> However, because environmental benefits generally are public goods which are not valued and exchanged in the market, capital and research and development funds will be undersupplied. We would argue that supporting EWMESS industries and the development of new technologies is in the public interest, not unlike the public interest in health research.

The Commission acknowledges that certain environmental attributes (eg clean air) are public goods and that government intervention is warranted. However, there is a continuous spectrum from pure private goods (the supply of which can generally be efficiently determined by market forces) to pure public goods (for which no market solution exists). As discussed in Chapter 9, research and development is an activity which can fall anywhere between the polar extremes, depending on the extent to which the benefits of research can be appropriated by those undertaking it. It is generally acknowledged that, if most of the benefits accrue to the community at large, there is a strong case for government support.

In this context, government support is not contingent on there being an environmental problem which needs to be addressed, but rather on the nature of research and development itself. Nonetheless, governments are likely to play a more significant funding role in environmental research (much of which benefits the wider community) than in, for example, industrial research and development (where private firms are more likely to be able to appropriate the benefits).

It needs to be stressed, however, that government support for environmental research and development is different to support for firms in the local EWMESS industry. If support is warranted, it should be available to any firm, irrespective of whether or not it is currently engaged in EWMESS activities. Of course, the experience and expertise residing in existing EWMESS firms may mean that they have a comparative advantage in undertaking environmental research and development.

The DEST view (as expressed above) appears to go somewhat further and argue that capital funds for the purpose of developing and commercialising an invention will be also undersupplied to the EWMESS industry. However, the same principles applied to research funding can be applied to development funding; that is, funding should be related to the magnitude of the public benefits.

The preceding discussion does not seek to illustrate that the EWMESS industry is necessarily different from a range of other industries (for example, the pharmaceuticals, computer, agricultural machinery and occupational health and safety equipment industries), but rather that some *environmental* goods and services (such as clean air and water) are different from such products as drugs, software packages, cane-harvesters and ear-muffs. Consequently, if government intervention is warranted, it is more likely that it should be targeted at *environmental* goods and services rather than at the EWMESS industry itself.

The Commission also acknowledges that, given the focus of this new style of inquiry on growth opportunities, there is an expectation among some participants that the Commission will recommend government support for the industry. In this regard, the statement by the Treasurer is relevant. It emphasises that industry development references are intended to deal with industries "which already do, or soon will, receive low levels of assistance". That is, the general thrust of the Government's policy of reducing assistance is the backdrop for such inquiries. It also needs to be recognised that, as summarised in Appendix F, the EWMESS industry already benefits from a range of government assistance measures (eg export promotion assistance and support for research and development activity).

The main rationale for government support to EWMESS firms is, in essence, little different to that for government involvement in environmental issues or in research and development — market failure. In the context of the EWMESS industry, some participants argued that market failure occurs because the industry's activities generate wider community benefits. While most industries can, to varying extents, claim to generate benefits which spill over to the wider community, an 'in-principle' case could be made to support industries which give rise to the largest spillovers. However, this would require a major empirical study of all industries in the economy. Work of this kind has not as yet been undertaken.

In an inquiry of this nature, it is difficult to assess requests for changes made by one specific industry to programs which have implications for a broad cross-section of industry. For example, because of the difficulties that small EWMESS firms face in obtaining development capital, some participants sought the introduction of measures to facilitate access to capital for EWMESS firms. However, such problems also confront small firms in other sectors of the economy. In these circumstances, it is difficult to consider policy changes without taking into account the views and experiences of players outside the EWMESS industry. To varying degrees, similar constraints arise in virtually all Commission inquiries. As usual, the Commission will carry forward the case history provided by the EWMESS industry into future inquiries and its general research program.

One other element of the Commission's approach which was raised by a number of participants at the draft report hearings relates to the need for the Commission to develop a 'vision statement' for the industry. For example, the EMIAA submitted that:

> Most notably missing [from the draft report] is a vision for the future ... of where Australian environmental management will be in ten or twenty years...

Two points need to be made. The first is that in this inquiry it is well beyond the terms of reference to attempt to present a 'blueprint' for environmental management per se. To some extent this would duplicate the work only recently completed by the ESD Working Groups. The second point relates to who is in the best position to develop longer term industry goals and strategies.

The development of a vision statement is a process which many industries have found useful, not only because it identifies long-term goals, but also because it requires the identification of barriers to development and of ways and means of combating such barriers. However, developing a vision of how an industry will be in ten or twenty years time necessarily involves a degree of speculation. In the case of the EWMESS industry, there is a high degree of uncertainty. Its future will be shaped by many unknowns, not the least of which are the extent

of future environmental regulation (both in Australia and overseas) and changes in the competitiveness of Australian EWMESS producers relative to their overseas counterparts. The high diversity among EWMESS producers adds to the complexity in that it is highly unlikely that one vision would be appropriate for all — separate vision statements would be required for each particular sector. Largely because of the complexity of this task, and the need for it to be developed by those having an intimate knowledge of the industry, the Commission considers the preparation of vision statements could be more competently prepared by the industry itself.

1.5 Structure of the report

The following two chapters of this report consider the EWMESS industry and its markets, both overseas and in Australia, including an examination of industry structure and emerging market trends. Chapter 4 examines the industry's competitiveness and actions that it can take to enhance its prospects. Chapters 5 to 7 consider instruments for managing waste discharges and other regulatory aspects of waste management in Australia. Subsequent chapters consider various issues related to government procurement, research and development, capital for commercialisation and foreign aid. The final two chapters — Chapters 12 and 13 — consider the role of government in information provision and a proposal for the establishment of an Environment Industries Council.

2 THE GLOBAL EWMESS INDUSTRY

The EWMESS industry is a diverse collection of firms and individuals providing equipment, systems or service-related solutions to solid, liquid, or gaseous waste management problems. Some segments of the industry have a long history (eg waste water treatment), while others are relatively new (eg industrial site remediation).

The industry has a dual structure. While certain segments are dominated by a small number of large multi-national firms (mainly North American, Northern European and Japanese), there is also a proliferation of small businesses specialising in a limited range of equipment and services. For example, in the USA, there are some very large multi-national companies and several thousand smaller firms. According to the OECD, the number of smaller EWMESS firms in North America, Europe and Japan totalled around 60 000 in 1990.

On the demand side, there are a growing number of customers ranging from large government agencies to small businesses and households. For a number of products, governments account for the majority of demand. Indeed, for some suppliers, government is the only buyer. At present, the overwhelming bulk of demand is from developed countries, but this is changing as a consequence of growing income and increasing recognition of environmental problems in a number of developing countries.

The fact that the EWMESS industry is difficult to define and is a sub-set of a more general environmental industry (which itself is very difficult to define), creates difficulties in compiling and presenting data. Indeed, there are no comprehensive statistics covering the industry's activities. Furthermore, those data that are available are not compiled on a consistent basis. For example, while some data are confined to the activities of firms *providing* the equipment and services used for waste management functions, others also include details concerning the *operation* of waste management services, such as solid waste collection and water supply. Because of these difficulties, the statistics provided in this chapter should be regarded as indicative rather than as precise measures, and attention needs to be paid to the definition used in each case.

The chapter commences by discussing the determinants of demand for EWMESS products. Subsequent sections discuss current and future market demand and trends within particular market segments.

2.1 Determinants of demand for EWMESS goods and services

A priori, aggregative demand for EWMESS goods or services in a country, at any point in time, is likely to mainly reflect the size of its population, its income level, the costs of EWMESS products/services relative to the price of other goods and services, the nature and extent of the environmental problems the country faces and perceptions of the need to address these environmental problems. While these factors largely explain the present level of demand for EWMESS goods and services, it is, of course, changes in these factors which will determine demand in future years.

Population size

A country's population influences demand in a number of important ways. All other things being equal, the larger the population, the greater the demand for a particular good or service. In the context of the EWMESS industry, the greater the population, the larger will be the quantities of waste and pollution generated. In terms of absolute population size, certain developing countries stand out (eg China), while high population growth rates in other developing countries are indicators of potential future problems (eg the Philippines and Indonesia). Table 2.1 shows relevant world population data, as well as data on each of the countries mentioned above.

Table 2.1: **World population statistics, 1991 and 2000**

Country/region	*Estimated population*		*Annual growth rate*
	1991	*2000*	
	millions		%
China	1171	1310	1.2
Philippines	6	76	2.0
Indonesia	188	218	1.7
Other developing countries	2737	3326	2.2
Total developing countries	**4160**	**4930**	**1.9**
OECD	802	840	0.6
Eastern Europe	420	440	0.6
World	**5382**	**6210**	**1.6**

Source: UNDP 1993.

Whether or not the need for increased expenditure on environmental matters in developing countries is actually translated into effective demand for EWMESS products will, of course, depend crucially on countries' capacity (and willingness) to pay for EWMESS products. This issue is discussed below.

Apart from the absolute size of a country's population, a number of other aspects of population influence demand. One is urbanisation. Increasing urbanisation — which is generally associated with greater industrialisation, particularly in developing countries — frequently compounds environmental waste problems as the waste generated is greater than the assimilative capacity of the local environment. The problems are most obvious in developing countries, with slum settlements developing on urban fringes and infrastructure stretched far beyond capacity. As shown in Appendix E, urbanisation has occurred rapidly in some Asian countries. For instance, whereas only 16 per cent of Indonesia's population resided in urban centres in 1960, by 1991 the urban population had doubled (UNDP 1993).

The environmental problems caused by rapid urbanisation are extensive. They include increasing air pollution from motor vehicles and industrial activities, contaminated land and water bodies, a lack of safe drinking water and increasing public health problems.

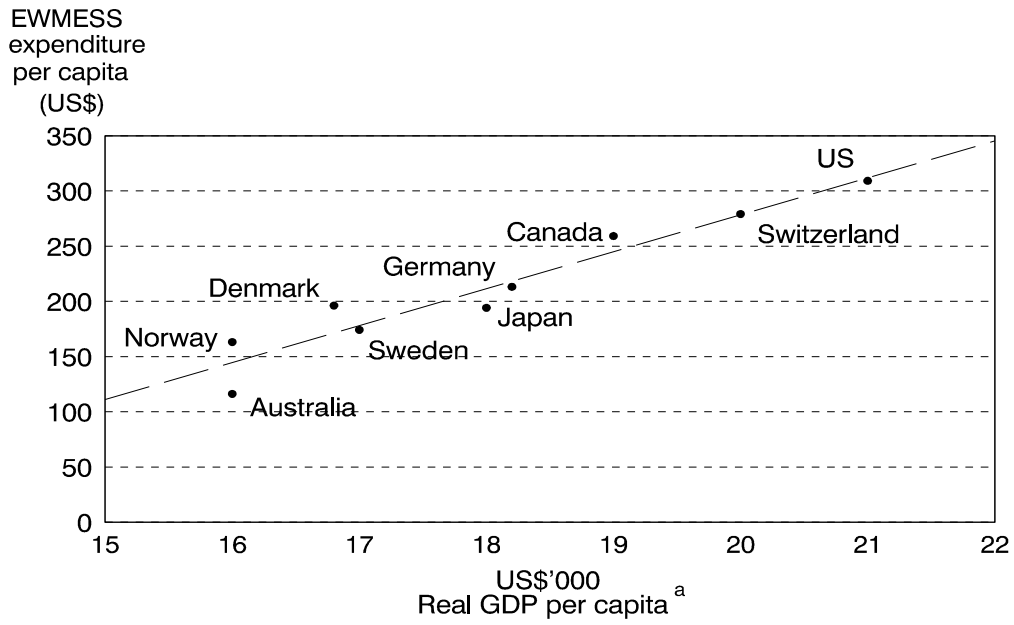
Income

Levels of per capita income influence demand for EWMESS products in two major ways. First, as a country's income (and standard of living) rises, there is likely to be greater interest in improving (or at least maintaining) the environment and in cleaning up problems caused by past neglect. Second, as a country's income level increases, its capacity to pay for measures to improve environmental protection also increases.

The strong correlation between per capita income and demand for EWMESS products is illustrated in Figure 2.1 which shows income and EWMESS expenditure levels for a number of OECD countries.

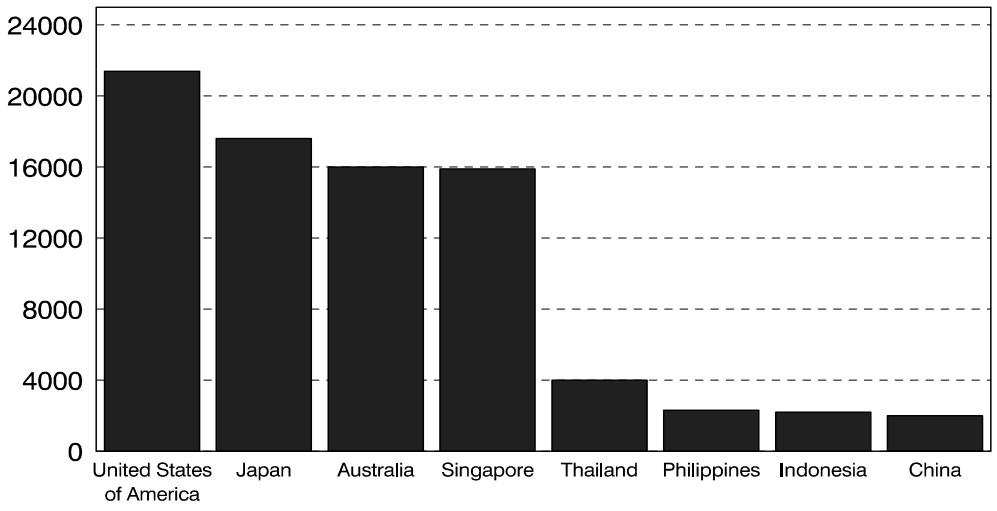
The substantial variation that exists in per capita income levels between countries — and in particular between developed and developing countries — helps explain the significant variations in EWMESS expenditure by different countries as outlined in the following section. To illustrate the disparities between countries, GNP per capita for a number of countries is shown in Figure 2.2.

Figure 2.1: **Income levels and EWMESS expenditure, selected OECD countries, 1990**



a In purchasing power parities.
Source: Derived from UNDP 1993 and OECD 1992a.

Figure 2.2: **Real GDP per capita[a], 1990**



a In purchasing power parities.
Source: UNDP 1993.

Relative cost of EWMESS products

As a rule, the lower is the cost of waste management equipment and services, the greater will be demand. While there is little information on the costs of EWMESS products, it is possible that, as existing technologies mature and new technologies are developed, and as trade barriers are gradually lowered, costs may decline. For developing countries, the cost (in terms of financial outlays) could be lower again if the availability of aid funds for environmental projects continues to increase.

Extent of environmental problems

The nature and extent of environmental problems varies considerably between countries, and regions within countries. The magnitude of the problems is related to some of the factors mentioned above (eg income levels and population size), although a range of other factors are also relevant (eg geographical features, climatic characteristics and cultural traditions). As a generalisation, environmental problems, from an ecological perspective, are generally recognised as being greatest in some developing nations and in some former Soviet bloc countries.

Community attitudes

While increased community interest in caring for the environment is undoubtedly partly attributable to rising living standards, there is little doubt that it has also been increased by recent national and global environmental problems. These have reinforced the view that environmental resources are scarce, and that the environment is a closed ecological system with limited assimilative capacities.

Governments have given effect to changing community demands through a range of environmental regulations and standards which are intended to reduce waste and pollution. The application of more stringent regulation has been accompanied by a tightening in enforcement procedures. While these measures generally have been directed primarily towards meeting environment goals, they have also stimulated demand for waste management equipment and services. Consequently, the OECD has argued that the leading international suppliers of EWMESS products have developed in those countries which have the most comprehensive environmental regulations (see Box 2.1).

Box 2.1: The OECD's comment on legislation, markets and competitiveness

"Most OECD countries have well developed environment markets due to the establishment of a broad legal framework for environmental protection and the high priority afforded environmental objectives. The largest and most technically advanced environment markets, and also environment industries, have developed in those countries with the most comprehensive and effective environmental regulations ... Government policies can create markets for new products and technologies and lead to the phasing out of different segments of the environment industry as policies and regulations change. The market for environmental equipment and services thus tends to be somewhat erratic and largely dependent on the content and direction of environmental legislation.

Variations in environmental problems and regulations have been instrumental in the development of specific environmental markets and products ... The Japanese air pollution control industry rapidly expanded in the 1970s and early 1980s as a result of increased domestic demand for flue gas desulphurisation equipment following specific legislation ... German expertise in waste and effluents treatment equipment derives in large part from early and stringent national legislation relating to water pollution control. In the Netherlands, a national effort in the early 1980s to overcome land contamination problems led to the development of advanced soil remediation technologies. In the United States, legislation relating to site clean-up and toxic wastes led to the vast US market and commerce in hazardous waste management technologies ...

It is generally those countries with comprehensive environmental policies and well-developed regulations and standards which have the most competitive environmental industries ...

The environment industry ... is a sector whose technology and products are important to improving performance in many industries, enhancing national trade balances and preserving the world's environment ...

Countries which lag behind in developing environmental products and services may find themselves with substantial trade deficits in this area, or a lower quality of the environment."

Source: OECD 1992a.

Notwithstanding government action, many firms have responded to changing community attitudes by voluntarily adopting measures to reduce the impact of their operations on the environment in order to be seen as good 'corporate citizens'. Indeed, the OECD (1992a) stated:

> ...some companies are moving ahead of regulatory requirements and setting themselves stringent targets for toxic emissions and waste management. The need to achieve a respectable environmental status is enhancing industrial demand for advanced environmental technology in addition to a wide range of environmental consulting services.

2.2 Current and future market demand

The published estimates of the size of world markets for environmental waste management products and services differ significantly. This is mainly because each study uses its own definition of the industry. The most widely recognised estimate of market size is that of the OECD (1992a).

While the OECD definition of what it terms "the environment industry" is not precise, it approximates those products and services which are the subject of this inquiry. Consequently, much of the remainder of this chapter draws on that source.

The OECD estimates the size of the world market in 1990 to be US$200 billion ($A280 billion), increasing to US$300 billion ($A430 billion) by the year 2000 (see Table 2.2).[1] This implies an average annual growth of 5.5 per cent.

As shown in Table 2.2, the Australian share of the world market is about 1.0 per cent. The annual growth in Australia is expected to be 4.4 per cent, which is the same as Norway's and comparable to that of Germany, the Netherlands and Austria, but lower than that of the US, Canada, the UK and Japan. With an annual growth rate lower than the world average, demand in Australia is forecast to decline marginally to 0.9 per cent of the world market by the year 2000.

It is not obvious that the OECD estimate of world demand has taken into account demand in some large developing countries (eg China, India, Brazil and African nations). Consequently, its forecast for the year 2000 might be an underestimate. The OECD's comment that its data and forecasts "should be interpreted with care" is warranted.

Some other sources suggest a considerably larger world market. An estimate presented at the international environmental trade fair held in Vancouver, 1990 — Globe 90 — suggested a world market for "environmental technology" of US$300 billion. The precise definition of "environmental technology" is not clear.

Ferrier (1993) quotes data presented in the Environmental Business Journal which suggest that the market was US$270 billion in 1991 and is forecast to increase by 9 per cent per annum to US$408 billion in 1996 (see Table 2.3). In this case, the industry is defined to include "environmental energy sources" (eg solar power) and some infrastructure which probably would not be included in the OECD estimates, but otherwise the products and services included do not appear to conflict with the OECD categorisation.

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[1] Elsewhere in this report, unless otherwise stated, monetary amounts are in Australian dollars.

Table 2.2: **OECD estimates of current and future EWMESS market demand, by region and country, 1990 and 2000**

Region/country	*1990*	*Estimated annual growth rate*	*2000*
	US$ billion	%	US$ billion[a]
North America	**84.0**	**5.4**	**125.0**
USA	78.0	5.0	113.0
Canada	7.0	7.9	12.0
Europe	**54.0**	**4.9**	**78.0**
Germany	17.0	4.0	23.0
France	10.0	5.5	15.0
UK	7.0	6.3	11.0
Netherlands	2.7	4.1	3.7
Italy	5.0	6.0	7.7
Denmark	1.0	2.2	1.2
Greece	0.3	7.4	0.5
Portugal	0.4	8.3	0.7
Spain	1.8	7.4	3.0
Belgium	1.4	6.4	2.3
Ireland	0.3	6.5	0.5
Austria	1.3	4.3	1.8
Switzerland	1.9	3.5	2.5
Sweden	1.5	3.7	2.0
Finland	1.0	3.3	1.3
Norway	0.7	4.4	1.0
Asia Pacific	**26.2**	**6.2**	**42.0**
Japan	24.0	6.7	39.0
Australia	**2.0**	**4.4**	**2.8**
New Zealand	0.2	5.5	0.3
Total OECD	**164.0**	**5.5**	**245.0**
Non OECD	**36.0**	**5.9**	**55.0**
East Europe/ Soviet Union	15.0	4.0	21.0
Other[b]	21.0	6.8	34.0
Total	**200.0**	**5.5**	**300.0**

a Expressed in 1990 US dollars.

b It is not clear what countries are included other than some Asian countries such as Hong Kong, South Korea and Taiwan.

Source: OECD 1992a.

Table 2.3: **Revenue estimates for the world environment industry**

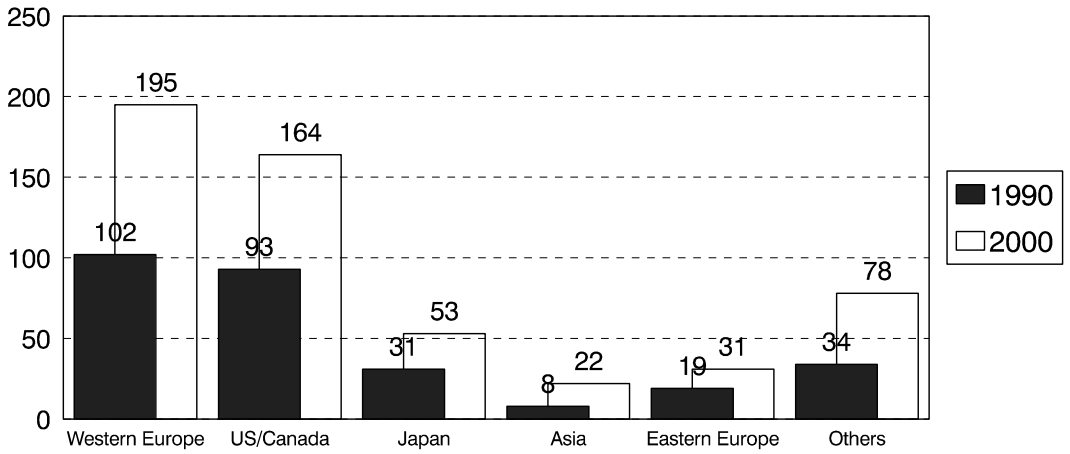
Country	*1991*	*Annual growth rate 1991-96*	*1996*[a]
	US$ billion	%	US$ billion
United States	120	7	164
Canada	10	11	17
Mexico	2	14	4
Latin America	6	12	10
Western Europe	82	9	130
East Europe - ex USSR	14	14	27
Japan	21	8	31
Australia/New Zealand	3	9	5
South east Asia	6	14	11
Rest of the world	6	8	9
Total	**270**	**9**	**408**

a Expressed in 1991 dollars.
Source: Ferrier 1993.

A German market research firm, Helmut Kaiser Unternehmensberatung, estimates the market for what it terms as the "world environment market: combined capital and operating costs" to be in the order of DM460 000 million (US$290 billion) in 1990 (HAZNEWS 1993). It forecasts that by the year 2000 the total will be nearly double that. Again definitional problems abound: for example, "operating costs" are not defined.

The German estimates (see Figure 2.3) for current and future world markets are similar to those suggested by the International Finance Corporation, an affiliate of the World Bank, which states: "The worldwide market for environmental goods and services is expected to grow rapidly during the decade, doubling from roughly US$300 billion (in 1990) to US$600 billion by the year 2000" (DITRD 1993). Again it is not obvious what is included in the market estimate.

Figure 2.3: **German estimates of the world environmental market - combined capital and operating costs** (US$ billion)



Source: Adapted from HAZNEWS (1993) based on estimates by Helmut Kaiser Unternehmensberatung.

Another estimate is by McCann (1992) based on the proportion of GDP expended in the US on "waste management". The world market is estimated to be US$410 ($A600) billion per annum, growing to more than $A1 trillion by the year 2000. Definitional issues aside, a problem with this estimate is that it cannot be assumed that the US proportion is — or will be — applicable world-wide.

On a country basis, there are also significant differences between the various studies. For example, the estimates for the US market vary from US$78 billion (Table 2.2) to US$120 billion (Table 2.3). The one year difference in the years to which the estimates relate could clearly not account for such a large difference.

All of the estimates indicate that the market is large and that strong growth is anticipated throughout the 1990s. However, there are large variations between the various estimates. For example, estimates of the world market in 1990-91 range from US$200 billion to US$410 billion. Definitional differences clearly account for some of the variation. In this regard, the OECD definition appears to correspond most closely with the waste management goods and services covered by this inquiry. As noted above, the OECD estimates a world market size of US$200 billion in 1990.

To emphasise the size of the industry (as defined by the OECD), it can be compared to the plastics industry, which has world-wide sales of around

$260 billion per annum, or the aerospace industry, which has annual sales of about $250 billion (OECD 1992a).

According to OECD data, some 85 per cent of world demand is presently generated in developed countries (see Table 2.2). The USA is by far the world's largest market. In 1990, demand was estimated to be US$78 billion — equivalent to nearly 40 per cent of the total world demand. The next largest markets are Germany and Japan. Together with the USA, these countries account for around 60 per cent of the OECD's estimate of world demand. However, to the extent that there is limited coverage of developing nations, these estimates would overstate the significance of demand in developed countries.

While the overall growth of the market in OECD countries is expected to be similar to worldwide growth — about 5.5 per cent annually — there is considerable variation between countries. For example, while demand growth in Denmark is forecast to be less than half of that for the OECD as a whole, demand in Spain is expected to be well above the OECD average — around 7.4 per cent annually. Largely because of a relatively long and sustained history in dealing with waste problems, growth in some countries (eg Germany, Netherlands, Austria and the Scandinavian countries) is expected to be relatively low. Conversely, growth in Japan is expected to be strong, as greater attention is given to improving standards in waste and water quality.

Markets in some south east Asian countries are expanding with the OECD nominating Hong Kong, Taiwan and South Korea (included in the "Other" category in Table 2.2) as likely to experience strong growth. There is also a very large potential market in eastern Europe, but its development will depend on how quickly political stability and economic growth are achieved. Financial support from OECD countries (eg the EC's PHARE program to assist air and waste pollution monitoring, and sewerage plant operation) is expected to promote demand growth in eastern Europe.

Throughout the developing world, the growing need to address environmental waste problems is likely to contribute to increasing demand. One indicator of need is access to safe drinking water, another is sanitation services. The magnitude of this need is illustrated by the fact that of the world population in 1991 of 5380 million — of which 4160 million were in the developing countries — 1300 million people were without access to safe water and 2000 million were without access to sanitation; that is, approximately one-third of the population in the developing countries did not have access to safe water and about one-half did not have access to sanitation (UNDP 1993).

It needs to be recognised however, that need does not readily translate into the ability to pay for EWMESS products. For example, countries with low per

capita incomes and low (in some cases, negative) income growth will not — at least in the short to medium term — be able to address these problems without aid from the industrialised world. In this regard it is worth noting that the World Bank, other multi-lateral aid agencies and individual country aid programs are focusing to a greater extent on environmental matters than in the past.

Industry structure

The size and structure of the EWMESS industry differs by country and region, and reflects local environmental concerns as well as variations in environmental legislation.

At the global level, the EWMESS industry is comprised of some very large multi-national firms (representing about half of the industry's output). Many are firms which, in the past, have mainly specialised in large scale engineering projects or the manufacture of chemicals or electronics, but have recently diversified into the environment industry. The remainder of the industry (particularly in major OECD countries) comprises small firms employing less than 50 people. The nature of this segment of the industry is described by the OECD (see Box 2.2).

Box 2.2: The OECD's description of small firms in the industry

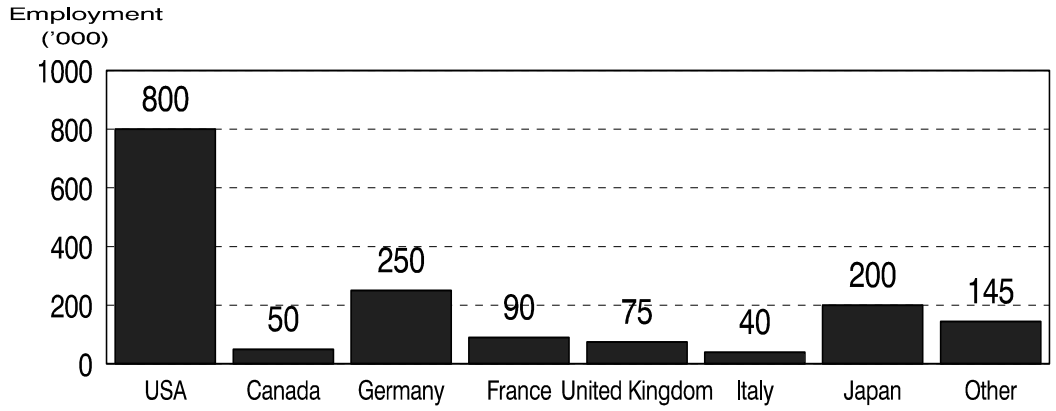
"Because of the diversity of the environment market and relatively low barriers to entry, suppliers have found numerous routes of access to the industry. It has provided fertile ground for start-ups and entrepreneurial ventures with smaller environment firms ranging from high-technology suppliers of chemicals, instruments and consultancy services to low-technology producers of recycling bins and suppliers of waste transport services.

Most small and medium-sized environment enterprises are specialised, owner-managed and offer a limited range of equipment in services. In total, there are estimated to be some 30 000 such firms in North America, 20 000 in Europe and 9 000 in Japan."

Source: OECD 1992a.

There are very scant data on employment in the industry. One estimate for the OECD countries is 1.7 million people, of which over half are estimated to be employed in the US (see Figure 2.4). On the basis of this estimate, output per person employed is in the range of US$110 000 and US$120 000.

Figure 2.4: **EWMESS employment in selected OECD countries** ('000)



Source: OECD 1992a.

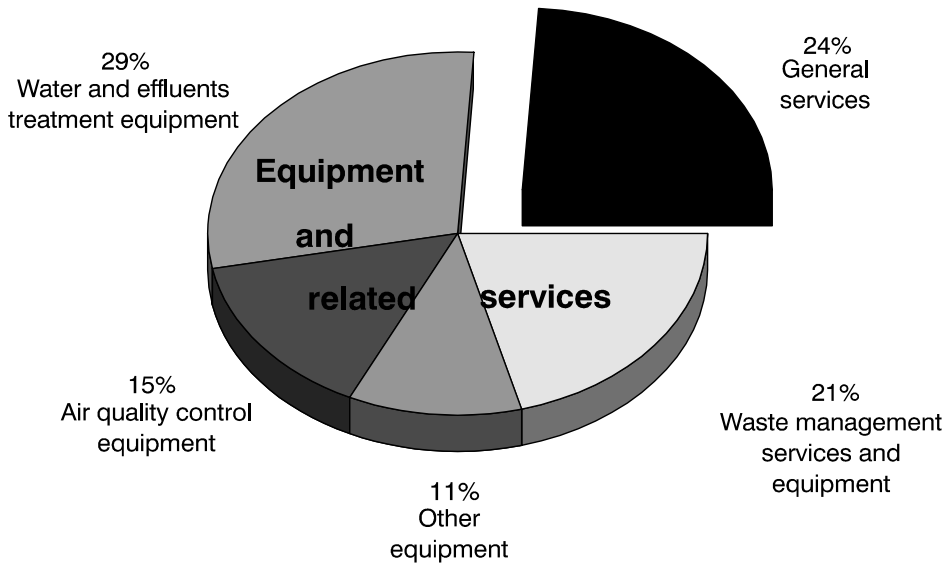
If employment in the developing countries was included — including people in the 'informal' sector of the economy who are involved in gathering wastes for re-use and/or sale — the total employment would be considerably greater than 1.7 million.

Another source (Environmental Business Journal 1992) provides estimates of employment in the US. It should be noted that this source has a wider definition of the industry to that used by the OECD. In 1991, the estimate is 971 000 employees. If that is adjusted to better reflect the OECD definition of the industry, the two estimates are relatively close.

Sectoral analysis and emerging trends

The equipment, systems and related services sector comprises a wide range of product segments, but is primarily end-of-pipe pollution abatement equipment. It accounts for roughly three-quarters of EWMESS industry demand in OECD countries (see Figure 2.5). Within this sector, the significance of individual market segments varies between countries (see Table 2.4).

Figure 2.5: **OECD markets by sector, 1990**



Source: OECD 1992a.

Table 2.4: **Market shares of EWMESS products in selected OECD regions and total OECD, 1990[a]**
(per cent)

Segment	*North America*	*Europe*	*Japan*	*Total OECD*
Equipment/related services	**74**	**76**	**79**	**76**
Water and effluents treatment equipment	24	34	22	29
Waste management services and equipment	25	15	22	21
Air quality control equipment	12	17	25	15
Other equipment (eg site remediation, noise)	13	10	10	11
General environmental services	**26**	**24**	**21**	**24**
Total	**100**	**100**	**100**	**100**

a Estimated share of value of output.
Source: OECD 1992a.

For example, the water and effluents treatment equipment segment represents a far more significant share of the market in Europe (34 per cent) than it does in either North America (24 per cent) or Japan (22 per cent). Similarly, the air quality control equipment segment is more significant in Japan (25 per cent) than in North America (12 per cent) or Europe (17 per cent).

Growth prospects and emerging trends in the main market segments of the industry are discussed separately below. In the broad, Table 2.5 suggests that, in the equipment, systems and related services sector, demand is expected to grow at around 5 per cent per annum. The general environmental services sector is expected to grow at about 7.4 per cent per annum (OECD 1992a). This high growth rate will be partly due to industry increasingly adopting cleaner production technologies. This will occur at the expense of end-of-pipe technology (CEST 1990). These global trends will, of course, vary considerably between countries depending on the extent of their environmental problems and the stringency of each country's regulatory framework (see regional trends discussion below).

Table 2.5: **Current and future EWMESS market demand, 1990 and 2000**

Segment	*1990*	*2000*	*Annual growth rate*
	US$ billion	US$ billion[a]	%
Equipment/related services	**152**	**220**	**5.0**
Water and effluents treatment equipment	60	83	4.0
Waste management services and equipment	40	63	6.4
Air quality control equipment	30	42	4.4
Other equipment (eg site remediation, noise)	22	32	5.1
General environmental services	**48**	**80**	**7.4**
Total	**200**	**300**	**5.5**

a Expressed in 1990 US dollars.

Source: OECD 1992a.

Water and effluents treatment equipment

As indicated in Table 2.5, the OECD expects water and effluents treatment equipment to remain the largest segment, at least through to the year 2000. In 1990, the world market for this segment was estimated to be about US$60 billion. However, due to the progress already made in solving problems, it will experience relatively low growth — about 4 per cent per annum through to the year 2000. Market demand is expected to exceed US$80 billion by the end of the decade. New equipment used in ground water clean-up systems, waste water treatment technologies (including secondary and tertiary treatment facilities) and computerised instrumentation systems are all expected to exhibit strong growth in this segment.

The largest firms in the water and effluents treatment segment are European, led by the German company Bilfinger and Berger, and the Swedish company Alfa Laval. Each firm operates in a number of countries and has a turnover of around US$3 billion. An increasing number of large water utilities in Europe, such as Lyonnaise de Eaux-Dumez and Compagnie Generale des Eaux in France, are becoming involved in the development and supply of water and waste water treatment systems in other countries, including Australia. There are many smaller specialised firms manufacturing or supplying products ranging from aerobic waste water treatment plants to sedimentation processes.

Waste management equipment and services

The OECD expects this segment, which encompasses both solid and liquid waste management, to be one of the fastest growing market segments. In 1990, world demand for waste management products and services was estimated by the OECD to be about US$40 billion, rising to more than US$60 billion by 2000 — a growth rate of more than 6 per cent per annum. The United States firm Waste Management International is the world's largest in this segment, with an estimated turnover of US$4.5 billion annually.

Stricter controls on, and higher charges for, waste disposal, as well as growing opposition to direct landfilling of certain liquid wastes without pre-treatment, are the main factors that are expected to contribute to market growth. Furthermore, in many countries, diminishing disposal options — due to decreasing space for landfill operations and community concern over incineration — will lead to increased demand for new waste management technologies and services. This is especially the case for hazardous (solid and liquid) waste disposal and recycling processes.

Air quality control equipment

The OECD estimates that particulate emission collectors, such as fabric filters and electrostatic precipitators, account for about 60 per cent of the value of air pollution control equipment. The market for air quality control equipment is expected to grow at a rate of about 4.4 per cent per annum and amount to more than US$40 billion by the year 2000. The OECD also forecasts that equipment used in new air pollution control techniques, such as microbial cleaning processes and electrostatic acid emission control, will exhibit strong growth.

The world leaders in air quality control equipment are the Japanese firms Mitsubishi and Hitachi and the Swedish firm Flakt (part of Asea Brown Boveri).

Other equipment

The OECD suggests that equipment, systems and services to identify, excavate, transport and treat contaminated soil, as well as for stabilising and enhancing land sites, will be in increasing demand. Equipment for noise reduction is also an expanding market niche, driven mostly by occupational health and safety regulations.

General environmental services

This sector is expected to generate sales of around US$80 billion by the year 2000 (up from approximately US$50 billion in 1990). This high growth rate (7.4 per cent per annum) partly reflects the trend away from end-of-pipe to cleaner production technologies (OECD 1992a). This view is also supported by the CEST study which states:

> In the long term, it is likely that environmental solutions will shift from end-of-pipe solutions to be integrated with every facet of a manufacturing operation and that environmental considerations will be an essential part of the total design process. This implies that ... opportunities will be available not only to suppliers of pollution control equipment, but to a much broader spread of manufacturing and service businesses.

Internationally, the general services sector is dominated by large engineering firms which provide technical engineering and construction services and have diversified into the environmental industries. However, there are many smaller, specialist environmental consultancy firms (eg in the US it is estimated that there are 12 000 consulting and engineering firms in this field).

Demand for specific services, such as environmental auditing, environmental monitoring, risk management and product testing, is expected to grow quite strongly.

Regional trends

A brief review of EWMESS regional markets, drawn mainly from OECD (1992a) material, is outlined below in respect to North America, Europe, Japan and the developing countries.

North America

In 1990, the North American market was estimated to be about US$84 billion, of which the USA accounted for some US$78 billion. The USA, the world's biggest market, is expected to grow at an annual rate of 5 per cent, with the solid and liquid waste management and site remediation segments (supported by the USA Government's Superfund Program) experiencing the strongest growth. Growth in Canada is predicted to be considerably stronger, largely reflecting the enactment of stricter legislation. In 1990, EWMESS exports by the United States totalled about US$8 billion, consisting mainly of solid and liquid waste management equipment, systems and services. Imports were valued at around US$6 billion (OECD 1992a).

The bulk of EWMESS firms in the USA tend to be small to medium sized operators. Overall, the industry has a fragmented structure and tends to focus on domestic markets. Ferrier (1993) states that many USA firms often do not venture into export markets due to a lack of: capital; information about foreign markets; and support from government trade representatives.

Europe[2]

The OECD estimates the European market for EWMESS products and services to be more than US$50 billion in 1990. The data show that the major components of European demand are for water and effluents treatment equipment and air quality control equipment. Equipment and services for solid and liquid waste management and site remediation are expected to become relatively more important in the future. Overall, the OECD forecasts industry growth in Europe to be somewhat lower than the OECD average of 5.5 per cent — although growth is nevertheless forecast to be strong at 4.9 per cent.

Germany's market for EWMESS products and services totals about US$17 billion. It is the largest market within Europe — accounting for around 30 per cent of the European market. German firms produce EWMESS products worth US$27 billion. Approximately 40 per cent of their output is exported, making Germany the largest exporter of EWMESS products and services of any country. Exports, which are mainly of water and effluents treatment equipment (40 per cent) and air pollution control products (35 per cent), totalled about

2 Excluding eastern European countries.

$11 billion in 1990. Approximately half of Germany's EWMESS exports are to other European countries, with the remainder divided more or less equally between North America, East Europe, the Middle East and Africa. German firms are also exploiting new opportunities in the fast growing Asian market.

The UK, France and the Netherlands export between 14 and 20 per cent of their EWMESS products and services, with a considerable amount going to the Middle East and Africa. They are also significant importers, particularly of air quality control and water and effluents treatment equipment and systems, mainly from German, Japanese and American companies. Imports account for around 15 per cent of the total market in France and the UK, and almost 25 per cent in the Netherlands.

A number of other European countries — such as Denmark, Finland, Norway and Italy — have well developed EWMESS industries and are relatively self-sufficient, being neither significant importers nor exporters. However, Sweden is a significant exporter of both water and air quality equipment. Other smaller European countries and those with less advanced environmental industries (eg Belgium, Greece, Spain and Portugal) are net importers of environmental equipment. The OECD estimates these countries to have some of the highest EWMESS industry growth rates in Europe.

The CEST study (1990) also points to high growth in those European countries which have to bring themselves up to EC standards (eg Greece and Ireland) and those experiencing strong growth in manufacturing (such as Portugal and Spain).

Japan

Japan has a EWMESS market of about US$24 billion. It exports some 18 per cent of its EWMESS production, mainly air pollution control equipment. Japanese firms are also expanding their exports of water treatment technology and solid and liquid waste management products.

The Japanese market is expected to show strong growth — around 6 to 7 per cent per annum — due mainly to efforts by the Government to raise environmental standards in the solid and liquid waste management and water treatment areas.

Developing countries

Trends in European and American environmental waste management are being mirrored in various developing countries (particularly the more rapidly developing Asian countries). As per capita incomes rise, demand for a better quality environment is increasing.

The CEST study identifies the newly industrialised countries in south east Asia and Latin America, as well as China and India, as countries which have experienced substantial growth without adequate environmental protection. Nearer to home, some Asian countries have experienced rapid industrialisation and urbanisation over the last 20 years, often with little regard for the environment. While it is difficult to generalise, there have been recent initiatives in a number of Asian countries to combat the environmental effects of industrialisation and urbanisation, with governments implementing waste minimisation strategies and tightening environmental regulations.

A number of Asian governments are committing significant resources to improve waste management over the coming years. For example, South Korea is building large scale waste disposal sites, while Hong Kong is building secure landfill sites. In addition, Bangkok, Jakarta and Manila are constructing large scale sewerage treatment systems. In Taipei, the government has allocated US$1.1 billion to a river clean-up project starting in 1994.

The South Korean Environment Ministry has estimated that the South Korean market will grow from US$1 billion in 1991 to US$4 billion in 1994. The EMIAA presented data which suggested that a minimum of US$10 billion per annum will be spent in Asia over the next five to seven years on environmental equipment, systems and services.

Given initiatives in Asia and in other parts of the developing world there will be increasing emphasis in these markets. For example, the CEST study predicts that by 2000 over 50 per cent of the world market for air pollution control products will be in the developing countries.

More details on demand for EWMESS products in certain Asian countries is provided in Appendix E.

3 AUSTRALIA'S EWMESS INDUSTRY AND MARKETS

The forces driving international demand for EWMESS industry products and services are also driving the Australian industry.

Australia is a highly urbanised society with the vast majority of its population residing in the capital cities. For a developed (or industrialised) society, Australia has a high population growth rate, mainly as a consequence of its immigration policy; for example, the annual population growth rate predicted for Australia between 1991 and 2000 is 1.4 per cent, compared to 0.4 per cent for Japan and Germany, 0.2 per cent in the United Kingdom and 1 per cent in the USA (UNDP 1993). Furthermore, Australia's urban population growth rate is predicted to be higher than all but a small minority of industrialised countries (UNDP 1993). Population growth — and its urban orientation — will mean more wastes and higher demand for either waste disposal or waste minimisation products and services.

Demand for EWMESS products and services will, of course, also be determined by our ability to pay for them. This will be reflected in changes in per capita income. There can be no certainty about future economic growth rates. However, even modest economic growth will provide greater capacity to pay for more EWMESS products and services.

Whether or not increased *ability* to pay is matched by the community's *willingness* to pay (as reflected in government environmental objectives and policies) will depend upon, among other things, the values attached to preserving environmental attributes and to rectifying past problems. In this context, there appears to be widespread concern about environmental problems that have emerged in recent years. For example, considerable attention has focussed on sewage outfall problems on Sydney's beaches, outbreaks of blue-green algal blooms in inland rivers and pollution from leaded petrol.

It is in this context that the Australian market — now and in the future — has to be assessed.

3.1 The Australian market

As noted earlier, there are no readily available official statistics that adequately cover the entire Australian EWMESS industry or its markets. There are,

however, some initiatives in train to help overcome these shortcomings (see Chapter 12).

OECD estimates for 1990 suggest an Australian market size of US$2 billion (about $A2.8 billion). On this basis, the Australian market would be around 1.0 per cent of the OECD EWMESS market and about 0.7 per cent of Australia's Gross Domestic Product (GDP).

Expenditure by governments

In 1990-91, aggregate capital outlays by governments on water supply services, sanitation and protection of the environment was approximately $1.8 billion (see Table 3.1 and Figure 3.1).[1] In the same year, Australian governments spent approximately $700 million on current outlays (eg wages, salaries and maintenance materials) on water supply services, sanitation and protection of the environment.[2] Total government outlays in 1990-91 on these items was, therefore, $2.5 billion.

Table 3.1: **Capital and current outlays by governments on water supply, sanitation and protection of the environment, 1986-87 to 1991-92**

($ millions)

Year	*Capital outlays*	*Current outlays*[a]	*Total expenditure*
1986-87	1656	380	2036
1987-88	1883	396	2279
1988-89	1548	461	2009
1989-90	1736	648	2384
1990-91	1813	704	2517
1991-92	1871	676	2547

a Current outlays in this column are for governments only, and exclude outlays by GBEs.

Note: Data includes outlays on water supply services, most of which is unrelated to waste management.

Source: Derived from ABS 1993c.

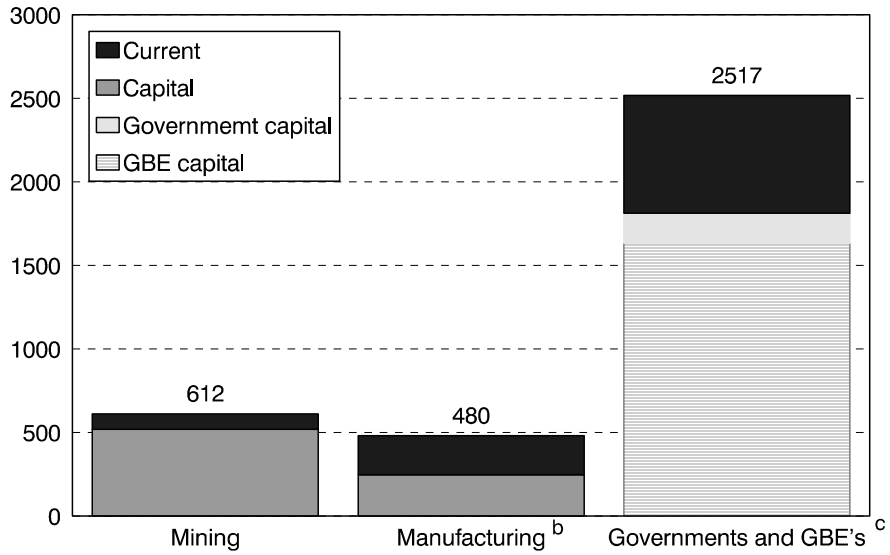
One problem is that "water supply services" as defined by the ABS covers all items (including reticulation and purification) in the water supply system other

1 Includes capital outlays by all levels of government (ie Commonwealth, state and local government), and by all types of government bodies (eg government business enterprises, departments and statutory bodies).

2 Current outlays are defined by the ABS as "net current expenditure on goods and services plus current transfer payments." They are therefore not directly comparable with "current expenditure" by mining and manufacturing establishments shown in Figure 3.1.

than irrigation systems. Much of this expenditure is not directly related to waste management (eg expenditure on dams and water reticulation). However, the AWWA estimates that EWMESS-specific capital expenditure by water authorities over the period 1989-90 to 1998-99 will represent 11 per cent of total capital expenditure on water supply services. If this proportion is assumed to apply to both capital and current outlays on water supply by water authorities in 1990-91, EWMESS-related expenditure by governments in that year would have been around $1.7 billion.

Figure 3.1: **Australian current and capital outlays[a] on water supply and protection of the environment, 1990-91** ($ millions)



a The ABS (1993a and 1993b) uses the term 'expenditure' for the manufacturing and mining sectors.
b Excludes some ASIC subdivisions.
c Current outlays are for governments only, and exclude outlays by GBEs.
Note: Data includes outlays on water supply services, most of which is unrelated to waste management.
Source: ABS 1993a, 1993b, 1993c.

Figure 3.1 highlights the significance of government outlays. In 1990-91, outlays by government accounted for approximately 70 per cent of total outlays by those sectors for which data are available. If expenditure on water supply services unrelated to waste management is excluded, the figure is a little lower — around 60 per cent. About 90 per cent of capital expenditure by government is made by GBEs, which gives them significant market power, and emphasises the importance of procurement policies (see Chapter 8).

Expenditure by the mining sector

In 1990-91,[3] the mining sector (metallic minerals, coal, oil and gas) spent $612 million (see Figure 3.1) on environmental protection (defined as equipment or processes used to reduce, control and abate pollution and wastes). Of this amount, $520 million (85 per cent) was for capital equipment. This represented 12.9 per cent of total capital expenditure in the mining sector in that year.

Expenditure by the manufacturing sector

Some information on environmental expenditure by manufacturing establishments was collected for the first time in the 1990-91 Manufacturing Census. It shows that, for the manufacturing sector as a whole, 53 per cent of establishments used special equipment or processes for environmental protection.

Information on capital and current expenditure was only collected from those industries considered most likely to incur expenditure for environmental purposes. Industries from which expenditure data were not sought were: Food, beverages and tobacco; Textiles, clothing and footwear; Wood, wood products and furniture; Transport equipment; and Other equipment and machinery. Each of these industries would have incurred some expenditure on environmental protection and pollution abatement.

In 1990-91, expenditure by the selected manufacturing industries on capital and current items related to waste management and pollution abatement was $480 million (see Table 3.2 and Figure 3.1). Of the $480 million, capital expenditure totalled $248 million. Capital items included new plant, machinery and equipment to abate air and water pollution and control other wastes by either changes in production processes or through end-of-pipe techniques. Current expenditure — which amounted to $232 million — was for waste management and the operational costs incurred by establishments for protection from pollution.

[3] This is the first year in which the ABS collected statistics on environmental protection in the mining industry.

Table 3.2: **Expenditure on environmental protection for selected manufacturing industries, 1990-91**

Industry	*Number of establishments*	*Number using special equipment*	*Capital expenditure*	*Current expenditure*	*Total*	*Proportion of expenditure*
	no.	no.	$ '000	$ '000	$ '000	%
Pulp and paper	4 694	2 464	14 228	19 047	33 275	7
Chemical, petroleum and coal products	1 131	770	104 880	62 834	167 714	35
Non-metallic products	1 687	947	19 250	31 263	50 513	11
Basic metals	809	565	79 867	84 679	164 546	34
Fabricated metal products	6 628	3 727	7 203	15 823	23 026	5
Miscellaneous	3 755	1 933	22 566	18 832	41 398	9
Total	**18 704**	**10 406**	**247 994**	**232 478**	**480 472**	**100**

Source: Derived from ABS 1993a.

Summary

The estimate for the three industry sectors for which data are available is consistent with the OECD's market estimate of $2.8 billion. However, no account is taken of private expenditure by a significant proportion of manufacturing industries or by any establishment outside of the manufacturing and mining sectors. Consequently, the size of the Australian market is likely to be significantly higher than $2.8 billion.

Sectoral analysis

The following analysis of EWMESS market sectors gives some indication of relative market size and growth trends. The segmentation adopted is that employed by the OECD (1992a) used in the previous chapter.

Water and effluents treatment equipment

The water and effluents treatment sector is one of the largest and oldest waste management sectors in Australia. Much of the infrastructure for water supply and sewage treatment has been in place for many decades, although the infrastructure has expanded and developed with increasing industrialisation and urbanisation. While some technologies for water treatment and sewerage systems are well established, this sector is now subject to significant

technological change, as the sewage to be treated becomes chemically more complex due to pollutants and more stringent standards are imposed on effluent discharges to protect the recipient land or water body.

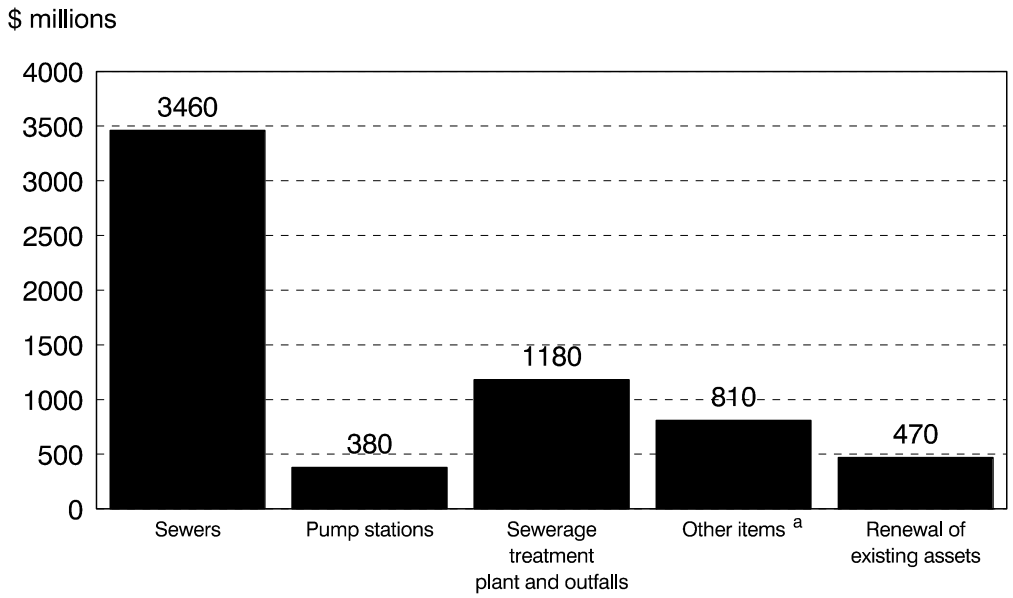
Future demand for water and effluents treatment equipment will come from GBEs, local authorities operating waste treatment facilities, industry and private contractors who provide reticulated water supply and sewerage systems for their communities.

A survey of major Australian water authorities commissioned by the Australian Water Research Advisory Council (AWRAC 1990) forecasts total capital expenditure on water supply for the period 1989-90 to 1998-99 to be $5960 million (in 1989 dollars). Of this amount, $5220 million is for new capital works and $740 million is for renewals of existing assets. New water treatment plants are estimated to cost $660 million. It needs to be recognised, however, that only 11 per cent of this expenditure is specifically EWMESS-related. The forecast total capital expenditure on sewerage systems for the same period is $6300 million, of which $5830 million is for new capital works and $470 million for renewals of existing assets. Details of capital expenditure on sewerage systems are shown in Figure 3.2.

The AWRAC (1990) claims that its survey results for expenditures on both water supply and sewerage systems underestimate capital projects by about 10 to 15 per cent.

A more detailed breakdown of the major components of capital expenditure for the period 1989-90 to 1998-99 by the major water authorities — which collectively service approximately 13.5 million people (81 per cent of the Australian population) — is shown in Table 3.3. The data show that the treatment technology component for water and sewage systems represents only about 4.7 per cent of total expenditure. It is this component which is essential to provide the quality of the water produced. The other costs are associated with the delivery of raw materials and the distribution of water products (AWRAC 1990). It is not possible to separately identify those costs directly associated with waste management.

Figure 3.2: **Projected capital expenditure on sewerage systems by Australian water authorities, 1989-99 to 1998-99** (1989 dollars)



a Other items include information systems, land resumption, computer installations and other miscellaneous items.
Source: Adapted from AWRAC 1990.

Table 3.3 **Major components of projected capital expenditure on water and sewerage treatment facilities by Australian water authorities, 1989-90 to 1998-99**

Major component	*$ million*[a]	*Percentage*
Pipes, valves and fittings	3025	28.2
Pumps	160	1.5
Process equipment - water treatment	200	1.9
Process equipment - sewage treatment	300	2.8
Electrical equipment	300	2.8
Civil construction - pipelines and sewers	4100	38.3
Civil construction - other	2415	22.5
Mechanical equipment installation	215	2.0
Total	**10715**	**100**

a In 1989 dollars.
Source: Derived from AWRAC 1990.

In addition to the above projections, the Sydney Water Board has announced expenditure of $600 million over the next 10 years to upgrade sewerage treatment systems discharging effluent into the Nepean-Hawkesbury River system. Also, in the Prime Minister's Environment Statement in December 1992, an additional $46 million (over the next four years) was allocated to upgrade water management in urban and rural catchments to combat the blue green algae problems in inland water systems. The Statement identified declining water quality as one of the nation's most pressing environmental problems.

One of the measures announce in the Statement was the broadening of the National Landcare Program to address nutrient releases to the Darling River and to assist small country towns improve their water supplies and waste water treatment. Of particular interest to EWMESS firms is an amount of $1 million allocated to trial new technologies which have the potential to achieve these objectives. It is expected that state and/or local governments will provide additional funding. Commonwealth support for any particular project will be allocated on a case-by-case basis. There are also various other components of the National Landcare Program which should provide opportunities for segments of the EWMESS industry (eg consultants have the potential to involve themselves in catchment management studies and planning).

The AWWA estimates that Australian industry spends about $90 million per annum for on-site treatment of effluents before being discharged to the sewer, and a further $10 million per annum on waste water and effluent minimisation.

In summary, total expenditure on water (provision and treatment) and effluents treatment is estimated to be $14 billion for the 10 year period, or an average of $1.4 billion per annum.

Waste management equipment, systems and related services

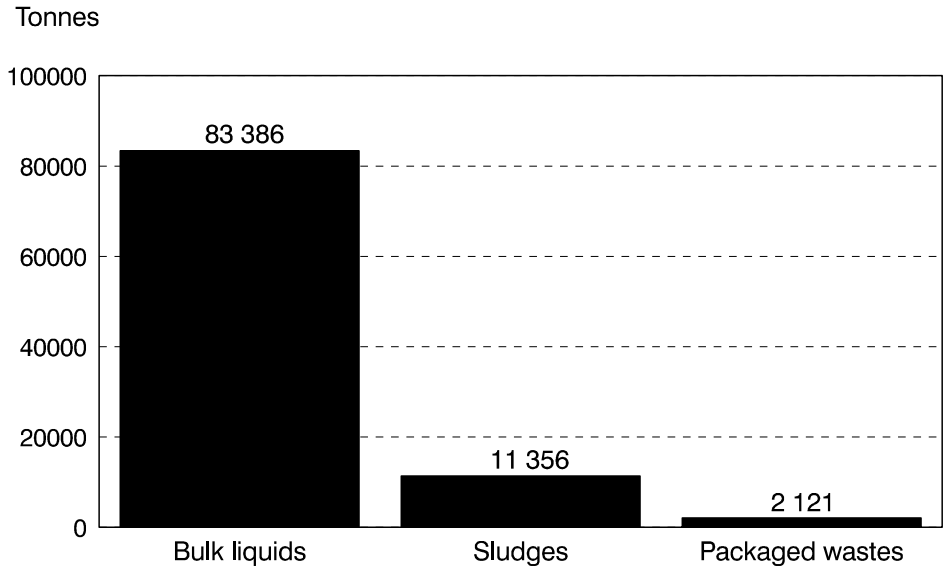
Under the OECD industry classification, this sector consists of two segments. One is associated with liquid waste disposal and the other is solid waste management.

Liquid waste management

Liquid waste management encompasses the collection, transportation, treatment and final disposal (generally to landfill) of liquid wastes, (including toxic and hazardous wastes), and sludges from households, industry and local authority water and sewerage treatment systems. It is estimated that more than 100 million litres per annum of liquid waste are collected and transported to treatment facilities and landfills throughout Australia (DITAC 1990). However, this volume appears to be a significant underestimate as approximately this

amount was treated at the two New South Wales liquid waste facilities alone in 1991. These two facilities received nearly 100 000 tonnes of liquid waste, earning about $14.5 million in revenue (see Figure 3.3). New South Wales is the largest producer of liquid waste.

Figure 3.3: **Liquid wastes accepted at the Castlereagh and Lidcombe Aqueous waste plants, 1991**
(tonnes)



Source: NSW WMA 1992.

With increasing charges based on the quantity and quality of liquid waste discharges to sewers, and stricter controls on illegal dumping, the volume of liquid waste being collected and treated at liquid waste treatment facilities prior to landfill disposal is rising significantly. The New South Wales Waste Management Authority (NSW WMA 1992) stated that this has resulted in a 40 per cent reduction in pollution concentration levels discharged to sewers in Sydney.

No comprehensive data on the actual size and growth trends for the liquid waste management segment are available.

Trends in solid waste management

Solid waste generation is linked to population size. Hence, using a population growth rate for Australia of 1.4 per cent (UNDP 1993) for the period 1989 to 2000, and taking an estimate of per capita solid waste generated in 1989

(IC 1990), it is possible to make some estimates of solid waste generation in future years.

The estimates are based on the assumption that the per capita solid waste generated remains constant. However, account must also be take of the likely impact of the National Waste Minimisation Strategy. It seeks to achieve a 50 per cent reduction in waste being disposed of to landfill by the year 2000. This implies significant changes in collection, recycling and final disposal systems. In this context, it is relevant to note that the Sydney solid waste management strategy indicates that about half the domestic waste stream is theoretically available for recycling. No detailed estimates are available on the proportion of commercial and industrial waste which is recyclable.

Assuming that the National Waste Minimisation Strategy of a 50 per cent reduction in solid waste being disposed of to landfill by the year 2000 is progressively achieved, and using as a base the recycled quantity directed to landfill estimated in the IC 1990 Recycling report, estimates of the quantities of solid waste generated, recycled and disposed of to the year 2000 are shown in Table 3.4.

With the widespread introduction of the 240 litre 'wheelie bin' and the introduction of source-based recycling, the majority of this waste will be collected by councils or private operators. About 10 per cent will be delivered to transfer stations or directly to landfills by householders (NSW WMA 1990). Using an average collection cost of $37 per tonne (IC 1990), annual collection costs (in 1989 dollar terms) are estimated to be in the range of $450 million to $500 million over the period between 1993 and 2000 (see Table 3.5).

A recent study on the full cost of waste management (Stanley & Maunsell 1992b) estimates that waste disposal costs by landfill at metropolitan and major rural sites are of the order of $21 per tonne for modern facilities (net of head office costs and amenity charges). Applying this figure to the projected quantities of waste to final disposal suggests total annual costs of solid waste disposal will remain relatively constant at around $655 to $675 million for the remainder of this century (see Table 3.5).

Table 3.4: **Solid waste generation and recycling, 1989 to 2000**

Year	*Estimated quantity of solid waste generated*	*Quantity recycled*		*Quantity disposed to landfill*
		Assumed rate	*Volume*	
	million tonnes	%	million tonnes	million tonnes
1989	12.8	3.0	0.4	12.4
1990	13.0	7.5	1.0	12.0
1991	13.2	12.0	1.6	11.6
1992	13.3	16.5	2.2	11.1
1993	13.5	21.0	2.8	10.7
1994	13.7	25.5	3.5	10.2
1995	13.9	30.0	4.2	9.7
1996	14.1	34.0	4.8	9.3
1997	14.3	38.0	5.4	8.9
1998	14.5	42.0	6.1	8.4
1999	14.7	46.0	6.8	7.9
2000	14.9	50.0	7.4	7.5

Source: Commission estimates.

Table 3.5: **Projected costs of solid waste collection and disposal, 1993 to 2000**
($ million)

Year	*Total estimated collection costs at $37 per tonne*[a]	*Total estimated disposal costs at $21 per tonne*	*Total cost of solid waste disposal*
1993	450	225	675
1994	456	214	670
1995	463	203	669
1996	470	195	665
1997	476	187	663
1998	483	176	659
1999	489	166	655
2000	496	158	654

a In calculating collection costs, the projected quantity of solid waste generated shown in Table 3.4 has been reduced by 10 per cent to account for householder deliveries to landfills or transfer stations.
Source: Commission estimates.

The cost of collecting recyclables are included in collection costs. However, the cost of processing recyclables and marketing them are not included. Given the substantial increase in the recycling rate which the National Waste Minimisation Strategy seeks to achieve, it is this area in which increasing demand for EWMESS products is expected.

Air quality control equipment

Comprehensive data on expenditure on air quality equipment are not available. Expenditure by manufacturing establishments and the mining industry on air pollution abatement are included in the estimates in Figure 3.1. Given the aggregated nature of the data, it is not possible to identify the amounts spent for this purpose. The ABS envisages providing more detailed expenditure data for manufacturing industries in late 1993.

Other equipment

This sector includes noise abatement equipment and site remediation. A vast range of products are involved in noise abatement, including soundproofing and buffers for industrial equipment and products that muffle noise. Details of expenditure on such products are not available.

Site remediation is a growing area of activity, although remediation of mine sites is a long established business. Demand for remediation depends, to a large degree, on new contaminated site legislation and on the property market. With regard to the latter, urban expansion into rural areas has identified possible problems with disused cattle and sheep dip sites that require remediation. Remediation work is also required at some disused petrol station sites.

Major remediation work is required to rehabilitate the former nuclear test site at Maralinga. The first allocation by the Commonwealth Government is $2.2 million in the 1993-94 budget.

All Australian states have, or are in the process of, compiling a register of possible contaminated sites. Environmental Management Australia estimates that 100 000 contaminated sites could potentially exist in Australia[4] (Schwaiger 1993). Using the same criteria to define contaminated sites, the (then) New South Wales State Pollution Control Commission (SPCC) estimated that, in New South Wales, perhaps 60 000 sites are contaminated. Of these, the SPCC estimated that 7 000 would require remediation at a total cost of greater than $2 billion (Powell 1992).

General services

There is no data that exclusively covers the Australian general services sector. However, the OECD (1992a) estimates that, globally, the general services sector will have a growth rate of 7.4 per cent to the year 2000 — nearly 50 per cent higher than that expected for the EWMESS sector as a whole.

[4] Based on more than 30 industrial and agricultural activities associated with land contamination designated by the Australia and New Zealand Environment and Conservation Council.

Indications in Australia are consistent with this high growth scenario. Underlying this is the adoption by firms of cleaner production techniques. This trend has been encouraged by government support. For example, the Commonwealth Government has allocated $3.1 million to assist companies to identify opportunities for waste prevention (Keating 1992).

To the extent that Australian environmental regulations become more stringent, and companies themselves strive to reduce the environmental impacts of their operations, demand for a wide range of environmental services (eg consultancy services to advise on means of reducing emissions and monitoring discharges) is likely to grow strongly.

3.2 The Australian industry

According to the DITRD, the local industry consists of around 1200 firms, the majority of which are small businesses. Firm size and experience vary considerably, from many new, relatively small R&D-based equipment supply firms, to a few large established engineering and construction companies which have expanded their operations to encompass environmental waste management activities. These larger businesses are often subsidiaries of international corporations operating in several sectors. The small firms are predominantly owner-managed, specialising in the one field.

Equipment, systems and related services

There is a large number of small to medium-sized EWMESS equipment manufacturers and suppliers in Australia. Most firms either manufacture locally-adapted equipment under licence or import equipment from various overseas sources — particularly from Germany, Japan and the USA. Many equipment manufacturers make relatively simple equipment such as pipes and pumps. Some of the more sophisticated equipment (eg centrifuges) is imported. However, there are a few emerging innovative local equipment developers and manufacturers, such as Johnson Matthey which produces catalytic converters for motor vehicles for both the domestic and international markets. The majority of compactors and collection equipment for household, industrial and commercial solid waste is manufactured in Australia and fitted to domestically assembled truck chassis. Although there are no trade data available, the EMIAA stated that Australia is a net importer of EWMESS equipment.

Water and effluents treatment

Public water authorities throughout Australia are the major providers of water treatment services. The significance of water and effluents treatment activities relative to the totality of their operations varies, largely because of the variation in quantities and quality of the water and effluents.

There are a number of local firms producing relatively small systems in the water and effluents treatment areas (eg Sepa Waste Water, Biocycle and Memtec). Some firms (eg BHP Engineering and ANI-Krüger) and some government authorities (eg water boards) have the capacity to design, develop and produce large systems for various purposes (eg effluents treatment).

Firms involved in the manufacture of water and effluents treatment equipment include a few large firms (eg Tubemakers of Australia) and many small to medium sized firms ranging from large plumbing suppliers to small firms providing specialist equipment.

Waste management equipment and services

Local governments are the major providers of solid waste management services. Their principal role in solid waste management is the collection and operation of landfill sites, transfer stations and waste recovery/recycling centres. Several private contractors, such as Pacific Waste, Cleanaway and Browning Ferris Industries, also operate waste disposal facilities, both privately and on behalf of government waste management authorities and local councils.

The disposal of waste from commercial and industrial sites is usually undertaken by private contractors such as Cleanaway and Pacific Waste. Other large firms that provide waste management services include Thiess and Collex Waste Management.

Cleanaway and Pacific Waste are the major contractors in the removal and disposal of liquid waste.

Other equipment

Clough MRT, Bergmann Australia and Thiess are the major contractors in site remediation in Australia. However, mining companies (eg CRA) are also involved in developing systems for site remediation. A number of companies produce equipment for noise abatement (eg mufflers and soundproofing materials).

General services

Many consultancy firms are engaged in providing process, appraisal, design, project management and engineering services of an environmental waste management nature. In addition to private sector consultants, research institutions such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and universities provide consulting services. Some of the large companies (eg Kinhill Engineers and Sinclair Knight and Partners) also operate in overseas markets, especially in Asia.

The major contractors involved in providing EWMESS construction services are Permutit-Boby Australia, Davy McKee Pacific and BHP Engineering. Civil construction contractors such as the Concrete Constructions Group are now joining EWMESS-specific firms to form joint ventures for Build-Own-Operate-Transfer (BOOT) or systems construction purposes. For example, a consortium comprising Concrete Construction (NSW), Kinhill Engineers, the French water treatment company, Compangnie Generale des Eaux, and the Australian Industries Development Corporation are the preferred tenderers for the $185 million water treatment plants at Illawarra and Woronora.

3.3 Future demand and export potential

Population growth and the community's increasing desire for improvements in environmental quality and public health will ensure continuing growth in Australian demand for EWMESS products and services. The OECD (1992a) estimates annual growth of 4.4 per cent in the Australian EWMESS market through to the year 2000.

Although most overseas countries provide potential markets for the Australian EWMESS industry's output, participants generally pointed to the Asia/Pacific region as representing the greatest potential source for export sales by Australian EWMESS firms. Moreover, many of the environmental priorities in Asian countries are linked closely to areas of Australian EWMESS firms' strengths (see section 4.2). The most immediate environmental problems for developing countries include unsafe drinking water and inadequate sewage treatments.[5]

A number of factors suggest that the Asian market is likely to experience strong growth:

- economic growth rates in the 'Dynamic Asian Economies' (DAEs) are expected to remain high. In the short term, these countries are expected to

[5] Appendix E provides more information on markets in some selected Asian countries.

grow at a rate of at least twice the average annual rate for OECD countries;[6]

- high population growth rates in Asia can also be expected to lead to greater demand for EWMESS products and services. For the period 1990 to 2000, population growth rates in east Asia and the Pacific are projected to be 1.4 per cent and, in south Asia, 1.8 per cent. These compare with the average for OECD countries of 0.5 per cent (OECD 1992b); and
- the adoption in June 1992 of Agenda 21 by the United Nations Conference on the Environment and Development will see an increasing emphasis on the environment in development assistance programs, a significant proportion of which is directed to Asian countries.

In summary, all of the available evidence points to continued growth in domestic and international demand for EWMESS goods and services. Australian firms are well placed to capitalise on the opportunities which will emerge. However, the extent to which Australian EWMESS producers can seize upon growth opportunities will ultimately depend on their competitiveness relative to their overseas counterparts. Issues relating to competitiveness are discussed in the following chapter.

6 In 1992, GNP growth rates in the DAEs (ie Hong Kong, South Korea, Singapore, Taiwan, Thailand and Malaysia) averaged 6.5 per cent, compared to the OECD average of 1.5 per cent. In 1994, the average growth rate of DAEs is expected to be 7 per cent, compared to 3.5 per cent for OECD countries (OECD 1992b).

4 COMPETITIVENESS ISSUES

While participants generally agreed on the range of factors that potentially influence a EWMESS firm's competitiveness, the diversity of the industry results in the relative importance of cost and other factors affecting competitiveness varying considerably both within and between sectors. Consequently, much of the information on the industry's competitiveness is illustrative rather than comprehensive.

This chapter reviews the information available on the current competitiveness of EWMESS sectors and discusses some broad factors identified by participants as influencing their competitiveness in local and overseas markets. Subsequently, the focus is on actions which the industry can take to improve its competitiveness. To illustrate possible strategies, the Commission has drawn on the experiences of a number of EWMESS firms (see Boxes 4.1 to 4.4). Actions which governments can take to improve the industry's competitiveness are discussed in subsequent chapters.

4.1 What is competitiveness?

Competitiveness can be regarded as the ability of a firm to compete in the market place. While competitiveness is in large part correlated with relative selling prices, a range of non-price factors also influence a firm's competitiveness. These include product quality, delivery times, follow-up service and the terms and conditions of sale.

Competitiveness can result from natural, historical or cultural/sociological factors. For example, it can reflect advantages resulting from access to natural resources and low labour costs. It can also be created through the process of innovation (research and development, training etc). Then again, it may merely reflect government assistance which makes a particular firm or industry competitive.

In principle, there are various quantitative indicators which could be used to assess the Australian EWMESS industry's present competitiveness. One such indicator is selling or tender prices. Alternatively, it is often possible to employ market share analysis to gauge local industry's competitiveness against imports, and changes over time. Other indicators include a range of measures which can be used to benchmark an enterprise's operational performance against its competitors (eg gross turnover per worker, capacity utilisation etc).

Information of this kind about the EWMESS industry is not available from official sources. Furthermore, participants did not provide this type of information in their submissions to the inquiry. Thus, in assessing current competitiveness, the Commission has relied mainly on qualitative observations from participants to make some broad generalisations.

4.2 Market perception of competitiveness

The EMIAA said that, while measuring competitive performance is important, market perceptions are often the most critical determinant of competitiveness. According to the EMIAA, perceptions are influenced significantly by companies' marketing programs, the extent and suitability of their personal networks, and relations with their workforce and governments at home and abroad.

Tables 4.1 and 4.2 provide the results of a recent survey, conducted by the Australian Trade Commission (Austrade), of foreign customers' perception of the competitiveness of the Australian liquid and solid waste management sectors. As indicated in the tables, Austrade included 17 criteria on management, marketing, technology and production-related factors in its survey. The results are given in terms of a ranking from double minus (ie highly uncompetitive) to double plus (ie highly competitive).

While showing some differences in competitiveness between liquid waste and solid waste management, and also in responses between regions, the survey points to some strengths and weaknesses of the Australian industry. For example, it suggests that the Australian industry is relatively competitive in terms of institutional support (eg Austrade's activities) and in product design/development capabilities. On the other hand, overseas customers perceive the effectiveness of the distribution networks and of logistics support to be relatively weak.

In terms of domestic users' perceptions, the EMIAA stated that, in spite of all the evidence underlining the local industry's capability, there remains a perception that Australian equipment and systems technologies are inferior to imported equivalents. In response to this problem, the EMIAA considered that:

> Much can be done to overcome this "perception gulf" between the industry and its principal clients by fostering development partnerships, project joint ventures, more flexible administrative and funding mechanisms for environmental projects — in short, there is far greater scope for public/private integration...

Some of the issues raised above are discussed later in this chapter, while others are addressed in subsequent chapters of the report.

Table 4.1: **Australian competitiveness in liquid waste management**

Assessment criteria	*Rating*														
	North America					*Europe*					*Asia*				
	- -	-	0	+	+ +	- -	-	0	+	+ +	- -	-	0	+	+ +
Management related															
Adequacy of management deployed				◆				◆				◆			
Span of international contacts/ alliances				◆					◆			◆			
Effectiveness of market intelligence				◆			◆							◆	
Marketing related															
Effectiveness of institutional support				◆					◆						◆
Effectiveness of distribution network		◆					◆						◆		
Appropriateness of pricing approaches				◆				◆					◆		
Advertising/promotion capability			◆				◆							◆	
Technology related															
Product design/development capabilities					◆				◆						◆
Adequacy of technology investment				◆					◆				◆		
Customer service support capabilities		◆						◆					◆		
Breadth of product line			◆					◆					◆		
Production related															
Cost competitiveness of operations					◆			◆				◆			
Adequacy of scale of operation			◆				◆						◆		
Consistency of quality control				◆				◆						◆	
Effectiveness of logistics support		◆						◆					◆		
Control of key inputs supply				◆				◆					◆		
Packaging and labelling			◆						◆				◆		

Source: EMIAA submission.

Table 4.2: **Australian competitiveness in solid waste management**

Assessment criteria	*Rating*														
	North America					*Europe*					*Asia*				
	- -	-	0	+	+ +	- -	-	0	+	+ +	- -	-	0	+	+ +
Management related															
Adequacy of management deployed				◆				◆				◆			
Span of international contacts/alliances				◆				◆				◆			
Effectiveness of market intelligence				◆			◆							◆	
Marketing related															
Effectiveness of institutional support				◆			◆								◆
Effectiveness of distribution network		◆					◆						◆		
Appropriateness of pricing approaches				◆				◆					◆		
Advertising/promotion capability			◆					◆						◆	
Technology related															
Product design/development capabilities					◆				◆						◆
Adequacy of technology investment				◆				◆						◆	
Customer service support capabilities		◆							◆					◆	
Breadth of product line			◆						◆					◆	
Production related															
Cost competitiveness of operations					◆		◆					◆			
Adequacy of scale of operation			◆				◆						◆		
Consistency of quality control				◆				◆						◆	
Effectiveness of logistics support		◆						◆					◆		
Control of key inputs supply				◆				◆					◆		
Packaging and labelling			◆					◆					◆		

Source: EMIAA submission.

4.3 Areas of competitive advantage

Australia's strengths in the EWMESS industry are linked to sectors where it possesses competitive advantages in international trade (eg mining and agricultural activities), or where there are opportunities to take advantage of Australia's relatively high level of science training skills and relatively low labour costs.

Information submitted by the EMIAA points to four important market segments in which local EWMESS firms currently have competitive advantages in domestic and/or international markets (see Table 4.3). The Commission does not necessarily agree with some of the assessments (eg the low ranking of solid waste management in the domestic sector). The market segments, and the Commission's view of the reasons underlying their competitive advantage, are:

- *Site rehabilitation/remediation* — site rehabilitation/remediation (including both mine site rehabilitation and industrial site remediation) — this sector's competitive advantages accrue mainly from its links with the Australian mining industry and relatively low local engineering costs compared to those in Northern America and Europe;
- *Consultancy services* — the relatively low cost in Australia of highly skilled engineers, scientists, researchers, educators and professional consultants, in what is a labour intensive area of activity, is the major factor explaining this sector's competitive advantage. Close proximity to the developing Asian market and experience in providing waste management solutions for similar climatic environments are also positive factors in Asian markets;
- *Waste water and sewage treatment* — this sector's competitive advantages are also tied mainly to the local industry's experience in applications relevant to Asian countries (eg tropical urban water supply and sewage treatment, protecting tourist sites such as the Great Barrier Reef and providing solutions for agricultural and mining pursuits in remote areas) and relatively low design, consultancy and engineering costs in Australia; and
- *Monitoring and sensing equipment* — in this sector, the local industry's advantages are derived from Australia's well developed scientific skills and its close association with research in Australia's medical equipment and scientific instruments sector.

As indicated in Table 4.3, the local industry's competitive disadvantages in the international and/or domestic markets are greatest in: the air cleaning equipment and systems sector and in hazardous waste disposal technologies and systems.

In the former case, there have been relatively few restrictions on discharges to the atmosphere in Australia. This is in contrast to countries such as Japan where, with tighter air pollution regulations, a large industrial capacity has developed which has captured much of the international market.

In the case of hazardous waste disposal, technological development has occurred in Australia. A wide range of experimental technologies have been developed. A well-known, but yet to be utilised, technology is SYNROC (a synthetic rock based on titanate minerals that can immobilise the elements in high level waste with its crystal structures). In recent years, two government-appointed bodies have considered issues involving the treatment of what has been called 'intractable waste'. The first was the Joint Taskforce on Intractable Waste. It supported the construction of a central high temperature incinerator. The siting of the proposed incinerator became a very difficult social issue. As a consequence, the Independent Panel on Intractable Waste (IPIW) was asked to report on alternative technologies. The very strong message which came from the panel's report was that techniques had not only to be technically feasible, but also socially acceptable. This, more than anything else, has led to the research effort and experimentation that has occurred recently. This community-driven search for alternative technologies is not limited to Australia (although incineration appears to be more readily accepted in other countries) and will not necessarily provide Australia with a competitive advantage. Furthermore, as the IPIW argues, Australia's intractable waste profile is different to that of most comparable countries and, hence, Australian solutions might not be exportable. On the other hand, if other countries make policy decisions in the future which require localised small-scale and/or relocatable facilities to deal with specific types of waste at or near source, the types of technologies being experimented with in Australia could be competitive in international markets.

Table 4.3: **Competitiveness ranking of Australian EWMESS sectors**

Level of competitiveness	*Domestic markets*	*International markets*
High	Mine rehabilitation	Mine rehabilitation
	Consultancy services	Consultancy services
	Water treatment	
	Waste water and sewage treatment	
Medium	Hazardous waste management	Industrial remediation
	Industrial remediation	Waste water and sewage treatment
	Clean Production	Monitors and sensors
	Monitors and sensors	Air monitoring
	Air monitoring	
Low	Air cleaning	Air cleaning
	Solid waste management	Hazardous waste management
		Solid waste management
		Clean production
		Water treatment

Source: Adapted from EMIAA submission.

4.4 Options for improving competitiveness

Participants outlined a range of different strategies for improving competitiveness. Some focused on reducing costs, while other strategies were contingent upon improving product quality, service, managerial and marketing skills.

Cost competitiveness

The main factors important to the industry's cost competitiveness are labour and capital costs, the cost of material and other inputs, and scale of operation. Each of these factors is discussed briefly below.

Labour costs

A number of participants indicated that Australian labour costs are lower than in the major EWMESS exporting countries of Germany, Japan and the USA, particularly where scientists, engineers and/or researchers represent a significant proportion of the workforce. Some participants said that these cost advantages could be better exploited, especially to increase penetration in Asian markets.

For example, the EMIAA considered that relatively attractive Australian labour costs create opportunities for local firms to develop collaborative relationships (eg sub-contract, joint venture) with firms in high wage cost OECD countries that are already exporting to Asian markets.

The information available to the Commission suggests that Australia has a competitive advantage because of its relatively low labour costs. The relative success of Australian consultants (a labour intensive activity) in Asia is evidence of this advantage.

Capital costs

There is very little information available on the cost of funds to Australian EWMESS firms relative to their overseas counterparts or about the capital costs of establishing new EWMESS plant in Australia. Given the increasing mobility of capital, it could be expected the only significant differences in the cost of funds would reflect such factors as comparative risk of investment, differing government monetary policies and macroeconomic management. Various participants pointed to examples of their overseas counterparts being favourably treated by their governments.

Materials and other inputs

The limited evidence provided by participants indicates that the importance of materials as a component of the total cost to make and sell goods or provide services varies considerably between EWMESS sectors, from virtually zero for consultancy work to around 60 per cent for a plastics recycling system.

The price of materials is influenced by government imposts. In this regard, EWMESS firms are penalised directly by the tariffs on imported materials (eg pumps, screens and filters) and indirectly through the effect that tariffs have on increasing the prices of materials purchased from domestic suppliers.

Most tariffs, including those on EWMESS outputs as well as those on material inputs, are being progressively reduced under the general tariff reduction program to a maximum of 5 per cent by 1996. This should result in a small positive impact on the EWMESS industry's future international cost competitiveness.

Other areas of microeconomic reform could also help improve the industry's cost competitiveness. For example, reforms in the energy and domestic transport sectors could lead to lower charges for some of these important inputs.

Scale

As indicated in Chapter 3, the local EWMESS industry is comprised of many small to medium-sized enterprises which collectively produce a diverse range of goods and services. Most of the equipment manufacturers tend to be relatively specialised, while many systems suppliers operate on a jobbing (ie 'one-off') basis.

Despite the predominance of smaller firms, Australia has a scattering of large companies that have an involvement in certain EWMESS sectors, such as: BHP Engineering in water and effluent treatment engineering, design and construction; Theiss Australia in site remediation; and Kinhill Engineers (Kinhill), Sinclair Knight and Partners, and Camp Scott Furphy in systems design, project management and consultancy services. Even so, most of these larger companies' EWMESS operations are small by world standards.

The potential savings from increasing scale depends on a number of factors, including the capital intensity of the product being manufactured. While it is difficult to generalise given the vast range of products produced by the EWMESS industry, economies of scale are likely to be most important in parts of the equipment segment. Economies of scale are not as important in the services sector as it comprises mainly labour intensive activities and there is a tendency for services to be tailored to the needs of individual clients. However, as turnover increases, savings may be available through the consolidation of marketing and common overheads.

A major barrier for many firms is establishing demand sufficient to justify the investment in larger scale plant. However, in some circumstances, joint ventures (with another Australian firm or with an overseas firm) and amalgamations between local firms could enable Australian firms to take advantage of economies of scale.

Quality and service performance

Most industry and user participants considered that high levels of quality and service performance are essential to future competitiveness. Some indicated that these attributes are often more important than price. For instance, both the Sydney Water Board and the Water Authority of Western Australia stated that long term contracts for water and waste water treatment plants are now, or about to be, subjected to whole-of-life costing appraisals which stress the importance of quality (eg reliability and manageability) and service (eg parts availability, maintenance costs, follow-up assistance and training).

Views on the quality and service performance, and the scope for improvement, of the local industry differ. For instance, while the EMIAA claimed that the high level of service and the industry's capacity to respond quickly are its most outstanding and competitive characteristics, some users, such as the Queensland Government, argued that the importance of quality and service performance has not been fully recognised, and that many Australian EWMESS producers remain supply, rather then user, driven.

Cooperation and collaboration initiatives

Until recently, there was only limited cooperation or efficient collaboration between local EWMESS firms or between firms and other interested parties (eg governments, users and universities). For instance, Austrade and others suggested that there is not enough cooperation between EWMESS firms and the various research institutions or, for that matter, between the institutions themselves. It was argued that there are too few resources available for basic research to waste them on duplicating research effort, and that greater cooperation is needed to ensure that R&D is targeted at niche market opportunities. An example of how the establishment of research links between a private company and universities can lead to improved competitiveness is illustrated by the 'Biocycle story' (Box 4.1) and the 'Ausmelt story' (Box 4.2).

According to participants, the establishment of the EMIAA, the CRCWMPC (a public/private sector research joint venture organisation — see Chapter 9 for details), and the Australian Environment Management Export Corporation (Austemex) (a collaborative public/private sector export marketing group — see Chapter 11 for details) has led to greater cooperation and collaboration in the industry.

There are benefits from collaboration, particularly when it is in the form of joint ventures which provide scale economies. In this regard, Austemex has increased the opportunity for mutually beneficial joint ventures to be formed to tender for major overseas environmental waste management projects. Such joint ventures can provide the gains — through lower transaction costs, cheaper financial arrangements (ie lenders perceive lower risks of failure) and thus, lower prices — required to improve the industry's competitiveness.

Box 4.1: **The Biocycle story**

Biocycle, an Australian-owned enterprise formed in 1985, employs over 80 persons in the manufacture, sale, installation and servicing of aerobic waste water treatment systems (AWTs). The company has developed an innovative treatment process to collect and treat waste water at source. The end product is an effluent that is suitable for recycling as irrigation water at source. While it is an 'off the shelf' product designed for residential purposes, the Biocycle system can be modified for applications by businesses. Biocycle systems account for well in excess of 50 per cent of AWT sales to Australian households. The company's turnover for 1992–93 was approximately $8.5 million.

According to Biocycle, its success in this competitive sector can be attributed to "its ongoing research and development of a distinctive, cost-effective, high quality product — combined with a commitment to efficient after-sales service".

Four years ago, the company established research relationships with the University of Sydney, the Queensland University of Technology and Trinity College in Dublin. Biocycle said that the research data collected through these links "has led to a greater understanding of the product [and] its processes, and has highlighted the greatly lessened environmental impact of AWTs compared to the traditional means of waste water treatment and disposal".

Biocycle said that dealing with the bureaucracy and the regulatory system have been the most difficult hurdles to contend with. The company said that this is a frustrating and time consuming process because the absence of a national approving body means that each state must be approached individually to gain approval.

Biocycle has extended its operations into Ireland, the United Kingdom, New Zealand and the United States of America. This expansion has been primarily by way of licensed technology agreements that allow for a royalty payment to the parent company for each system sold. The licence agreements have enabled the company to expand more rapidly into overseas markets without the need to commit start-up funding. Recently, however, the company has exported direct to New Zealand, a first in what Biocycle expects could be a considerable direct export market for its products in the Asia/Pacific basin.

Collaboration can take many other forms. One avenue offering potential benefits is to have one body (for example the EMIAA) gather and disseminate market and other relevant information on behalf of the industry. Establishing closer links with the public sector may also help, particularly given that government is a significant purchaser of much of the industry's output. In this latter regard, the AWWA indicated that it had recently formed a Contractors and Suppliers Group, not only to facilitate discussion amongst suppliers, but also to improve the opportunities for consultation with the major urban water authorities (which are to be offered corporate membership).

Establishing closer linkages and/or collaborative arrangements with user organisations might also provide benefits in the form of: early identification of market, technology and research trends; use of laboratory testing facilities; pilot plant schemes; and preferred contractor/supplier arrangements.

Box 4.2: **The Ausmelt story**

Ausmelt is a metallurgical development company formed in 1981 to commercialise state-of-the-art SIROSMELT smelting technology. In terms of EWMESS activity, Ausmelt concentrates mostly on treating mining, mineral and radioactive wastes.

Ausmelt employs 30 people and has approximately $1 million of capital invested. Last year it earned $3 million, mostly from EWMESS-related activity — largely in overseas markets.

The process started within CSIRO and, after government funding of the research for several years, financial backing was taken over by the private sector.

The viability of Ausmelt and its technological processes has been recognised by industry. During the 1980s the company received an injection of equity capital from Australian Pacific Technology and the mineral resources company, Triako Resources. Subsequently, Ausmelt gained the impetus and the security to expand overseas. The SIROSMELT technology is now actively marketed in 52 countries around the world. Less than 10 per cent of the company's sales revenue is associated with domestic sales.

Ausmelt believes that its success is founded in "technical excellence, quality and professional integrity, complemented by the innovative and dynamic nature of the company". It has also benefited from various types of government support. Ausmelt said that both Austrade and AIDAB have provided worthwhile support, as have grants under the Export Market Development Grants and the Grants for Industry Research and Development schemes (despite their administrative costs) to the firm.

Management and marketing skills

A number of participants stated that the industry's competitiveness could be improved with better managerial and marketing skills. For example, the Queensland Government claimed that manager/owners of small technology-based EWMESS firms generally have good technical skills but lack management and marketing skills. These skills are important to drive such firms through the commercialisation and growth phases of their development.

To improve management and marketing skills, small firms can either seek outside help or look to employ persons with such skills. However, according to participants, firms often lack the resources to do so, especially during their early

growth phase. Programs administered under the National Industry Extension Scheme (NIES) are intended to develop management and marketing skills in small to medium sized firms. This issue is discussed further in Chapter 10.

Export marketing

Participants identified export marketing strategies as another determinant of competitiveness. They said that management's understanding of how to do business and of the costs of doing business in Asia are fundamental to increasing competitiveness in this market.

Most participants agreed that marketing strategies which are product and market specific are important when trying to access Asian markets, as no two markets are the same. For example, there is little sense in promoting high technology products in countries which only require, or have the capacity to pay for, low technology solutions.

It is also important to adopt strategies to overcome the various cultural and trade barriers that operate in most Asian markets. While institutional material (which is available from Austrade) can assist, there is no better way of gaining the necessary insights about doing business in other countries than through extended periods of first hand experience. Again there is evidence of Australian firms being successful by investing the time and resources in understanding different cultures and business environments and/or achieving the same outcome by forming joint venture partnerships with local firms.

As tariffs on imported EWMESS goods and services are high in most Asian countries, licensing technologies for production overseas can be the most sensible commercial response to these trade barriers. In the case of small firms, licensing avoids the need to commit start-up funding.

Joint venturing with a local Asian partner is commonly regarded as one of the best ways to gain access to most Asian markets. In fact, many consider it is essential to gain entry to some Asian markets. Joint venturing with several large overseas companies is cited as the principle reason for the success of ESI and Kinhill in Asian markets (see Boxes 4.3 and 4.4).

Box 4.3: The Environment Solutions International (ESI) story

ESI is involved in process engineering, consulting and design services. The company has been involved in EWMESS-related activities since 1987. It employs 15 staff and has between $2.5 and $3 million of capital invested in EWMESS activities. ESI's sales revenue is about $2.5 million per annum.

ESI said that its reputation for technical excellence and innovation, and joint ventures with several large overseas companies are the principal reasons for its success. This success extends to the high growth Asian market, with good prospects for further export expansion. Management is confident that "ESI should become a $20 million per annum revenue company within 3 years". Within the same time frame, exports are expected to account for 50 per cent of sales.

With SNC-Lavalin of Canada, ESI developed the 'environmentally friendly' oil-from-sludge disposal process known as ENERSLUDGE. This process produces hydrocarbons, char and gas from organic sludges. Cost savings are claimed to be about 40 per cent over alternative technologies. ESI has established demonstration plants in Australia, is negotiating to establish similar plants in Singapore and Hong Kong, and is finalising a licensing agreement with Samsung in Korea. The company claims to have good export prospects, particularly in overcoming Hong Kong's sewage sludge problem. ESI recently gained a contract for the preliminary design and costing of a 15 tonne per day plant in Germany. Other innovative technologies which ESI is adapting for local use include: the Eco Logic process, which destroys intractable waste without incineration; RETEC, a heavy metal recovery system; and the Hybractor, which treats high strength industrial waste water and produces methane for on-site use.

ESI said that one of the main obstacles for small businesses in the environmental waste management field is securing the continuation of funding during the expensive commercialisation phase. The company suggested that small firms should negotiate with special interest venture and development capital groups, as well as the larger investment institutions managing small business portfolios. ESI itself is supported by the Melbourne specialist development capital group, Greenchip, as well as a number of Australian institutional investors.

ESI perceives the conservative nature of major public sector clients to be an impediment. The company has had to contend with the fact that a number of its proposed solutions are 'unproven', while the "procurement processes in [the] public sector force the selection of the cheapest and most proven solution, usually from overseas". ESI believes that greater coordination of government agencies is important to the future development of the industry.

Box 4.4: **The Kinhill story**

Kinhill is wholly Australian-owned. It employs 54 staff in environmental work and, in 1991-92, the environmental arm of the company generated $9.9 million of revenue within Australia, and $10.9 million from overseas work.

Kinhill's environmental services cover environmental assessment, audits, pollution control, management plans, site contamination, planning, economic analysis, monitoring and ecological surveys. Where necessary, the company also utilises outside expertise to form appropriate project teams.

Kinhill's capabilities in environmental management consulting developed from its preparation of environmental impact statements during the 1970s. This capability had been fostered through prior involvement in urban and social planning, and in feasibility studies (which called for the integration of engineering and economic factors).

Kinhill's capability to undertake overseas projects has been enhanced by the establishment of a joint venture with a leading United States water/waste water engineering firm to undertake work in Australia and in south-east Asia.

Kinhill has successfully employed a two-pronged strategy for overseas expansion. One is to form joint venture companies with a local partner in order to establish a long term presence. This has been achieved in Indonesia, Papua New Guinea, Fiji, Hong Kong, China and Singapore. The second approach is through the export of Australian expertise for project specific work. In most cases, this involves bringing together skills from other Australian consultancies, industries, government institutions, research organisations and universities in order to obtain the appropriate mix of skills needed for the project.

For example, in conjunction with several other major Australian companies, Kinhill undertook environmental management plans for the steel plants and mines for the Steel Authority of India. On this project, Kinhill provided environmental assessment and monitoring expertise, BHP Engineering provided steel plant upgrading experience and Mount Newman Mines advised on mine rehabilitation.

Kinhill's long standing involvement in south east Asia has also provided an avenue for further expansion of environmental services throughout the region. The combination of local joint ventures and technology joint ventures has led to Kinhill Tan and Kinhill, Metcalf and Eddy being awarded a $10 million contract to design and supervise the construction of the upgrading and expansion of the Seletar sewage treatment works in Singapore. Other recent examples of Kinhill's success overseas are: rehabilitation, mine planning and operations of the major lignite mine in Thailand; monitoring of sea level changes for the south west Pacific climate monitoring program; an environmental assessment and management plan for a gold mine on Wetar Island, Indonesia; and, a joint venture project for the preparation of an environmental management plan for Shanghai.

From a sales and distribution viewpoint, having someone 'on-the-ground' in Asian markets (eg local office, expatriate or local agent) to promote the firm's products or services, and/or for distribution purposes, is also considered to be a worthwhile strategy. For instance, recent feedback from companies participating in the Austrade-administered Asia-Pacific Fellowship Program, which provides assistance for deploying key Australian staff in Asia, indicated that the return on their investments in the program was sometimes exceptional.

As in any market, information is critical to decisions on how best to enter or achieve an expansion in an overseas market. For example, knowledge of the country's foreign investment regulations, trade restrictions (ie tariffs, non-tariff barriers etc), infrastructure, inflation rate, political and investment risks and general economic conditions are all relevant considerations. In addition, access to sophisticated market intelligence is necessary to identify project availability and niche market opportunities.

4.5 Summary

Given the diversity both between and within the EWMESS sectors, and the limited available information, it is difficult to make generalisations about the industry's competitiveness.

Austrade's survey of the competitiveness of Australia's solid and liquid waste management sectors as perceived by foreign customers provides some indications of competitiveness in two EWMESS sectors. For instance, it suggests that the Australian waste management industry is relatively competitive in terms of institutional support, product design/development capabilities and consistency of quality control. But there is a perception that weaknesses exist in the effectiveness of distribution networks and of logistics support. The survey also reveals that both North America and Asia generally perceive Australia's competitiveness in solid and liquid waste management more highly than in Europe.

As the survey focused only on two particular sectors of a very heterogeneous industry, it is unlikely that it can be considered representative of other sectors of the industry. However, there is some agreement among participants that Australia's EWMESS industry has strengths in those areas that are linked to sectors where the country possesses competitive advantages, such as in mining, agriculture and scientific skills. The corresponding EWMESS sectors include: site remediation/rehabilitation; consultancy services; waste water and sewage treatment; and some segments of the industry associated with the production of monitoring and sensing equipment.

Firms in the EWMESS industry have the potential to improve their competitiveness through a range of strategies. These strategies range from reducing costs and improving productivity and efficiency, to improving product quality, service, managerial and marketing skills. However, given the diversity in the EWMESS industry, it is likely that there will be a corresponding variation in the strategies required to improve competitiveness. Moreover, many of the measures available to improve competitiveness in Australia are also available to overseas competitors. Consequently, the challenge is not just to improve efficiency and competitiveness: it is to improve at a rate beyond that achievable by the industry's overseas counterparts.

5 ENVIRONMENTAL POLICY INSTRUMENTS

The focus of the previous chapter was principally on the internal factors that influence the activities of EWMESS firms. However, a number of factors outside the control of firms are also important in shaping the development of the industry. In particular, governments in Australia have an important impact on the industry. For example, government-owned agencies, in particular water authorities and electricity utilities, are major users and/or providers of EWMESS industry goods and services. However, government regulations that aim to protect the environment by restricting and/or controlling uses of the environment are a much more important factor for the EWMESS industry. Without government involvement in environmental management, the industry would undoubtedly be considerably smaller.

As the community's awareness and knowledge of environmental matters has increased, governments have responded by extending environmental controls to new areas and by varying the stringency of these controls. In many instances, tighter regulatory requirements (ie reductions in allowable pollution levels) will stimulate demand for EWMESS industry products. However, higher environmental standards could conceivably have an adverse impact on some sectors of the EWMESS industry. For example, higher standards could encourage producers to adopt technologies that have fewer environmental impacts (eg clean technology) and therefore, reduce the need for EWMESS products used for end-of-pipe treatment. Nonetheless, on balance, it is likely that the extension of environmental regulation to new areas and the gradual raising of environmental standards will increase overall demand for EWMESS goods and services.

In these circumstances, the development of the industry will be closely linked to future changes in environmental regulation — both in Australia and overseas. Assessing the nature, extent and impact of these changes is, of course, enormously difficult. However, the nature of environmental management is affected by the types of policy instruments used by governments to achieve environmental objectives. This inquiry provides an opportunity to consider these instruments, as well as participants' concerns about specific aspects of the regulatory frameworks put in place by different levels of governments in Australia (see Chapter 6).

This chapter briefly outlines the policy instruments that should be considered when assessing options for overcoming environmental problems. However, as background to this discussion, the following section considers why government

intervention to control the discharge of waste into the environment is necessary in the first place.

5.1 Background

Economic activity and the environment are integrally related. Indeed, almost every form of commercial activity has implications for the environment. For example, paper mills utilise natural resources such as water and wood pulp to produce paper. In doing this they also generate pollution, the nature and extent of which will depend on the procedures used and the standards applied. If chlorine bleaching of paper is involved, organochlorides can be released into the environment. This in turn imposes costs on the community. These costs could fall on other firms which depend on the receiving environment for their production (eg commercial fisheries), or on nearby residents in terms of health impacts and, more generally, by reducing environmental amenity.

There has been a significant increase in the community's awareness of the need to preserve environmental qualities. In response, many individuals and companies have recognised the possible marketing advantages of 'environmentally friendly' production processes and products. Nevertheless, in the absence of government intervention, it is likely that individuals and firms would discharge more pollution into the environment than society as a whole is prepared to accept.

The propensity for individuals to pollute at levels that are unacceptable to the community at large mainly reflects two factors. First, it is exceedingly difficult (and sometimes impossible) to allocate property rights over the environment (eg clean air and water) and, therefore, to restrict the number of users of the environment.[1] Second, the actions of any individual polluter frequently have little effect on the overall level of pollution. Consequently, users of common resources (such as the atmosphere) will tend to overlook the costs that their activities impose on others. They will only consider costs that they incur in using a resource, such as the cost of equipment, labour and other inputs into production (ie private costs) and will ignore the wider costs borne by others (ie social costs). Therefore, governments have deemed it necessary to intervene in an attempt to ensure that some account is taken of the effect that polluting the environment has on the activities and well-being of others.

[1] An important condition for the efficient operation of markets is well defined and enforceable property rights. Where this condition is not met, the market, by itself, will not efficiently allocate environmental resources.

Government intervention can take a number of forms. For example, it can attempt to give greater incentives to people to care for environmental assets by more rigorously delineating and allocating property rights. The same result can be achieved by governments imposing pollution taxes. The more common approach to date has been direct government regulation (eg prohibiting or specifying the levels of certain discharges, or requiring the use of certain production technologies). The underlying objective is to make polluting firms or individuals bear the full cost of their activities, rather than others in the community. This is referred to as internalising costs (of externalities).

In some cases, governments can address environmental problems without enormous difficulty. For instance, in the example of the pulp mill, government could direct the firm to change the production technology used or impose a tax on discharges of effluent. However, in many cases, the number of firms and individuals discharging to the environment may be large and the issues far more complex. This means that a simple solution to the problem is not obvious. A case in point, is the Murray-Darling basin. In this region, there are a large number of competing users, such as manufacturing industries, agricultural producers and domestic users, all of which have different impacts on water flow and quality. Moreover, the region has experienced a range of environmental problems, such as salinity, water-logging, blue-green algae and changes to water flow, that require different and more complex solutions.

The next section discusses advantages and disadvantages associated with the use of regulatory instruments. Section 5.3 then discusses the applicability of economic instruments.

5.2 Regulatory instruments

Australian environmental authorities have traditionally relied on standards-based forms of regulation for achieving environmental objectives. For extreme cases of pollution (eg involving highly toxic or hazardous substances) this may involve outright prohibition. However, in many cases, the objective is to achieve some set environmental quality. In this case, two major forms of regulations have been applied: process-oriented regulations; and outcome-oriented regulations. The former involves setting limits on the quantity and quality of effluent discharged and/or specifying actions to be taken in order to reduce environmental damage (eg mandating the installation of specified pollution control equipment). In contrast, outcome-oriented regulations set a limit on the level or nature of any environmental impact due to the discharge of a pollutant and leave individual firms to determine the best method for reducing pollution to the required level.

A major disadvantage of process-oriented regulation is its relative inflexibility. It is possible that it will not allow firms to choose a method for achieving environmental objectives that will minimise their costs. That is, the equipment that firms are directed to install, or the processes they are required to use, may not be the most cost-effective way of achieving the environmental goal. Even if the mandated equipment or process is cost-effective when the regulation is introduced, this will not necessarily be the case as technologies change. Consequently, unless regulators keep abreast of developments in technology and modify regulations accordingly, process-oriented regulations can lock firms into outmoded technology. They also provide no incentive for firms to search for better and less costly solutions.

Empirical evidence on the magnitude of the cost penalty from using process-oriented regulations is summarised in Box 5.1.

Box 5.1: Impact of process-oriented regulations on compliance costs

Studies conducted in the USA and elsewhere indicate that, in many cases (although not all), the costs of meeting environmental objectives are lower using outcome-oriented regulation or alternative instruments such as pollution taxes and tradeable pollution permits. They show that the cost penalties from using process-oriented mechanisms are potentially large. This is demonstrated by the following table, which summarises the results of a number of USA studies examining the cost of using process oriented-regulation compared to the most cost effective alternative environmental policy instruments.

Empirical studies of air pollution control

Study	*Pollutants covered*	*Location*	*Cost penalty from using process-oriented regulation (per cent)*
Atkinson and Lewis	Particulates	St Louis	500
Roach et al	Sulphur dioxide	Utah	325
Hahn and Noll	Sulphates standards	Los Angeles	7
Krupnick	Nitrogen dioxide	Baltimore	496
Seskin et al	Nitrogen dioxide	Chicago	1340
McGartland	Particulates	Baltimore	318
Spofford	Sulphur dioxide	Delaware Valley	78
Spofford	Particulates	Delaware Valley	2100
Harrison	Airport Noise	United States	72
Maloney and Yandle	Hydrocarbons	All US DuPont plants	315
Palmer et al	CFC emissions	United States	96

Source: Adapted from Tietenberg (1990).

In some examples cited, the cost penalty is extraordinarily large. However, it needs to be recognised that the cost penalties are estimates, not savings that have been actually realised. Indeed, Tietenberg (1990) qualifies the results by pointing out that practical difficulties associated with implementing "the lowest cost" solutions may exist and that, in practice, the cost penalties may be smaller. The data also demonstrate the wide variation in potential cost penalties. This suggests that governments need to carefully assess the applicability of different instruments in different circumstances.

As mentioned above, the reduction of incentives to develop new technology is another adverse impact. Development of new technologies can provide scope for reducing the costs of complying with environmental standards. For example, by specifying a particular form of emission control, process-oriented regulation may discourage the development of 'clean' production processes. In others cases it could slow down the diffusion and adaptation of technology and stifle technical change.

This latter view is supported by an OECD study on environmental regulation which concluded that the more environmental regulations concern themselves with specifying technology, the more they are likely to impede technical change (OECD 1985).

Greater reliance on outcome-oriented regulations would therefore appear to provide scope for lowering the cost of achieving environmental objectives at any point in time. Moreover, the greater range of technologies that would be encouraged by outcome-oriented regulations may provide additional opportunities to reduce the costs of meeting environmental objectives over time.

A range of economic instruments have been developed, and in some cases applied, by policy-makers in an attempt to achieve environmental goals by influencing the economic behaviour of firms and individuals. These are discussed below.

5.3 Economic instruments

The OECD describes economic instruments employed for environmental purposes as:

> ...instruments that affect costs and benefits of alternative actions open to economic agents, with the effect of influencing behaviour in a way that is favourable to the environment. They typically involve either a financial transfer between polluters and the community (eg various taxes and charges, financial assistance, user charges for services, product taxes), or the actual creation of new markets (for example, marketable permits) (OECD 1991, pp. 10-11).

At an operative level, the key difference between economic instruments and regulation is that economic instruments do not prescribe the behavioural patterns of individual polluters. Polluters are permitted some flexibility to modify their behaviour according to their own particular circumstances. By attaching a financial cost to varying levels of emissions, economic instruments provide firms with an incentive to reduce emissions in order to realise cost savings.

Economic instruments have the *potential* to improve economic efficiency and to bring about better environmental outcomes. Economic efficiency is promoted as a consequence of the following:

- the explicit inclusion of environmental costs and benefits in prices;
- the flexibility firms and individuals have to modify their production and/or consumption behaviour given their own circumstances and compliance costs; and
- shifting the burden of obtaining significant information requirements, such as production technologies, from government regulators to the firms and individuals directly concerned.

Governments will generally require a mixed approach, whereby some degree of regulation is coupled with the use of an economic instrument.

Evaluating economic instruments

As a rule, individual environmental problems need to be examined on a case by case basis to determine the most appropriate policy instrument for achieving environmental objectives. However, in some circumstances, it may not be easy to establish the most efficient way of achieving the desired outcome. These sentiments are reflected in the following quote by one environmental economist:

> It is not at all clear that any particular economic instrument is the best one to use, whether combinations of economic instruments can and should be applied, whether direct regulations can and should play a supportive role, or whether economic instruments will be better than other administrative arrangements for environmental and resource protection (James 1993, p. 9).

To determine which is the most appropriate instrument for achieving a designated environmental objective, it is generally necessary to evaluate a range of possible instruments against a broad range of criteria. Relevant criteria include the effectiveness of instruments in meeting environmental objectives, flexibility, community acceptance, equity impacts (ie distributional implications), administrative cost and ease of monitoring and enforcement. These criteria are most appropriately applied to individual applications rather than particular economic instruments per se.

A description of the major types of economic instruments available for solving environmental problems and their major characteristics is set out below.

5.4 Types of economic instruments

There are many different types of economic instruments which may be applied to achieve environmental objectives. Some instruments (eg environmental taxes) apply an environmental damage cost which is intended to account for the external costs of polluting activities and, hence, ensure appropriate pricing of environmental resources. These instruments are based on the 'polluter pays' principle. Some economic instruments (eg grants) are not based on this principle. Although they may achieve the desired environmental outcome, they usually impose a cost on taxpayers and, because they do not appropriately price environmental resources, they will generally result in a less efficient outcome.

The more important instruments for achieving environmental objectives include: tradeable permits; environment taxes and charges such as emission and effluent charges, user charges, product charges and levies for clean-up or restoration; deposit-refund systems; and performance bonds.

Tradeable permits

When used to manage wastes, tradeable permits are instruments giving the owners a right to discharge a prescribed level of waste. The right is fully transferable — it may be freely bought and sold.

Special trading conditions may be attached to a permit. They may, for example, limit trade to specified locations and/or for a designated time period. Alternatively, there may be a requirement that exchanges be approved by an environmental control authority.

If necessary, pollution levels can be reduced by either the regulatory authority buying back the permits or attaching conditions to them which lead to a reduction in the level of pollution (eg an automatic reduction in the quota when the permit is traded).

Once an environmental standard has been established, the allocation of permits can be by grants to existing firms (or individuals), or by sale (for example by auction). It is by subsequent trading that, in theory at least, the firms with the most cost-effective technology or means of dealing with pollution expand. Over time, higher cost firms are likely to sell their permits and eventually leave the industry.

The major benefits of a tradeable permit system are that:

- polluters with lower abatement costs have an incentive to take pollution prevention measures and sell permits, while polluters with higher abatement costs have an incentive to buy permits. Ultimately, trade in permits will result in firms that value the use of the environment most highly securing the usage rights.[2] This would also mean that the overall compliance costs would be minimised;
- the operation of a market system reduces the information needs of regulators (eg there is no need to identify and specify appropriate technologies); and
- as tradeable permits set a ceiling on the allowable level of emissions, there is more certainty regarding the quantity and quality of pollution than is the case with some other instruments (eg charge-based systems which allow any level of emissions, provided the charges are paid).

To date, there has been very little use made of tradeable permits. Where they have been applied, there has been varied success. In practice, in some cases, difficulties have been associated with:

- establishing an efficiently operating market (eg attracting a sufficient number of buyers and sellers);
- hoarding by firms because of uncertainty about future requirements and the future availability of permits; and
- preventing transaction costs from escalating due to the schemes' rules and controls.

In some quarters, concern has been expressed about the use of permits to restrict competition from new or expanding firms in the industry (ie trade is limited because the permit has a significant value in restricting competition over and above the value attached to the level of emissions it allows).

The Air Emissions Trading Program administered by the United States Environment Protection Authority (EPA) is one example of a scheme which has not delivered the expected cost-savings (US EPA 1992). A scheme assessed as having been more successful is the Lead Trading Program, also conducted by the EPA. One Australian scheme which is relevant to the environmental waste management industry is the Murray-Darling Salinity Credit Scheme. Characteristics of each of these schemes are briefly outlined below.

[2] In these circumstances, the environment would be treated in a similar manner to other goods and services which are bought and sold.

Air Emissions Trading Program

This program was established in 1982 under the *Clean Air Act* (although some elements of the program date back to 1975). At the centre of the program are Emission Reduction Credits (ERCs) which accrue to firms that reduce emissions below the legal requirement. ERCs may be put aside for subsequent use, used elsewhere in a plant to offset increases in discharges from plant modifications or expansions, or traded with other firms which discharge pollution.

According to EPA estimates, cost savings from introducing air emissions trading could be in the order of 50 per cent of traditional regulatory costs. However, although savings have been lower than anticipated, cumulative savings have been estimated to range from $5.5 to over $12.5 billion since 1975 (US EPA 1992).

The bulk of the cost-savings have not been attributed to trading in permits as the majority of trades have been intra-company. Hahn and Hester attribute the limited trading to excessive regulatory controls, such as the need to seek approval for each transaction. They also argue that the costs of gathering the information needed for trading are greater than the alternative of adopting the EPA's suggested control technology (BIE 1992).

US Lead Trading Program

This program was established to facilitate a reduction in lead levels. From 1 July 1983, the EPA allowed refiners and importers of petrol to trade lead reduction credits in order to meet the set limit for the lead content in petrol. Credits accrued to refiners and importers who reduced the lead content of their petrol below the EPA limit. The credits could be sold to refiners and importers who exceeded the limit.

The EPA considers it likely that, without the lead trading, the phase down would have taken much longer, or that there would have been a short-term contraction in the supply of petrol (with possible disruptions to supply in some areas). The EPA claims that, based on the large volume of lead rights traded and banked, savings have been substantial and in excess of $226 million during the period 1985 to 1987 (ie when banking was allowed) (US EPA 1992).

The success of the program is attributed to the successful operation of markets, the minimal restrictions applying to the program and the low administrative costs involved. As markets were already well established within the industry for trade in petroleum products, participants were accustomed to dealing with each other. Consequently, the introduction of a lead trading program did not involve significant additional costs related to establishing a market (BIE 1992; Government of Canada 1992).

Murray-Darling Basin Salinity Credit Scheme

A tradeable permit scheme is in operation as part of the Murray-Darling Salinity and Drainage Strategy. The scheme is administered by the Murray-Darling Basin Commission. It is a limited form of a tradeable permit system, as pollution rights are only exchanged between the participating governments of New South Wales, Victoria and Queensland, and trade does not include industries or individuals.

Programs of capital works which are aimed at reducing salinity generate salinity credits for the participating governments. They receive debits for the salinity effects of drainage or development works such as irrigation diversions, industrial waste disposal or changes in river regulation. The credits are tradeable between states, but are generally applied within states to offset debits from drainage entering the river system.

New South Wales is about to introduce a system of tradeable salinity rights for all water users contributing saline drainage to the Murray-Darling and for all water users diverting dilution flows from the Darling Basin (James 1993).

Environmental taxes and charges

Regulatory authorities may impose taxes or charges directly on amounts of pollution discharged (eg on emission and effluent discharges), or indirectly as is the case with product charges and clean-up or restoration levies. User charges for waste services (eg household and industrial waste disposal services) may also include an environment component where appropriate.

Environmental taxes and charges extend the concept of ‘user pays’ to activities which pollute the environment. If environmental taxes and charges are to appropriately reflect environmental damage costs, they should vary in accordance with the quantity and quality of the pollution discharged. Charges that are too low may provide users with little incentive to modify their use of the environment and be more akin to a revenue raising instrument.

The revenue collected from environmental taxes and charges could become a part of consolidated revenue. However, if it is applied to offset the costs of administering environmental protection and services and/or for environmental restoration, and not merely absorbed into consolidated revenue, then it is likely that public acceptance of environmental taxes will be higher.

The main benefit of using environment charges as a policy instrument for achieving environmental objectives is that they provide an incentive, on a continuing basis, for the reduction of both polluting activities and the use of

environmentally harmful products. In comparison to tradeable permits, charges eliminate the need to spend resources finding and negotiating with other traders.

The main drawbacks of environmental taxes and charges include:

- the administrative difficulty of determining an appropriate tax or charge rate which achieves the desired environmental outcome and efficient resource allocation;
- the need to continually monitor the effectiveness of taxes and charges to determine if they are meeting the desired environmental outcome. As economic conditions change, so do levels of production and, hence, pollution levels. Thus, it is likely to be necessary to adjust environment taxes and charges in order to maintain a particular environmental outcome; and
- the practical problem of overcoming fears that they will become revenue raising devices for the government.

While most environment taxes charges incorporate the characteristics outlined above, the nature of charges and their effect on pollution varies. This variation is illustrated in the following discussion of four forms of environmental charges: emission and effluent charges; product charges; user charges; and clean-up and restoration levies.

Emission and effluent taxes

Emission and effluent taxes are based on the quantity and quality of pollution discharged to the environment. They provide incentives for polluters to introduce new technologies and cleaner production processes in order to reduce the use of the environment as a sink for pollutants.

Emission charges are particularly suitable where the costs of pollution abatement vary across polluters. Polluters with high abatement costs will find it more cost effective to pay the charge rather than reduce pollution, while polluters with lower abatement costs will find it cost effective to reduce pollution. Thus, reductions in environmental emissions are achieved through adjustments made by those producers that can modify their operations at least cost.

Emission charges are not an efficient means of controlling emissions in cases where the source of pollution is not readily identifiable. As emission charges are based on a measured level of pollutants emitted, monitoring and enforcement must be feasible and not too costly.

Emission charges have been common in some European countries for a number of years, for example:

- Sweden introduced emission charges on sulphur dioxide during the 1980s (see Appendix D);
- France introduced an emission charge on major producers of sulphur dioxide and nitrous oxides during the 1980s;
- Germany imposes effluent charges on pollutants such as mercury, cadmium and oxidating substances; and
- effluent charges have been applied in France, Italy and the Netherlands for some years.

A recent survey of the use of emission and effluent charges (as economic instruments) in Australia indicates that they have rarely been applied (James 1993). The South Australian *Marine Protection Act* was found to be one of the few examples of an emission or effluent charge in Australia which provides incentive effects for firms discharging effluents to the environment. Under this Act, a system of fees has applied to effluent discharges since March 1993. Effluent discharges are measured for every point source discharge to tidal water in South Australia. The charge is levied according to the impact of the effluent on the environment and it takes account of the discharge of salts and pollutants as well as the area of marine environment affected by the discharge.

Product charges

Product charges are levies on products or their residues which are harmful to the environment when used in the production process, consumed or disposed. They may be applied to inputs of raw materials or intermediate goods in the production process, or on final (consumer) goods. The harm to the environment may result from either the toxicity of the product (eg heavy metals, PVC, CFC, halogenated hydrocarbons, nitrogen and phosphorus) or the volume of waste generated.

Product charges differ from emission taxes in that they are directly related to the use of harmful products rather than the discharge of the pollutant causing environmental damage. As such, product charges are a 'second best' economic instrument. They are usually applied when emission charges are not feasible — for instance in cases where it may be impossible to identify all of the polluters. For example, a general tax on fertilisers would be more feasible and cheaper to administer than a system of charges based on the level of individual farm run-offs.

Product charges should be levied in accordance with the potential of the product to damage the environment. Proper pricing of products that generate waste provides an incentive for the product to be used more sparingly and for alternative less harmful products to be substituted (especially over the longer

term). However, the impact of product charges depends on the responsiveness of demand to price changes (eg product charges are likely to be more effective if users can easily switch to a substitute product).

Throughout OECD countries, product charges are applied to a range of inputs including fuels, containers, fertilisers, pesticides and detergents (OECD 1991). For example, Sweden has introduced product taxes on pesticides and weedicides and also on chemical fertilisers in order to reduce the detrimental effects of their use (see Appendix D).

One of the few examples of the use of product charges in Australia is the application of fees levied by the Commonwealth and some states on ozone depleting substances. However, these fees have only been designed to collect revenue for administration costs. According to James (1993), the cooperation of industry and other complementary controls implemented by Commonwealth and state governments has been such that stronger economic incentives have not been needed.

User charges

These are charges which are imposed on users of the environment (eg a fishing ground or a national park) or on activities which have an impact on the environment. The services in question are often provided by government bodies and include, for example, water supply and waste water treatment, and waste collection and disposal. To be fully effective, user charges for such services should be structured to reflect both the financial costs of providing the service and the environmental damage cost, and linked to the actual use of the services.

A detailed discussion of user charges, in the context of user charges for waste disposal to landfill, is contained in Chapter 7.

Clean-up or restoration levies

Where governments cannot recoup the costs of environmental clean-up or restoration from those responsible for causing past environmental damage, the next best solution is to finance restoration by means of a levy. One advantage of a levy is that it is transparent. Consequently, it may be more acceptable to the public than a general increase in taxation or municipal rates.

While a levy could have universal coverage (eg apply to all rate payers), this would be tantamount to a general taxation measure. Hence, where practical, it may be preferable to apply the levy to the beneficiaries of environmental restoration. Although the size of the levy should be in the proportion to the benefits received, intergenerational equity and environmental sustainability are

factors which may justify partly funding the remedial project from general revenue.

Although levies are an appropriate ad hoc mechanism for funding specific remedial projects, restoration levies are not an appropriate means for financing remedial work related to pollution problems of an ongoing nature. In these cases, it is more appropriate to fix a charge related to the pollution output (eg an emission or effluent tax) in order to provide an incentive for pollution to be reduced.

The Sydney Water Board introduced a clean-up or restoration levy, known as the Special Environmental Levy (SEL), in 1989 to fund environmental improvement programs. As the levy was a flat rate of $80 per household, households were not charged in accordance with their respective 'willingness to pay' or with the benefits received (in this respect the flat rate levy was inequitable). A new pricing scheme, based on the concept of 'user pays' for water services is to replace the SEL. It will result in current water users being subject to both a user charge and a levy for remedial projects. The levy rate will relate to the extent which users contribute to the existing problem.

Deposit-refund systems

Deposit-refund schemes involve the payment of a sum of money on products which can cause pollution if discarded. The money is refundable either fully or in part if the product or its residual is returned. To operate on a purely voluntary basis, the products need to have sufficient value as reusable or recyclable products. This was the case for soft drink and beer bottles for many years and is still the case for milk bottles. However, in most cases, it is now more financially advantageous for beverage manufacturers to use non-returnable (or disposable) containers.[3]

Legislation is required for the implementation of deposit-refund systems which cannot be sustained on financial grounds, but which are considered to be desirable on broader economic grounds which take account of environmental damage.

The benefits of a deposit-refund system stem from reductions in the volume of waste and the release of toxic substances into the environment. Deposit-refund systems may form an integral part of an integrated life-cycle management system for the proper handling of certain products eg electrical appliances and car bodies (OECD 1991).

[3] Manufacturers make modest payments for recycled cans and bottles which may be reused as material input in the production process.

South Australia is the only Australian state which has introduced container deposit legislation.

Container Deposit Legislation (CDL), South Australia

In order to ensure the continuation of the then existing voluntary system of deposit refunds on beverage containers, the South Australian Government introduced the *Beverage Container Act* in 1975. This Act requires that certain beverages be sold in containers subject to a deposit refund. Containers may be returned to the point of sale or to collection depots.

The aim of the legislation is to provide a financial incentive for the return, refilling and recycling of non-exempt beverage containers, and thereby reduce litter and waste and conserve resources. While proponents of the scheme claim that it is achieving these objectives, opponents claim that they are achieved at high costs compared with alternative measures.[4]

Under the scheme, the recovery rate for soft drink and beer bottles and cans has been claimed to be between 80 to 95 per cent, compared to the recovery rate of 43 per cent for beverage glass in New South Wales and around 50 per cent for cans in other states. While a reduction in beverage containers in the litter stream is evident, the significance of the reduction is less clear. However, the Litter Research Association has reported that beer and soft drink containers account for around 5 to 15 per cent of the litter stream (IC 1991a).

Some of the costs of the CDL include:

- wholesalers, retailers and specialist container-collection agents incur additional handling, transport and storage costs; and
- the extra costs imposed on those beverages subject to the legislation put them at a competitive disadvantage relative to products such as cider and fruit juices which are not subject to the legislation.

Regardless of the costs and benefits reported, public support for the deposit refund system is strong according to surveys reported by the Beverage Container Unit (James 1993).

Following a challenge in the High Court, it was ruled that it was valid for the South Australian Government to impose the deposit refund system, but invalid for it to discriminate between non-refillable and refillable bottles. This latter finding could have implications for the use of differentiated product charges in other situations.

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[4] A comprehensive discussion of the costs and benefits of the South Australian container deposit legislation is included in IC 1991a.

Performance bonds

Performance bond schemes impose a requirement on potential polluters to lodge a security or a bond. The security, which provides for sufficient funds to cover the cost of rehabilitation of any environmental damage, acts as a guarantee against the risk of default of conditions prescribed in environmental safeguards.

From a government's perspective, performance bonds are attractive because they avoid the possibility of incurring considerable costs in attempting to obtain compensation for environmental damage after the event. Further, the taxpayer is not left with the costs of clean-up if the polluter becomes bankrupt.

In Australia, performance bonds have been used by state governments, mainly for the mining industry, as a means of inducing land rehabilitation. Other applications have included pollution reduction programs in New South Wales and effluent control programs in South Australia. For example, a feedlot in the Murray Irrigation Area was required to lodge a bond of $2 million with the Department of Water Resources and the EPA as security against environmental damage (James 1993).

5.5 Summary

There are a number of regulatory measures and economic instruments suited to solving many environmental problems. However, as the benefits and costs associated with using each differ, it is important that regulatory authorities attempt to identify the most appropriate instrument for achieving environmental objectives. Table 5.1 summarises the relevant characteristics of economic instruments.

Table 5.1 **Main characteristics of selected economic instruments**

Type and definition	*Advantages*	*Difficulties or disadvantages*	*Relevance*
Tradeable permits			
A transferable right to discharge a prescribed level of pollution.	• allocation of resources to the highest valued use; • reduced information needs for regulators; • more certainty regarding pollution levels.	• establishing an efficient market; • transactions costs may be high.	Most relevant where environmental impact is independent of pollution source eg for air pollution within a defined area.
Emission and effluent taxes			
Charges based on the quantity and quality of pollutants discharged.	• the absence of transactions costs for firms.	• setting the charge at the right level; • monitoring requirements.	Most relevant to discharges from point sources.
Product charges			
Levies on products which are harmful to the environment when used or disposed of.	• reduces the use of products that are harmful to the environment.	• setting the charge at the right level; • monitoring requirements.	Most relevant where it is not feasible to monitor pollution from individual sources.
Clean-up or restoration levies			
A levy that is used to raise funds for environmental clean-up.	• levy funds are linked to environmental purposes.	• determining the relevant group to levy.	To fund clean-up costs caused by past (but not ongoing) activities.
Legislated deposit-refund systems			
A refundable deposit which is paid on products which can cause pollution if discarded.	• reduces the volume of waste and/or the release of toxic substances into the environment.	• transaction costs may be high.	Most effective if applied to products which have an existing distribution system eg household milk deliveries.
Performance bonds			
Financial security lodged with government against environmental damage.	• minimises the risks and potential costs of polluters defaulting on liability; • encourages restoration and clean-up where necessary.	• setting a realistic level of security.	Where it is necessary to minimise the risk that environmental damage will not be rectified.

The Commission considers that there is a strong case for greater use of outcome-oriented regulation instead of process-oriented regulation. The major advantage of outcome-oriented regulation is the flexibility allowed to polluters to select least-cost technologies for achieving the required environmental outcome.

In addition to achieving environmental objectives at least cost, greater use of economic instruments could also benefit the EWMESS industry by boosting demand, particularly for innovative technologies.

6 ENVIRONMENTAL REGULATION IN AUSTRALIA

The previous chapter outlined the reasons why, in the absence of government intervention, the amount of pollution discharged into the environment may be greater than the community as a whole is prepared to accept. It subsequently identified a number of ways in which governments can intervene to ensure that the community's environmental objectives are achieved.

However, in the past, development of environmental regulation in Australia has been beset by problems. For example, lack of coordination between Commonwealth and state governments has meant that arrangements for administering and enforcing environmental laws have varied significantly between states. A number of recent changes to environmental regulation in Australia are aimed at improving these arrangements. Some seek to improve consultation and coordination between governments, others are directed at rationalising regulation within the states. Despite these changes, many participants argued that on-going problems frustrate the achievement of many environmental objectives, impede the further growth of the EWMESS industry and discourage the development of new waste management technologies.

The existing problems — and possible solutions — are the subject of this chapter. However, to provide the background for discussion of these matters, the following section provides a broad outline of the institutional framework underlying environmental regulation in Australia.

6.1 Institutional framework[1]

Understanding environmental regulation in Australia is a difficult task. This is partly because Commonwealth, state, territory and local governments all have environmental responsibilities. Moreover, the regulatory frameworks (ie the legislation, agencies and instruments) put in place by the three levels of government differ substantially. Compounding the problem is the fact that environmental responsibilities, and the government bodies responsible for their administration, are changing rapidly.

[1] The discussion in this section draws on the overview of institutional arrangements contained in Appendix B.

Regulatory powers

Responsibility for the formulation of environmental goals and regulatory programs in Australia largely rests with the state and territory governments and, to a lesser extent, with local government. Until recently, the Commonwealth only had environmental responsibilities in areas that it controlled directly, such as land owned by the Commonwealth (within the states) and Australia's external territories.[2]

Since the early 1980s, the Commonwealth has increased its role in environmental regulation by using a number of its constitutional powers (eg its external affairs and trade and commerce powers). It has used these powers to intervene in a number of environmental issues that were once considered the sole responsibility of the states. For example, in 1983, the Commonwealth used its external affairs powers — authorising it to promulgate laws relating to Australia's obligations under international agreements — to stop construction of the Franklin dam in Tasmania.

Despite the increasing role of the Commonwealth, state governments still have extensive powers to legislate on environmental issues and to resolve environmental disputes. In practice, the major change that has occurred since the Commonwealth increased its involvement is that decisions on some environmental issues, such as major developments (eg pulp mills and large mining projects) by the states, are potentially subject to Commonwealth intervention.

Administrative arrangements

Commonwealth and state governments have established a range of different bodies for administering environmental matters. Administration of most Commonwealth legislation is now undertaken by the Commonwealth Environment Protection Agency (CEPA) within the Department of the Environment, Sport and Territories (DEST). However, a range of other agencies such as the Department of Primary Industries and Energy (DPIE) also play a role.

There are also a number of important Commonwealth/state ministerial councils operating in areas related to environmental management. The most important is the Australia and New Zealand Environment and Conservation Council (ANZECC). Other ministerial councils, for example, those dealing with agriculture, fisheries and energy, cover a range of issues, some of which have

[2] The Commonwealth also had an indirect influence through its environmental impact assessment legislation (enacted in 1974).

environmental implications. As of May 1993, there were 48 Commonwealth/state ministerial councils (Galligan & Fletcher 1993).

Within some states, environmental regulation is relatively centralised. For example, New South Wales, Victoria and Western Australia have established integrated environment protection agencies (EPAs). These bodies have responsibility for administering environmental legislation and controls over air and water quality, noise control, waste management and some aspects of marine pollution. The Western Australian EPA also has responsibility for environmental impact assessments and land use planning.

Responsibility is also relatively centralised in Tasmania and the Australian Capital Territory. However, environmental powers in these two jurisdictions reside within the Department of Environment and Land Management and the Department of Environment, Land and Planning respectively, rather than in autonomous environmental protection agencies.

The trend towards centralisation does not mean that all environmental laws within a state are administered by one body. For example, public health laws, which for many firms in the EWMESS industry are more important than environmental laws, are still separately administered by state health departments. In addition, the central environmental agencies sometimes delegate environmental powers to other agencies. This is more common in Western Australia where, for example, the Water Authority administers water pollution control legislation.

The remaining jurisdictions (ie Queensland, South Australia and the Northern Territory) currently have a variety of bodies with regulatory and administrative powers. For example, in South Australia, the Department of Environment and Land Management oversees air quality, noise control, beverage container and marine environment protection legislation; the Department of Housing, Urban Development and Local Government Relations is responsible for land use planning and environmental impact assessments; the Department of Engineering and Water Supply regulates water quality; the Waste Management Commission is responsible for solid and liquid waste management; the Department of Marine and Harbours has jurisdiction over some aspects of marine pollution; the South Australian Health Commission regulates areas of public and environmental health, including protection from radiation hazards; and the Department of Mines and Energy has environment protection responsibilities in relation to mining and petroleum activities.

As discussed in Appendix B, the South Australian, Queensland and Northern Territory Governments are considering implementing major changes to their regulatory frameworks. These changes would significantly rationalise and consolidate existing agencies and legislation.

In most jurisdictions, local governments play an important role — usually in the area of land-use planning and environmental impact assessments. As discussed in Chapter 7, local councils also often have responsibility for municipal solid waste disposal (through the ownership and operation of landfills).

Adequacy of environmental regulation in Australia

In examining environmental regulation, two issues are particularly relevant. The first is the general adequacy of environmental regulations in achieving appropriate environmental outcomes. Second is the question of whether the mechanisms and processes used to achieve environmental objectives are appropriate.

While a thorough examination of the adequacy of current regulations is not the focus of this report, it is worthwhile making a number of general points regarding the impact of existing regulations — because regulation is an important factor influencing the growth prospects of the EWMESS industry.

Most importantly, governments in Australia have rarely charged organisations or individuals for using the environment. People have therefore had little financial incentive to account for their use of the environment and the harmful impacts of their activities on environmental quality and the activities of other industries. Instead, governments have relied on regulatory controls to protect the environment. However, as discussed in Sections 6.2 to 6.5, participants have argued that environmental regulation has been beset by a number of problems.

As a result of these deficiencies, Australia now faces a range of serious environmental problems including: beach, river and air pollution in many cities and towns; soil erosion and other forms of land degradation (eg salinity and waterlogging); blue green algal growth in many of Australia's inland waterways; contamination of land and groundwater; and damage to coastal ecosystems. Hence, there is little dispute that more needs to be done to deal with the consequences of poor waste management and pollution control in past years and to ensure that similar problems do not arise in the future.

Governments in Australia have implemented a number of strategies to effect improvements. For example, a key reform is more appropriate pricing of water and waste services to provide consumers with financial incentives to reduce their output of waste (see Chapter 7). Clearly, improvements to environmental regulations are also required. In fact, participants argued that the current environmental mechanisms and processes in Australia are deficient in a number of other ways. Major problems cited were: excessive complexity and overlapping responsibilities; non-uniformity in environmental criteria and

standards; over-reliance on command and control forms of environmental regulation; and lack of monitoring and enforcement. These problems are the focus of the remainder of this chapter.

6.2 Reducing complexity and overlap

While recognising that regulating the use of the environment is an extremely complex task, many participants said that current regulatory structures are overly complex — giving rise to gaps in the regulatory framework and unnecessary overlap and duplication of regulatory functions.

For example, the South Australian Department of Environment and Planning (SADEP 1992) commenting on environmental controls in South Australia stated that:

> The current arrangements are cumbersome, with many industries being regulated under several different Acts ... Some heavy industries, for example, need to hold or comply with a number of licences (eg air emissions, discharges to water and waste production) as well as complying with the usual planning and development requirements and noise controls.
>
> It is estimated that approximately 15 per cent of those regulated require more than one licence. Some require three or more (p. 15).

Similarly, a recent report (AMLIPC 1990) which discussed the impact of environmental controls on the feedlot industry, found that complexity and overlap were a problem in Queensland, New South Wales and Victoria (see Box 6.1).

This case study illustrates the potential impact of excessive complexity and overlap. For industry in general, excessive complexity and overlapping responsibilities have the potential to reduce efficiency by increasing compliance costs associated with licensing and works approval procedures and by increasing confusion and uncertainty, particularly for major new developments. This can result in new investment proposals being deferred or even abandoned. The resultant costs are typically spread between industry and the community.

Initiatives taking place at both the national and state/territory levels may assist in eliminating excessive complexity and overlap and improve coordination between agencies. At the national level, an important initiative has been the development of the Intergovernmental Agreement on the Environment (IGAE) (see Box 6.2).

Box 6.1: **Environmental regulation in the Australian meat and livestock industry**

A report released by the Australian Meat and Livestock Industry Policy Council (AMLIPC) in July 1990 highlighted a number of problems with regulatory arrangements applying to feedlots. Environmental regulation of feedlots is primarily designed to minimise their impact on water quality and to reduce odour emissions.

Firstly, the report noted the differing arrangements put in place by state governments for dealing with feedlots. In addition, a variety of bodies are involved in each jurisdiction. For example, in New South Wales, a range of organisations including, local governments, state environment protection authorities, the Department of Water Resources and others may be involved in assessing applications for the development or expansion of feedlots. In fact, project proponents often have to prepare an environmental impact statement for more than one body.

Secondly, the report illustrated the lack of uniformity in feedlot controls. For example, in New South Wales, environmental controls are imposed on feedlots with more than 400 head and smaller feedlots may be established with fewer controls. In contrast, Queensland imposes controls on feedlots holding more than 50 head. The report did not estimate the impact of these variations on the structure of the industry, but did claim that small feedlots could be just as polluting as larger feedlots.

Third, the report identified a lack of adequate guidelines regarding the criteria used for assessing water quality and odour problems. According to the report, only Queensland has attempted to detail air quality objectives and criteria associated with feedlot design. In other states, the lack of guidelines had posed problems, particularly at the stage where Local Councils had to approve development applications. Decisions apparently took much longer and were more likely to result in the imposition of more stringent controls and even rejection of proposals based upon “unfounded” community concerns.

The report argued that a number of foreign companies had deferred plans to invest until such time as these problems were overcome. AMLIPC estimated that this was holding up investment of about $100 million in feedlots that had the potential to generate approximately $200 million in annual export revenue.

Source: AMLIPC 1990.

Box 6.2: **Intergovernmental Agreement on the Environment**

In May 1991, the Commonwealth, States and Territories and Local Government Association signed the Intergovernmental Agreement on the Environment (IGAE). It aims to improve environmental regulation by establishing mechanisms that: clearly define the roles of different levels of government; reduce the number of disputes between levels of government on environmental issues; provide greater certainty in government and business decision-making; and encourage better environmental protection.

The IGAE also sets out principles of environmental policy to be followed by governments when developing environmental programs. For example, environmental protection measures should be cost-effective and not be disproportionate to the significance of the problem being addressed, environmental factors should be included in the valuation of assets and services, those who generate pollution should pay the costs (ie polluter-pays), users of goods and services should pay 'full-cycle costs' (ie prices should include a component relating to the use of natural resources and assets and the disposal costs of any wastes), and environmental goals should be pursued in the most cost-effective way by establishing appropriate incentive structures (including market mechanisms), that enable firms and individuals to determine the best solutions and responses to the problems.

Some of the aims of the IGAE are to be achieved through established arrangements (eg the Australian Water Resources Council and the National Health and Medical Research Council). However, the IGAE also proposes the establishment of a National Environmental Protection Authority (NEPA). It is envisaged that NEPA will have the power to establish mandatory national standards for ambient air, marine, estuarine and freshwater quality and for noise pollution — where variations in noise objectives would have an adverse effect on national markets for goods and services. NEPA may also issue non-mandatory guidelines for the assessment of contaminated sites and the environmental impact of hazardous wastes.

NEPA will comprise ministers from the states and territories (chaired by the Federal Minister) and decisions will require support from at least two-thirds of the members. Individual states and territories will still be responsible for ensuring that such objectives are promoted within their jurisdictions. However, the Commonwealth and states may implement more stringent controls within their jurisdictions if specific circumstances warrant — provided agreement has been reached with NEPA.

The IGAE also specifies actions to be taken to implement the agreements reached in the IGAE. These include: the establishment of a working group on environmental policy, to prepare draft legislation for NEPA; the preparation and publication by the Commonwealth and states of an annual report detailing the measures adopted to attain and maintain environmental standards and guidelines established under the IGAE, by September 30 each year; and a review of the IGAE in May 1995.

Source: Heads of Government 1991.

As noted in Box 6.2, the IGAE aims to facilitate consultation and greater coordination of environmental policies between different levels of government. The achievement of this objective would be promoted by the establishment of a more detailed, publicly available timetable for the implementation of the principles and measures outlined in the IGAE.

RECOMMENDATION

The parties to the IGAE should establish and adhere to a detailed timetable for implementing the specific processes and measures set out in the Agreement.

Similarly, at the state level, some governments have moved to consolidate environmental laws and reduce the numbers of administrative and other bodies with a role in environmental issues. For example, as noted in Appendix B, most states have established, or will soon have, integrated statutory environment protection bodies charged with administering and enforcing environmental laws previously administered by a range of organisations.

The initiatives to rationalise regulatory structures are aimed primarily at improving service to the community, industry and government by: reducing the number of organisations that deal with environmental issues; streamlining and rationalising the environmental protection framework; identifying and eliminating gaps in legislation; and bringing together the range of environmental controls over chemicals, toxic substances and hazardous wastes.

Excessive complexity and overlap also impact adversely on the EWMESS industry, particularly where states and territories have different requirements for approving technologies that are used to address the same environmental problems. This is likely to increase the industry's costs, especially those associated with the development of new technology. This is because a firm, seeking to encourage the use of a new technology, may need to ensure that it complies with the requirements of a variety of environmental bodies within the jurisdiction of an individual state, as well as with the requirements of different states. For example, in one case, Biocycle claimed that, whereas it took 12 months to gain approval in New South Wales, it took 39 months in Western Australia.

Excessive complexity and overlap can also give rise to uncertainty in EWMESS firms, especially with regard to the requirements of different agencies. Uncertainty increases the risks associated with investments in research,

development and commercialisation and thereby deters innovation. It may also encourage industry fragmentation and loss of scale economies because similar products have to be produced in a way that meets the particular requirements of different states.

To overcome the problem of different approval standards, a number of participants suggested that a national approving body be established. They argued that such a body would eliminate the need to approach each state and territory individually (and possibly different agencies within each jurisdiction) to obtain approvals. Some participants also argued that a national body would provide additional support for technologies being marketed overseas in the form of a 'seal of approval' from the Australian Government.

However, there are also arguments against the establishment of a national agency. In particular, the AWWA argued that the performance and relative efficiencies of different forms of waste management equipment are often governed by the site specific characteristics of each installation. Clearly, it would not be possible for a national approving body to account for these differences.

The need for environmental agencies to test the suitability of technologies largely reflects their reliance on process-oriented forms of regulation. As discussed in Chapter 5, process-oriented regulations specify the actions or technologies that firms must install in order to achieve compliance with standards. The increased use of alternative instruments (such as outcome-oriented standards and economic instruments — see section 6.4) would reduce (and possibly eliminate) the need to approve technologies. This would also reduce the need for having a national approving agency.

6.3 Uniformity of environmental criteria and standards

Many participants argued that the lack of uniformity in the environmental criteria and standards used by Commonwealth, state and territory governments to achieve environmental objectives is a significant impediment to the further development of the EWMESS industry.

Uniformity of environmental criteria

Criteria can be thought of as the principles by which the suitability of a particular environment for a given use (eg drinking water, recreation or commercial fishing) can be assessed. As a rule, this will entail determining the appropriate measurement and the techniques or instruments that will be used to assess the environment. For example, noise pollution will be measured in

decibels on the dBA scale using a noise meter. Similarly, the suitability of a water body for human use (eg drinking or swimming) will be assessed by measuring for faecal coliforms and other contaminants.

There is an alternative use of the term 'environmental criteria'. This relates to measures of levels of acceptability (eg noise criteria which are sets of curves that relate sound levels in octave bands to acceptability for, say, a conversation to take place or for undisturbed sleep).

However, the latter definition of 'criteria' blurs the distinction between 'criteria' and environmental 'standards'. Environmental standards are the legally enforceable levels for different pollutants. The distinction between the two terms can, therefore, be highlighted by defining 'criteria' as the principles used to assess the quality of the environment for a particular use.

In the process of developing legislated standards for discharges of pollutants to the environment, authorities may adjust the desired levels of the standards to take into account the known characteristics of the population likely to be affected (eg to protect the most sensitive members of the population) or to provide safety margins, particularly when there is uncertainty as to the likely impact of different pollutants on human health.

Regulators will also take into account the ability of the environment to deal with different concentrations of pollutants. For example, it might be acceptable to discharge more of some substances into a fast flowing river than a near stagnant water body. Similarly, discharge standards may be more stringent for a water body used for drinking water than for irrigation purposes.

A number of participants argued that greater uniformity of environmental criteria is required. According to participants, non-uniformity of environmental criteria raises costs and introduces unnecessary uncertainty for EWMESS firms. Costs may be raised because EWMESS firms must invest time and effort in seeking out and understanding the criteria used in different jurisdictions as part of the process of developing and marketing their products and services. Similarly, lack of understanding of the criteria used by regulators in different jurisdictions can raise uncertainty, which increases the risks associated with developing and marketing technologies and services.

The Commission has been unable to identify any impediments to the adoption of uniform environmental criteria. In fact, it is likely that many of the existing differences are due to the historical fragmentation of responsibility for legislating on environmental issues between the various levels of government and also between different agencies within each government. This has allowed different jurisdictions to develop different approaches over time.

The process of encouraging greater uniformity would be facilitated by extending the approach of developing non-mandatory national guidelines. In fact, ANZECC and the AWRC have recently issued a joint discussion paper on water quality criteria as part of the process of developing a National Water Quality Management Strategy. In part, the exercise aims to provide states with a set of recommended national criteria. In addition, through the IGAE (see Box 6.2), the Commonwealth and states have agreed to set up a National Environment Protection Authority (NEPA). It is envisaged that NEPA will have responsibility for developing non-mandatory guidelines for the assessment of contaminated sites and the environmental impact of hazardous wastes.

The Commission supports the process of developing national guidelines on important environmental issues. Greater uniformity in environmental criteria used by environmental agencies would be encouraged by the extension of the process of developing national guidelines to a range of environmental issues, using existing consultative arrangements.

In areas where national guidelines exist, states and territories should not be prevented from adopting different criteria if circumstances warrant it. This is important for ensuring that states have sufficient flexibility for taking into account specific circumstances that may be peculiar to that state. However, where this is done, states and territories should explain the reasons for any departures as part of the community consultation process.

Basis of environmental standards

The issue of the scientific basis for some standards was raised by the Commonwealth Scientific and Industrial Research Organisation (CSIRO):

> Many current Australian regulations ... cannot be scientifically justified by authorities ...[such as]... trade waste acceptance standards, guidelines for the use of sludges on agricultural land, guidelines for the assessment and management of contaminated sites, and priority wastes.

In many cases, adequate scientific information is simply not available or is excessively costly to collect. In such cases, standards have been based on judgements regarding the desirable concentration of the pollutant. This seems appropriate, provided the reasoning underlying such judgements is disclosed by authorities.

CSIRO also claimed that governments are reluctant to alter standards, especially to make them less stringent, even when presented with new scientific evidence that shows that current levels are inappropriate. CSIRO suggested periodic reviews to ensure that standards are soundly based and incorporate the latest scientific evidence.

While periodic reviews are desirable, it is important to recognise the costs involved — hence the need to focus on potentially toxic pollutants or those which are most important, (eg in terms of potential environmental and/or health impacts) or the most costly for industry to comply with.

Uniformity of environmental standards

Some participants raised the issue of uniform national environmental standards. However, most participants rejected the need for national standards and emphasised the need to cater for regional variations. For example, BHP said that:

> ...the concept of introducing uniform environmental standards is generally opposed by BHP. Uniform standards for some aspects of air, water and soil quality may be justified on health grounds, but naturally occurring variations in the concentrations of various substances mean that generally, discharge [standards] should consider the local ambient conditions and be determined on a site-specific risk-based approach.

It is possible that uniform national standards would benefit some suppliers in the EWMESS industry. This would be the case if scale economies can be gained by producing larger numbers of some pieces of equipment. However, the guiding principle in setting standards should be environmental protection. For example, applying the same standard of sewerage treatment that is required in Sydney to a small town discharging into a bay or ocean with different oceanographic processes at work does not necessarily make sense in environmental protection terms. It could, for example, impose large costs for seemingly little gain. A case-by-case assessment of standards is therefore required.

RECOMMENDATION

Environmental standards should be developed on a case-by-case basis. In developing standards, governments and regulators should assess the costs and benefits of different standards in light of the characteristics of particular regions.

6.4 Using economic instruments to achieve environmental objectives

In Australia, polluting activities are often controlled by the use of process-oriented regulations. Over recent years, environmental regulators in Australia have recognised the deficiencies associated with standards that prescribe technologies. Changes have been implemented that are aimed at improving the operation of process-oriented regulations to ensure that they do not unduly limit flexibility and discourage the use of better and more cost effective technologies and processes. For example, most states now require regular reviews of licences to ensure that firms are using the best available means for controlling or limiting discharges of pollution (including cleaner production processes). Nevertheless, process-oriented regulation is still the mainstay of government controls for achieving environmental objectives.

As noted in Chapter 5, many of the shortcomings associated with process-oriented regulations can be overcome by using outcome-oriented regulations. Regulations based on outcomes permit firms to choose the most appropriate and cost-effective methods for achieving environmental objectives.

RECOMMENDATION

Where regulation is appropriate, the Commission considers that greater reliance should be placed on outcome-oriented regulations.

There are a range of economic instruments which can be used to pursue environmental goals. However, as the efficacy of using different economic instruments differs according to the particular circumstances, a case-by-case assessment of the adequacy of different instruments is required. This is explicitly required in some other countries, such as New Zealand (see Box 6.3).

Box 6.3: New Zealand's resource management legislation

The New Zealand *Resource Management Act 1992* aims to consolidate the country's environmental legislation and define clear roles for government and other bodies.

Among other things, the Act explicitly requires regulators to have regard to a number of principles when developing environmental goals and regulatory programs. These include:

- principle of necessity: requiring decision-makers to consider the extent to which a regulation is necessary to achieve a deemed objective;
- principle of alternatives: requiring decision-makers to consider all available means for achieving a given objective including: provision of information and services; the use of both monetary and non-monetary incentives; and the levying of charges;
- principle of explicit reasoning: requiring decision-makers to make explicit the reasons for and against the adoption of a particular approach; and
- requirement that the decision-making process includes an assessment of the costs and benefits (including monetary and non-monetary values) of objectives, policies, methods or rules introduced under the Act.

These requirements are aimed at encouraging the adoption of efficient regulatory techniques, including the application of economic instruments.

The need to weigh up alternatives also underpins the IGAE (see Box 6.2). Under the Agreement, Commonwealth and state governments have agreed that the implementation of environmental policies should be pursued in the most cost-effective way and by applying appropriate instruments (including market instruments) which enable firms to develop their own solutions and responses to environmental problems. The Commission supports these principles and believes that their implementation would benefit the EWMESS industry and the broader community.

6.5 Improving monitoring and enforcement

Eliminating overlap, excessive complexity and unnecessary non-uniformity of environmental criteria and standards are important steps that governments in Australia can take to help achieve better environmental outcomes. These reforms are also likely to benefit the EWMESS industry, other industries and the community.

However, having the best regulations and regulatory frameworks will count for little if there is not compliance with environmental standards. There are various

means of ensuring compliance, depending on the nature of the law governing a particular environmental issue. It is possible that common law sanctions and remedies may be available. A particular statute may provide for incentive-based licence fees and/or the use of tax incentives. However, irrespective of the provisions, monitoring and enforcement of environmental regulations are integral components of environmental policy.

In broad terms, monitoring is required in order to: detect breaches of environmental controls; determine the effectiveness of regulation and of different instruments; and assess the appropriateness of environmental goals.

In Australia, environmental authorities monitor the quality of the environment in a number of ways. In many industries self-monitoring is important. For example, the Commission's water report (IC 1992c) noted that voluntary self-monitoring is undertaken by major water authorities. Some environment protection agencies also require firms to self-monitor. Under self-monitoring, firms must submit results regularly to environment protection bodies.

Enforcement responses commonly used in Australia include: suspension or revocation of licences — or variations in licence conditions; prosecution; the issue of notices to undertake specific works; and the issue of warnings and compliance orders that notify firms of the need to comply.

Assessing the adequacy of monitoring and enforcement in Australia is difficult. This is partly because different agencies around Australia generally have different approaches to enforcement. In addition, inadequate information on the effectiveness of different enforcement strategies makes it difficult to effectively compare states and territories. However, many participants to the inquiry argued that enforcement of existing regulations is inadequate. Some claim that this is due to the lack of monitoring by regulatory authorities. Others noted that regulatory agencies may be reluctant to prosecute offenders, especially if the likely penalties for major offences are small.

While the most obvious (and important) consequence of the failure of authorities to adequately enforce environmental requirements is a deterioration in environmental values, it also has repercussions for EWMESS firms. In particular, inadequate monitoring and enforcement are likely to reduce demand for technology, systems and services and may discourage technical change and innovation. Outside the EWMESS industry, firms that do comply with environmental regulations may be placed at a competitive disadvantage compared to those that do not comply.

Enforcement approaches

There is no uniform approach to enforcing environmental regulations in Australia. Regulatory agencies have generally adopted a mixture of cooperative and adversarial approaches. The former emphasises conciliation and assistance in encouraging compliance. The latter places relatively more emphasis on prosecution and other sanctions as a deterrent to non-compliance.

A recent study sought the views of officials from environmental agencies around Australia on the use and effectiveness of compliance strategies based on conciliation, as against those based on punishment. It found:

> ...considerable differences of opinion were expressed, between jurisdictions and between agencies. And even within agencies there were differences between the perceptions of traditional enforcement officers and newer policy makers (Norberry 1993, p. 60).

The enforcement programs of most Australian regulatory bodies have traditionally focussed on conciliation and negotiation as the major method of securing compliance with environmental goals. For example, the West Australian EPA has had a long-standing strategy of education and cooperation with industry. It believes this is the most effective strategy for achieving environmental goals, and considers that prosecution engenders antagonism.

According to Norberry, New South Wales and Victoria are the most "adversarial" states in Australia. Evidence for this is the relatively high number of prosecutions initiated in these jurisdictions compared to others (see Table 6.1). For example, in 1990-91, the New South Wales State Pollution Control Commission laid 69 charges for environmental offences and the Victorian EPA brought 32 charges (excluding charges for motor vehicle emissions and noise). In comparison, the available data (see Table 6.1) indicate that other states are considerably less reliant on prosecution. However, the information should be interpreted with care, as some relates to prosecutions initiated while some relates to successful prosecutions. Furthermore, there is no comparable information on monitoring efforts.

In New South Wales and Victoria, prosecution has been an integral part of enforcement. For example, according to Norberry:

> In New South Wales it can be said that prosecution, conciliation and education are all regarded as part of the necessary mix of strategies for compliance. As stated, New South Wales has traditionally been considered and has considered itself as a prosecution-oriented jurisdiction (1993, p. 61).

Table 6.1: **Enforcement by environmental protection bodies, 1990-91**

Agency	*Number of prosecutions*	*Maximum fine imposed*	*Enforcement philosophy*
New South Wales State Pollution Control Commission (now EPA)	69[a]	$75 000	Prosecution, conciliation and education are integral components of enforcement strategies.
Victoria EPA	32[a]	$6 000	Similar to New South Wales.
Queensland Department of Environment and Heritage	na[b]	na	Conciliatory/educational focus. Infrequent prosecution of offenders.
Western Australia EPA	4[c]	$37 500	Cooperation/educational focus. Prosecution viewed a failure on the part of WAEPA.
South Australia Department of Environment and Planning (now Environment and Land Management)	3	na[d]	Negotiation and cooperation is preferred. Prosecution is a last resort. However, penalties have significantly increased.
Tasmania Department of Environment and Land Management	4[e]	nil[f]	Conciliatory/educational focus. Authorities have preferred to encourage the implementation of "performance improvement plans" over prosecution.
Northern Territory Adminstered by various agencies[g]	na	na	Consultation/negotiation focus. Dept of Mines and Energy has the power to close mines but this has only been exercised once.
Australian Capital Territory Department of Environment Land and Planning	na	na	Consultation/educational focus. Prosecution is only pursued if this is unsuccessful.

na not available

a Prosecutions instituted. Figures exclude prosecutions for motor vehicle noise and emissions.

b There have only been 5 charges laid under the *Clean Waters Act* since its inception in 1971.

c Figures relate to successful prosecutions rather than prosecutions instituted.

d The maximum fine in the last five years has been $1000.

e Prosecutions instituted.

f The maximum fine in the three years prior to 1990-91 was $2500.

g See Appendix B.

Sources: Norberry 1993, Grabosky & Braithwaite 1986, various Annual Reports, Appendix B.

Information on enforcement

An assessment of the relative effectiveness of the different enforcement strategies of Australian environmental authorities would require detailed information on a range of factors, such as: resources devoted to monitoring and enforcement; numbers of complaints, prosecutions, licenses, orders, compliance notices, etc, issued; and numbers of breaches of licences. Some of this information is available in the annual reports of environmental agencies but it is seldom comparable (across years and between agencies). Some states are looking at addressing this deficiency by requiring agencies to report on the effectiveness of environmental programs as part of the process of producing State of the Environment reports. For example, New South Wales is expected to publish its first State of the Environment report later in 1993.

RECOMMENDATION

Governments should direct environmental agencies to collect and publish information on monitoring and enforcement programs. This could be done as part of the process of producing State of the Environment reports. The information should be collected on a uniform basis, both within and between states.

There are some general principles which, if adopted by regulatory authorities, would enhance monitoring and enforcement, with consequent benefits for the EWMESS industry. In particular, agencies should encourage greater self-monitoring by firms as part of the licensing process. This would help shift more of the cost of monitoring discharges on to polluting firms. To ensure that self-monitoring is effective, licenses could detail the responsibilities of firms and the likely consequences of non-compliance. Random monitoring and auditing of firms' monitoring programs would be necessary to ensure that self-monitoring is properly carried out. Without these checks, firms may deem it worthwhile to fail to report episodes of non-compliance. The frequency of random monitoring and audits should be greater for those industries or pollutants with larger potential environmental impacts, and for those organisations or individuals with a poor history of compliance.

Penalties should seek to reinforce the incentives for firms to comply with standards. For example, the size and structure of penalties will influence incentives faced by firms. With imperfect detection of violations, penalties such as fines should substantially exceed the costs avoided by firms due to deliberate

non-compliance. This could be implemented by relating penalties to damage costs and, as in cases of income tax evasion, adding a large additional sum.

7 WASTE PRICING

Many participants suggested that both government environmental objectives and the EWMESS industry's competitiveness and growth would be enhanced if governments more vigorously pursued the proper pricing of products that generate waste, waste disposal activities and natural resources. Participants said that, at the present time, undercharging is prevalent. This was said to remove the financial incentive for firms and individuals to take account of the impact of their activities on the environment. They argued that pricing reform would encourage greater use of waste minimisation technologies, including recycling technologies and systems. For instance, the AWWA said that:

> Until rational pricing and regulation of landfill sites is introduced, there will be insufficient impetus for alternative, and environmentally preferable, sludge disposal options to be implemented.

The major concern was the non-pricing, or under-pricing, of the environment. DEST said that, in many instances (eg urban and irrigation water usage and disposal, and landfill disposal of solid wastes), charges are insufficient to cover financial costs, let alone the full social costs, including costs for environmental damage and loss of amenity.

Participants sought a broad range of waste pricing reforms. For instance, the EMIAA requested that the section of the Intergovernmental Agreement on the Environment dealing with improved environmental valuation, pricing and incentive mechanisms be given priority consideration and application by all levels of government. More specifically, the EMIAA and other participants variously requested the implementation of user pays, beneficiary pays and/or polluter pays concepts to water and waste disposal activities.

The Commission recently reviewed water, waste water and trade waste pricing issues in its report on Water Resources and Waste Water Disposal (IC 1992c). Many of the recommendations made in that report would, if implemented, deal directly with some of the concerns of the EWMESS industry. Consequently, this chapter focuses on how the current pricing practices for solid waste disposal to landfill could be improved and on what these, and other waste pricing reforms, might mean to the EWMESS industry. Some of these issues were addressed in the Commission's report on Recycling (IC 1991a).

7.1 Pricing of waste disposal to landfill

At present, charging and pricing practices for landfill disposal vary widely across Australia. They generally discriminate between industrial and domestic sectors, the type of waste and, in some cases, the source of waste. However, charges are rarely linked directly to the actual cost of providing services to individuals and firms.

Charging practices for waste disposal to landfill are broadly as follows:

- charges for the disposal of industrial and commercial wastes to landfill are normally levied according to the amount of waste (ie by volume and, increasingly, by weight); and
- charges for household waste collection and disposal are normally levied through general property rates, either as an (unspecified) component of the total general rate or as a specified fixed component.

Some councils also distinguish between users within each of these categories. For instance, some notionally charge their own operators a lower amount than they charge for deliveries by commercial operators. This is generally justified on the grounds that commercial waste transport operators tend to handle proportionately more non-putrescible wastes. Thus, higher landfill access charges to commercial operators are, in part, designed to encourage waste generators to undertake more on-site treatment of such wastes. Some councils also give local residents a certain number of 'free' tip passes (after which they are liable to gate entry charges at set rates for cars and trailers) while others, such as those in the Australian Capital Territory, give householders unlimited free access to tip face disposal.

Charges levied on industrial and commercial users in most Australian cities for landfill disposal of liquid and hazardous wastes, some solid wastes — such as tyres and car bodies — and general waste (putrescible and non-putrescible), vary according to the type of waste and the cost of treatment. This is intended to provide a direct link between the waste generated and the cost of disposal.

According to a 1989 local council survey conducted for the Commission's Recycling report, councils raised, on average, 55 per cent of their income from waste management services through specific garbage rates and 33 per cent through general rates (IC 1991a). Most of the remaining revenue was obtained from gate entry charges.

Charges for landfill disposal applying to industrial and commercial users vary between regions, depending mainly on the value of the land occupied, the extent of landfill usage (which determines capital equipment requirements and costs) and the cost of meeting differing environmental regulations. For example,

participants indicated that "general waste" charges for industrial and commercial users in Sydney were around $30 per tonne; in Melbourne, $15-30 per tonne; in Brisbane, $45 per tonne; and in Canberra, $11 per tonne.[1] The variance is even greater for some prescribed wastes, such as tyres. For instance, the charge in Sydney is upwards of $100 per tonne while, in Melbourne, it is currently around $35 per tonne. Differences in charges provide incentives for inter-regional disposal.

Variances aside, landfill prices have generally been increasing in most urban centres and will continue to do so due to the higher costs for new landfill sites, tighter environmental requirements and the increased enforcement of existing regulations.

Participants' views

Many participants sought changes to the charging structure for, and under-pricing of, waste disposal to landfill. They considered both to be at odds with stated government ecologically sustainable development objectives of reducing waste disposal by up to 50 per cent by the year 2000 and promoting waste minimisation nearer to source, as well as being detrimental to the development of the EWMESS industry. They argued that significant under-pricing, both in terms of financial cost recovery and in accounting for the environmental damage caused by landfill operations, reduces demand for alternative waste technologies, especially those which seek to minimise and recycle waste. For example, the Brisbane City Council (BCC), in pointing to significant under-pricing of waste disposal in Brisbane (despite recent increases in landfill charges), said that:

> In a climate of low disposal prices and minimal controls over dumping there is little incentive to invest in treatment and disposal equipment let alone equipment designed to reduce waste closer to source.

The EMIAA sought transparent costing, the removal of cross-subsidies and implementation of direct charging (ie user pays) for domestic waste services, so as to provide a direct incentive for households to minimise waste (through, for instance, the use of recycling, composting and green waste mulching technologies). To achieve greater cost efficiencies, the Association also sought greater regionalisation of the waste management regimes; that is, cooperation at local government level to overcome duplication of services such as landfills and materials recovery facilities. It considered that modern waste management systems and processes (eg materials recovery facilities, secure landfills, high

[1] The charge for landfill disposal of general waste in Canberra is to rise to $22 per tonne on 1 December 1993.

temperature incinerators and the latest compaction technologies) are too expensive for most local authorities to countenance by themselves.

A number of other participants, including DPIE, DEST, Bergmann Australia, Australian Paper Manufacturers, Alex Fraser and Australian Native Landscapes, generally sought full social cost recovery (including environmental costs) on solid waste collection and landfill disposal services. Pacific Waste Management said that full cost recovery should also include the cost to compensate 'host' communities for the loss of amenity resulting from the location of a waste facility in their area. However, most recognised that full recovery of social costs would only be achievable over time, as further research is done on valuing the loss of environmental amenity and damage costs. Indeed, some impacts may prove to be beyond measurement. Nonetheless, they saw recovery of at least the full financial costs of landfill operations as being an essential move in the right direction.

The Queensland Government argued that pricing reforms for landfill should be phased-in at an announced rate to encourage waste minimisation and recycling while, at the same time, avoiding an upsurge in illegal dumping.

Direct charging for waste services

By ensuring that solid waste products are properly disposed of, waste management services provide public health benefits. In theory, these public health benefits could support a case for government to subsidise the provision of some waste management services. However, there are two factors which need to be taken into account in this regard.

First, user charges are important to provide consumers with a financial incentive to account for the costs of disposing of their waste products. In the absence of charges, there would be little incentive for consumers to reduce their waste through recycling or other strategies.

Second, without full cost recovery from users, the disciplines on (government) waste service providers to minimise costs will be reduced. This is because, where the taxpayer meets part of the cost, service providers are shielded from the full consequences of inefficient service delivery.

For these reasons, the Commission considers that full commercial pricing for solid waste management services is appropriate.

Against this benchmark, charges for solid waste disposal in most parts of Australia are less than adequate. Charges are frequently unrelated to an individual's or firm's usage of waste disposal facilities and the total revenue raised from landfill operations is insufficient to recover costs.

Structure of charges

The cost of disposing of waste reflects a range of factors, including the quantity and type of waste. However, as outlined above, existing pricing practices for household waste disposal generally pay only limited regard to these factors. A set charge generally applies, irrespective of the quantity or type of waste deposited. As household waste disposal charges are commonly encompassed in property rate charges, some householders do not even know that they are being charged for garbage disposal, let alone know the magnitude of the charge. Although not without shortcomings, charges for industrial and commercial users at least partially reflect the quantity and type of waste.

Where waste disposal charges are unrelated to usage, individual users have no direct financial incentive to account for their production of waste. This is because the price of depositing additional waste is effectively zero. Thus, they provide no financial incentive to use alternative means of disposing of waste (eg recycling), or to minimise waste in the first place. This, in turn, will have an adverse impact on suppliers of waste management technologies.

The existing structure of charges is also inequitable. In particular, lump sum charging means that frequent (and/or major) users of landfill areas are subsidised by those that seldom use landfill areas. In economic terms, there is 'cross-subsidisation' between users.

Level of charges

A number of recent studies (eg Stanley & Maunsell 1992 and Travers Morgan 1992) have established that, at present, landfill charges set by local governments and waste management authorities do not generally cover operating costs and a return on capital, let alone broader social costs (including environmental damage and loss of amenity costs). This creates a number of problems, some of which are similar to those posed by the deficiencies in the structure of charges.

To the extent that charges do not recover costs, users of landfill are subsidised and excessive waste is deposited at landfills. In turn, excessive demand forces councils to invest in new landfill areas which could be deferred if charges reflected the true cost of waste disposal.

The failure of authorities to recover costs at public landfill areas also discourages private sector investment in waste disposal. For example, low (or zero) charges applied by local councils may make it uneconomic for a private owner of land suitable for landfill to develop it for that purpose, even if the cost is less than the true cost of developing alternative sites under public sector management.

FINDING

Poorly structured charges for solid waste disposal at public landfills and low levels of cost recovery have adverse efficiency and equity implications for the wider community.

Implementing better pricing practices

The problems that arise from the present pricing practices would be largely overcome if user charges reflected the cost of landfill operations, and if landfill revenue were sufficient to cover all costs, including a return on assets. Of course, implementation of improved pricing regimes inevitably involves some problems and, in most instances, additional administrative costs. Nonetheless, experience elsewhere (eg electricity and water pricing) has shown that it is feasible to change pricing practices significantly, to the benefit of the community as a whole.

Charging for landfill disposal of solid wastes could be modified in a variety of ways. In those instances where costs increase with greater use of services (as is the case with waste collection and landfill disposal services), charging based on usage is more efficient than a single fixed access charge. This is because it provides clearer signals about the costs of managing waste. Consequently, charging structures would be improved if disposal charges varied (by weight or volume) or if a 'two-part' charging structure were introduced. (Two-part charges incorporate both an access charge to cover fixed costs — such as landfill closure, clean up and administration — and a variable charge related to usage.) Charging on either of these bases would provide a clear incentive for those generating waste to consider ways to reduce waste (eg through on-site recycling or purchasing goods which involve less waste or which are made from materials that can be recycled).

Technologies already exist to give effect to charging for domestic services on a volume or weight basis. Some, such as the variable bin system, where households are charged on a per-bin basis, and the tag technology system — a computer-based system developed for recording the weight of garbage collected at each residence and for subsequent separate billing on this basis — are already in place or being trialed in some parts of Australia. For instance, Melbourne City Council began trialing a weight-based system in May 1993 covering 1000 homes. The Western Australian Municipal Association (WAMA) said that a pay-for-weight trial by the Town of Mosman Park is likely to be the forerunner of its wider adoption by local governments in Western Australia. On the basis of Seattle Waste Authority's experience, while significant reductions

in domestic waste (26 per cent) were achieved when a volume-based user pays system was introduced, additional reductions (12 per cent) were achieved when they moved to a weight-based system (*Herald-Sun* 19 July 1993, p. 1).

One negative aspect of variable charging on a volume (or weight) basis is that it involves greater administrative costs in recording and billing separately from general rates accounts. Also, cheating is said to be a concern with weight-based charging (eg residents dumping their waste in neighbours' bins). Another potential problem is the likely increased incidence of illegal dumping. Improved technologies will help reduce the additional administrative costs. In the case of illegal dumping, public information programs and the phased introduction of revised charges should help contain its incidence (see discussion later in this section).

RECOMMENDATION

Public authorities operating landfill services should examine the case for implementing charging structures linked to use of those services.

As part of a move towards improved charging structures, there is little, if any, merit, on economic grounds, in exempting residents from the payment of a fixed gate entry fee for their direct use of landfill facilities.

Covering waste disposal and associated environmental costs

Disposal charges should be set to ensure that the full social costs of disposal are met, including environmental damage and loss of amenity costs. While further work is required to put a value on some of these costs, this should not preclude councils and waste management authorities from at least pursuing full financial cost recovery, including post-closure costs.

Environmental damage and/or loss of environmental amenity that may be caused by landfills relate mainly to leachate and heavy metal contamination, the generation of methane gases, the release of CFCs, odours and litter, noise, traffic congestion and damage to roads, and disease transmission by pests. As noted in a recent study done by Travers Morgan (1992) on Sydney's landfill operations, most of the potential environmental damage costs would already be accounted for in the costs of meeting environmental regulations in establishing a secure landfill. Any remaining environmental costs that are not included because of difficulties with valuation can be added into the pricing equation as valuation techniques are developed and estimates calculated. In regard to loss

of environmental and other amenity, recent studies done by Stanley & Maunsell (1992a and 1992b) estimated this cost in the City of Portland to be about $1 per tonne, while Whittlesea City Council recently imposed a levy of $2.50 to compensate for the loss of amenity resulting from the operation of the Council's landfill facility.

Unlike water supply, estimating the financial costs of waste disposal to public landfills is seemingly a relatively straightforward exercise. Operating and maintenance costs can be readily estimated. Also, there are a number of market-based indicators available to measure the value of a landfill site and changes in its value. Further, the costs of developing a landfill site (including capital equipment, buildings and structures) and meeting environmental guidelines to provide a secure landfill represent a normal commercial costing exercise, while rehabilitation and site after-care (including monitoring costs) are a matter for well established risk management assessment to ascertain appropriate cost allowances (or financial assurances).

Further, there is little, if no, reason why public landfills should not be operated on a commercial basis and be required to set their charges on the same basis as privately-owned landfills (eg include a return on the community's investment).

Illegal dumping

As noted earlier, direct charging for waste disposal by volume or weight, combined with full cost recovery pricing, may provide some with an incentive to dump waste illegally.

The costs of increased illegal dumping of waste are the additional enforcement costs (ie increased surveillance, administration of fines and penalties, and prosecution costs) and the costs of cleaning up the waste or the loss of environmental amenity. These sorts of costs must be considered when assessing the extent and pace at which charges should be increased. In a recent study on landfill pricing, the Bureau of Industry Economics, stated that:

> If the expected social costs due to illegal dumping and on-site accumulation of wastes resulting from full cost pricing of landfill, are higher than the implicit subsidy flowing to waste disposal, underpricing of waste disposal is economically efficient (BIE 1993, p. 17).

However, it is important not to overstate the likely extent of illegal dumping in response to higher charges. For instance, it is unlikely that reputable commercial waste transport operators would be willing to jeopardise their business through illegal dumping, especially given their capacity to pass on higher charges (at least partially) to users of their services. A survey conducted for the Commission's recycling inquiry indicated that householders are generally socially responsible about the way they dispose of their waste and are more

likely to dump illegally out of frustration over, say, tip closure, than in response to the charge that they would have otherwise had to pay (IC 1991a).

Nonetheless, in view of the way major adjustments in pricing practices are being handled elsewhere in the economy and the potential problems that can be created by illegal dumping, it is appropriate to err on the side of caution. The Commission considers that phasing-in of full cost recovery pricing (under a direct charging mechanism) for waste disposal to landfill services is a sensible compromise. Public education about the costs of waste disposal would also be of assistance in gaining greater community acceptance of pricing reform.

RECOMMENDATION

Local councils and waste management authorities should pursue full cost recovery on the provision of their waste disposal to landfill services including, where possible, environmental damage costs and a commercial rate of return on the community's investment in those assets. Changes in pricing practices should be phased-in.

Regionalisation of waste management facilities

Along with seeking to utilise private industry where appropriate, the Commission considers that the amalgamation of waste management and landfill functions frequently undertaken by numerous local bodies within the same region (ie 'regionalisation') would provide scope for cost savings and increase the opportunity to employ new technologies. A good role model for such an exercise would be the Delaware Solid Waste Authority in the USA.

While regionalisation will not be appropriate in all circumstances, it is important that adjoining councils be prepared to review this option, especially before commissioning any new landfill sites.

In its draft report submission, the WAMA stated that, in accordance with that State Government's policy, a regionalised approach to waste management services is already evident in metropolitan Perth. Similarly, the Tasmanian Government said that its new Solid Waste Management Policy recommends significant rationalisation of landfill facilities within Tasmania.

RECOMMENDATION

Governments should examine the cost savings available through greater regionalisation of their waste management and landfill activities.

7.2 Other pricing reforms

Water and waste water pricing

The AWWA and others indicated that there is considerable scope for extending pay-for-use pricing more widely for water, domestic sewage and trade waste services. As noted earlier, the Commission undertook an extensive review of pricing issues relating to each of these activities in its Water Resources and Waste Water Disposal report (IC 1992c).

Water pricing

A number of water, sewerage and drainage authorities in the capital cities and major towns have introduced, or are considering, volume-based charges for water supplied to households and industry. However, charges in most centres still fall short of fully recovering costs, including a return on capital. And, there are many centres which retain charges based on property values, with no direct usage charge.

More efficient water pricing would lead to a significant increase in the demand for water conservation and waste water re-use technologies. In its water report, the Commission proposed a range of pricing reforms which were designed principally to move this sector towards full cost recovery and to link charges directly to levels of use.

Sewage pricing

In the absence of technology to measure waste water produced by individual households, the Commission recommended in its water report that water, sewerage and drainage authorities should consider charging for sewage services according to the percentage of water presumed to be returned to the sewerage system.

The incentives to conserve water and develop water saving technologies from user pays pricing for water services would be reinforced by this proposal. That is, reduced use of water would lower both the water and the sewerage charge. At present, imputed usage charges only apply in the Hunter Valley Region and

Geelong. In most places, charges for sewage are based on property values or on the number of pedestals.

Effluents (trade) waste pricing

Charging based on the quantity and strength of effluent (trade) waste discharges to the sewerage system, as recommended by the Commission in its water report, is becoming more widespread. This charging mechanism provides the incentive for firms to pursue waste minimisation strategies, cleaner production technologies and a greater level of on-site waste treatment.

The AWWA indicated that the Australian Water Resources Council is currently developing national guidelines for trade waste tariff structures and acceptance criteria for the constituents of trade waste.

Off-site liquid waste treatment pricing

Most major urban centres in Australia have a number of public and private facilities for the off-site treatment of liquid industrial wastes. Competition is strong, with most applying pay-for-use pricing arrangements. Consequently, inefficient pricing is unlikely to be a concern in these areas. However, this is generally not the case in most regional areas.

7.3 Effects of pricing reform on the EWMESS industry

More efficient pricing practices for waste disposal to landfill, water supply and domestic and commercial sewage (including trade waste to sewer) will benefit some in the EWMESS industry but penalise others. For example, improved pricing for waste disposal to landfill is likely to lead to increased demand for a wide range of waste minimisation and recycling technologies, systems and processes. However, it would also lead to a reduction in demand for waste disposal hardware.

Similar considerations apply to the more efficient pricing of water, domestic sewage and effluents (trade) waste. User pays pricing in these activities will encourage industry to look to cleaner production technologies, as well as to increased recycling and general resource conservation activities. However, it will also mean reduced waste water and, thus, lower demand for treatment technologies and systems.

The BCC, in pointing to a likely diversification of EWMESS products as a result of waste pricing reforms, said that:

> The industry is developing a range of alternative solutions to waste problems, many of which are becoming commercially viable as the reforms proceed and the demand for cost effective solutions increase.

While it is somewhat unclear what might happen in the short term, in the long term, most participants believed that, in aggregate, the industry would benefit from improved water, waste disposal and resource pricing.

8 GOVERNMENT PROCUREMENT

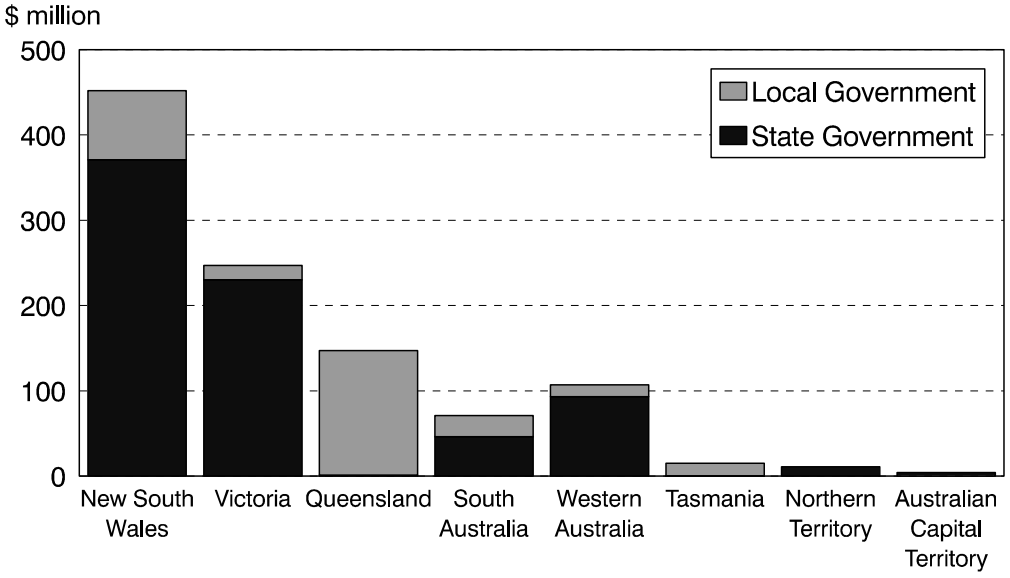
Government EWMESS purchases have a very significant impact on the industry's development. According to the EMIAA, Australian governments at federal, state and local level account for more than 60 per cent of demand for local EWMESS products. The majority of these purchases are by government business enterprises (GBEs) and local government bodies.

In both 1990-91 and 1991-92, total capital and current outlays on EWMESS products and services by governments (including GBEs) was about $1.7 billion. The most significant component was capital outlays — around $1.1 billion in 1991-92 (see Figure 8.1). Of this amount, the overwhelming majority — about 90 per cent — was undertaken by GBEs.

In coming years, governments expect to spend large amounts of money on waste management equipment and systems. For example, projected expenditure on sewerage systems by Australia's water, sewerage and drainage authorities during the 1990s is estimated to be about $6.3 billion (see Figure 3.2). In addition, the Sydney Water Board is to spend some $600 million over the next ten years to improve the quality of the effluent discharged to the Nepean-Hawkesbury River system. The Australian Water Resources Council has estimated that new investment of more than $2.5 billion in urban sewerage treatment plants will be required to provide limited improvements in nutrient removal (eg to overcome blue-green algal outbreaks in Australia's rivers and lakes).

This chapter focuses on the two main issues of concern raised by EWMESS industry participants in relation to government procurement: namely, shortcomings in the tender process and participants' belief that government purchasing should encompass an explicit industry development role.

Figure 8.1 **Capital outlays on sanitation and protection of the environment by Australian Governments, 1991-92**



Source: ABS 1993c.

8.1 Tendering issues

The government purchasing process in Australia is dominated by a competitive procurement system[1] with open tendering as a basic feature. Generally, several firms bid for each tender. In turn, these firms will often utilise the services of several sub-contractors to fulfil the tender requirements.

At the national level, tendering guidelines are published by the Department of Administrative Services (DAS) consistent with the requirements of the *Commonwealth Audit Act* and the objectives of the Commonwealth Government. State and territory purchasing procedures are developed by the respective government agency that has carriage of the appropriate Act(s). Local government authorities are subject to purchasing requirements under their own Acts, as well as other relevant state policy and tendering guidelines. GBEs (such as water authorities) also operate under relevant state purchasing guidelines.

[1] Procurement generally covers the following stages: identification of a requirement for a good or service; definition of the requirement, including preparation of any necessary specifications; authorisation and funding; purchase of the goods, services or works; inspection and receipt; and warehousing and issue for use (Commonwealth of Australia 1975).

Although tender procedures vary widely across jurisdictions in Australia, participants raised a number of common concerns with the existing guidelines and processes, including: the cost to firms of preparing a bid; confidentiality practices; the specification of tenders; limited use of whole-of-life costing techniques; the current trend towards aggregation of tenders; and the possible adverse consequences of commercialisation of GBEs for local EWMESS suppliers.

Underlying a number of these concerns were the views that government officials involved in procurement are not always sufficiently skilled or accountable for the functions they are performing or the decisions they make, and that tendering processes are not sufficiently transparent.

Costs of the tender process

A number of participants expressed concern about the costs of bidding for a contract. For example, the Queensland Government said that:

> Currently the cost of tendering is a significant impost on industry.

In theory, the advantage of a tendering system is that competition between tenderers will help a government agency to identify the most cost-effective means of supply. However, the preparation of tenders is a costly exercise. As the number of tenders increases, the premiums built into tender bids to account for these costs also increase. This is because the probability of a successful bid falls as the number of bidders increases. Also, the administrative costs for agencies of assessing tenders obviously increases in line with the number of tenders. This raises the issue of whether an open tendering system is in fact the most cost-effective method.

In recognition of the potentially high costs of the open tender system to both firms and government agencies, the latter often use various forms of selective tendering. For example, some New South Wales Government agencies use two types of selective tendering: “expression of interest”; and “pre-registration of tenderers”. The first method requires interested firms to submit an expression of interest in response to a public advertisement. An assessment of the prospective tenderers is then made and invitations to tender are sent to a short-list of respondents. Under the second method, firms are publicly invited to register for projects of a certain value, or of a particular kind. When a project is to be commissioned, a selection of tenderers is chosen from the register and asked to submit bids.

Further, government agencies sometimes negotiate directly with suppliers of their choice when purchases are below a certain threshold value. This threshold varies from state to state. For example, in Tasmania it is $20 000 and in

Queensland $10 000 (although for contracts valued between $10 000 and $100 000 the procuring agency only needs to invite, in writing, a minimum of three genuine competitors to tender for the supply contract).

In addition, joint venture arrangements between a public agency and a private sector partner are sometimes used. These arrangements can remove the need for tendering altogether. For instance, the Sydney Water Board and Memtec Limited are presently joint venture partners in demonstrating a continuous microfiltration membrane system for sewage treatment, with a view to possible scaling-up to a commercial size in the future.

Given the diversity of EWMESS products and services required by government agencies, the method of procurement is likely to vary depending on the circumstances. Open tendering, direct purchasing (including joint venturing) and selective tendering arrangements should all be assessed as possible purchasing strategies with a view to choosing the one which is the most cost-effective overall, given the particular circumstances of the project.

However, with any move away from open tendering arrangements, it will be important to ensure accountability and transparency. Without these disciplines in place to begin with, the most appropriate technology may not be chosen. For example, the New South Wales Legislative Standing Committee on State Development said of pre-registration arrangements:

> This approach saves time and money, but it has to be administered efficiently if it is to remain fair and cost-effective; the register must be kept up-to-date, and an equitable system of performance assessment should be introduced. ... The system of pre-registering tenderers can place considerable power in the hands of those administering it (NSWLSCSD 1990, p. 13).

In the case of joint ventures between a government agency and a private firm, accountability and transparency concerns are particularly important. GBEs are in a special position because of their relationship to their owners, the taxpayers, but, increasingly, they are also expected to operate in a commercial manner. Direct negotiation, joint venturing and open tendering are all strategies considered as part of normal practices in the private sector. However, even where private sector organisations have preferred suppliers, it is a common practice to use periodic open tendering as a means of testing the market and keeping the preferred supplier(s) 'honest'.

This raises the issue of whether GBEs should be constrained in their choice of purchasing strategy, particularly where very large and costly projects are concerned.

In the Commission's view, GBE purchasing strategies should be flexible, allowing management to make decisions on a case-by-case basis. However, it is

important that managers be accountable for their decisions. At the very least, the basis for major sourcing decisions should be outlined in annual reports. Ultimately, GBE management should be paid on the basis of results.

Confidentiality practices

The confidentiality attached to tenders throughout the tender process varies considerably across states. With regard to bid prices, the AWWA stated that:

> Some authorities announce the face value of tenders at opening (largely the practice in Queensland), others announce later the order of pricing (Public Works Department in NSW), but others still (eg Sydney Water Board) may never announce the prices, even after the award of a contract.

Where confidentiality applies it can have the effect of reducing the effectiveness of the competitive learning process and may discourage potential bidders from submitting tenders.

Although some confidentiality is obviously required with regard to bid prices during the selection of tenders, the Commission views total confidentiality, particularly after a tender contract has been awarded, as serving no useful purpose. In fact, disclosure of the price for major purchases is an important mechanism to ensure the accountability of GBEs.

Some local government authorities publish the name and tender price submitted by both successful and unsuccessful tenderers in the local print media. The Commission recommends that the practice of publishing details of the successful tenderer be applied to major purchases by all government agencies. Tender documents should advise bidders of when and where notification will occur. While the Commission considers that relevant details of purchases should also be recorded in annual reports, this initiative in itself is inadequate because, in many instances, the information would not be available until long after the tender has been finalised.

RECOMMENDATION

All public agencies that are subject to government tendering requirements should be required to notify details of successful tenderers (including the bid price) in the print media, soon after the signing of contracts.

Tender specifications[2]

Many government tender documents still specify the types of process (or technology) required, rather than simply the problem that needs solving. This may limit the number of possible suppliers, and can discourage consideration of innovative and/or less expensive alternatives. In the extreme, it can have the effect of pre-determining a supplier because other suppliers with different technologies are excluded or dissuaded from competing (see Box 8.1). This problem is further compounded for local EWMESS suppliers where tenders are so specific that only imported products can fill the contract. For example, ANI-Krüger said that:

> Our observations are that imported equipment tends to get used because engineers specify known brands or items seen on overseas plants. As a result, the purchasing people have restricted choice and if they do exercise discretion, it is safer to go with the imported items.

Industry participants saw this problem as a major impediment to their ability to compete both locally and for overseas contracts, particularly as they perceive acceptance of locally produced products by government in Australia as providing the necessary 'seal of approval' for that particular product in overseas markets (see Section 8.2).

Some participants argued that there is a need to rely more on outcome-related or performance-based specifications. For instance, the EMIAA said that:

> Rather than designs being detailed drawings and lists of old technology, users should be specifying improved performance and allowing the technology and service providers to proffer solutions.

By largely removing restrictions on the type of technology or process to perform a particular function, the Association argued that this would ensure that government agencies consider new and innovative solutions.

[2] A tender specification is a description of any item or service that defines what the purchaser wishes to buy and what the supplier is expected to provide. Tenders can be specified in terms of either process (technology) or outcome (performance) requirements.

Box 8.1: **Tender specifications**

Latrobe Valley Recyclers, in contracting the supply of mobile garbage bins ('wheelie bins'), for the City of Morwell, specified in the tender documents that the bins must be manufactured to a German standard. This included a minus 20 degree Celsius test and prohibition of the use of reclaimed material in the product. Fullcycle Plastics manufacture a similar bin in Australia using 55 per cent recycled post-consumer waste in the manufactured product. As a result, Fullcycle Plastics could not tender for the bins. Furthermore, the company had to seek the documentation of these standards from Germany and pay for their translation because they were not readily available from either Latrobe Valley Recyclers or the Morwell Council.

Similarly, on another occasion, the City of Melville requested tenders for bins with a wall thickness specification of 4-5 mm. Fullcycle Plastic bins have a 7 mm wall thickness and, hence, the company was prevented from tendering for the contract.

In some instances, process specifications may be used by the procuring agency as a risk minimisation strategy because there are uncertainties involved with new or untested technologies or techniques. Specifying proven processes and/or technologies reduces the risk that the desired outcome will not be met. This is particularly relevant given that it is the public authority (and ultimately the taxpayer) who will most likely bear the costs associated with the failure to deliver specified services to an adequate or predetermined standard. The Commonwealth purchasing guidelines suggest that:

> For major purchases, an appropriate specification is an essential ingredient — it makes it far easier to avoid disputes later on or to resolve disputes if they occur (DAS 1992a, p. 11).

However, while there may be particular circumstances where process-based specifications are the most cost-effective way to purchase products (in particular, where the costs of monitoring performance are prohibitive), in the Commission's view, performance-based tenders will be preferable in most circumstances. Performance-based specifications offer greater scope to access superior and more cost-effective solutions. Their use reinforces incentives to suppliers to develop better solutions to environmental waste management problems as they know that their solution will be assessed on its performance rather than with reference to its inputs or processes. In this regard, the BCC said that:

> In principle a greater emphasis on outcomes rather than specification of processes would allow regulatory objectives to be met at a lower cost. It would encourage innovation and enable greater flexibility in achieving outcomes.

The greater risks involved in purchasing unproven technology must, of course, be taken into account when assessing tenders. Such risks should be assessed as

part of the tender evaluation process, rather than at the outset through input-related tender specifications.

In any event, with a move to performance specifications, the need to maintain reputation and the possibility of securing future work with the agency are strong incentives for the supplier to make sure the product works to the performance specification required. In addition, forms of insurance, such as performance bonds or process guarantees, are often required by the client. They would go some way towards ensuring that the costs of rectifying non-performance are charged to the supplier. In fact, some form of insurance is often a condition of a tender, with the cost being added into the tender bid.

A greater reliance on outcome specifications places greater demands on purchasing officers. They must have the necessary expertise to judge the respective merits of various technologies, often by applying quite complex analytical techniques. The need for training to ensure that procuring officers have the necessary skills to undertake these functions is recognised at most levels of government. In fact, DAS's Office For Better Buying recently published a 'Guide to Procurement Courses', which lists the relevant courses available in each state and territory (DAS 1992b). In addition, where in-house expertise is limited, there is always the option for the procuring agency to seek specialist outside help.

A move towards performance-oriented specifications is already occurring. The new Commonwealth purchasing guidelines suggest that specifications should be written as far as is possible in terms of the functions and performance needed by the user, rather than the process or technical specifications. And, the recent Queensland Government's purchasing reforms support a move to performance criteria:

> Government, including local government, should move to professional purchasing systems as soon as possible. This would include performance based tendering...

The BCC indicated that its tender specifications are changing accordingly. The Council said that in many cases, while there will still be a "conforming" or preferred specification detailing a process, bids detailing alternative processes will also be invited.

The Commission supports moves by Australian governments to use outcome or performance-based specifications. This will help ensure that taxpayers get the best value for money, and provide opportunities for suppliers of new technologies.

RECOMMENDATION

All public agencies should specify in their tender documents the required performance (or outcome) of the equipment, system or services to be supplied, rather than particular processes and/or technologies.

Purchase price versus life-cycle costing

Another concern raised by suppliers is the use of the purchase price as the main basis for assessing tenders, rather than taking account of both current and future costs. For example, ANI-Krüger stated that:

> Current practice is to buy the cheapest of everything with little thought as to future operating and maintenance costs.

Participants argued that this practice disadvantages local EWMESS suppliers when competing against foreign suppliers with established technologies.

This criticism is acknowledged by at least some users. For example, WAWA stated that:

> ...as we have a fundamental obligation to look for the lowest price, generally the lowest price is an overseas product. It is something that we are trying to address at the moment, looking at not only the basic price of purchase, but the price overall in terms of purchase, reliability, operation and maintenance — all these sorts of issues. ... After-sales service is a prime consideration.

In the Commission's view, commercial good sense and responsibility to taxpayers demand that government agencies look at all costs associated with a particular piece of equipment or system. This will involve the use of more comprehensive assessment techniques than are apparently used by many government agencies at present.

The Commonwealth purchasing guidelines acknowledge that purchase price is only one cost factor for consideration:

> When assessing offers the aim should be to achieve a fair comparison between prospective suppliers. Some factors to consider include the supplier's capacity to meet the requirements, the availability of long-term support, delivery and distribution arrangements and whole-of-life costs (installation, training, maintenance, running costs, changeover price etc) (DAS undated, p. 1).

RECOMMENDATION

All public authorities should adopt whole-of-life costing for major capital equipment purchases.

Aggregation of tenders

A tendering practice which is becoming more common is the assembly of complete projects in the form of main contracts comprising numerous smaller sub-contracts.[3] According to participants, it is common that the civil engineering/construction contractor becomes the head contractor because of the usually significant civil engineering/construction component of most large scale projects. The head contractor then sub-contracts for the supply of other components, such as mechanical and electrical equipment.

As well as reducing transactions costs for the procuring agency, there are other benefits from contracting in this manner. The AWWA stated that:

> From the client's point of view ...[aggregation of tenders]... has appeal because it minimises the administrative load as well as making for a very clear chain of responsibility. The client thus relieves himself of the quite onerous responsibility for ensuring that all interfaces between subcontracts are correct and that no item has been overlooked.

However, the AWWA also pointed to disadvantages with aggregation:

> ...most main contractors tend to be civil construction companies, having varying levels of expertise in the mechanical, electrical and process aspects of the complete plant. These civil contractors then assemble tenders which might pay scant regard to the importance of the sub-contracts. The processing of the projects may then proceed without the client being aware of the details of the subcontract components.

In addition, some participants suggested that head civil contractors are also more likely to focus on purchase price alone, rather than whole-of-life costing when assessing sub-contracts (see Box 8.2).

However, Clough MRT suggested that problems of this nature are more likely to occur where project consultants, rather than civil engineers, are engaged as the head contractors. It argued that, whereas an engineering firm is legally bound to ensure the required outcome of all works undertaken, a project consultant faces few incentives to make sure the required outcome is achieved.

[3] The difference between an aggregated tender and a Build-Own-Operate-Transfer (BOOT) scheme (see next section) relates to project financing. In the latter case, the contracting firm finances the whole project. BOOT projects are, in most cases, considerably larger projects than those let via aggregated tenders.

Clough MRT said that:

> The major problem with over utilisation of consulting services is that in essence consultants are unable to accept performance risk in the delivery of services. This means all risk in consultant designed and managed projects lies with the client or site owner. There is no motivation to warrant performance but significant motivation to scope works in a manner which provides lowest up front project cost irrespective of long term cost and effects, avoids risks to consultants, lowers warranties and lowers apparent fees in a competitive market place.

Box 8.2: Aggregation of tenders

Aquatec-Maxcon indicated that a recent tender it had submitted for the supply of equipment for an aeration plant had been rejected by the head civil contractor's estimation team. It said that:

> In a project currently under construction, our firm offered alternative equipment which although a little more expensive offered improved process flexibility and substantial savings in operating costs. During evaluation of tenders, the client who had been quite interested in the alternative, enquired why it had not been offered. It had, but regrettably in every case, the estimation team compiling the bid for the civil contractor had failed to understand the benefits and the client had been denied the option which would have saved him substantial sums over the life of the equipment.

Aquatec-Maxcon was confident that had their equipment been brought to the attention of the client earlier, they may have been successful.

It is not clear to the Commission whether the concerns cited above are significant problems. Ultimately, provided managers of GBEs are publicly accountable for the performance of the authority, the Commission considers that the level of aggregation is a decision best left to management, rather than something warranting direction from government.

Government business enterprise reform — commercialisation

Some participants were concerned that the commercialisation of water and sewerage authorities would adversely affect them.

Managements' attitude to risk

The current trend to commercialise GBEs may influence management's perception of risk.

One view is that the additional freedom associated with commercialisation will increase the willingness of GBE management to take risks with new technology. The WAWA suggested that:

> ...in the years to come we will be prepared to take a lot more risks because as a commercial organisation we will be able to benefit from any returns from those risks.

The WAWA also said that performance-based remuneration for the decision-makers will be among the factors that will encourage more risk taking.

Similarly, the CSIRO suggested that:

> This initiative [commercialisation] represents a positive move forward for the industry as it will allow such authorities to play a more constructive role and reduce their propensity for conservatism and risk avoidance.

However, there are others in the industry who believe commercialisation will have the opposite effect, primarily because managers will become more accountable for their decisions and actions through requirements to measure and publicly report on an authority's performance.

A central purpose of commercialisation is to improve management decision-making by making both governments and managers more responsible for their actions, and to have GBEs mimic private sector firms. In this instance, it is difficult to judge whether commercialisation will lead to more or less risk taking on the part of those managing GBEs.

BOOT arrangements

The discussion thus far has centred on the provision of EWMESS goods and services to meet the specified waste management needs of government agencies. However, as well as being responsible for specifying requirements in tenders, public agencies are also responsible for financing these needs, and for collecting the revenue from any subsequent sale of services (eg sewerage treatment). Recently, the 'contracting-out' process has been extended to these latter services under Build-Own-Operate-Transfer (BOOT) schemes.

Under BOOT schemes, the private sector finances, builds, owns and operates the infrastructure for a period before transferring ownership to the public authority. Examples of this sort of arrangement include the Rouse Hill development in Sydney's west, the F4 tollway in Western Sydney, the Sydney Harbour Tunnel and the Sunshine Motorway and Gateway Bridge in Queensland.

The value of BOOT projects is considerable. For example, the expected capital costs for stage one of the Rouse Hill development are $285 million, while the expected capital costs for the proposed water treatment plants at Prospect,

Macarthur Reservoir and Illawarra/Woronora, are $200 million, $130 million and $185 million, respectively.

The major advantage for governments of BOOT structures is that it removes the burden of funding infrastructure. This is particularly important since, in recent years, there has been increasing pressure on both governments and public authorities to expand and improve the quality of infrastructure services yet, at the same time, constraints on authorities' access to investment funds have been retained by governments.

There are two main funding constraints: constraints on rates of increases in charges for infrastructure services that limit the capacity of GBEs to generate investment funds internally; and borrowing constraints set by the Australian Loan Council (ALC).[4]

BOOT arrangements represent a means of overcoming the latter funding constraint by shifting the financing role to the private sector.

Concerns were raised by participants about the impact of BOOT arrangements on the local EWMESS industry. Some argued that such arrangements prevent the local industry participating in contracts because of their inability to fund large infrastructure projects. One respondent to the Queensland Government's survey said that:

> Sydney BOOT schemes were structured to preclude Australian companies effectively competing. ... It is pointless for governments to say they are encouraging local industry while largely ignoring its capability and inviting British, French, US and other countries' major water/waste water companies to Australia and inviting competition on the basis of rules which discriminate against the local players... People in Asia will have little credibility for our claims if we demonstrate that we have little credibility in them ourselves and go to these overseas firms for our own major projects. It just is stupid! It also robs local industry of major reference and the kind of 'big league' experience that we need to compete overseas for the major plants which are to be built over the next few years.

Clean Air TechniQ stated that:

> Currently there are very few companies with the capacity to take on the market and consequently the market may shrink significantly for many suppliers if this trend becomes a major influence.

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[4] Currently, the global borrowing limits set by the ALC restricts the amount of borrowings by a GBE, although there is some scope for a GBE to apply for exemption under the following two criteria: 'first, enterprises without substantial private equity need to demonstrate an established record of meeting strict commerciality criteria; and second, enterprises with substantial private equity (of the order of 40 per cent or more) need to be constituted to operate in a commercial manner and have at least a demonstrated commitment to operating in a commercial manner, including the achievement of satisfactory performance...' (Commonwealth of Australia 1991, pp. 79-80).

Similarly, Aquatec-Maxcon stated that:

> ...by going to such big projects Australian companies have been effectively excluded. All the bidders are owned or effectively controlled by overseas companies. ... we [have] handed [a] major revenue base to foreigners giving them a substantial beachhead into our country and into our markets and an opportunity to dominate them.

The AWWA said that, while BOOT-type schemes in general are acceptable to most members, the speed at which they are being adopted is causing concern:

> The resistance which is felt at the moment arises because the rate of change from one system to the other is so fast that the local industry cannot adapt in time to react.
>
> Given that, for the last hundred years or so, all sewerage and wastewater treatment systems have been operated by public agencies, the structure to supply those services does not exist in the private sector. With the natural operation of market forces, though, any prospect of ongoing contracts in this field will encourage a range of companies to meet the demand.

The AWWA concluded that BOOT-type schemes should be introduced in a gradual way, preferably including extensive consultation between client (authority) and industry. To this end, the AWWA has recently formed a Contractors and Suppliers Group to facilitate discussion among suppliers, and has agreed in principle to have the major urban water authorities as corporate members, in the hope that opportunities for better consultation will arise.

It is not clear to the Commission that BOOT schemes will necessarily operate to the detriment of the local industry. For example, the preferred tenderer for the $185 million water treatment plants at Illawarra and Woronora (south of Sydney) is a consortium of French and Australian companies. Importantly, the design and construction of the plants will be undertaken by an Australian joint venture company, Con-Kinhill, formed by Concrete Constructions (NSW) (civil contractors) and Kinhill Engineers (design engineers and project managers). Most of the equipment for the plants will also be sourced in Australia. Similarly, two other proposed water treatment plants recently announced for Sydney also have a considerable Australian content.

Moreover, without BOOT financing, some projects (including those mentioned above) may not have gone ahead. In such cases, the local industry benefits from BOOT financing, even if it gets only a small share of the contracts.

It may be, however, that BOOT (and other aggregated tender arrangements), will make it more difficult for some small local suppliers to compete, at least in the short term. This is because many parts of the local industry consist of a large number of small firms focused on one or very few niche markets. Thus, the trend towards BOOT-type schemes may be one factor encouraging rationalisation in the local industry.

However, there are other ways for Australian companies to increase their opportunities to participate in BOOT. For example, they can:

- form a consortium to bid against foreign suppliers;
- negotiate a joint venture arrangement with foreign suppliers; or
- negotiate a joint venture arrangement with the public authority.

One mechanism which will help the EWMESS industry coordinate its efforts in this direction is the network of Industrial Supplies Offices in each of the states (see Section 8.2). The Commission also sees a role for the EMIAA in helping to increase the scope for its members to participate in BOOT, and other aggregated tender arrangements, by providing information on the opportunities available, both locally and overseas, and on the particular requirements for sub-contractors.

In fact, the EMIAA suggested that BOOT approaches can be used in a positive manner, particularly to overcome any narrow perceptions that public agencies have about the use of local technologies:

> ...there is far greater scope for private/public integration and this may best be facilitated by greater emphasis on BOO(T) approaches in future.

However, the Commission notes that the desirability of these sorts of arrangements from the taxpayers' point of view, has been questioned. For example, Schroders Australia Limited undertook an analysis of BOOT projects in Australia and concluded, among other things, that as a means of financing infrastructure, BOOT schemes are expensive. It said that:

> [BOOT] projects are almost always highly debt financed on a non-recourse, stand-alone basis. This is partly to minimise the tax effects ... and partly to minimise the equity contribution required of the project sponsor.

and:

> Being small and unique in the nature of their risks, [BOOT] projects typically have disproportionately high overhead costs associated with structuring, risk evaluation, debt and equity placement and general diseconomies of scale. This also increases the cost of finance (Schroders 1992, pp. 23-24).

Schroders also concluded that, because of their complexity, BOOT tendering processes cannot always be relied upon to achieve the best results and that BOOT schemes lack transparency.

However, without a change to ALC borrowing limits, and other funding constraints facing GBE management, BOOT arrangements may be the most efficient option available for the replacement or provision of waste management and other infrastructure to cater for a growing population.

8.2 Procurement as a tool to foster industry development

The Commonwealth and some states have recently reformed, or are presently improving, their purchasing policies. The general emphasis of these reforms is on obtaining value for money, open and effective competition, and increased flexibility of purchasing methods. These changes represent a positive step towards improving the efficiency of government purchasing.

There are also opportunities to use more efficient government procurement as a tool to support other government objectives, such as industry development and environmental policies. For example, the Commonwealth reforms to aid local participation in supplying to government include: removing unnecessary restrictions, bias and discrimination in specifications and considering offers from local industry which propose innovative and alternative solutions; planning procurement needs so that early consultation with local industry can take place; providing extensive training for purchasing officers; undertaking the 'Purchase Australia' campaign[5]; and providing free advisory services for industry on procurement matters. The South Australian Government is "committed" to assisting the development of Australian and New Zealand industry by requiring that all public sector agencies "pursue opportunities to assist this development by achieving the maximum practicable and economic level of Australian content in all their procurement". The Queensland Government's recent purchasing reforms pursue the principle of "enhancing the capabilities of local business and industry".

To assist local participation in government contracts, all states and territories, except Tasmania, operate Industrial Supplies Offices (ISOs). ISOs are non-profit organisations managed by industry and funded by state and Federal Governments. The aim of the ISO network is to provide a link between major purchasers and local suppliers of goods and services. Specialist staff are available to make independent evaluations of companies interested in manufacturing under licence, and also potential joint venture partners. They also assist in providing local firms with feedback on why they have failed to win orders and how they could improve their chances in the future.

As discussed in Section 8.1, other initiatives to facilitate local participation include programs advertising future government needs through, for example, draft tender specifications and registrations of interest, published in government gazettes, trade journals and the print media. Such initiatives allow local

[5] The Purchase Australia campaign aims to encourage purchasers of goods and services to seek out and order Australian and New Zealand made products that 'represent value for money'.

suppliers time to assess their options, perhaps modify a process, or form a consortium or joint venture, in order to compete with foreign suppliers.

A more recent addition to these initiatives is the requirement for 'Quality Assurance' certification of suppliers to Government. The Queensland, Western Australian and South Australian Governments will require, as part of the tender specifications, some degree of quality assurance for all purchases. The Commission understands that New South Wales and Victoria will soon follow. In July 1993, the Commonwealth Government also adopted quality assurance requirements in procurement for suppliers to Government of goods. The requirements will apply to services from July 1994.[6]

The Commonwealth Government defines quality assurance as:

> ...the ability to provide a formal assurance that goods and services to be supplied have been either: certified as meeting a relevant product Standard; or produced by a process certified as meeting a relevant Quality System Standard.
>
> [It] is the outcome of all the planned and systematic actions and operational techniques you can put in place to give customers confidence that your goods and services will consistently meet certain requirements for the whole of their useful life (DAS-Purchasing Australia, undated, Suppliers Handbook (draft), pp. 13-14).

For suppliers, quality assurance means formal certification of the firm's operational system in terms of an Australian or international standard. These standards are the AS3900 series of quality systems standards for manufacturing and service industries, which are equivalent to the International Standards Organisation's ISO9000 and the New Zealand NZ9000 series. Construction and heavy engineering industries require an AS2990 certification.

Quality assurance certification is gained via an audit of all aspects of a firm's procedures. The audit is normally conducted by an independent (third party) accrediting body, such as Standards Australia.

The Commonwealth Government states that the objectives of the quality assurance policy is:

> ...to improve the quality of goods and services purchased by the Commonwealth and to improve the competitiveness of local industry in domestic and export markets (Commonwealth of Australia 1993c, p. vii).

Similarly, the South Australian Government Quality Management Policy states:

> The main objective of this requirement is to encourage Australian industry to become more competitive (Government of South Australia 1992, p. 14).

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[6] Quality assurance will not be a mandatory requirement for Commonwealth Government purchases.

Government agencies benefit from a system of formal quality assurance through the reduction of the risks associated with purchasing generally. Furthermore, since certification acts as a pre-screening mechanism, they will require fewer resources to evaluate tenders.

The Commission believes that quality assurance specifications should not be included as a mandatory requirement for a firm to be eligible to bid for a government contract. Rather, certification (or non-certification) should be evaluated along with the host of other considerations procurement officers must consider when selecting the successful bid.

Whilst it should not be a compulsory requirement, firms may well choose to seek quality assurance certification. For example, Biocycle stated that:

> [Certification] further lends credibility to the company, the company's product or service, reduces the risk imposed on the government decision makers in accepting the particular tenderer and gives assurance to the community that the product or service chosen is the best that was available.

Furthermore, once government work is obtained, additional benefits to the firm may also be possible. Biocycle stated that:

> By the securing of government business, companies are able to approach their lending institution for advancement of funds or extensions to the current overdraft facilities they may have. This significantly aids the business in removing one major concern, allowing the company to concentrate on the job at hand.

While participants acknowledged that many of the reforms already discussed above will help the local EWMESS industry, some were concerned about the lack of an industry development role in procuring policy. For example, the EMIAA said that:

> ...industry and trade development criteria have been excised or not included in procuring programmes.

Many of these concerns were expressed in general terms. Hence, it is not clear whether some participants are simply concerned that present procurement policy disadvantages local EWMESS firms relative to foreign suppliers of similar technology — that is, the 'playing field' is not level. If that is the case, the recent reforms to purchasing policy will go a long way to dealing with the industry's concerns.

However, it would seem that some in the EWMESS industry believe that procurement policy should have an explicit industry development role. This presumably means that they would like agencies to purchase Australian products for industry development purposes, even when commercial considerations suggest that the imported alternative is superior. Indeed, some participants

suggested that Governments should provide the 'seal of approval' for export sales through buying local products.

Acceptance of a product by an Australian government agency is clearly an important factor in raising the credibility of Australian products in the eyes of potential overseas customers. For example, Enviroflow Water and Waste Treatment stated that:

> It is generally accepted that Australia employs high standards in waste management and acceptance of our technology by Australian Government and Semi-Government Departments is an important and positive factor in our success overseas.

ANI-Krüger stated that:

> If an Australian Government department or authority or municipality buys foreign equipment, no-one should be surprised if an export customer interprets this as implied criticism and lack of confidence in Australian products.

And the EMIAA stated that:

> ...from a commercialisation viewpoint, procurement priority should be given to selected world class Australian technologies to enable public authority (procuring) personnel to work in joint development or partnership mode with the technology company.

While the Commission endorses initiatives to remove discrimination against local suppliers, it sees no justification for forcing GBEs to buy locally if economic considerations would suggest otherwise. Indeed, requiring GBEs to favour local suppliers would contradict the underlying thrust of GBE reform which seeks to ensure that government businesses function in a fashion similar to their private sector counterparts. Other relevant considerations include those raised by the Commonwealth Department of Industry, Technology and Regional Development:

> Protective government purchasing policies are going out of favour, at least in developed economies, for a number of reasons:
>
> - there is a growing appreciation that protection is not the path to international competitiveness, except perhaps in the very early stages of industrial development;
> - there is a move towards liberalising trade in services and the removal of non tariff barriers to trade is also receiving increasing attention in multilateral fora [Uruguay Round of the GATT] and within trade blocs such as the EC; and
> - the growing trend towards privatisation and corporatisation of government activities clearly reduces the opportunities for intervention (DITAC 1992, p. 23).

Significantly, the EMIAA commented that government intervention such as through civil offsets, and similar schemes like the Partnerships for Development Program, are not appropriate for the EWMESS industry.

9 RESEARCH AND DEVELOPMENT

In the context of the EWMESS industry, research activity underlies the development of the technologies and processes necessary to promote and safeguard community health and protect the natural environment. Research is usually categorised as either pure (basic) research or applied research.

Pure research, or what is sometimes termed 'scientific inquiry', is undertaken for no other reason than the advancement of knowledge. On the other hand, 'applied research' is directed at solving a particular problem. Somewhere in between is what is commonly termed 'strategic' basic research. This is undertaken for the advancement of knowledge, but is directed into specified broad areas in the expectation of useful discoveries. There is, therefore, a continuum running from pure scientific inquiry through to problem-solving research.

The task of pursuing pure scientific inquiry is mainly that of the universities and specialised research institutions. Because the benefits of this activity flow through to society generally, governments and/or philanthropists need to fund pure research — otherwise it would not be undertaken. In Australia, most of the funding is provided by governments.

The same applies to much of the strategic basic research which is undertaken in Australia, but in this case there might be a 'client' — for example, a government agency charged with managing a fishery — which will commission the research. Examples relating to the environment include research into ecosystem functioning undertaken for the Great Barrier Reef Marine Park Authority and for the Murray-Darling Basin Commission.

At the other end of the spectrum, applied research is likely to be funded by both the public and private sectors. Whether or not the private sector funds such research will depend on the financial benefits it expects to obtain.

There is significant uncertainty involved in research — the expected benefits such as a cost-saving technology or a new product might not materialise. Consequently, there is a view that the community as a whole should be more willing to accept this risk than individual firms or providers of finance (because of the wider sharing of risks). This argument is sometimes used to justify government support for research. However, the external or 'spillover' benefits associated with a considerable part of R&D activity — particularly basic research — provide the central rationale for government measures to support research. Although the patent system is intended to address the problems associated with the spillover of commercial benefits from research, the inability

of firms to capture all of the benefits — particularly from basic research — significantly reduces the incentive to undertake research.

A private firm undertaking, or funding, research will expect to take the discoveries through to a commercial application. It is in this context that research leads to an invention which might be able to be developed (the R&D part of the process) and ultimately commercialised — thereby completing what some refer to as the complete process of innovation.[1] Where to draw a line between any one of these activities in the continuum is a moot point. What is of significance for this inquiry is the role of applied research in the development of the EWMESS industry.

9.1 Existing Commonwealth R&D support schemes

In 1989, the last year for which data are available, Australia was one of the lowest amongst OECD countries in terms of spending on public sector R&D (OECD 1992a). In that year, Australian environmental R&D expenditure amounted to around US$20 million, representing 1.3 per cent of total government R&D expenditure. This compared with an average of 2 per cent for OECD countries as a whole (see Table 9.1).

As shown in Figure 9.1, there are four main ways by which the Commonwealth Government supports R&D: direct funding of Commonwealth Government research agencies; funding of research in higher education institutions and universities; funding of industrial research and innovation (through tax concessions and grants); and funding for a variety of other research agencies and grants. Total Commonwealth expenditure on R&D in 1991-92 was around $2.7 billion (Commonwealth of Australia 1992c).

Publicly available statistics documenting Commonwealth support for R&D do not distinguish between the various kinds of research. Furthermore, in most instances it is not possible to determine the extent of R&D associated with the EWMESS industry.

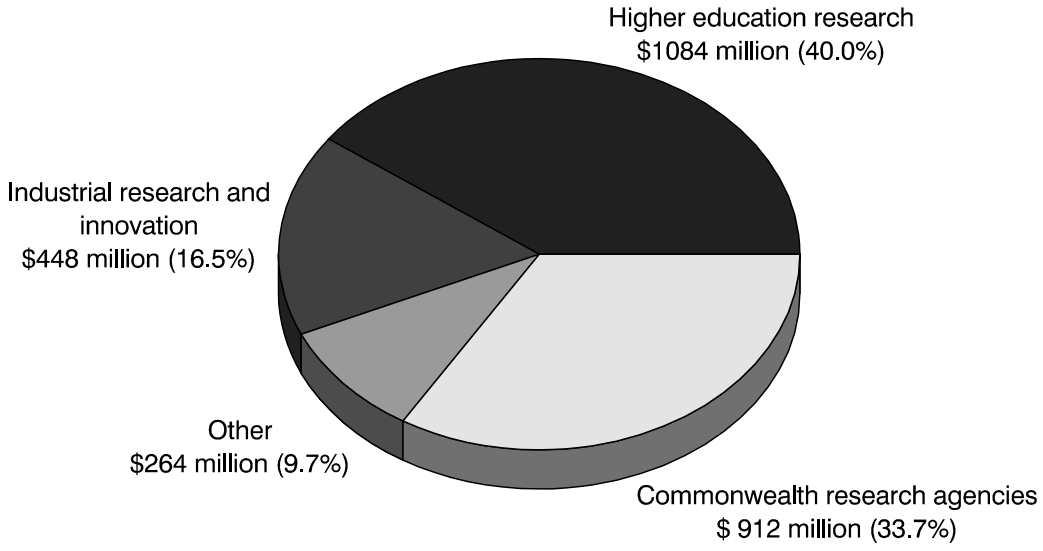
[1] Innovation is the last stage of the introduction of new production processes or new products. Invention is the discovery of new processes or products, and can be thought of as the scientific or research part of the process. Development is the process by which the ideas and/or principles derived at the science/research (invention) stage are embodied into specific products/processes, leading to innovation.

Table 9.1: **Public sector environmental R&D expenditures, 1989**

Country	*Expenditure on environmental R&D*	*Share of total government R&D expenditure*
	US$ million	%
Australia	20	1.3
Austria	11	1.4
Canada	50	1.6
Denmark	28	3.0
Finland	15	1.7
France	95	0.7
Germany	420	3.4
Italy	120	1.9
Japan	150	1.4
Netherlands	75	3.8
Norway	27	2.7
Sweden	65	2.5
Switzerland	85	2.0
United Kingdom	170	2.3
United States	420	0.5

Source: OECD 1992a.

Figure 9.1: **Commonwealth support for R&D, 1991-92**



Source: Commonwealth of Australia 1992c.

Commonwealth research agencies

Total direct funding for Commonwealth research organisations in 1991-92 was a little over $900 million (see Figure 9.1). About half ($453.7 million) was allocated to the CSIRO. Other major recipients were the Defence Science and Technology Organisation (DSTO), the Australian Nuclear Science and Technology Organisation (ANSTO) and the Australian Institute of Marine Science (AIMS), with allocations of $232.3 million, $64.3 million and $14.2 million respectively.

Within a framework of national goals and objectives set by the Government, the government-funded research institutions are free to determine their own research priorities. The CSIRO, for example, has developed an internal mechanism to target its research effort more effectively to national priorities. In 1991-92, around 20 per cent of its expenditure was on environment related research (CSIRO 1992).

Given CSIRO's charter, this research is likely to be focussed on understanding how ecosystems behave and/or how they react to disturbances and pollution. It is possible that findings from research of this type ultimately could stimulate the development of inventions or processes in the private sector EWMESS industry. However, it is likely that the major user of CSIRO's environmental research will be government agencies (eg EPAs and water authorities).

All of the research undertaken by AIMS can be categorised as environmental, and some of the research undertaken by DSTO and ANSTO is directed at environmental problems. What is difficult, if not impossible to determine, is how much of the research undertaken by these bodies is related to environmental waste and, hence, of potential interest to the EWMESS industry.

There are some explicit examples of EWMESS-related research. For instance, DSTO undertook research to identify, and recommended solutions for, the causes of toxic gas generation in the oily water wastes that accumulate in ships' bilges. ANSTO developed new computer modelling techniques to predict pollutant generation and migration in pyritic mine wastes which have been successfully applied commercially to waste heaps at mine sites in Sweden.

Higher education research

The Commonwealth Department of Employment, Education and Training supports research at higher education institutions. Funding in 1991-92 was more than $1 billion (see Figure 9.1). A large part of this — $844 million — was provided through operating grants to higher education institutions. In addition, $240 million was allocated through the Australian Research Council

for other higher education research, postgraduate awards, fellowships and overseas postgraduate research scholarships.

Industrial research and innovation

This category comprises government programs which support research and innovation by Australian businesses. Total funding for 1991-92 (including revenue foregone via the tax concession) was $448 million. Programs relevant to the EWMESS industry under this category are the 150 per cent tax concession scheme and the Grants for Industry Research and Development (GIRD) Scheme (see Box 9.1). Both are administered by the Industry Research and Development Board.

The 150 per cent tax concession

Since 1985, a 150 per cent tax concession has applied to R&D expenditure by industry. Total revenue foregone under this arrangement was more than $300 million in 1991-92 (Commonwealth of Australia 1992c). There is no upper limit to eligible expenditure, but firms have to spend at least $50 000 before becoming eligible for the full benefit.[2]

In constant 1984-85 dollars, business expenditure on R&D increased from around $750 million in 1984-85 to more than $1350 million in 1990-91 (Commonwealth of Australia 1992c). It is not possible to estimate the extent to which EWMESS firms have increased their expenditure on R&D.

The GIRD Scheme

Under the GIRD Scheme, firms have access to four different kinds of grants. These are the Discretionary Grants, the Generic Technology Grants, the Advanced Manufacturing Technology Grants (AMTG) and the National Procurement Development Program (NPDP) Grants. Funds allocated under all four kinds of grants in 1991-92 were $36.7 million.

Firms unable to "adequately benefit" from the tax concession scheme — such as those not earning any taxable income — can apply for a Discretionary Grant. In 1991-92, grants to the value of $14 million for 43 projects were approved (IR&D Board 1992). Three EWMESS firms were amongst the recipients, receiving a total of $190 000 (see Table 9.2).

[2] A sliding scale applies to annual expenditure between $20 000 and $50 000.

Table 9.2: **EWMESS recipients of Discretionary Grants, 1991-92**

Name of firm	*R&D activity*	*Payment in $*
Cenicourt Pty Ltd	Braemar Murrell Water Purifier	50 000
Environmental Products Amalgamated	Supaskye	110 000
Plastic Recyclers (Qld) Pty Ltd	Formulation technology for recycled polymers	30 000
Total		**190 000**

Source: IR&D Board 1992.

Box 9.1: **GIRD schemes available to EWMESS firms**

Discretionary Grant Scheme

This scheme is available to those firms unable to adequately benefit from the tax concession. Grants can be for up to 50 per cent of eligible R&D project costs, which must be at least $50 000. Projects must be completed within three years.

Generic Technology Scheme

Environmental technology (ET) is one of the five technologies identified for support under this scheme. The ET component is designed to promote technology which will:

- enable Australian industry to perform more efficiently and competitively through the application of effective waste management, recycling and waste minimisation technologies;
- facilitate resource development projects and industrial activities proceeding within environmental constraints; help develop products, systems or expertise which assist in the maintenance, restoration or monitoring of the environment; and
- address the environmental needs of the Australian — and international — community through new methods for collecting, treating and disposing of urban and industrial wastes.

Advanced Manufacturing Technology Grants (AMTG) Scheme

The AMTG provides support to companies to research and develop, or trial and demonstrate, advanced manufacturing products, services or systems, in collaboration with a user company.

National Procurement Development Program (NPDP)

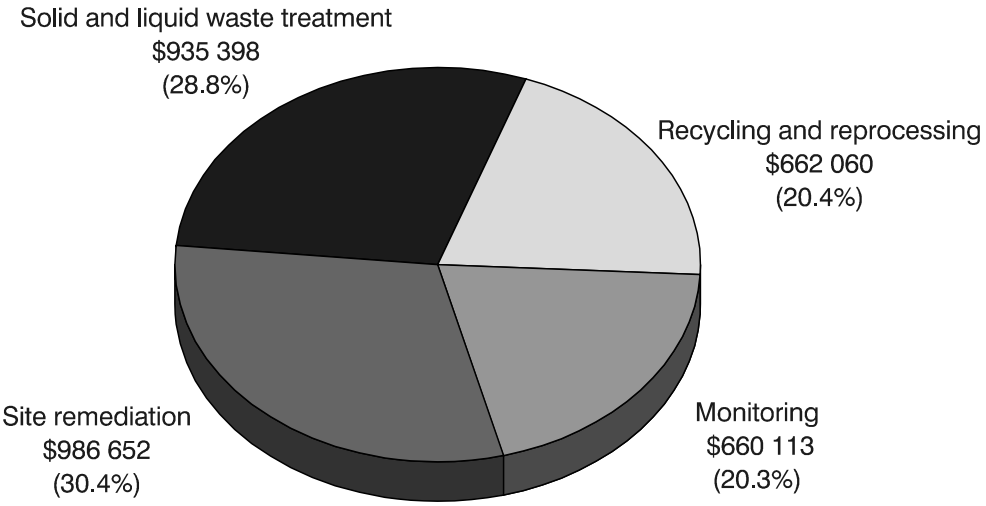
The NPDP provides financial assistance to support joint projects to trial and demonstrate and/or research and develop new products, services and systems, including prototypes, which link into forward procurement requirements of government departments and agencies.

Environmental technology grant agreements signed during 1991-92 under the Environmental Technology component of the Generic Technology Scheme totalled $3.2 million, with actual payments made during the year totalling nearly $1 million. Individual payments ranged from $11 600 to around $160 000 (IR&D Board 1992). Figure 9.2 shows a breakdown of the categories under which projects were approved.

Expenditure under the AMTG Scheme was about $140 000 in 1991-92. No EWMESS firms were amongst the recipients in that year.

Total expenditure in 1991-92 under the NPDP was $4.4 million. Approved projects related to EWMESS activity included $135 000 for a "timber waste-size-reduction system" and $272 000 for water quality, environment planning and design software.

Figure 9.2: **Environmental Technology Grants approved[a], 1991-92** (by category)



a Grants approved totalled $3.2 million, while actual payments made totalled $1 million.
Source: IR&D Board 1992.

Further R&D funding

Of the $264 million identified in Figure 9.1 as 'Other', the largest proportion was allocated to the National Health and Medical Research Council

($103.3 million). A further $94.4 million was allocated for rural research. An additional $18.2 million (increasing to $54.5 million in 1992-93) was provided for the Commonwealth Government's relatively new Cooperative Research Centres (CRC) program. The remaining $50 million mainly comprised funding for research into health, greenhouse gases and energy issues.

Cooperative Research Centres

The CRC program aims to improve cooperation between researchers and industry and to better align research to market needs. When the program was launched in May 1990, Commonwealth Government funding, rising to $100 million annually by 1995, was to be provided to support up to 50 Centres. Recently, the program was extended to include another 10 Centres.

Each CRC must have at least two partners, one of which must be a university. CRCs will receive up to $2.5 million annually from the Commonwealth Government, provided the partners at least match this in cash or in kind. Funding is through renewable contracts, normally of 5 to 7 years.

The CRC of greatest relevance to the EWMESS industry is the CRC for Waste Management and Pollution Control (CRCWMPC). The CRCWMPC will receive Commonwealth funding of $2 million annually until 1998, and operate as an incorporated joint venture comprising business enterprises, public authorities and research institutions. According to the CRCWMPC, it expects its Commonwealth funding to be supplemented by industry contributions (in cash or in kind) of about $5 million per year. Nine broad areas of research have been delineated: waste minimisation and recycling; sewage and water quality; site remediation; instrumentation and monitoring; wastes from intensive rural industries; on-site treatment of liquid wastes; safe disposal of wastes as solids; odours and atmospheric emissions; and the social ecology of waste management.

Other public sector involvement in R&D

State governments also provide support for R&D. For instance, the Queensland Government provides assistance to innovation and research through the provision of direct financial assistance. The states also contribute to the National Landcare Program which, among other things, involves research into issues related to land and water management.

In New South Wales, the Sydney Water Board, through its New Processes: R&D Group, has developed a 'Technology Plan' for R&D. This is intended to guide the management of the research and development of new technologies and processes within the Clean Waterways Programme. Its primary focus is on

research into new technologies in waste water treatment. Expenditure over the three years to 1991-92 totalled $11 million. A further $38 million has been budgeted for the five year period to 1996-97 (Sydney Water Board 1992).

Participants' views of R&D support schemes

Participants raised a number of concerns, particularly with the GIRD scheme. One is the high administrative cost. For instance, Ausmelt, which received a grant of $80 000 under the GIRD scheme, said that, although the project had been successful, the costs of obtaining the grant had not, on reflection, been worth it.

The Queensland Government said:

> A common comment from firms is that schemes ... are not meeting the needs of small firms in that application forms are too complex and approval times too long.

Biocycle argued that there are too many schemes offering grants with too many varying conditions. It stated that it does not have the staff resources to determine which grant scheme is most appropriate for its particular circumstances.

In recognition of this problem, the IR&D Board said the approval process is now a two-stage process, whereby applicants initially submit a brief expression of interest. They are then provided with early advice about their project's eligibility and, where appropriate, invited to submit a detailed application.

Some participants said that the $50 000 threshold required for a project to qualify for a grant or the full benefits of the tax concession is too high. For instance, the Tasmanian Government said that some Tasmanian firms find it difficult to obtain grants or tax concessions due to the small scale of their operations. It suggested that:

> ...there is a need for the Commonwealth to review its guidelines for the provision of such funds ... Such [a] review should ensure that such guidelines do not discriminate against operators in regional areas where their scale of operation currently excludes them from such programs.

Biocycle agreed and suggested that the threshold should apply to all expenditure incurred on a project (even if the project extended over a number of years), rather than to annual expenditure.

The IR&D Board, however, considers the threshold is reasonable because, in its view, the minimum represents a fairly low level of expenditure. According to the Board, the annual salary cost of a junior researcher is approximately $50 000. Furthermore, small companies which do not have the facilities or expertise to conduct R&D themselves can contract their research to a Registered

Research Agency (RRA). RRAs are organisations approved by the IR&D Board as being capable of undertaking contract R&D for multiple clients. All eligible R&D activities contracted out to a RRA attract the full 150 per cent concession. As at June 1992, there were 174 RRAs (IR&D Board 1992). In 1990-91 (the latest year for which information is available), around $59 million in R&D was contracted to RRAs (IR&D Board 1993).

A number of participants stated that the tax concession is of limited use for small firms. For example, Envirotest said:

> The 150 per cent tax benefit for R&D is important but is designed to assist medium to larger organisations which can sustain the level of investment to derive the longer-term benefits.

The Metal Trades Industry Association suggested that the 150 per cent tax concession should be extended to the costs associated with establishing a patent.[3] However, other participants suggested that there are more significant problems with the patent system than the costs of registration. For instance, enforcement was said to be a problem. Greater tax deductibility would not address difficulties of this nature.

Another problem identified by participants concerned the difficulty of determining whether the assistance provided under special purpose grants is being effectively targeted. Ideally, this requires that the assistance is directed at research activities which would not proceed without government support. In this context, Adas stated that:

> Grants and funds are awarded by State and Federal Governments to big and known companies for work they could and would carry out with their own resources anyway.

With regard to funding, some participants at the DITRD/DPIE sponsored EWMESS inquiry workshop held in Sydney on 24 May 1993 suggested that the problem with EWMESS R&D is not so much inadequate funding as fragmentation of the existing R&D effort. They also suggested that there is a lack of information about the types of research being carried out and by whom.

The Commission acknowledges the concerns of the EWMESS industry in relation to the range and administrative complexity of R&D support schemes. However, most of the concerns raised above are not confined to the EWMESS industry. They present problems for small businesses in all sectors of the economy. An assessment of these concerns is more properly a task for the Commission's forthcoming inquiry into R&D. In that inquiry, the Commission

[3] Minimum establishment costs, not including the fees of a patent attorney (which can be significant); are close to $1000. After the patent has been established, there are annual renewal fees starting from the third anniversary. These range from $115 on the third anniversary to $575 on the fifteenth anniversary.

will be seeking the views of small businesses (and other firms) in all industries, as well as those bodies administering the programs.

The other concern raised at the workshop — the lack of information about EWMESS R&D activity — could possibly be overcome if there was a central register of current EWMESS-related R&D projects. While a register would clearly be of considerable benefit if it contained details of all relevant R&D activity, in practice it may be difficult to obtain a comprehensive coverage of private EWMESS-related R&D activity.

9.2 Are further EWMESS-specific R&D initiatives required?

As outlined above, there is already some funding for EWMESS R&D. In considering whether this is adequate, it is important to distinguish between basic and applied R&D, and the consequent appropriation of benefits by the firms themselves and the community at large.

In the case of applied private sector R&D, the case for additional funding is not clear. As with applied R&D undertaken by other industries, it is likely that EWMESS firms are able to appropriate a large part of the benefits of the applied research that they undertake This is not to deny that there may be wider benefits (ie spillovers) which accrue to other firms and the community at large.

The case for government support for R&D is much stronger for basic research. Because many environmental resources are collectively owned by the community and are not priced, there would appear to be a need for government to support basic research in the environmental area. This has been recognised through the re-orientation of CSIRO funding. It may well be that the results of current research and community pressures will result in greater emphasis on basic environmental research in the future. This could lead to greater funding priority for EWMESS basic research, although this would have to be assessed against emerging research priorities in other areas.

This inquiry has demonstrated the difficulties in assessing one industry's concerns for R&D funding. In practice, all industries are seeking research funding. Since resources are limited, decisions about funding inevitably involve assessments of competing claims. Clearly, this issue cannot be properly considered in an inquiry which is concerned only with the EWMESS industry. Consequently, a broadly-based inquiry — such as the Commission's forthcoming inquiry into R&D — provides a more appropriate forum for addressing many of the concerns raised by EWMESS firms about funding of R&D activity.

10 CAPITAL FOR COMMERCIALISATION

The chapter discusses commercialisation. In terms of the definitions of the various stages involved in progressing from scientific inquiry through to innovation, commercialisation can be equated with innovation (ie the introduction of a new product or process).

While the returns from successful commercialisation can be large, the investment required can also be large. Consequently, access to capital is vital for the successful commercialisation of new inventions. However, investment in commercialisation ventures can be risky. Just because a newly developed technology works satisfactorily at the pilot stage does not mean that it will perform to expectations when scaled up to full operational size. Nor does it guarantee that sales will be sufficient to ensure a return on the investment.

There is a view that the overwhelming reason for Australia's problems in developing new technologies is the difficulties firms face in obtaining access to finance. Some consider that government action is required to reduce such problems.

This chapter focuses on factors which influence small and medium-sized EWMESS firms access to capital. It also considers whether there is justification for government to facilitate that access. Some alternative means of overcoming impediments to commercialisation are also explored.

10.1 Problems raised by participants

The evidence on the availability of funds for commercialisation of new technologies is inconclusive. Industry representatives commented about difficulties in obtaining both debt finance and equity funds. On the other hand, the Australian Bankers Association (ABA) claimed that banks are now attempting to increase lending to small businesses. However, the ABA stated that lending could be curtailed by concerns that banks could be liable for environmental damage caused by borrowers, an issue discussed in more detail later in this chapter.

Debt funding

Many industry participants claim that funding for commercialisation is very difficult to obtain. For instance, Plastic Recyclers (Qld) said:

> We have been remarkably unsuccessful in obtaining support funding from traditional sources. As [Plastic Recyclers] is a profitable company ... it is all the more surprising...

Some participants contended that banks are not prepared to take into account the long term prospects of a firm, or the management skills of the innovator, when assessing loan applications. They stated that, while banks generally require real estate as collateral, many firms just starting up have few real estate assets.

Some commented that funding had been easier to obtain in the early 1980s than at present. For instance, the EMIAA said:

> Our experience of trends in the availability of funding from the banking sector is that bank credit policy continues to be tightened.

In this context, some participants suggested that banks are penalising businesses for banking failures during the 1980s. For example, Enviroflow Water and Waste Treatment said that one of the reasons why EWMESS firms do not have access to adequate capital is that Australian banks are in "damage control mode".

The banking industry disputed claims that it is restricting debt finance for small and medium sized firms. The ABA stated that:

> Whilst it is true that greater scrutiny is now being given to banks' lending practices as a result of experiences in the recent past, lending volume is primarily attributable to lack of demand rather than lack of supply of finance.

and:

> ...major banks are undertaking aggressive programmes for lending to small business.

However, the ABA said that a number of factors relating to credit assessment can make it difficult for banks to finance small businesses. Two factors are of particular relevance to the EWMESS industry. One is the industry's use of new technologies. The ABA stated that it is difficult for financial institutions to make credit assessments when new technologies are involved — such as those employed by many EWMESS firms — because there is no 'track record' or other relevant information to feed into their assessment procedures. The second, lenders' liability, is discussed below.

Financial liability of lenders and environmental damage

According to the ABA, one of the reasons for banks being hesitant about financing environmentally sensitive activities is that the environmental legislation in Australia creates some uncertainty about who is financially liable for environmental damage. The ABA stated that banks are concerned that they could be held responsible for clean-up costs on contaminated sites.

The ABA contended that banks are particularly concerned where the activities they are asked to finance involve new technologies and processes, which generate contaminants with uncertain or even unknown effects on the natural environment or human health. The ABA cited paper recycling with its de-inking processes and dioxin waste as an example.

The possibility of environmental liability arose first in the United States in 1989, when the United States Federal Appeals Court held that a lender could incur environmental liability by "participating" in the financial management of a corporation. The Court found that such participation could indicate "a capacity to influence" a corporation's treatment of hazardous waste.

In the Australian context, various state governments' environmental laws impose liability on a broad range of persons. Depending on the jurisdiction, these include persons "concerned in the management" of an enterprise, and the owners or occupiers of property. At the present time, the legal responsibilities of the various parties are far from clear. However, it is possible that financiers could be deemed to be liable through the structure of a financial facility, for instance a sale and leaseback arrangement, or if the bank is forced to foreclose on the assets. In addition, it is possible, that in some circumstances, financiers may incur losses indirectly (eg if the security for a loan — in the form of real estate — is devalued because of environmental contamination).

In Australia, lender liability for environmental damage has not yet been tested in the courts. In the meanwhile, banks are seeking ways of limiting their potential liability. One way for banks to assess the risk is to require potential borrowers to submit environmental audits with their application for finance, and at regular intervals during the term of the loan. However, this could significantly increase both borrower and lender's costs.

It is likely that the banks' concerns are not just confined to firms in the EWMESS industry. There are many other industries engaged in activities which are potentially environmentally sensitive. Examples include some types of mining activity, electricity generation and chemical production, all of which currently use EWMESS products.

The significance of the problem has been recognised by the ANZECC. In June 1993, ANZECC published a comprehensive discussion paper and called for public comment. The intention is that comments will be incorporated into a position paper. The complexity of the issues involved and the desirability of achieving a uniform legal approach mean that it will be some time before the issue is resolved. In the meantime, the access to capital of EWMESS firms, and others engaged in environmentally sensitive activities, may be restricted.

FINDING

It is important to clarify lenders' liability. Until this occurs, EWMESS firms (and others) which engage in environmentally sensitive activities may be restricted in their access to capital.

Equity funding

According to some participants, equity finance — as well as debt finance — is in short supply. Whereas larger companies can access institutional and public financial markets via the stock exchange or traded debt markets, smaller unlisted companies have to raise their funds from the private equity market. Participants alleged that this market is currently very tight. The EMIAA said:

> The difficulty faced by operating businesses requiring expansion capital is great, but the financing task facing the promoters of new technology projects is greater. The professional development capital market is unreceptive to these investments at the current time...

Furthermore, raising equity through new share issues is subject to the prospectus requirements of the corporations law. Compliance with these requirements can be very costly. For instance, Environmental Solutions International said that the cost of a public float of $5-10 million could run into 'six figures'. While such amounts are likely to be beyond the means of many small firms, the prospectus requirements are intended to facilitate capital raising by simplifying approval processes and enhancing investor confidence in the contents of a prospectus.

10.2 Current initiatives

In response to the difficulties faced by small and medium sized firms attempting to commercialise new technology, the Commonwealth Government announced in its One Nation Statement the establishment of the Pooled Development Fund (PDF) and the Australian Technology Group (ATG).

Under the PDF arrangements, companies registered as PDFs are taxed at a concessional rate of 25 per cent rather than at the general tax rate of 33 per cent. PDFs provide 'patient' equity capital to companies with total assets not greater than $30 million. There is no limit on the amount of capital PDFs can raise. As at August 1993, there were seven registered PDFs, two of which have raised $20 million between them.

The Commission understands that investor interest has not been great. Some suggest that this is because the tax concession is insufficient given the risks

attached to investments. Others believe that the restrictions under which PDFs operate should be altered or removed. These restrictions include a requirement that PDFs invest "only in companies and only for the purpose of establishing new businesses or substantially developing new production capacity or markets for established businesses" (Button 1992, p. 2).

The ATG was established on the recommendation of the Block Report (DITAC 1991a) and will operate as a "technology transfer company". Its objective is to contribute to the commercialisation of Australian inventions by, among other things, identifying research with commercial potential, particularly from public sector research bodies, and providing seed capital to advance ideas to the stage where they are attractive to private sector partners. The Commonwealth Government has provided an initial equity contribution of $30 million. It is intended that this be matched by investment from private sources.

The ATG commenced operations as a fully commercial company on 1 August 1993. The Government anticipates that, within 10 years, the Group will generate a sufficiently high return to compensate investors and that, in the longer term, the government equity will be sold.

In addition to the above initiatives aimed at increasing the availability of equity capital, the Commonwealth Government has also taken steps to improve the availability of debt finance to small and medium sized firms. Since July 1992, the Reserve Bank has paid a rate of interest equal to the yield on 13-week Treasury Notes on the non-callable deposits which banks must lodge with the Reserve Bank (previously banks received the market rate less five percentage points). This is expected to increase the gross revenue of the banks by about $140 million annually (Dawkins 1993). In return, banks are expected to direct this increase in revenue to small and medium sized businesses. To assist in monitoring the scheme, the banks are required to provide the Reserve Bank with information on lending to small and medium sized businesses.

DITRD is also investigating the possibility of introducing a securitisation scheme as a means of increasing the availability of finance for small business. Securitisation involves the pooling of loans into a package. The intention is to spread the risk attached to individual loans and thereby increase the incentive for financiers to lend to small business.

DPIE said that there are also funding opportunities for EWMESS firms under the Commonwealth/state partnership agreements incorporated in the recently established National Landcare Program. These agreements provide for joint government and industry funding for demonstration and commercialisation of new technologies, systems and services. The total funding allocation for 1992-93 relevant to the EWMESS industry is around $90 million. While none of the projects funded under the National Landcare Program are directly aimed

at supporting the EWMESS industry, water projects funded under, for instance, the Country Towns Wastewater Treatment Initiative and the Healthy Rivers and Catchments Initiative may provide opportunities for demonstrating or piloting the use of innovative technology. About $16 million will be made available over three years to improve waste water treatment for country towns.

Some state governments also facilitate access to finance for small businesses. For instance, Biocycle said it had received assistance from the New South Wales Government in the form of a guarantee on an overdraft facility. According to the company, this had been useful in demonstrating the Government's faith in the company as a successful organisation.

The Commission received little information about the likely impact on the EWMESS industry of the government initiatives described above. This may be partly because of their recent origin. However, a priori, they should result in at least some increase in the availability of funds to small and medium sized businesses, including those in the EWMESS industry.

10.3 Does the EWMESS industry warrant special measures?

Notwithstanding the above initiatives, some participants argued for special measures for the EWMESS industry. The CRCWMPC proposed the establishment of an Environmental Technology Commercialisation Program (ETCP), with Commonwealth and/or state government contributions in the form of commercial equity. Within the ETCP, funding would be directed to a number of 'units', each comprising one commercialisation project. Once the commercial viability of the unit was established, the government funds would be recovered through the sale of the equity to new commercial investors. The CRCWMPC estimated that the total funding needs would be between $50 million and $100 million over five years.

While participants seeking additional government initiatives to improve their access to finance cited a number of factors in support of their claim, a major concern is the relatively small size and lack of experience and business expertise of many firms in the industry. For instance, the EMIAA said:

> The immature stage of the environment management industry and the large number of small businesses within it mean that it is exposed more than most industries to the harsh conditions of the current capital market within Australia.

Some of the difficulties in raising capital identified by the EWMESS industry echo those raised by other industries and have been the subject of ongoing debate and a number of inquiries and reviews in recent years. For example, in its inquiry into the Availability of Capital (IC 1991d), the Commission found

that small businesses generally pay higher interest rates than many large firms, and experience greater difficulty raising equity funds. However, to some extent, this is only to be expected as smaller firms frequently represent less secure investments for financiers. As the EMIAA said: "The cost [of finance] reflects the risk".

As outlined in Section 10.2 above, the Government has acknowledged the difficulties of small and medium sized firms and taken steps to facilitate their access to finance. Establishing an industry-specific capital fund — or providing additional concessions to EWMESS firms — raises equity issues about the access to capital of small firms in other sectors of the economy. Moreover, to the extent that subsidised finance is involved, there is a cost which must ultimately be paid for by other groups in the community. The Commission considers that (with the exception of lenders' liability discussed above) any difficulties are more efficiently addressed using measures which are generally available to all small and medium sized businesses, and not just EWMESS firms.

FINDING

With the exception of lenders' liability and difficulties that financial institutions may experience in assessing risks associated with new technologies, there is little evidence to suggest that EWMESS firms experience greater difficulties in gaining access to capital than small businesses elsewhere in the economy.

10.4 Other measures to facilitate commercialisation

Apart from measures directly facilitating access to finance by small and medium sized enterprises described in Section 10.2, there are some other government programs in place which could, indirectly, improve EWMESS firms' access to capital for commercialisation. These include some state government programs. There are also some actions that the firms themselves can take to facilitate the commercialisation of new environmental — or any other — technology.

The National Industry Extension Scheme (NIES)

A number of recent studies have found that many small and medium sized firms lack commercial, marketing and other management skills. For instance, one of the findings of the Block Report (DITAC 1991a) was that Australia lacks expertise in the marketing of R&D. DITAC (1993, personal communication)

said the most common barriers to commercialisation are deficiencies in management skills. McKinsey & Company (1993) found that some small firms lack the expertise to adequately prepare the documentation required by financial institutions when applying for finance. It stated:

> Many firms lack the financial and business strategy skills to present their business in a way that appeals to potential financiers. Many financiers complain that firms miss out on finance because they are unable to provide meaningful cash flow summaries for the business.

A number of other participants made similar statements. For instance, Bio-Track suggested that management needs advice on how to successfully commercialise inventions.

One government program which seeks to improve management training is the National Industry Extension Scheme (NIES). This scheme, which is jointly funded and administered by Commonwealth, state and territory governments, aims to improve the internal efficiency of enterprises — particularly small and medium sized firms — by developing networks and by providing information and advisory services utilising outside consulting expertise.

Opinions differ on how successful NIES has been. One evaluation of the NIES scheme (Price Waterhouse 1992) found that it had encouraged adoption of best practice amongst participating firms. The report also found that in the areas of price competitiveness, export intensity and profitability, NIES participants appear to have performed better than non-participating firms. In other areas, such as sales, quality and customer service, the study found little difference between NIES and non-NIES respondents.

A common concern is that NIES is costly in terms of the assistance provided. In assessing the NIES scheme's administration and procedures, Price Waterhouse (1992) concluded that:

> ...the allocation of resources, financial and human, varies widely amongst States... Improvements in administrative efficiency could enable NIES in some States to increase resources available for direct assistance to industry (pp. 11 & 14)

Firms lacking management skills have strong commercial incentives to upgrade those skills. However, the Commission sees an ongoing role for government in management training.

State initiatives

Some state governments have taken, or are in the process of taking, steps to promote the commercialisation of new technology in the EWMESS industry.

For instance, in New South Wales, the Department of Business and Regional Development administers the Environmental Industries Program. This program aims to enhance export activity, promote the commercialisation of innovative technology, optimise the use of government procurement to benefit local firms, and encourage the marketing of public sector skills in joint ventures with the private sector. To realise these aims, the New South Wales Government is to promote the establishment of strategic alliances in key areas of innovative environmental technology, and help facilitate the funding of projects to demonstrate near-commercial products and processes that protect and enhance environmental quality. Currently, the major emphasis of the program is on promoting the commercialisation of "innovative" technology and using government procurement as a tool for industry development.

Collaboration with larger firms or public agencies

Small firms which are unable to attract development finance from traditional sources may be able to gain access to financial resources and management skills, distribution networks and markets by collaborating with larger firms, specialist development capital groups or government agencies (eg large water authorities). Another major benefit to small firms from collaboration is the sharing of risk.

Collaboration can involve the construction and testing of demonstration projects. For example, the Sydney Water Board, as part of its Clean Waterways Program, invites inventors, entrepreneurs, researchers and product/service organisations to consider the Water Board as a potential partner or customer for the development and application of appropriate technology. The technology must be relevant to the Board's activities, and provide a likely financial benefit to the Board through, for instance, the generation of royalties from sales of the technology or some form of joint venture. The scheme is not limited to Australian inventors. For instance, the Lyonnaise des Eaux Dumez (a French water services group) has entered into a long-term R&D agreement with the Board to examine ways of expanding the availability of its leading-edge water treatment techniques.

The CRC Program (see Chapter 9) also brings together inventors of new technology, both in the public and the private sector, and those able to provide funds and other resources necessary for successful commercialisation. The CRCWMPC currently comprises some 15 partners, including CSIRO, ANSTO, a number of universities and several private firms.

Commercialisation intermediaries

The Block Report (DITAC 1991a) found that there was a need for intermediaries in the commercialisation process to act as facilitators and brokers, and to bring together researchers with commercially valuable technology or capability and a firm able to benefit from the technology or capability. As a result of that recommendation, the Government established the ATG (see section 10.2).

According to the ATG (1992), some similar overseas schemes have been commercial successes. For instance, the British Technology Group Limited (BTG), originally a government-operated technology transfer group, has been self financing and profitable since the 1970s. In the USA, Research Corporation Technologies was established in 1987 as a spin-off from a non-profit foundation established in 1912 to commercialise American university research. Provided with a US$35 million loan (by the foundation) and a patent portfolio, it generated income of US$128 million in its first five years of operation.

Some research institutions and universities have established their own technology transfer companies. For instance, SIROTECH was established to facilitate technology transfer for CSIRO. Such companies provide commercial liaison, consultancy, legal and patenting services to their host institution (DITAC 1991a).[1]

The programs and measures described in this section have the potential to promote the development and commercialisation of new technology, not only in the EWMESS field, but also in the wider economy. Most of the initiatives seek to achieve this by addressing the more fundamental causes of the failure of many firms to commercialise their inventions, rather than by providing the finance directly. Firms and inventors themselves need to select and avail themselves of the facility most appropriate to their needs.

[1] These are intended to be commercially focused operations. However, not all are profitable (DITAC 1991a).

11 FOREIGN AID AND INDUSTRY DEVELOPMENT

Most Commonwealth Government foreign aid is provided through global and bilateral country programs. Global programs include contributions to the Multilateral Development Banks (MDBs), primarily the World Bank and the Asian Development Bank (ADB). The Australian International Development Assistance Bureau (AIDAB) administers the country programs[1] and the Development Import Finance Facility (DIFF).[2] AIDAB has some co-financing agreements with the World Bank and the ADB.

Although humanitarian concerns are the driving force behind Australia's foreign aid program, Australia's foreign policy and commercial interests are also important factors. The aid program has a strong regional emphasis, aiming to contribute to peace, stability and security in the Asia-Pacific region.

Ecologically sustainable development is a criteria applied to many foreign aid programs. Thus, aid provides business opportunities for the EWMESS industry. Indeed, some inquiry participants saw the use of aid funds as a means of facilitating the industry's development.

11.1 Export opportunities for the EWMESS industry

Australia's official aid expenditure for 1992-93 was around $1.4 billion, or 0.36 per cent of Gross National Product. This included $480 million for the global programs and $800 million for the country programs. In 1992-93, some 40 per cent of country program aid (or 23 per cent of total aid) was allocated to Papua New Guinea (see Figure 11.1).

AIDAB has estimated that approximately $100 million (around 9 per cent) of its expenditure for 1992-93 was for activities, or components of activities, that were environment-related (Commonwealth of Australia 1993).

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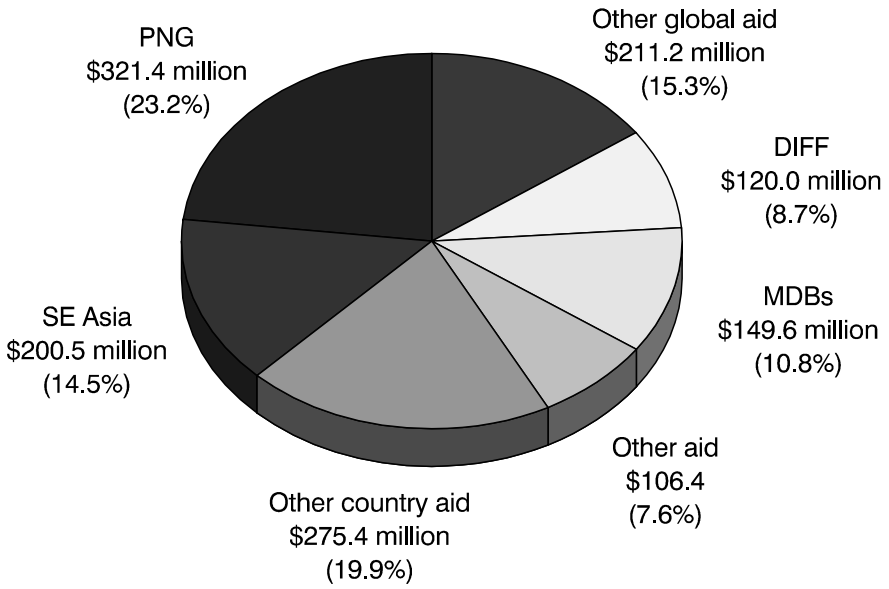
1 Country programs are mostly arranged on a government-to-government basis.

2 The DIFF is a global aid program which provides grants to developing countries for high priority public sector projects. It is also used to assist Australian firms to compete in markets where other governments provide mixed credit finance (see Appendix F).

Figure 11.1: **Australian aid program; major components, 1992-93**



Source: Commonwealth of Australia 1992b.

Australian aid funding designated specifically for environment projects in 1992-93 was at least $40 million (around 3 per cent of total aid funds). This included $20 million allocated to the Environment Assistance Program (EAP), an additional $8 million for environment initiatives and $12 million for environmentally beneficial projects under the DIFF. Projects eligible for EAP funding include those relating to population, forests, landcare, climate change, biodiversity and support for international environment organisations and activities. The EAP includes projects in bilateral, regional and global cooperation programs.

In addition to the $40 million designated specifically for environment projects, other projects may include an environment component. Environment projects funded by the MDBs provide additional opportunities for Australian EWMESS suppliers.

Aid funding which is effectively tied to procurement in the donor country is regarded as 'tied aid'. Most of Australia's aid is not formally tied to the procurement of Australian goods and services. Contributions to the MDBs are not subject to tying arrangements. Further, AIDAB assesses tenders for projects under the Commonwealth Government's procurement policy guidelines which are based on competitive tendering (as discussed below).

In 1990, 45.3 per cent of Australia's total aid funding was classified by the OECD as being tied aid[3] — this compares to the average of 23.5 per cent for OECD countries. Only Italy, with 47.2 per cent, and Austria, with 45.5 per cent, had a higher rate of tied aid in 1990. Information for selected OECD countries is shown in Table 11.1 below.

Table 11.1: **Tying status of Official Development Assistance (ODA) for selected countries: tied aid**
(per cent)

Country	*1989*	*1990*
Australia	52.0	45.3
Canada	36.5	28.4
Germany	32.5[a]	38.2
Italy	58.4	47.2
Japan	13.8	12.5[b]
Sweden	20.1	14.5[b]
United Kingdom	44.0	0.0[b]
United States	40.2	19.2[b]
Total DAC[c]	**33.0**	**23.5[d]**

a 1988 data.

b Including forgiveness of non-ODA debt.

c Development Assistance Committee (DAC) includes 20 OECD countries (not including Greece, Iceland, Luxembourg or Turkey).

d Secretariat estimate in whole or in part.

Source: OECD 1992c.

Benefits arising from membership of the Multilateral Development Banks

The World Bank and the ADB are required to take account of the environmental impacts of their projects and include environment projects in their programs. As Australia is a shareholder in both banks, as well as the European Bank for Reconstruction and Development (EBRD), Australian firms are entitled to bid for projects funded by them.

The Australian Government contributed $180 million to the MDBs in 1990-91 (and $160 million in 1991-92). Australian suppliers received an estimated

[3] The Development Assistance Committee of the OECD assesses the 'tying status' of member countries. At one end of the tying status spectrum is 'tied aid', and at the other 'untied aid'. Tied aid is defined as aid which is mainly tied to procurement in the donor country. Untied aid includes aid which is fully and freely available for essentially world-wide procurement (OECD 1992c).

$150 million worth of procurement from the World Bank in 1990-91 and an estimated $60 million from the ADB in 1991 (Commonwealth of Australia 1992b).

Although the absolute number of bids submitted by Australian firms is comparatively low, World Bank and ADB figures indicate that Australian firms have a high rate of success in winning contracts.

In 1991, 6330 contracts were awarded under ADB financed loans. In aggregate, the contracts had a face value of US$ 2.2 billion. Australian firms were awarded 31 of these contracts from a total of 35 bids. One of the successful bids in 1991 was for a major EWMESS related project (ADB 1992). Other ADB financed contracts may also have included a EWMESS component.

Over the period January 1981 to June 1992, Australian firms were successful in 18 out of 40 contract bids for contracts valued at more than $500 000 and awarded under ADB financed loans. Three of these successful bids were for EWMESS related projects (ADB 1992).

Multilateral Development Bank projects

World Bank and ADB contracts are filled through a competitive tendering process which is open to firms from all member countries.

Sagric International made the following points about the tender process for World Bank and ADB contracts:

- it is the responsibility of individual companies to ascertain normal marketing procedures and to identify client needs;
- Austrade representatives are used to promote Australian expertise and equipment, and to introduce appropriate overseas contacts (see section 11.3);[4] and
- only the best in the world win contracts — that may mean having the best technology, but normally it also means having the best marketing skills.

A recent report by DFAT (1993) found that market intelligence and information are the principal factors which influence the levels of success firms have in winning tenders with the MDBs. The report identified Austrade, AIDAB and DFAT as Government agencies which have a market intelligence and information role to play in promoting Australia's procurement performance with the MDBs.

[4] Austrade has Specialist Commissioners located at the MDBs.

Participation of Australian suppliers in MDB projects

Participants raised two factors which have the potential to impede participation of Australian EWMESS firms in MDB projects. First, a lack of knowledge within the industry about the opportunities provided by foreign aid programs and, second, small firm size. These characteristics are often closely related.

The Queensland Government said that the majority of respondents to its survey of EWMESS firms had no experience or knowledge of aid programs. While the Commission notes the findings of this survey, it observes that a significant number of firms in the EWMESS industry are aware of the business opportunities provided by aid programs.

The DFAT Task Force (1993) did not report any problems regarding the market intelligence and information roles which Austrade, AIDAB and DFAT play concerning MDB procurement. Rather, the report's emphasis was on recommendations for expanding the market intelligence and information roles of these agencies.

Information about the opportunities provided by MDB programs is available from a number of sources. Dissemination of this information to firms in the EWMESS industry is seen as an important role for industry bodies such as the EMIAA. Moreover, the improvement of exporter awareness is a two way process. The onus is on industry to market itself and to complement this effort by using the services provided by government. Industry can also contribute to the quality of those services by communicating its needs and any problems faced.

Small firm size may be a more significant impediment to participation in MDB projects. Owner-operators of small firms often do not have the time to undertake the necessary investigations and may not have the financial capacity to pay someone else to gather this information.

The DFAT Task Force reported that Australian exporters have identified long lead times and difficulties in maintaining financial commitment during these lead times as impediments to participation in MDB projects. Consequently, firms which are insufficiently capitalised would, on their own, not be serious contenders for MDB contracts. There is nothing, however, preventing such firms from entering into joint venture arrangements.

Programs administered by AIDAB: bilateral country programs and the DIFF

AIDAB programs also provide business opportunities for the EWMESS industry with environmental impact being considered in the design and

implementation of all projects administered by the Bureau. AIDAB is also building a portfolio of environmentally targeted projects.

Opportunities provided to local EWMESS firms by AIDAB programs depend on the development priorities determined in negotiations between recipient countries and AIDAB. For some years, AIDAB has sought to alert recipient countries to Australia's environmental expertise. In 1989, it commissioned the Environment Institute of Australia to undertake a major survey of the capabilities of Australian firms and research institutions. The findings were published and distributed widely overseas. The Commission understands that AIDAB is presently updating its information on industry capabilities.

AIDAB procurement

AIDAB's purchasing policy for country programs is to apply standard Commonwealth Procurement Guidelines. These guidelines emphasise the selection of suppliers on the basis of value for money. They also provide for the maximisation of competitive opportunities for Australian and New Zealand suppliers (see Chapter 8).[5]

A register of consultants and companies offering particular expertise is maintained by AIDAB. AIDAB publishes a newsletter called *Business News* to communicate business opportunities in the aid program to industry. A 'Business Kit', which contains information about the various aid programs, is also available. AIDAB advised the Commission that it regularly advertises requirements for equipment and services through the *Commonwealth (Purchasing and Disposals) Gazette* and in national newspapers.

Participation of Australian suppliers in AIDAB programs

Notwithstanding the AIDAB initiatives mentioned above, communication between AIDAB and Australian industry is perceived to be a problem by some participants. For example, the Queensland Government said that respondents to its survey:

> ...felt that there needs to be an improvement in communication between AIDAB and Australian industry, along with a better industry understanding of foreign aid programs.

Some industry participants said that they needed more warning about forthcoming aid opportunities.

[5] "Australian and New Zealand suppliers" are defined as suppliers of goods and services which are wholly or partly produced in Australia. The country of origin is determined on the basis of the source of value-added.

AIDAB advised that it intends to improve the timeliness of such information by producing a register of forthcoming projects. AIDAB also indicated that it conducts information seminars for firms interested in supplying aid projects.

A new publication, Environmental Assessment Guidelines for Development Assistance Projects has recently been issued to AIDAB officers in Australia and overseas. These guidelines provide for the identification and assessment of waste management issues in the design phase of projects.

As suggested previously, the Commission sees the communication of opportunities provided by aid programs to firms in the EWMESS industry as an important role for industry bodies such as the EMIAA. The Commission notes that the EMIAA has recently taken steps to provide AIDAB, and others, with information on the industry's capabilities. For its part, AIDAB has market information which might be useful for the EWMESS industry.

11.2 Tied aid as an industry development mechanism

In addition to improving information flows on aid opportunities, the EMIAA, and others, saw the aid program as a mechanism for facilitating the development of the local EWMESS industry.

Some participants argued that the aid program should be focused more towards environmental projects and that the provision of aid should be tied to Australian supply. For example, the EMIAA said that Australia's aid program is one of the "crucial support mechanisms" for local EWMESS industry development. The Association said that, although the aid program is environmentally aware, it is:

> ...still geared to the traditional development activities ... rather than expanding into projects that are concerned with waste, its minimisation, treatment and disposal.

To rectify this perceived imbalance, the EMIAA suggested that Australia should use its aid program to assist neighbouring countries to develop environment management capabilities in areas where Australia has equipment, systems and services. It nominated environment sciences, water, waste water and solid waste management as areas of expertise in which Australia could assist neighbouring regions.

The EMIAA and others also claimed that competitor countries are using their aid programs to install 'beacon' or demonstration facilities in Asian countries as catalysts for later commercial sales. Hence, they proposed that Australian aid funds should also be targeted at projects which demonstrate innovative Australian environmental technology. This proposal was supported by Austrade and Austemex.

In support of their requests, participants generally pointed to financial and other benefits flowing from aid-funded exports, including the development of an export orientation and the prospects for follow-on business for participating suppliers.

Despite the shortcomings perceived by some participants, AIDAB indicated that recent reviews of development cooperation programs with China and Indonesia indicate that Australian companies have benefited from the aid program through the 'internationalisation' process (see Box 11.1).

Box 11.1: **Benefits from development cooperation with China**

To determine the commercial benefits provided by participation in AIDAB funded projects, AIDAB surveyed over 150 Australian organisations which took part in Australia's aid program with China during the period 1980-81 to 1991-92. A high priority objective for this program is the fostering of mutual benefits for China and Australia.

Organisations surveyed by AIDAB rated their project involvement as important with respect to cash-flow and/or follow-on business. More than 40 per cent of firms reported that AIDAB-supported activity provided their first contract in China. Following their participation in the AIDAB funded activity, more than 60 per cent of firms increased the proportion of their income derived from exports.

The AIDAB study cites the experience of BHP Engineering in the $48 million Shunchang Cement Factory Project which started in 1985. This was BHP Engineering's first major project outside Australia. AIDAB reported that the project provided 50 additional person years of employment in the company. Moreover, AIDAB stated that the project demonstrated the company's international competitiveness and its capability to carry out large engineering projects overseas. BHP Engineering now has offices in every south-east Asian country, as well in the USA and Mali. AIDAB reported that, in 1991-92, 18 per cent of BHP Engineering's revenue was derived from overseas. Little of this was sourced from Australian aid, although some work was funded by the World Bank (AIDAB 1993).

Summary

Tied aid provides direct benefits through the additional demand created for Australian goods and services and also from the development of Australian firms as exporters. As previously noted, according to OECD criteria, about half of Australian aid is effectively tied (see Table 11.1). This is a higher proportion than occurs in most OECD.

However, there can be costs to tying aid. The exclusion of other global suppliers means that countries could be prevented from obtaining the benefits of least-cost supplies and/or selecting the goods and services which are most appropriate to their needs. In practice, tying of aid may simply mean that the benefit of Australian aid to the recipient is reduced.

The benefit/cost trade-off turns critically on the flow-back of aid funds to Australian suppliers that would otherwise occur without formal tying arrangements. The higher the flow-back, the smaller would be the increase in domestic economic activity from tying aid and, hence, the more likely the costs of tying aid would outweigh those benefits. The significance of the impact tied aid may have on Australia's international standing, and the consequent effects this could have on Australia's trade performance, is extremely difficult to assess.[6]

Even if a judgment was made that a formal policy of tied aid would bring net financial benefits to Australia, the Commission considers this would not justify modifying the present policy in favour of one particular sector. For this reason, the Commission also has reservations about the EMIAA's request that it be represented on the Advisory Council on Aid Policy. The Commission notes that AIDAB has selected members of the Council based on their individual capacities, rather than as representatives of particular industries.

While the Commission does not support giving any particular industry priority over other industries in Australia's aid program, the trend towards greater environment protection in newly industrialising countries will probably see some refocussing of aid towards projects of relevance to the EWMESS industry. For example, one objective of the Australia-Thailand Development Cooperation Program conducted by AIDAB is to target projects which are of benefit to Thailand and which provide the opportunity to demonstrate competitive Australian EWMESS technology.

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[6] The Development Assistance Committee of the OECD has reported that tied aid contradicts efforts to strengthen multilateral trading principles and to enhance concern for efficiency in the use of public resources (OECD 1992).

12 THE ROLE OF GOVERNMENT IN INFORMATION PROVISION

As in all industries, information is a vital prerequisite for commercial decision-making by EWMESS producers. Information is required to, inter alia, assist in the:

- identification of market trends and opportunities;
- promotion of the Australian industry overseas;
- identification of forthcoming projects;
- formation of strategic alliances; and
- achievement of consistency in inter-governmental regulation.

Participants said that there is limited relevant information available about the EWMESS industry and its markets, and that this factor is impeding the industry's development. For example, the EMIAA stated:

> One of the major impediments to the orderly development of the environmental industry is the almost total lack of co-ordinated information and data collected on the state of the Australian environment, problems, solutions and the EWMESS industry.

Similarly, the Queensland Government said that:

> ...this lack of information is not only of concern to Government decision makers in determining planning and project priorities, but also to members of the EWMESS industry who are attempting to design systems and equipment.

12.1 Data availability

There are some relevant data currently available. For example, in its 1990-91 and 1991-92 manufacturing census and 1990-91 census of mining operations, the ABS collected data on expenditure on environmental protection. Some information on overseas markets is provided by Austrade. In addition, some state government bodies, such as the Queensland Department of Business, Industry and Regional Development (DBIRD), provide information on a range of matters, including market opportunities for the EWMESS industry. The Brisbane City Council (BCC) said that some local authorities have databases on the type and quantities of waste produced which may help EWMESS firms in identifying market opportunities. In addition, there are also a number of trade magazines and other publications which provide information on market

developments, both locally and overseas. Nonetheless, as indicated above, it is widely recognised that the information currently available is inadequate.

As explained in earlier chapters, the limited data available about the EWMESS industry and its outputs largely reflects the industry's diverse nature and the basis used for compiling industry statistics. As a result of these factors, structural and commodity data relating to the EWMESS industry and its outputs are subsumed in classifications that relate to a variety of industries engaging in activities ranging from general engineering, to chemicals production, to the provision of consulting services.

12.2 Recent initiatives

Additional initiatives have recently been put in place to address some of the information shortcomings. For example, in a statement on the environment in December 1992, the Prime Minister announced that:

> In recognition of the information gap facing environment management industries in Australia, the Government will set up a National Environment Information Database (NEID) at a cost of $1.6 million over four years.

Information on the environmental consequences of waste management is central to the setting of appropriate regulatory controls. Consequently, a primary objective is to provide Australian authorities with access to the latest international and local environmental information and developments. The new database is also intended to assist the transfer of technology, to encourage Australian exports and to improve industry competitiveness.

As part of this initiative, CEPA has commissioned the CRCWMPC to develop a uniform national waste classification system and waste database. The database will provide details on the types and amounts of all kinds of solid and liquid waste and assist EWMESS firms to identify and evaluate potential markets. The Queensland Government said that the project was important, not only for the industry, but also for environment management in general.

Other exercises being undertaken to improve the availability of information include the preparation of a database for the EMIAA (being prepared by Intermedia), as well as some preliminary investigations by the DITRD into requirements needed to formulate an information strategy for the environment industries.

12.3 Proposed Solutions

Notwithstanding the preceding initiatives, participants consider that additional action is required. Some of the measures proposed are considered below.

The role of the Australian Bureau of Statistics

Participants argued that the ABS should collect the same kind of information about the EWMESS industry as it does for other industries. The Commission understands that the ABS has undertaken some preliminary work on assessing the data it holds on the "environment industry" and avenues to improve the information available. As noted above, the ABS conducted censuses in 1990-91 and 1991-92 which included questions on current and capital expenditure on environmental protection. The ABS is willing to collect this information on an annual basis if there is sufficient interest. However, the problems created for information and data collection by the fragmented nature of the industry are compounded by the emergence of many new waste management products and technologies in recent years.

Initial discussions between the ABS, the industry and DITRD have been held with a view to improving data collection. The ABS has suggested that the EMIAA may have a role to play in collecting data from its own members so that a common core group of respondents can be identified. Such information would help refine the list of goods and services to be included in any statistical collections for the industry.

In the Commission's view, current ABS initiatives are a step in the right direction. As Australia's economy changes, there is a need for data collection to respond, even if that means some changes to the way in which industries are viewed. An analogy can be drawn with the tourism industry, which only a few years ago presented similar difficulties in terms of data collection when the first attempts were made to collect more comprehensive data. Industry support for the process of defining and gathering data on the industry will obviously be crucial to a successful outcome.

An associated issue which would also need to be resolved concerns the appropriate data collection agency. While the ABS is Australia's principal statistical body, it may be appropriate for an industry body, or even another arm of government, to help gather the required data. This already occurs in a number of sectors of the economy. For example, the Australian Bureau of Agricultural and Resource Economics collects considerable data on rural/agricultural industries and the Bureau of Tourism Research has contributed to the development of a tourism database.

In addition to having a role in collecting industry-specific data, the ABS compiles the national accounts for the country. An important recent initiative is the very early work on the expansion of the national accounts to include 'satellite' environmental accounts. The Commission supports this initiative.

State of the Environment (SOE) reporting

SOE reporting is intended to provide information on trends in the condition of Australia's environment.

The EMIAA argued for an information strategy that would culminate in a national annual SOE report.

> EMIAA regards as fundamental to industry development the implementation of comprehensive environment policies, their monitoring and reporting to Parliament through an annual State of the Environment Report, and their underpinning with suitable economic instruments.

SOE reporting has had a chequered history in Australia. The Department of Environment, Sport and Territories had SOE reports prepared over a period of years in the late 1980's and some state governments have involved themselves in the concept at particular points in time.

CEPA recently held a workshop, the main objective of which was to identify environmental indicators and priority environmental issues that could be addressed by national SOE reporting. Once the environmental indicators have been identified, CEPA proposes a four-year reporting cycle.

In a separate but not unrelated exercise, a major study is presently underway to prepare a report on the state of the nation's marine environment. This is being coordinated by the Great Barrier Reef Marine Park Authority.

The Commission sees merit in the general concept of SOE reporting. It can assist, among other things, in highlighting problems that need to be addressed, and in the formation of standards. SOE reporting should also help assess progress made in dealing with environmental problems. As such, it would help to give effect to announced government initiatives to include environmental damage and the depletion of natural resources in the calculation of national income.

FINDING

While the initiatives currently in train will help redress the existing information deficiencies, there is a need for the industry and the ABS to collaborate to improve the availability of relevant data about both the industry and its products.

Public education

Participants argued that programs are needed to educate the public about waste minimisation and environmental/recycling issues. DBIRD stated that:

> In the case of local authority involvement with waste management and recycling, the provision of relevant information needs to be targeted at the whole community ie. all industry sectors as well as the general public.

A number of programs are already in operation. For example, the WAWA is undertaking a program to educate the community on water quality issues. It has produced information kits and pamphlets, displays, videos etc and gives educational talks to interest groups.

Some participants advocated a 'Buy Australian' campaign to promote the domestic EWMESS industry and help overcome the perception that Australian products are inferior to imported products. The Commonwealth Government is running a 'Buy Australian' campaign for purchasing officers of government authorities in which the benefits of buying Australian are outlined.

The Commission sees an important role for public awareness campaigns on general waste management issues. Such programs will help reveal to the community the consequences of not dealing properly with waste management problems. Public awareness campaigns can also assist in outlining options and costs for solving environmental problems. In this way, they can, among other things, help to illustrate the important role of appropriate pricing of waste disposal.

13 ENVIRONMENT INDUSTRIES COUNCIL

Throughout this report, the Commission has highlighted the diverse and fragmented nature of the EWMESS industry. The institutional arrangements are similarly fragmented. There are numerous Commonwealth, state and local government agencies and authorities, as well as a wide range of government programs, which impinge upon the activities of the EWMESS industry.

Partly for these reasons, DPIE and DITRD asked the Commission to consider recommending the establishment of an Environment Industries Council (EIC), modelled to some extent along the lines of the recently established Agri-Food Council (see Box 13.1). Both Departments envisage an EIC playing a key role in developing and implementing an "environment industries development strategy".

Box 13.1 **The Agri-Food Council**

The Agri-Food Council was established by the Commonwealth Government in July 1992 as part of a $12.7 million four year package to boost exports of fresh and processed foods. The Council was established following an extensive period of consultation with the food processing industry about its future.

The Council is constituted along the lines of a combined government-industry body, chaired jointly by the Ministers for Industry, Technology and Regional Development and Primary Industries and Energy. Its membership includes representatives from industry, trade unions, the farming sector and research institutions. It is serviced by the equivalent of three full-time officers, drawn from, and jointly funded by, DITRD and DPIE.

The Council's role is to: provide the focal point for implementing a range of government-funded initiatives; identify and remove impediments to industry development at both government and industry level; encourage the adoption of best practice techniques; and to coordinate programs across portfolios, particularly those of DITRD and DPIE.

There are a number of working groups, led by Council members, which address specific issues, such as workplace and regulatory reform, linkages between growers and processors, and the 'Clean Food Export Strategy'.

The agri-food industry does not contribute to the running or program costs of the Council.

13.1 Council proposal

Both DITRD and DPIE suggested that, under the current institutional and industry structures, the EWMESS industry may not reach its full potential. Consequently, they proposed the establishment of an industry council (as distinct from a Ministerial Council), principally to improve the coordination considered necessary to ensure that industry development and export expansion issues are adequately addressed. DITRD also suggested that an EIC could increase the effectiveness of existing government assistance provided to the EWMESS industry and, thus, avoid the need for new industry-specific assistance measures.

More specifically, DITRD proposed that, inter alia, the Council have overall responsibility for the following areas:

- consideration of industry development issues, in particular, providing a focus for Commonwealth, state and territory government action;
- developing an export strategy, including an overseas marketing campaign;
- strengthening the information base required to support industry development; and
- initiating government and/or industry action required to implement the Government's decisions flowing from the Commission's findings and recommendations in this report.

DPIE considered that:

> A broad-based Industry Council would enhance the industry's cohesion and negotiating strength with governments. Industry and community dialogue would be heightened. Strategic planning processes in relation to such key areas as research and development priorities, funding commercialisation of technology, and integration of environmental management outcomes into industry policy and development would be strengthened.

Both DPIE and DITRD proposed that an EIC should only operate on a part-time basis, possibly with secondments from industry and other key stakeholders to supplement the resources of the Secretariat. DPIE also suggested the possibility of establishing working groups under the Council (similar to the Agri-Food Council) to address specific issues or priority areas.

Further, DPIE indicated that the Council need not be a permanent body. It stated that:

> [The EIC]...could be something that would last for 2 or 3 years while industry establishes itself or establishes a culture and vision in the joint area with government.

DITRD suggested the Council be re-evaluated after its first three year term to determine its effectiveness.

Participants' views

The majority view was one of qualified support for the concept of an EIC. Some industry participants, while supporting the concept, were concerned that an EIC would end up being just another layer of bureaucracy with which the industry would have to deal, and that it could marginalise the role of existing industry associations. For example, the EMIAA stated that:

> Initially, EMIAA greeted the suggestion of an Environment Industry Council with scepticism — if the single or main outcome of this inquiry is to be another government committee we have wasted our time. On further reflection, however, there may be merit in establishing an ... EIC to pick up where this Inquiry must end.

The AWWA expressed "initial fears of an extra layer and/or player on the scene". However, recent discussions with representatives from DITRD have "allayed" these fears to some extent, although it still remains "cautious" to the Council proposal.

Pacific Waste Management expressed the view that, rather than create another new organisation, existing organisations should be consolidated to eliminate what it perceives to be "overlapping agendas". However, it did see a role for the Council if it "truly represented the industry and its practitioners".

While supporting the proposed Council, some key stakeholders expressed strong views about its membership. In particular, they argued that it was crucial for the Minister for the Environment to be on the Council.

13.2 Possible functions and operations

The concept of a combined industry/government body to liaise with governments and coordinate certain industry activities is not a new idea. A number of similar bodies presently exist in various guises covering a range of industries in Australia. In the main, they have been established to address problems facing specific industries. Consequently, the purpose, functions, funding, membership etc of these bodies differ markedly. The question is whether it is possible and desirable to establish a combined industry/government body for the EMWESS industry — an industry in which different segments face different problems.

The role of an EIC

Most participants saw an EIC as fulfilling similar functions to those proposed by DITRD and DPIE (see Section 13.1). Additionally, as discussed in Chapter 9,

an EIC might be able to establish and maintain a central registry for current and past EWMESS-related R&D activity.

There are currently a number of industry and government bodies which represent the interests of all, or some, EWMESS sectors. For example, the EMIAA is a national umbrella organisation for the environmental industries. The WMAA and the AWWA are national associations which cover solid waste management and water and waste water management respectively. Individual environmental professionals are represented by the Environment Institute of Australia (EIA). All of these bodies are interested in achieving better coordination and more effective liaison with relevant government agencies. Similarly, there are a range of government agencies that interact with the industry. Consequently, if an EIC were to be established, it would be important to ensure that it does not duplicate the role of existing industry bodies or government agencies involved in waste management issues.

Council membership

The role and functions of the proposed EIC would, of course, to a large extent determine its membership. The more wide-ranging the EIC's role, the greater the representation of interests required.

Existing industry/government bodies generally comprise around 15 members, drawn directly from industry and/or industry bodies, unions, government departments and Ministers. All state governments are not always represented, particularly in cases where the industry predominantly operates in specific states. In the case of the Agri-Food Council, there is no state government representation at all.

There is a large and diverse range of interested parties that would need to be considered when determining the composition of an EIC. For instance, major government interests include the key Commonwealth portfolios (DITRD, DEST and DPIE), other Commonwealth portfolios (eg DFAT), relevant state government portfolios, and local governments. There are a number of associations representing the various stakeholders, such as industry bodies, professional associations, unions, environment groups and local government associations. Finally, there are the users of EWMESS goods and services. Some of these groups represent a very diverse membership and the difficulty of representing all views within each group must be recognised.

It would be difficult for all major stakeholders to be represented on a Council and for it to still be of a workable size. A relatively large membership would clearly have adverse consequences for an EIC's effectiveness and operating

costs. Consequently, in practice, there would need to be some trade-off between membership size and the representation on the Council of key stakeholders.

Funding issues

With the establishment of any new body, an important consideration is the establishment and ongoing costs involved and, importantly, who will be financing these costs. Relevant costs include those required to fund a Secretariat to provide professional and administrative support services, as well as those required to support the Council itself.

For a combined industry/government Council, there are a number of alternative sources of funding, including, funding by the industry itself (through compulsory or voluntary contributions) and funding by the government (ie the tax-payer) or a combination of the two. Between these two extremes, there are a number of other possible funding options. For example, if the Council's activities are to be industry funded (either partly or in whole), it could be funded directly by individual firms and/or funded by industry associations through membership fees.

The main difficulty with voluntary contributions is that some in the industry may not contribute, but would still benefit from the Council's operations. Over time, this could lead to a situation where fewer and fewer firms in the industry would want to contribute.

Alternatively, the Council could be funded by industry through the imposition of a compulsory levy. In this case, the levy would have to be legislated for by Parliament. While the imposition of a levy on individual firms to fund an EIC may appear a reasonable expectation, particularly if the industry is to be the main beneficiary of the Council's operations, there are a number of considerations which need to be taken into account.

For a levy to be imposed on individual firms, it must be possible to identify all those in the industry. That is, the industry must be reasonably well-defined, and its product homogeneous as, for example, is the case with wool. In contrast, the EWMESS industry is diverse, and its products are not always readily identifiable. This lack of industry or product definition would make it difficult to impose a compulsory levy on individual EWMESS firms.

In addition, if a levy were to be imposed on the industry, it would have to be based on some measure, for example, some designated proportion of turnover. But this would also present difficulties. Many firms in the industry are not solely producers of waste management products. EWMESS firms tend to be diversified and may be involved in a number of other activities. Consequently,

there would be difficulties in identifying (and verifying) EWMESS-related turnover.

Finally, because of the aforementioned characteristics of the EWMESS industry, the administration costs to collect a levy may be quite high. Where this occurs, it would clearly be more efficient for the government to fully fund the Council's activities.

Accountability, transparency and review mechanisms

If an EIC were to be publicly funded, it would be important that it be accountable and its decision-making processes transparent. Non-statutory bodies, such as an industry council, are not generally subject to the reporting requirements of statutory bodies — most of whom must report their activities annually to Parliament. Nonetheless, if public funds were to be involved, it would be desirable for an EIC to be required to report publicly in a similar fashion to statutory bodies.

The inclusion of a review mechanism, incorporating a sunset provision, in the arrangements establishing the Council, could increase accountability and provide a means of determining the effectiveness of an EIC in pursing its objectives. The effectiveness of a review mechanism would be enhanced if the evaluation was carried out according to established reporting guidelines, and undertaken by an independent third party.

13.3 The Commission's view

The Commission has some reservations about the efficacy of establishing an EIC. Given the heterogeneous nature of the industry and its outputs, there must be some question as to whether it is possible to establish a single body which can adequately represent the interests of all those involved in the EWMESS industry. In addition, the difficulty in accurately defining the industry would also have implications for the membership of the Council. In particular, it may be difficult to restrict membership to a workable size and, at the same time, ensure that the membership is representative of the industry.

Although there is qualified support for the concept of an EIC, there is less certainty regarding the role it should perform. Indeed, as existing agencies appear to presently perform a number of functions specific to the EWMESS industry, the Commission is concerned that an EIC could lead to some degree of duplication.

On the other hand, the Commission recognises that there may be potential benefits to the industry and the community at large if an EIC were established.

An EIC could benefit both the industry and government if it could improve the coordination and communication between the two parties. An EIC may, for example, be able to provide the appropriate forum to coordinate the activities of existing industry bodies, as well as bring together the relevant ministerial representation.

There are also a plethora of government agencies that oversight programs and perform a range of functions intended to assist the EWMESS industry. However, participants have raised concerns that, because of the number of agencies and programs involved, access can often be time consuming and/or complex. An EIC could therefore benefit the industry if it could also liaise with government on options for rationalising current government programs.

The Commission believes, however, that the achievement of benefits such as those outlined above are contingent on the Council having widespread industry support. Consequently, it considers that such support should be demonstrated before any further commitment is made to establish the Council.

FINDING

If it is decided to form an EIC, the Commission considers that the likelihood of its success would be enhanced if:

- **membership is related to the functions of the Council and restricted in size;**
- **non-ministerial membership is based on expertise, not organisational affiliation (although this would not preclude members being drawn from EMIAA, AWWA, WMAA, EIA, ACTU, ACF etc);**
- **apart from ministerial representation, Council members are appointed for a set period, with the option of reappointment for a further term(s);**
- **government funding be limited to that which is needed to finance the immediate operations of the Council and its Secretariat;**
- **the Council has a sunset clause whereby, after three years of operation, it is subject to an independent review of its effectiveness, including an assessment of whether an industry/government Council is still the best way to achieve future objectives; and**
- **the Council reports publicly on its activities by submitting an annual report to Parliament.**

APPENDIX A: INFORMATION SOURCES

Participants that made written submissions to this inquiry are listed in Table A.1 below. The Commission also consulted with the organisations and companies listed in Table A.2 and held discussions with various organisations in Europe and south east Asia as indicated in Table A.3.

Table A.1: **Inquiry Participants**

Participant	Submission no.
ACT Department of Environment, Land and Planning – Office of the Environment	62, 69
Adas Pty Ltd	14
Aquatec-Maxcon Pty Ltd	4, 57
Ausmelt Pty Ltd	20
Australian Bankers Association	67
Australian Bureau of Statistics	21
Australian Conservation Foundation	88
Australian International Development Assistance Bureau	33, 59, 75
Australian National Industries Ltd (ANI-Krüger Pty Ltd)	8, 55, 79
Australian Native Landscapes Pty Ltd	34
Australian Paper Manufacturers	49
Australian Process Technology Pty Ltd	18
Associated Pulp & Paper Mills	25
Australian Water & Wastewater Association Inc	32, 58, 76, 85
BCD Technologies	45
Bergmann Australia (A division of Linatex Australia Pty Ltd)	22
Bio-Track Pty Ltd	1
Biocycle Pty Ltd	37, 70
Brisbane City Council	19
Broken Hill Pty Ltd	73
Canberra Institute of Technology (formerly ACT TAFE) – School of Applied Science	23,41, 64
Cedec Pty Ltd	13, 60
Cetec Pty Ltd	26
Clean Air TechniQ Pty Ltd	48
Clough MRT (A Division of Clough Engineering)	9
Cooperative Research Centre for Waste Management and Pollution Control Ltd	10, 61, 65
Crown Techniglass Pty Ltd (a division of Crown Scientific Pty Ltd)	35

Table A.1: **continued**

Participant	Submission no.
Commonwealth Scientific Industrial Research Organisation	40, 82
Commonwealth Scientific Industrial Research Organisation – Division of Wool Technology	47
Department of Agriculture (WA) – Peel-Harvey Catchment Support Group	11
Department of the Environment, Sport and Territories (formerly the Department of Arts, Sport, Environment and Territories)	56, 86
Department of Environment, Sport and Territories – Australian Antarctic Division	54
Department of Industry, Technology and Regional Development	92
Department of Primary Industries and Energy	39, 90
Eastbourne Consulting Group	3
Enviroflow Water & Waste Management	2
Environment Management Industry Association of Australia	17, 77, 78
Environmental Solutions International Ltd	84
Envirotest Pty Ltd	38
Formark Pty Ltd	*30
Full Cycle Plastics Pty Ltd	*5, 29
MasterFibre Pty Ltd	28
Maunsell Pty Ltd	15
May, Gordon & Pamela	80
Memtec Ltd	24
Metal Trades Industry Association of Australia	46, 87
Monash University - Centre for Innovation in Waste Management	50
New South Wales Government	91
Pacific Waste Management Pty Ltd	72, 83
Phillips, Mrs D	52
Plastic Recyclers (Qld) Pty Ltd	6, 43, 44
Pratt Industries	71
Premier Plating Co	16
Printing and Allied Trades Employers' Federation of Australia	31
QTR Industries	53
Queensland Government	51

Table A.1: **continued**

Participant	Submission no.
Rala Information Services Pty Ltd	74
Roto-Compactor Australia Pty Ltd	36
Royal Australian Chemical Institute (NSW Branch)	7
Shire of Bright	42
Shredding Systems Pty Ltd	27
South Australian Waste Management Commission	63
Tasmanian Government	89
Technosafe Waste Disposal Pty Ltd	66
Victorian Recycling and Resource Recovery Council	81
Water Authority of Western Australia	12
Western Australian Municipal Association	68

* Confidential submissions

A.2 Informal discussions

The Commission held informal discussions with the following companies and organisations throughout Australia.

Table A.2: **Informal discussions**

State/Territory	Company/organisation
Australian Capital Territory	Commonwealth Environment Protection Agency
	Department of Industry, Technology and Regional Development (formerly the Department of Industry, Technology and Commerce)
	Professor Ben Selinger, Independent Panel on Intractable Waste
	Resource Assessment Commission
New South Wales	Australian Environment Management Export Corporation
	Australian Trade Commission
	Australian Water Technologies
	Bain Consultants Incorporated
	Cooperative Research Centre for Waste Management and Pollution Control
	Memtec Ltd
	Sydney Water Board

Table A.2: **continued**

State/Territory	Company/organisation
Queensland	Australian Institute of Marine Science BCD Technologies Pty Ltd Brisbane City Council Cairns City Council Department of Business, Industry and Regional Development Daikyo (NQ) Pty Ltd - Green Island Environment Management Industry Association of Australia Great Barrier Reef Marine Park Authority J J Richards & Sons Mulgrave Shire Council North Queensland Conservation Council Townsville Trade Waste Pty Ltd Wapparaburra Haven, Great Keppel Island Wright's Industrial Waste
South Australia	AGC Woodward-Clyde Consultants Engineering and Water Supply Department Kinhill Engineers Pty Ltd Multi Function Polis Rib Loc Group Ltd South Australia Waste Management Commission
Tasmania	Pasminco Metals - EZ Tasmanian Confederation of Industries Tasmanian Government
Victoria	Australian Conservation Foundation Browning Ferris Industries Camp Scott Furphy Cleanaway - Brambles Commonwealth Scientific Industrial Research Organisation Department of Water Resources Environment Protection Authority Lurgi (Australia) Pty Ltd Ausmelt Pty Ltd
Western Australia	Environment Protection Authority Environmental Solutions International Pty Ltd Centre for Water Research, Department of Civil and Environmental Engineering, University of Western Australia Institute for Science and Technology Policy, Murdoch University Water Authority of Western Australia

A.3 Overseas visits

Following the release of the draft report, the Commission visited and had discussions with the following companies/organisations in Europe and south east Asia.

Table A.3: **Overseas visits**

Country	Company/organisation
Sweden	Austrade Environment Protection Authority Ministry of the Environment Sellbergs, Stockholm Sellbergs, Kumla
Germany	German Ministry of the Environment Nature Conservation and Nuclear Reactor Safety Agency Otto Group of Companies
Indonesia	Austrade Environment Protection Authority Environmental Management Board Indonesian Chamber of Commerce & Industry PT Environmental Nusa Geotechnica
Malaysia	Austrade Department of the Environment Environmental Management and Research Association of Malaysia
Thailand	Austrade Loxley BHP Engineering (Thailand Ltd) National Economic and Social Development Board
Singapore	Austrade Miltox Singapore Pty Ltd Ministry of the Environment National Science & Technology Board Resources Development Corporation Ltd Singapore Institute of Standards and Industrial Research

APPENDIX B: AUSTRALIAN ENVIRONMENTAL REGULATORY FRAMEWORK

This appendix highlights the institutional arrangements and some of the major features of environmental regulation employed by the Commonwealth, state and territory governments. Specifically, it focuses on the allocation of regulatory responsibilities, administrative bodies, instruments, trends in regulation and enforcement approaches.

At the time of federation, environmental management (as presently understood) was not an issue for government. Consequently, in the division of powers between the (then) colonies and the new Commonwealth, no recognition was given to conservation or environmental matters. As land use allocation and planning, provision of water and power, transport services and a host of other functions which are now recognised as influencing the state of the environment were left with the newly created states, the Commonwealth Constitution provided little scope for the national government to involve itself in environmental matters.

Significant Commonwealth involvement in environmental matters commenced in the early 1970s. A number of important statutes were enacted by the Commonwealth Parliament in the mid-1970s. These included the *Environment Protection (Impact of Proposals) Act 1974*, the *Great Barrier Reef Marine Park Act 1975* and the *Australian Heritage Commission Act 1975*.

The environmental protection legislation when married to Commonwealth powers with regard to foreign corporations, exports etc, allowed the Commonwealth to involve itself in a range of environmental issues which previously had been the sole domain of the states.

The next phase in the expansion of Commonwealth influence came in the early 1980s with the enactment of the *World Heritage Properties Conservation Act 1983*. By linking various heads of power (in the Constitution), such as those relating to commerce and corporations, to powers pertaining to Australia's obligations under international agreements, the Commonwealth was able to involve itself with — and determine the outcome of — the Franklin dam dispute and the Wet Tropics rainforest logging controversy.

The most recent Commonwealth initiative was the establishment in 1989 of the Resource Assessment Commission (RAC) as an independent advisory body on generic environmental issues (eg forest use and coastal zone management). The function of the RAC was to take an inter-disciplinary and holistic approach

(consistent with the principles of ecologically sustainable development), and when it was formed it was unique in the world. At the completion of the present Coastal Zone inquiry in November 1993, the RAC will cease to exist, but the legislation will remain in place.

As a result of these developments, the Commonwealth now exercises considerable power over environmental issues. As Galligan and Fletcher argue:

> The problem is not one of insufficient constitutional power for the Commonwealth, but how the Commonwealth and states can coordinate the legitimate presence of multiple governments in environmental policy (1993, p. 11).

The need to discuss — and attempt to coordinate — environmental policy in the nation has been recognised for many years. This is the main function of the Australia and New Zealand Environment and Conservation Council (ANZECC). This is a Ministerial Council, which not only has all state and territory Environment Ministers plus the Commonwealth Minister on it, but the New Zealand Minister. The Papua New Guinea Minister has observer status.

A very recent initiative is the acceptance by the states, territories, Commonwealth and the Australian Local Government Association of the Intergovernmental Agreement on the Environment (IGAE). Under the IGAE a new Ministerial Council, the National Environment Protection Authority (NEPA) will be formed. Its powers will relate to the establishment of national goals and standards, promotion of better processes for environmental impact assessment and some other matters.

Commonwealth

The Commonwealth department specifically responsible for environmental matters is the Department of the Environment, Sport and Territories (DEST). With the recent establishment of the Commonwealth Environment Protection Agency (CEPA), certain functions have been transferred to this body; the most important is the administration of the *Environment Protection (Impact of Proposals) Act*. Among its other functions, CEPA was to re-establish State of the Environment reporting, but in a very recent reorganisation of functions this has been returned to the Department.

A number of Commonwealth statutory authorities reporting to the Minister for the Environment have specific environmental management functions. One of particular interest — because of its regulatory functions — is the Great Barrier Reef Marine Park Authority.

The Authority's function is to manage the Great Barrier Reef according to ecologically sustainable development principles. It seeks to achieve this by use

of zoning plans (to separate incompatible uses), regulations and public education. It places most emphasis on the latter and in September 1993 was awarded the Einstein Gold Medal by the United Nations Educational, Scientific and Cultural Organisation.

In addition to the specific environment authorities, a number of Commonwealth departments and agencies have major interests in the environmental matters. These include the Department of Primary Industries and Energy, the Department of Industry, Technology and Regional Development, the Department of Tourism and the Department of Health, Housing, Local Government and Community Services.

New South Wales

Recently, the New South Wales Government has moved to reduce the number of bodies involved in environmental regulation and to streamline environmental legislation.

Administrative arrangements

The Environment Protection Authority (EPA) of New South Wales was established on March 1 1992, after the Authority's enabling legislation (*Protection of the Environment Administration Act 1991*) was passed in December 1991. It has assumed the functions of the former State Pollution Control Commission (SPCC), the Ministry for the Environment, the Radiation Health Services of the Health Department and the regulatory functions of the former Waste Management Authority (WMA). With the inception of the EPA, the WMA's waste regulation and licensing functions were taken over by the EPA, while the WMA's role in planning and operating waste disposal facilities has been transferred to the Waste Recycling and Processing Service (WRAPS, or Waste Service of New South Wales).

The EPA now has regulatory jurisdiction over air and water quality, noise control and aspects of marine pollution. The EPA shares responsibility for regulating solid and toxic waste management with local councils.

State and regional 'Environment Protection Community Consultation Forums' have also been established to advise the EPA on community concerns and attitudes to environmental protection.

Another important institution is the Land and Environment Court. It has the power to grant development consent and to adjudicate on any breach of

planning and environmental laws, as well as the authority to hear and adjudicate on criminal prosecutions brought by the EPA.

Local government plays an important role in New South Wales through involvement in land-use planning. Under the *Environmental Planning and Assessment Act 1979*, councils have responsibility for the preparation of Local Environmental Plans (LEP's), either individually or jointly with other councils. LEP's establish land use zones and specify permissible or prohibited activities within each zone.

LEP's are subject to public scrutiny, and must be approved by the Minister for Planning before taking effect. The Minister has the power to 'call-in' a particular development, which then precludes councils from determining the outcome of projects which have state significance (Holm 1993).

Regulatory instruments

Regulatory authorities in New South Wales use a variety of instruments for achieving environmental objectives. The EPA predominantly uses licences and works approvals. Licences may require certain emission reductions to be achieved, or they may specify abatement measures to be implemented within a certain time frame. Works approvals may involve the obligation to install pollution control technology before the proposed works can proceed. Environmental impact assessments may be required for certain new developments, not otherwise subject to assessment under planning laws, before the EPA can finalise applications for approvals or licences.

The EPA has also established an Economic Evaluation and Reporting Branch to ensure integration of economic and environmental considerations in decision making. This is achieved through assessing the economic impact of legislative and regulatory proposals, designing innovative market-based approaches to complement traditional regulatory practices, and reporting regularly on the state of the environment. The costs and benefits of environmental protection and an assessment of the effectiveness of environment protection programs will also form part of the State of the Environment reports. The first report is expected to be tabled in the New South Wales Parliament in October 1993.

The EPA is also investigating the use of economic instruments as complements to traditional regulation. Case studies to develop market-based instruments — such as tradeable discharge permits or effluent discharges for phosphorous control in the Hawkesbury-Nepean, salinity control in the Hunter and air pollution control in Sydney — are underway. The EPA will also be developing a 'load-based licensing system' which will provide incentives to industry to reduce pollution.

Enforcement

The EPA believes that a strong regulatory and enforcement program provides the basis for effective environmental protection. Compliance notices, revocation or suspension of licences, as well as regular monitoring and reporting requirements, are employed to ensure compliance.

Under the new *Environmental Offences and Penalties Act*, penalties have increased significantly. The Act establishes a three tiered framework of offences and penalties. These include: on-the-spot fines for minor infringements; fines of up to $125 000 for strict liability offences; and fines of up to $1 million or seven years jail for wilful or negligent action.

New South Wales generally imposes a higher level of fines for environmental offences than other Australian jurisdictions (Norberry 1992). In the period 1984-85, 15 prosecutions were initiated by the SPCC for environmental offences while, in 1990-91, this figure increased to 69 (excluding motor vehicle noise and emission prosecutions).[1]

Victoria

Regulatory functions are relatively centralised in Victoria compared to some other Australian states.

Administrative arrangements

The Environment Protection Authority (EPA) was established under the *Environment Protection Act 1970*. The Act outlines the Authority's powers, duties and functions. Within Victoria, the EPA is the main regulatory body, with jurisdiction over air and water quality, noise control, waste management and some aspects of marine pollution.

Local Port Authorities and the Ministry of Transport also have jurisdiction over aspects of marine pollution. Similarly, the Ministry of Planning and Environment jointly oversees land use planning and environmental impact assessments. There is also a twelve member Environment Council which provides advice to the Minister.

Another important body is the Recycling and Waste Reduction Council. Established in 1992, it aims to halve the amount of waste going to landfill by 2000. Another recent initiative was the industrial waste management policy (waste minimisation), which was proclaimed in November 1990. This policy

[1] These figures relate to charges laid, rather than successful prosecutions.

aims to reduce potential hazards to human health and the environment posed by industrial wastes, by minimising the generation of waste and by establishing waste minimisation as an integral part of pollution prevention.

Central to the EPA's operation is the development of State Environment Protection Policies (SEPPs) which can be prepared for any element of the environment and applied to the environment generally, or to specific segments. For example, a SEPP may involve the preparation and implementation of water catchment management strategies. SEPPs are designed to protect beneficial uses of the environment. Industrial waste management policies are utilised as a complementary tool to SEPPs.

Local municipalities in Victoria are responsible for planning control of freehold land through powers vested in them by the *Planning and Environment Act 1987*. These responsibilities are implemented within the Planning Scheme in each municipality, through the preparation of plans and the issue of permits for use and development of land.

Regulatory instruments

The most common instruments utilised by the EPA are licences, works approvals, notices (pollution abatement, noise abatement and clean-up), environmental improvement plans (EIPs), environmental audits (which are an important component of EIPs) and financial assurances (for site clean-ups). Works approvals are required from the EPA for works (eg process modification) which will cause, increase or alter a waste discharge. Following the issue of a works approval, operators of scheduled premises must obtain a licence (or an amendment to an existing one), which specifies the conditions under which on-going discharges to the environment are permitted. Licences may also include self-monitoring and reporting requirements. The EPA may also enforce pollution standards through pollution abatement notices.

EPA licence fees involve the application of the 'user-pays' principle. The fee incorporates a flat administrative component, as well as a variable component, weighted by the volume and nature of emissions.

In some cases, the EPA may refuse to issue a licence or works approval if applicants fail to adequately address waste minimisation options or if proposed discharges would violate policy limits. The EPA may require organisations to prepare waste management plans or conduct a waste audit as part of issuing or renegotiating licences or pollution abatement notices.

A new system of environmental management is being considered in Victoria. It proposes that firms which have demonstrated the capacity to consistently deliver

acceptable environmental outcomes be given greater autonomy in exercising their environmental responsibilities. The system is to be known as the "accredited licensee" system, and potentially offers significant benefits to participating firms — including the establishment of a performance based, whole of site "bubble licence". This will allow increased operational flexibility. For example, there is the potential for works approvals exemptions and licence fee reductions as a result of reduced EPA input in achieving the required level of environmental performance. The rationale for such a system is based on the view that the traditional 'command and control' approach has reached the point of diminishing returns (Government of Victoria 1993).

Victoria also attempts to promote waste minimisation via the Cleaner Production Grants scheme (CPG), which was introduced in 1988. This scheme provides an opportunity for firms installing cleaner production technologies to receive 10 year interest free loans. CPG is not intended to fund R&D projects, but to facilitate the commercialisation of proven technology. Many applicants have been successful in securing support for clean technology through the CPG scheme.

Enforcement

The EPA has released an enforcement policy which details its approach, and informs industry of its obligations under environmental protection legislation. The EPA perceives cooperation to be the first step in resolving instances of non-compliance, although prosecution is pursued if this approach proves unsuccessful. For example:

> ...increasingly industry is recognising the advantages of cooperation and consultation. But until all industry places as much importance on the environment as it does on profit, the need for punitive action from EPA will remain (EPA Information Bulletin 1990).

In 1990, the *Environment Protection (Fees and Penalties) Act* was passed. This increased penalties to a maximum of $1 million for companies and $250 000 for individuals, or seven years jail. In 1989-90 and 1990-91, the EPA made 50 and 32 successful prosecutions respectively, for breaches of Victoria's pollution laws.[2]

[2] These figures exclude motor vehicle prosecutions.

Queensland

Administrative arrangements

Queensland does not have an Environment Protection Agency. The Department of Environment and Heritage (DEH) is the central coordinating agency for environmental management in Queensland.

DEH has responsibility for administering environmental legislation relating to air, water, noise and contaminated land. The Department of Housing, Local Government and Planning has responsibility for environmental impact assessments (EIAs) and planning (although the DEH has an advisory role with respect to these matters).

There has been consolidation in the administration of environmental legislation in Queensland. For example, in 1988 the State Environment Advisory Council (SEAC) absorbed the functions previously undertaken by the Air Pollution Council, the Water Quality Council and the Noise Abatement Authority. The SEAC was to advise the Minister on matters relating to the prevention, abatement and mitigation of land, air and water pollution, and on technological advances relating to environmental management. However, no meetings were held in 1991-92 and the members were not reappointed in view of the Government's foreshadowed environment protection legislation.

The Queensland Government is currently rationalising the three relevant Acts (Clean Air, Noise Abatement and Clean Waters) into a single Environment Protection Act. Negotiations with Queensland Local Authorities on the prospect of devolving certain environmental management responsibilities are continuing. The extent of this responsibility will be detailed in the proposed new environmental legislation.

The Queensland Government is also planning to undertake further changes to the regulatory framework. For example, it is currently finalising a waste minimisation strategy which would enable a single department to be responsible for all aspects of waste minimisation, licensing, transport, treatment and disposal. In line with the Public Sector Management Commission's recommendations, waste management responsibilities in Queensland are in the process of being transferred from the Health Department to the DEH.

Other government bodies also have responsibility for elements of water quality, land use planning and marine pollution. For example, bodies with some responsibility in the area of marine pollution include local port authorities and the Department of Transport. Local authorities have jurisdiction over land use

planning and waste management — the latter responsibility being shared with the Department of Health.

The role of local government is prescribed by the *Local Government (Planning and Environment) Act 1990*. It details specific powers vested in local authorities in relation to town planning, subdivision and environmental matters.

Local government authorities may operate a planning scheme which involves zoning, development control plans, town planning and subdivision by-laws and the preparation of a strategic plan (which has the force of law).

However, in light of the current narrowly focused planning system, reform is underway. The *Local Government (Planning and Environment) Act Amendment Act 1992* is directed at streamlining the development approvals process. In the preceding review of Queensland's development approval system, "in excess of 400 separate approval processes and over 60 Acts affecting development were identified" (Queensland Department of Housing, Local Government and Planning 1993, p. 1) — which was causing frustrating and expensive delays. In response to these shortcomings, the Integrated Development Approval System (IDAS) was announced in April 1992, as part of Premier Goss' "Queensland — Leading State" economic package. The aim of IDAS is to integrate the majority of state and local government approvals in a single approval system based at local government level.

> Its [IDAS'] underlying rationale is that it is simpler and more efficient to do things once, using the existing Local Government land use and building approval system wherever possible (Queensland Department of Housing, Local Government and Planning 1993, foreword).

Another initiative has been the establishment of the Queensland Waste Management and Pollution Control Industry Task Force. It was established with financial support from the Department of Business, Industry and Regional Development to assist in the preparation of an industry development strategy for the waste management and pollution control industry in Queensland.

Regulatory instruments

Licences are the most important regulatory instrument in use in Queensland. Licences are issued by DEH to the occupier of premises from which a discharge occurs. Licensing requirements are currently under review, and consideration will be given to such issues as 'user pays', 'polluter pays', economic instruments and environmental risk.

Other less important regulatory instruments in use in Queensland include the recovery of expenses for monitoring programs, performance bonds for various

developments on Crown land and fines for non compliance with Acts and regulations.

The State Government has recognised that the current EIA process is deficient, in that processes are unclear and there are difficulties in determining responsible agencies for complex projects. In response, the Queensland Government has announced its intention to overhaul the process.

Enforcement

The current enforcement philosophy in Queensland involves the adoption of a conciliatory rather than an adversarial approach.

> Prosecution is less favoured as an option in some ... jurisdictions. In Queensland there have been twelve prosecutions under the *Clean Air Act* since its enactment in 1963, six prosecutions under the *Noise Abatement Act* since its enactment in 1978, and five prosecutions under the *Clean Waters Act* since its enactment in 1971. With few exceptions, the fines have been in the order of a few hundred dollars (Norberry 1992, p. 58).[3]

This reluctance to prosecute is borne out of faith in the negotiating and educational process, scepticism as to the benefit of prosecution, and a political environment that has traditionally been unfavourable to the prosecution of polluters (Norberry 1992).

As previously mentioned, however, an *Environment Protection Act* has been proposed for Queensland. It is intended that, with the inception of the Act, enforcement will be through environment protection notices, infringement notices, injunctions and a three tier level of offences and penalties.

In addition, a Planning and Environment Court has been established in Queensland. It will provide specialist consideration of environmental appeal cases. The Land and Environment Court currently performs a similar role in New South Wales.

Western Australia

The Western Australian EPA, like its counterparts in New South Wales and Victoria, is the central environmental regulatory body in the State.

[3] These figures relate to charges laid rather than successful prosecutions.

Administrative arrangements

The EPA, which was originally established in 1971, assumed a number of the functions previously undertaken by the Department of Health and Medical Services and the Department of Environment and Conservation, when the recast *Environmental Protection Act 1986* was proclaimed in February 1987. This gave the EPA jurisdiction over air and water quality, noise control, marine pollution, land use planning and environmental impact assessments.

The Western Australian Authority is significantly different from the other state agencies. For example, the EPA is the responsible agency for the administration of environmental impact assessment — a function carried out by planning agencies in some other jurisdictions. The Authority delegates a number of its pollution control powers to other agencies. For example, the Water Authority manages water pollution control under delegated powers (RAC 1993c).

Other agencies also have important roles. For example, the Department of Marine and Harbours is involved in some aspects of marine pollution. The Health Department has responsibility for regulating waste management. A Waste Management Authority has been proposed for Western Australia. It would function in a similar fashion to the South Australian Waste Management Commission. A decision will be made after negotiations with local government.

Local government in Western Australia has a role in the planning, development and management of land through powers vested under the *Local Government Act 1960*. Local government authorities are responsible for Town Planning Schemes, which may involve the zoning of land (ie residential/commercial), as well as development schemes. These schemes have the full force of law once gazetted and approved by the Minister for Planning.

Regulatory instruments

A range of instruments are used by WA agencies to implement environmental policies. For example, most premises discharging waste, particularly toxic or hazardous wastes, must be licensed under the *Environmental Protection Act*. Offences include pollution, improper discharge of wastes and failure to comply with prescribed standards or licence conditions. Clean-up costs can be recovered from owner/occupiers (Waste Management and Environment 1992). Other regulatory measures include permits, works approvals and pollution abatement notices.

Enforcement

Western Australian authorities have traditionally preferred to develop cooperative relationships with industry, and to use negotiation and education to secure compliance. Prosecution is viewed as a last resort. There were four successful prosecutions under the *Environmental Protection Act* in 1990-91.

The EPA perceives its long-standing strategy of education and cooperation with industry as being the most effective in achieving environmental goals, and considers that prosecution engenders antagonism.

The EPA has taken a broad perspective — balancing the relatively insignificant environmental effects of minor infringements against potentially negative employment effects that may occur as a result of over vigorous enforcement (Norberry 1992).

South Australia

The South Australian Government is currently considering a proposal to create an EPA. If implemented, this would significantly centralise and rationalise the regulatory framework. It is proposed that the EPA will become the prime regulatory body.

Administrative arrangements

At present, the Department of Environment and Land Management administers legislation relating to air quality, noise control, beverage containers and aspects of marine pollution; the Department of Housing, Urban Development and Local Government Relations is responsible for land use planning and environmental impact assessments; the Department of Engineering and Water Supply regulates water quality; the Waste Management Commission is responsible for solid and liquid waste management; and the Department of Marine and Harbours has jurisdiction with respect to certain areas of marine pollution. The South Australian Health Commission regulates areas of public and environmental health, including protection from radiation hazards. The Department of Mines and Energy has environment protection responsibilities in relation to mining and petroleum activities.

It is proposed that the EPA will take responsibility for environment protection in relation to air quality, noise control, beverage containers, marine protection, waste management, water quality and some areas of mining and petroleum activities. The EPA will also undertake a program of environmental monitoring and reporting.

The EPA's running costs will be approximately $8 million annually. Funding will be drawn from several sources, including a surcharge on fuel franchise fees, waste disposal levies, fees from activities requiring an environmental authorisation and an expected contribution from expiation fees and other penalties.

Local government has a role to play in planning policy through powers vested under the *Planning Act* (currently being replaced by the *Development Act 1993*) and the *Local Government Act 1934*. Responsibility for planning is currently shared with the State Government.

Councils are generally responsible for decision making in relation to development control and certain land management issues. However, in certain circumstances, the development control decision-making power rests with the South Australian Planning Commission (SAPC) (eg for major projects that require an environmental impact assessment). The SAPC is an independent body which, inter alia, advises the Minister for Housing, Urban Development and Local Government Relations on matters relating to the development of land. The SAPC will be replaced by the Development Assessment Commission in October 1993.

In South Australia there is also a Marine Environment Protection Committee (as a committee of the Environment Protection Council with delegated functions), to advise the Minister on the adoption of regulations and statutory instruments for licensing point source discharges into the marine environment. The Council and the Marine Committee will be replaced by the new EPA.

Community input to the policies of the EPA is to be provided through the establishment of an Environment Protection Advisory Forum, public consultation on development of environment protection policies, and issuing of environmental authorisations and a range of other avenues. Specialist committees are also likely.

Regulatory instruments

South Australia, like other states, currently utilises licences as its major regulatory instrument. In particular, licences are required to operate waste depots and for the collection and transportation of waste. Industrial or commercial processes producing prescribed waste must also be licensed. Licensing or similar arrangements also exist in relation to air quality, ozone protection, beverage containers, marine discharges and discharges affecting water quality. Exemptions in relation to noise standards and other provisions are possible in some circumstances.

Under existing arrangements in South Australia, "there is no coordinated approach to environmental protection" (Norberry 1992 p. 61). At present, industries are often regulated under several Acts and may need to hold several licences. However, new arrangements will involve replacing six Acts and licensing systems with one single Act and a composite EPA licence. This will lead to a more coordinated and streamlined environmental protection system.

In addition to licences, development authorisations or works approvals are required to construct, or alter, plant and equipment used in "environmentally significant activities".

Enforcement

In the past, enforcement of environmental regulation has generally been seen as a last resort. For example, in 1990-91 there were three noise pollution prosecutions and no air pollution prosecutions (South Australian Department of Environment and Planning 1991). Governments have been conscious of working constructively with industry, rather than adopting an adversarial approach.

However, legislation is now in place which provides for significant penalties for deliberate contravention of regulations. For example, maximum fines of $250 000 can be imposed, or seven years jail for individuals, and maximum fines of $1 million may apply to companies in relation to offences under the *Marine Environment Protection Act* and the *Water Resources Act*.

In addition, offences may result in revocation of licences or other sanctions, including payment of clean up costs. The proposed EPA will have additional powers including, for example, a specified power to require an environmental audit and environmental improvement programs.

Tasmania

Administrative arrangements

Environmental regulation in Tasmania is highly centralised. The Department of Environment and Land Management has jurisdiction over most regulatory areas, including air and water quality, noise control, waste management, marine pollution and environmental impact assessments. Local government also has involvement in the regulation of waste management and land use planning. Local Port Authorities oversee aspects of marine pollution.

Under the *Local Government Act 1962*, local government is responsible for the development and control of private land use, building control and public health. Municipal councils have responsibility for planning and development consent with respect to private land and the enforcement of building and public health regulations. However, they do not at present have control over such matters with regard to Crown land.

The *Local Government Act 1962* is currently undergoing revision as part of the "Local Government Modernisation Program". This is expected to result in a rationalisation of functions and financial relations between state and local government in Tasmania, leading to more effective local government participation (RAC 1993b).

The State Government recognises current business frustrations in obtaining planning approvals, and so:

> ...will subject the whole range of regulatory and planning approvals, including those of local government, state regulatory authorities and the Town and Country Planning Commission to a rigorous examination with a view to removing unnecessary red tape and bureaucratic procedures (RAC 1993b, p. 40).

In terms of advisory bodies, there exists the Environment Protection Advisory Council and the Waste Management Advisory Committee. The latter body aims, inter alia, to reduce waste to landfill by 50 per cent by the year 2000.

Regulatory instruments

As is the case with most other Australian states and territories, licences are the major regulatory instrument utilised in Tasmania; and:

> ...all applications for licences under the Environment Protection Act, or variations to licences, are subject to environmental impact assessment (Tasmanian Department of Environment and Planning 1992, p. 52).

The Minister for Environment and Land Management has the authority to exempt firms from compliance with emission standards under the *Environment Protection Act 1973*. However, it has been announced that no new exemptions will be granted, and current exemptions will be phased out by 30 June 1994.

An innovative program introduced by the Department of Environment and Land Management, is the "Performance Improvement Plan", whereby firms that are not currently complying with emission standards must develop and implement such a plan to reduce emissions to the relevant standard.

Recently, significant expenditure has been committed by industrial and municipal operators to eliminate the need for their ministerial exemptions. One drawback of the exemption system is that it provides little incentive for firms to

invest in new technology — leading to unsatisfactory environmental performance.

Other instruments include Municipal Planning Schemes, fees, charges, building and health controls and sea dumping permits.

There is also an "Industry Group Review" program which summarises, on an industry basis, the environmental performance of an industry group and highlights specific industry-related problems. It is hoped that this mechanism can provide:

> ...positive feedback to industry associations so that an increased environmental awareness can be communicated to operators, and mechanisms for addressing specific industry related problems can be developed (Tasmanian Department of Environment and Planning 1992, p. 55).

Enforcement

Tasmania, like most other Australian jurisdictions, has not traditionally enforced environmental protection legislation vigorously. A discussion paper on the Tasmanian *Environment Protection Act* stated that:

> The statutory backing for enforcement has been weak and penalties for non-compliance have been minimal. Courts have not imposed deterrent fines. The legislation has relied on 'command and control', and there have been no incentives or inducements which encourage the adoption of state of the art pollution control technology. Economic and other policy instruments have not been applied to secure better protection for the environment (Tasmanian Department of Environment and Planning 1991, p. 14).

As an alternative to enforcement, Tasmania has preferred to improve environmental performance by education and the adoption of a general conciliatory approach. For example, no significant prosecutions for violations of environmental regulations were carried out in 1991-92.

New environmental legislation under consideration in Tasmania will be based on the principles of best available technology, waste minimisation and clean production. Concentration will no longer be on end-of-pipe emission levels, but on ambient environmental considerations.

Northern Territory

Administrative arrangements

Responsibility for administering environmental legislation in the Northern Territory is spread between a number of agencies. For example, the regulation

of water quality is the responsibility of the Power and Water Authority's Water Resource Division. The Department of Mines and Energy regulates water quality on mine sites. The Department of Health oversees aspects of noise control (police and local government also have a role). The Department of Transport and Works (Marine Office) regulates marine pollution and the Conservation Commission oversees environmental impact assessments and heritage conservation, and coordinates the waste management and pollution control activities of other agencies. The Department of Lands has a role in land use planning.

Local government is involved indirectly in the planning process in the Northern Territory through its representation on the Planning Authority. The *Planning Act 1989* establishes the Planning Authority, and provides for the Authority to make a "Planning Instrument" in respect of any land. Public consultation is required in this process, including negotiation with affected land owners — only then can the Planning Instrument be submitted for Ministerial approval (Holm 1993).

Although the Conservation Commission administers EIA and heritage legislation, the Commission:

> ...has very little power to compel substantive behaviour, but rather acts in an advisory capacity to those authorities such as the Department of Mines and Energy, which do have specific regulatory powers (Grabosky & Braithwaite 1986, p. 46).

The EIA process in the Northern Territory is currently under review, with amendments expected by early 1994.

Government Ministers may, at their discretion, constitute Committees or Panels on specific environmental issues (eg there is a Water Advisory Committee and a Water Resources Review Panel). The aim of these bodies is to provide a forum for community and other interests to participate in environmental policy making. An Ozone Protection Consultative Committee has also been formed. It consists of industry and government representatives.

Regulatory instruments

Licences are the major regulatory instrument utilised by the regulatory agencies. However, agencies often attach operating conditions to other instruments such as exploration permits, leases on land and development approvals.

Enforcement

The Northern Territory Government adheres to a policy of consultation and negotiation, and views prosecution as a last resort. The Conservation

Commission has no power to prosecute, but can make recommendations to other Ministers and can compulsorily audit the operations of firms to assess compliance. The power to prosecute firms and individuals therefore rests with administering agencies. Up until the late 1980s, no corporate prosecutions for environmental offences had been made in the Northern Territory (Grabosky and Braithwaite 1986).

In addition, some agencies, such as the Energy and Health Departments can respond to pollution incidents in the mining industry by shutting down operations. This power has been used infrequently in the past, and it is viewed as a last resort.

Australian Capital Territory

The environmental regulatory framework in the Australian Capital Territory (ACT) is relatively centralised.

Administrative arrangements

The Office of the Environment (OE), within the Department of Environment, Land and Planning (DELP), is responsible for the formulation and administration of controls on air, water and noise pollution, and controls on chemicals and hazardous wastes.

The Pollution Control Authority (PCA) exists as a statutory body. The General Manager of the OE is currently appointed as the PCA, and exercises the powers given to that office under the Act.

The ACT Planning Authority, which exists as an arm of DELP, has responsibility for land use planning and environmental impact assessments in relation to ACT land, and the National Capital Planning Authority has similar responsibilities in relation to Commonwealth land, and some ACT land with national significance.

In terms of community consultation, DELP engages in regular meetings with the Conservation Council (which represents several local environment and conservation groups).

Regulatory instruments

Air and water pollution legislation provides for the issuing of pollution abatement notices by the PCA for non-compliance. These require remedial action to be taken within a specified period, otherwise prosecution may be

initiated. Licences to discharge waste are a complementary regulatory tool utilised by the PCA.

Enforcement

The philosophy of the OE with regard to enforcement is to initially inform and educate polluters of their need to amend their activities. Only if this approach proves unsuccessful will prosecution be pursued.

The ACT Government performs the unusual dual role of being both a Territory/local government combined. This means the ACT Government is involved in much of the day-to-day enforcing of environmental legislation, usually the precinct of local councils in other jurisdictions.

APPENDIX C: NEW WASTE MANAGEMENT POLICIES AND LEGISLATION IN THE FEDERAL REPUBLIC OF GERMANY

C.1 Introduction

This appendix outlines the significant legislative changes proposed and implemented over recent years in Germany to solve the solid waste problem. While some of the legislative changes may not be directly relevant to Australia, the German approach to solid waste management is being increasingly adopted by the European Community (EC) and countries like Sweden. Thus, many of the changes will indirectly impact on Australia's exports to these countries. Also, the adoption of 'sustainable economic development policies' by the Australian Government will accelerate the implementation of similar solid waste management legislation in Australia.

C.2 Environmental concerns in Germany

Protection of the environment is a high profile issue in Germany with the public demanding that action be taken to deal with a perceived environmental crisis. A 1992 opinion poll commissioned by the Federal Environment Ministry indicated that 74 per cent of the German population believed there was an existing environmental crisis (Schnurer 1993). However, most people, (84 per cent), believed that the existing environmental crisis could be solved with appropriate government legislation providing the framework for the environment industry to develop and implement technological solutions. The highest ranking environmental problems were the ozone layer and air pollution, both of which require international cooperation to solve. The next major problem was solid waste — a problem that can be dealt with at the national level.

Public opinion on measures to solve the waste problem were contradictory. Only 23 per cent were prepared to pay higher waste disposal costs. Similarly, only 39 per cent would approve incineration of waste and only 22 per cent considered landfill as an acceptable disposal method. There was, however, strong community support for recycling, with 98 per cent of respondents using

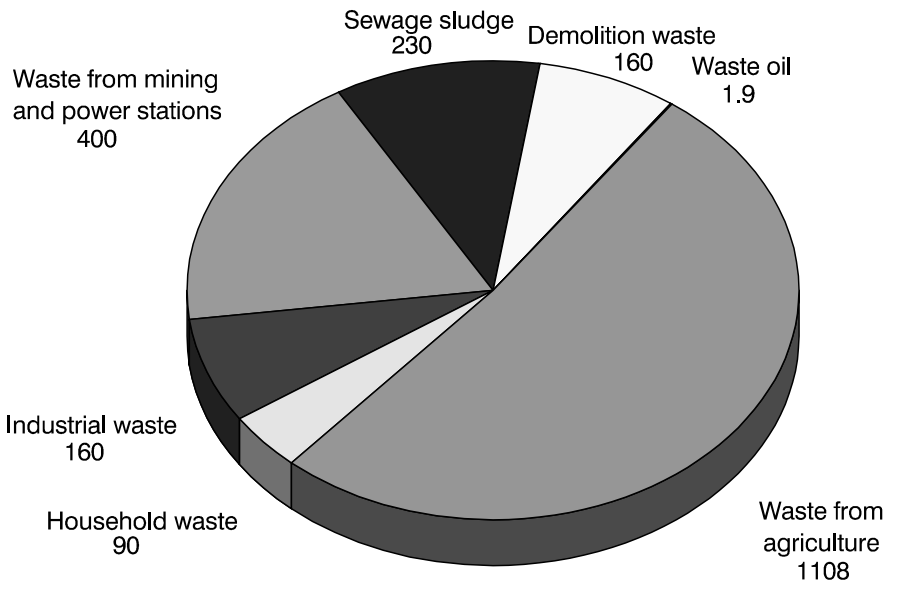
the glass recycling facilities and 97 per cent using the paper recycling facilities located throughout the country (Schnurer 1993).

C.3 The solid waste problem

The quantity of waste generated

About 2 billion tonnes of waste per year is generated annually in the EC (see Figure C.1). Over half comes from agriculture and forestry, which is recycled directly into the natural ecosystem without posing any problems for community's waste disposal facilities. The remaining categories of waste require legislation and management systems to ensure that disposal occurs in an environmentally acceptable manner.

Figure C.1: **Waste generation in the European Community** (million tonnes)

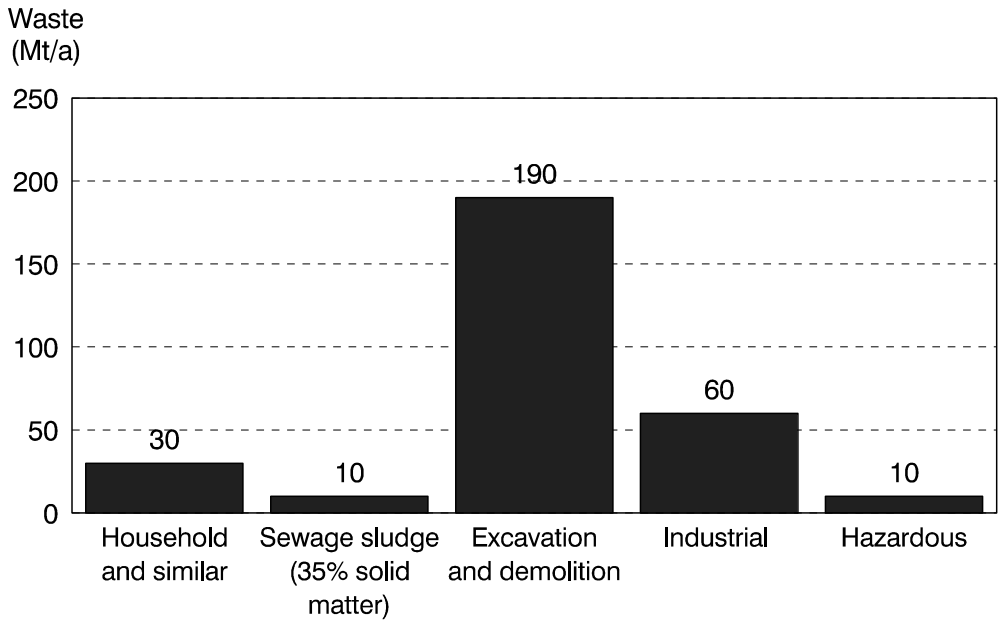


Source: Schnurer 1993.

In Germany (excluding the former East Germany), waste generation in 1990 was around 300 million tonnes. The composition of this waste is shown in Figure C.2.

In addition to the 10 million tonnes of designated hazardous waste, high levels of hazardous substances may also be contained in domestic waste, construction waste, commercial waste and sewage sludge. Inappropriate disposal of these wastes in the past has led to pollution legacies which have to be dealt with now. Tens of thousands of potentially contaminated sites have been registered in Germany with an estimated clean up cost of between 50 and 100 billion Deutschmarks (about $A45 billion to $A90 billion) (Schnurer 1993).

Figure C.2: **Waste generation in Germany (excluding former GDR)**



Source: Schnurer 1993.

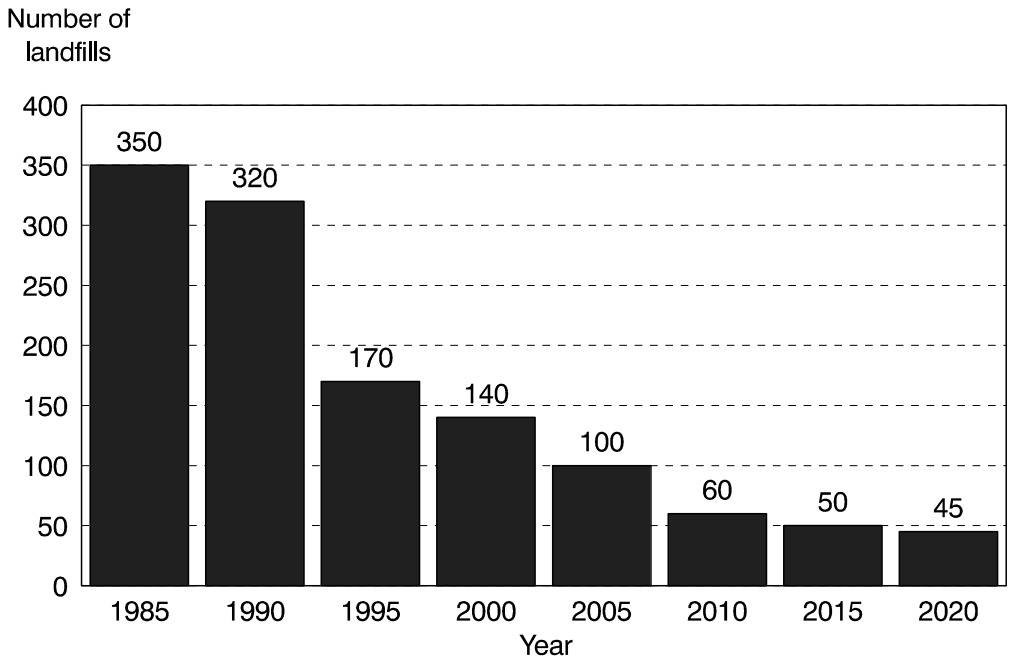
Lack of disposal capacity

The siting of new landfill facilities and incineration plants has encountered massive resistance by nearby residents who have yet to be convinced that these facilities can be managed on a safe and environmentally sound basis. In 1975, there were about 4500 landfill sites. By 1985, the number had fallen to 350. In about five years, half the domestic waste landfill capacity will be exhausted,

with little prospect of replacing it with new landfill capacity (see Figure C.3). There is a wide consensus in Germany that waste levels must be drastically reduced by avoidance and recycling. However, the lack of economic incentives for the producers of waste to avoid and recycle mean that these solutions are unlikely to succeed.

Germany was, until recently, able to export its waste to other countries. However, many consider that this is not a long term solution, as was demonstrated by France's decision to ban the import of domestic waste from 1992. This caused major difficulties for southern Germany and other European countries dependent on the export of waste.

Figure C.3: **Remaining landfill capacity in Germany**



Source: Schnurer 1993.

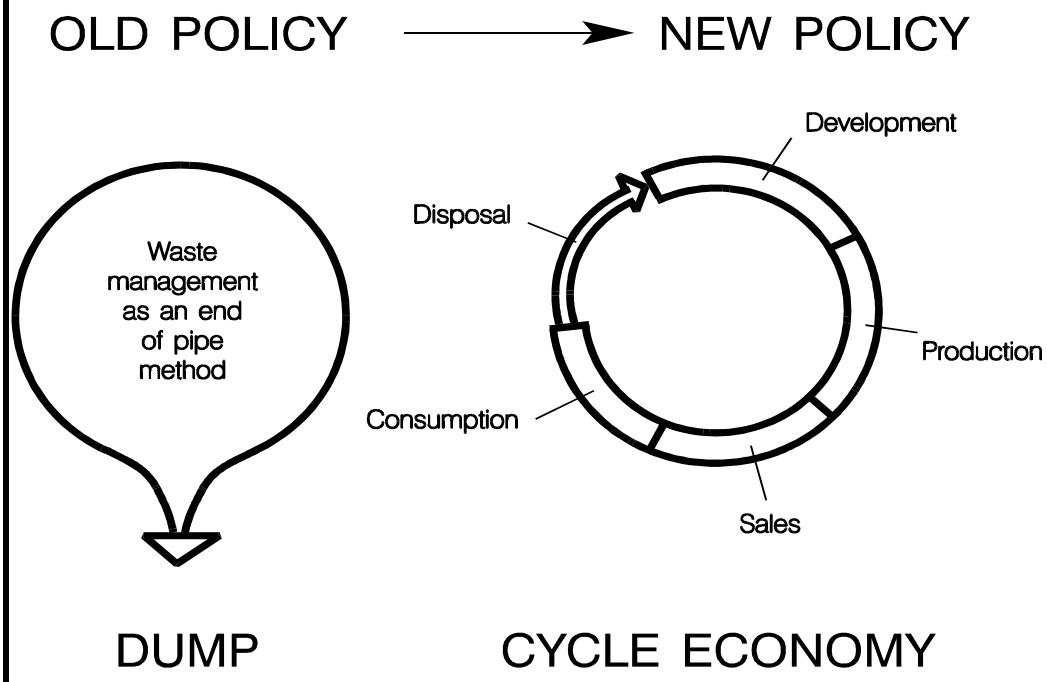
C.4 The German Government's response

Problems with the Waste Act of 1986

The *Waste Act 1986* had, as its primary objective, the avoidance, reuse and recycling of waste, all of which were given priority over traditional waste

disposal to landfill. The Act failed to drastically reduce the quantity of waste generated and to ensure the environmentally sound disposal of the remaining wastes. The Act allowed the owner of a substance to determine whether it was waste and therefore subject to the Act. This gave rise to many legal and illegal possibilities to evade the provisions of the Act (eg by classifying substances similar to waste as economic goods, residual materials, substitute fuels etc). The Act also embodied the traditional 'end of pipe philosophy' to waste management, based on the principle that any waste arising is to be disposed of cheaply with little concern for the environmental impacts (see Figure C.4) (Schnurer 1993).

Figure C.4: **Changes in environmental policy**



Source: Schnurer 1993.

New waste management policy

The new policy adopts a new philosophy based on a 'cycle economy' which embodies approaches which take effect as the waste is generated. This means that the waste problem must be considered in all phases of the product cycle — raw material extraction and preparation, the production process, the product itself, its marketing, consumption and final disposal. Implementing this new policy required changes in:

- production techniques;
- so-called product responsibility;
- disposal standards;
- economic instruments; and
- international cooperation.

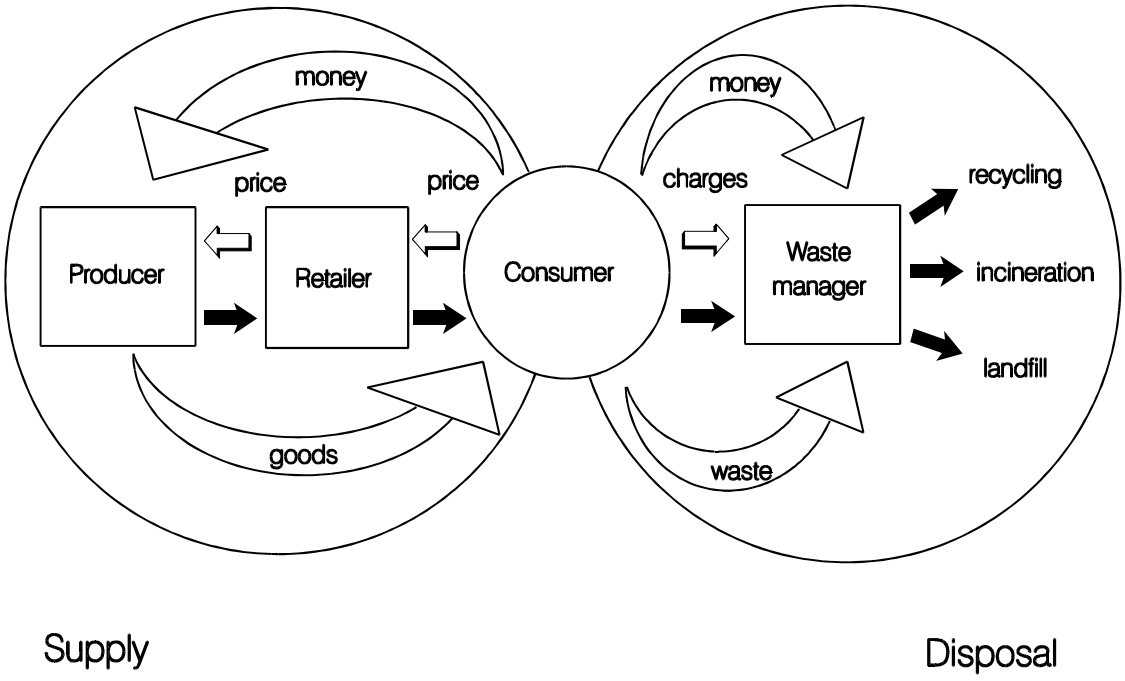
The new policy aims to encourage the modification of production techniques so that waste residuals are reused within the firm itself. Where this is not possible, the materials used should have properties which enable them to be used in other external production processes. Direct state intervention into production processes are to be avoided, but incentives and 'polluter-pays' policies are to be applied.

Product responsibility involves the manufacturer being made generally responsible for the environmentally sound disposal of products. To this end, manufacturers are obligated to take back used products at the end of their life cycle. The trade sector is to be included in product responsibility, utilising its distribution logistics and experience to facilitate the return of used goods. The costs of additional tasks associated with returning, sorting, processing, recycling and disposing of products will be included in the price of the goods to be borne by the consumer, thus enabling the market to reward those who respond to the new tasks more efficiently. Figure C.5 shows the old system where the consumer paid the 'waste manager', usually the local council to collect and dispose of any consumption waste. The producer and distributor/retailer's responsibility for the waste ceased on sale of the product to the consumer.

The new waste management policy approach is shown in Figure C.6, where both physical and economic responsibility for the disposal of any consumption waste is transferred from the local council to the producer and distributor/retailer. This provides a direct economic incentive to the producer and distributor/retailer to avoid or minimise waste.

Stringent standards placed on the environmentally sound disposal of unavoidable residuals materials which cannot be recycled or reused are required to ensure pretreatment prior to final disposal. The pretreatment is required to create inert and, as far as possible, insoluble residues which can then be dumped without risk. To complement the technical and organisational provisions, the German Government plans to use economic policy instruments. Some of the states in Germany have levied a charge of up to 300 Deutschmarks per tonne of special waste to provide an incentive for waste producers to avoid or recycle waste of this kind. A national charge on all waste is being investigated to assess whether the benefits of such a charge would outweigh the costs.

Figure C.5: **Old waste disposal system — supply not linked to disposal**



Source: Schnurer 1993.

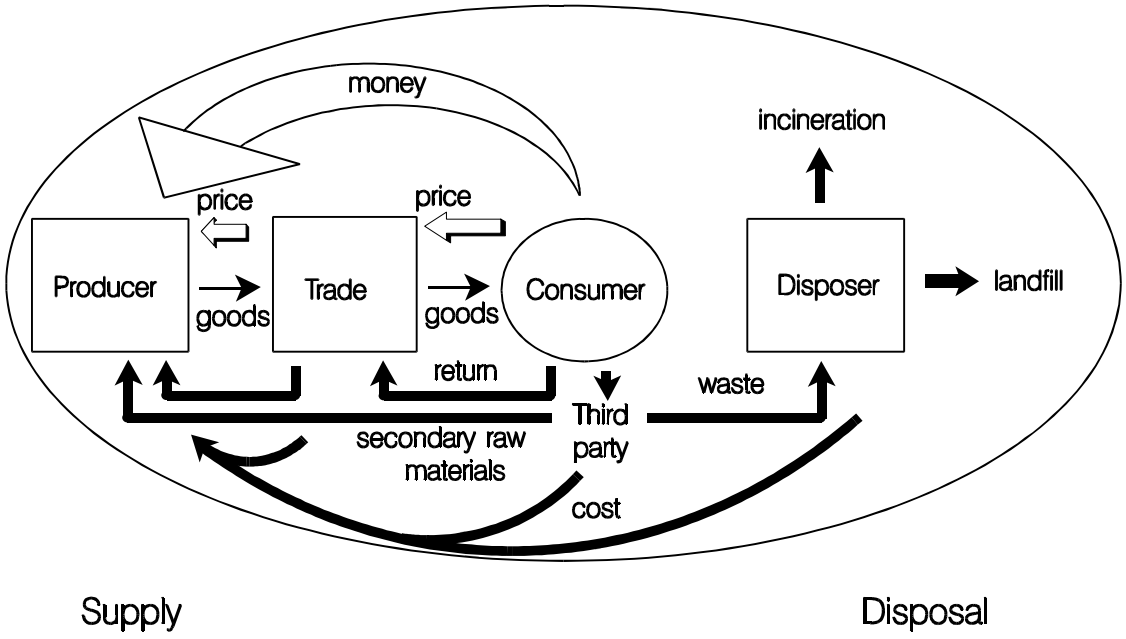
Finally, as a member of the EC and a major international trader, Germany's waste legislation must not discriminate against foreign producers or between domestic goods and imported goods. Free movement of goods, however, does not apply to the export of waste. The future EC provision on this matter will specify that the export of waste for final disposal is only permissible within countries of the EC and EFTA.

Proposed Cycle Management and Waste Act

In order to implement the new waste management policy described above, a new *Cycle Management and Waste Act*, together with ordinances containing product-related regulations and administrative provisions dealing with technical aspects, are being formulated. The new Act covers ten major areas as follows:

1. The scope of the new Act is considerably extended and a new term 'residual material' has been introduced. Residual material is deemed to be all substances which arise in production plants where the principle objective is not to manufacture these substances. Residual material also includes all products at the end of their useful life.

Figure C.6: **New waste disposal system — supply linked to disposal**



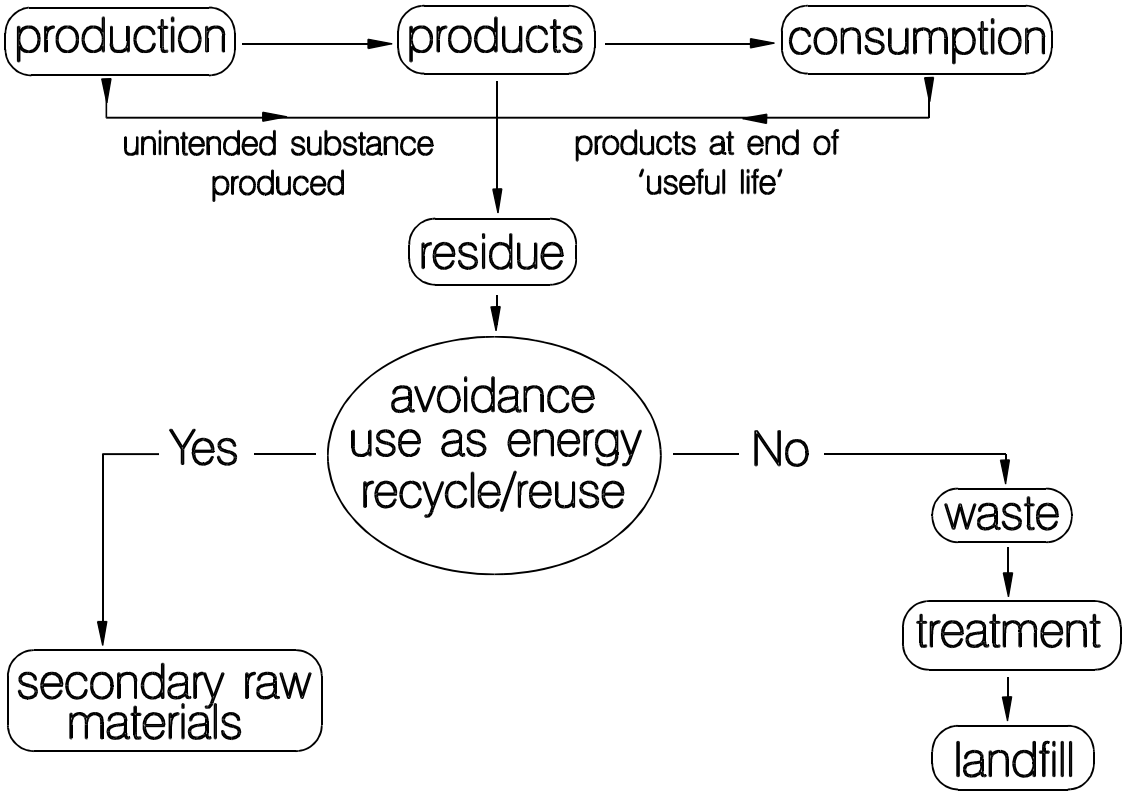
Source: Schnurer 1993.

2. There is a hierarchy of priorities consisting of five elements:
    - avoidance;
    - recycling/reuse;
    - use as energy;
    - pre-treatment; and
    - dumping.

The first three steps listed above are aimed at creating *substance cycles* in which the residual materials are called *secondary raw materials*. The last two steps are aimed at breaking the cycle for hazardous substances contained in, or generated by, poor disposal practises. Residual material in these two steps are defined as *waste*. Waste, therefore, consists of those residual materials which cannot be recycled or reused as secondary raw materials. Figure C.7 shows the relationship between residue, secondary raw material and waste.

3. Criteria are being developed to distinguish between these individual steps.

Figure C.7: **The new definition of waste**



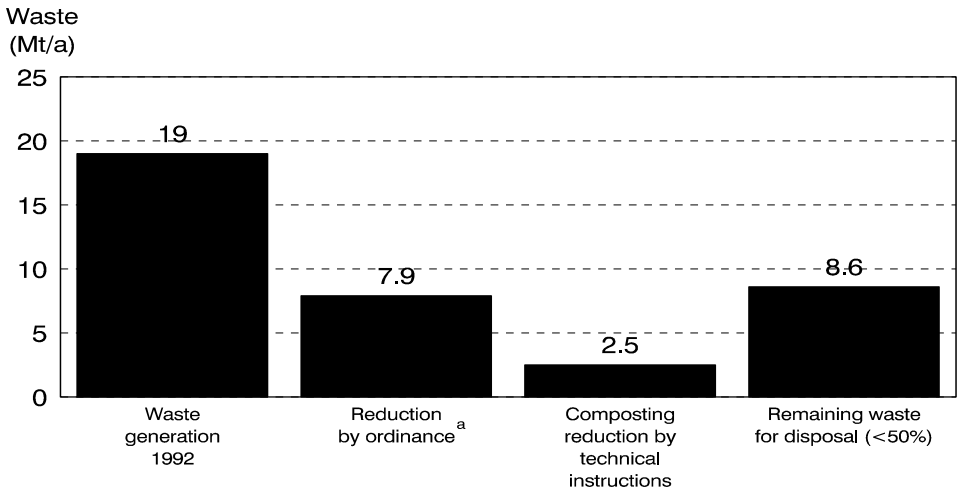
Source: Adapted from Schnurer 1993.

4. The new Act introduces the general principle that producers are also responsible for the recycling and disposal of their products. Given the range of products available, ordinances are to be issued for particular product groups. The responsibility is exercised through the obligation to accept the return of the used product. The ordinances also require the owner of the specified product — the consumer — to return it and not simply dispose of it in the rubbish bin (see Figure C.6).
5. It is envisaged that associations or chambers of commerce will be set up to establish substance cycles or to dispose of waste where the market for specified products is supplied by a large number of small firms.
6. State or regional waste management authorities are required to develop integrated waste management plans with realistic objectives.
7. In order to speed up the siting of waste disposal facilities in densely populated areas, where local authorities have a financial incentive to approve residential and commercial development, it is proposed that regional planning, town planning and waste disposal planning be integrated.

8. To speed up the construction of new waste facilities, plants for recycling, treatment or even incineration will be subject to the same approval procedures as other industrial plants. The only exception to this will be the approval process for siting landfills where special provisions will apply.
9. Simple balance sheets will apply to control and monitor secondary raw materials. In the case of hazardous residual materials, special survey procedures will apply. No differentiation will be made between hazardous waste and hazardous secondary raw materials.
10. The new Act will integrate the requirements of international agreements (EC, OECD, and the Basel Convention) and include the new waste schedule with a structure based on the origin and properties of waste being drawn up by the EC.

In summary, the new cycle management and *Waste Act* extends waste legislation to now become a *Substance Act*, and shifts the responsibility for waste disposal to the manufacturer of the residual material. The authorities role is the monitoring of substances, the licensing of plants and the securing of sites for waste facilities. The projected annual reduction in household waste due to the new *Cycle Management and Waste Act* is shown in Figure C.8.

Figure C.8: **Possible reduction of household waste**



a Packaging Ordinance 5.1 Mt/a, Waste paper Ordinance 2.0 Mt/a, Electric appliances 0.8 Mt/a.
Source: Schnurer 1993.

C.5 Ordinance on the avoidance of packaging waste, June 1991

Objectives

This ordinance has the following objectives:

(i) encourage the manufacture of packaging from materials which can be recycled or disposed of in an environmentally acceptable manner;

(ii) minimise the waste from packaging by restricting the volume and weight to that actually required to protect the contents and to market the product; and

(iii) encourage the design of refillable packages where this is technically and economically feasible and compatible with regulations applying to the contents.

Scope of Packaging Ordinance

The ordinance defines three types of packaging — transport, sales and secondary. It applies to manufacturers of packaging or products from which packaging is directly manufactured and 'distributors' who bring into circulation packaging, products from which packaging is directly manufactured or packaged products at any commercial level. This ordinance came into force in various stages and, since 1 January 1993, has applied to the major areas of sales packaging. From that date, distributors have been obliged to take back at the point of sale the packaging from packaged products (Schnurer 1993). After much lobbying and opposition by the packaging manufacturers and distributors, the Minister of the Environment agreed that they could be relieved of this obligation by taking part in an alternative comprehensive system to collect packaging directly from the consumer. Should this alternative system fail to meet the specified two-thirds recycling or reuse targets by 1 July 1995, distributors will be obliged to take back packaging at the point of sale. The Packaging Ordinance sets targets both in terms of percentage collected by material type and percentage of collected material which should be recycled (see Table C.1).

Table C.1: **Packaging Ordinance targets** (per cent)

Packaging materials	*From 1 January 1993*			*From 1 July 1995*		
	Collection	*Sorting*	*Total recycled*	*Collection*	*Sorting*	*Total recycled*
	%	%	%	%	%	%
Glass	60	70	42	80	90	72
Tin plating	40	65	26	80	90	72
Aluminium	30	60	18	80	90	72
Cardboard, carton	30	60	18	80	80	64
Paper	30	60	18	80	80	64
Plastics	30	30	9	80	80	64
Compounds	20	30	6	80	80	64

Note: From 1 January 1993 to 30 June 1995, the percentages for collection will also be considered attained if, on average, a total of 50 per cent of all packaging materials are collected. The percentages for sorting will be valued for the actual percentages for collection of individual materials.

The alternative system — the Duales system

This is organised by a private firm known as the Duales System Deutschland GmbH (DSD). The 800 shareholders, each holding two $10 000 shares in this company, are major German packaging manufacturers and distributors. The initial capital cost is estimated at $7 billion and annual running costs at $2 billion (Schnurer 1993). These costs are covered by the granting of a licensing symbol known as 'the green dot', and the charging of a fee based on the volume of the packaging as shown in Table C.2.

Table C.2: **Licence fees for sales packaging**

Volume	*Licence Fee*
(litres)	(pfennings/package)
0.0 - 0.2	1.0
0.2 - 3.0	2.0
3.0 - 30.0	5.0
> 30.0	20.0

It was estimated that there was approximately 150 billion packaging units. With the average fee/package of 3.0 pfennigs, total annual revenue would be $A4.5 billion. The packaging materials to be collected and recycled are:

- glass — clear, brown and green collected in bottle banks based on 500 people or 500 metres to travel (relaxed in rural areas);
- paper — cardboard, paper and cartons placed in blue bins located at source;
- light fraction — consists of plastic films, plastic bottles, polystyrene (including cups), polypropylene, five layer tetrapak, aluminium and ferrous metal placed in yellow plastic bags at source.

Collection frequencies are two weeks for glass and four weeks for paper and the light fraction. Because 75 per cent of the paper collected is non packaging paper in the form of newspaper, magazines and cardboard, DSD only subsidises 25 per cent of the total paper collected from the blue bins. Any packaging material collected via the Duales system which cannot be recycled is disposed of as waste, generally to landfill. This waste attracts a differentiated penalty disposal fee which ranges form $A800 to $A1000 per tonne and is paid by Duales (Rief 1993, personal communication).

DSD awards contracts on a county-wide basis which cover approximately 250 000 people, with each contract amounting to about $A12 million in value. About 60 per cent of the contracts are awarded to the private sector, 18 per cent to local authorities/GBEs and 20 per cent to joint private/GBEs programs.

Evaluation of the Duales system

Generally, public reaction has been favourable to the green dot licensing system. The packaging market has reacted to the Packaging Ordinance in many areas:

- superfluous packaging is being avoided;
- levels of packaging are being reduced;
- in many areas reusable packaging is being introduced;
- to meet the demand for recycling and reuse, packaging is becoming more homogenous and easier to recycle;
- packaging which is easy to recycle or reuse is gaining market dominance over packaging where this is difficult; and
- new systems for collection, sorting and recycling/reuse of packaging are now being developed (Schnurer 1993).

The packaging material from a technical perspective causing major problems is plastic. Schnurer claims the plastic industry in Germany in the past has made little effort to develop the recycling of its product and is now paying the penalty through loss of market share. In future, new technologies will need to be developed to ensure the necessary recycling or reuse of plastic packaging. It is

therefore expected that higher licensing fees will be levied by the Duales system for plastic packaging. From the evidence to date, this market-oriented path is proving its worth in practice. It is, therefore, planned to introduce further similar provisions for other products.

There is a special ordinance on packaging for products containing hazardous substances. This packaging is causing problems for the Duales system as it increases the cost of recycling and is a hindrance for the environmentally sound disposal of remaining solid waste from households and commercial enterprises (Schnurer 1993). The other product is graphic paper which includes newsprint, magazines and office paper where 2.5 billion tonnes per year is disposed of as waste.

It was recently reported that the companies that pick up recyclable plastic are owed $A788 million by the companies that make recycled products. The waste pick up companies announced they would stop pick ups unless they are paid immediately. More than 400 000 tonnes of plastic rubbish is expected to be collected — five times more than can be recycled. More than half the companies whose products carry the green dot, and are therefore placed in the recycling bins, are not paying their fees to DSD.

While the technical and physical success of the Duales system in collecting and sorting packaging materials is widely accepted, the failure to find markets for the secondary raw materials generated by the Duales system has created serious problems in the EC. The infant recycling schemes in Britain, France, Spain and Italy are being threatened by German exports of recycled packaging materials (Hay 1993). France banned the importation of unsorted municipal solid waste from Germany in July 1992 and now threatens to ban the importation of sorted recyclable solid waste. The German Government recognises and accepts that market disruption in foreign countries and lack of domestic markets for sorted recyclable solid waste are major problems. It is investigating policy options to solve these problems (Szelinski 1993, personal communication). Export of sorted recyclable solid waste is not considered to be a viable long run solution.

C.6 Waste disposal standards

Technical standards are being drawn up for the disposal of remaining solid waste to accompany the legislative provisions of the *Cycle Management Act* and product related regulations. As a first step, the *Technical Instructions on Hazardous Waste* were issued on 1 April 1991. These instructions provide detailed criteria and instructions for the total management of hazardous waste from ‘conception to grave’.

In August 1992, the Federal Government passed the *Technical Instructions on Waste from Human Settlement*. These instructions apply to domestic waste, similar commercial waste, municipal sewage sludge and construction debris. They will provide local councils and regional authorities with detailed criteria and guidelines on waste avoidance, recycling, reuse and environmentally sound final disposal of solid waste. Transitional deadlines have been set for these waste disposal standards, with the year 2000 being the target date for the full implementation of environmentally sound disposal of all solid waste.

C.7 Conclusion

Germany is leading the world in many areas of environmental waste management. Its environment industry is the largest exporter of EWMESS products and services in the world and its US$17 billion domestic market represents around 30 per cent of the total European market. Public demand for rapid improvement in environmental quality in Germany has been transformed into a policy framework which has led to an expanding domestic market, and growth of the German EWMESS industry to the stage where it is now the world's largest exporter of EWMESS products and services.

While the extent of environmental problems and the level of public demand for improved environmental quality is not as intense in Australia, the German dominance and influence in the development of EC environmental directives will have a significant direct effect on Australian exports of all products to the EC.

APPENDIX D SOLID AND LIQUID WASTE MANAGEMENT IN SWEDEN

D.1 Introduction

Fundamental goals of Sweden's environmental policy are:

- assuring the survival, health and prosperity of the population;
- preserving biological diversity;
- achieving sustainable preservation and exploitation of natural resources; and
- preserving natural and cultural landscapes and historic monuments.

Today there are no acute threats to public health from pollutants. However, the most serious threat probably comes from diesel exhausts in major cities which are estimated to cause 300 to 2000 cases of cancer per year. The accumulation of heavy metals and persistent toxic organic substances are potential major long run threats if preventative measures are not taken (Swedish Ministry of the Environment 1990).

In Sweden, responsibilities for environmental management are shared between the national government, the county administrations and local authorities. The national government determines policy, enacts legislation and delegates responsibility for implementation, administration and enforcement to the Swedish Environmental Protection Agency (SNV), the county administrations and the local authorities. This structure of government means that national environmental goals and policies can be formulated and applied to the whole nation. However, regulations and standards may vary from region to region to account for the varying assimilative capacities of the environment.

The formation of SNV in 1967 accelerated the formulation, coordination and transformation of environmental policy goals into policy instruments. The period from 1967 to 1977 is viewed as the major clean-up period in Sweden's environmental history. Significant improvements in water and air quality were achieved by dealing with emissions from point sources. During the 1980s, the focus shifted to non-point sources of emissions, as well as point sources.

In recent years, Sweden's environmental policies have adopted a holistic ecological sustainable development approach. The most recent example of this approach is the Government Proposition 1992-93:180 entitled "National

Guidelines for Sustainable Society Development". This was adopted by the Parliament on 28 May 1993. This Proposition outlines radical changes to the *Waste Management Act (1979:596)*, the *Act on Water and Waste Water Facilities (1970:244)*, the *Act on Certain Drink Containers (1991:336)* and the *Planning and Building Act (1987:10)*, and introduces a new Act and regulations on producer's responsibility for packaging.

D.2 Summary of changes to environmental acts

Waste Management Act (1979:596)

The major changes include the addition of sections which make the producer, importer or seller of a good or package, both economically and physically responsible for the management of any waste which results from the production or consumption of the good or package. The collection, reuse, materials/energy recovery and final disposal of the waste must occur in an environmentally approved manner.

Other sections of the Act require particular marking of a good or package and the supply of data on collection, reuse rates, material/energy recovery rates and other factors.

A charge will be made by the government or nominated authority for the collection and final disposal of waste. This charge is to be paid by the producer, importer or seller of the good or package.

Fines or up to six months jail apply to those convicted of serious offences under this Act.

These changes become law on 1 January 1994.

Water and Waste Water Act (1970:244)

This Act applies to reticulated water and waste water. The changes require the authority responsible for design, construction and operation to achieve the specified health and environmental standards. Previously, the emissions and discharges were determined by reference to health standards.

These changes became law on 1 July 1993.

Act on Certain Drink Containers (1991:336)

The production or importation of drink in PET bottles requires a special permit. This permit is issued to those firms who participate in a return or materials recovery system for PET bottles which includes a deposit which is refundable when the bottle is returned.

These changes became law on 1 July 1993.

Planning and Building Act (1987:10)

The main change to this Act was the inclusion in the introductory section that an objective of the Act was to provide national development with "equitable and good social living conditions and a good and long term sustainable living environment".

A new Act on producer responsibility for packaging

A new Act on producer responsibility for packaging will come into force in January 1994. This Act and accompanying regulations will make producers, distributors and importers of goods responsible for the collection, reuse, recycling or materials recovery of packaging or waste remaining after final consumption.

Table D.1: **Target recovery rates in the National Guidelines for Sustainable Society Development**

Item	*Requirement*	*Recovery rate 1991*	*Target recovery rate 1996*
		%	%
Beer/soft drink bottles	reuse	95	95
Wine/spirit bottles	reuse	65	90
Other glass containers	material recovery	45	70
Aluminium cans	material recovery	85	90
Other aluminium containers	material recovery	5	70
Corrugated cardboard	material recovery	65	65
Other paper, cardboard and cartons	reuse/material recovery	5	65
PET bottles	material recovery	na	90
Other plastic packaging	reuse/material recovery	5	65
Tin plate	reuse/material recovery	5	70

na not available

Source: Swedish Government Proposition 1992-93:180.

Newspaper and magazines recycling will become producers' economic and physical responsibility from 1 July 1994, with a target recovery rate of 75 per cent specified for the year 2000.

D.3 Economic policy instruments used in Sweden

Sweden has been at the forefront in using economic policy instruments to achieve environmental goals. In 1985, the SNV identified in excess of 30 economic policy measures which had environmental objectives. A more recent study identifies 79 such economic measures (SNV 1993) A number of factors have contributed to the increasing use of economic policy instruments.

Firstly, the recent economic recession, coupled with increasing public pressure to improve environmental quality, has forced politicians and administrators to examine new sources of revenue. Economic policy instruments can achieve the dual goals of improved environmental quality and increased government revenue and, in many cases, be more efficient and less costly to implement, administer and enforce than regulations.

Secondly, many economic policy instruments embody the 'polluter pays' principle, providing a direct economic incentive to 'optimise' the level of pollution. A summary of the number, type, magnitude and area of application are outlined in Table D.2 and D.3.

From Table D.2 it can be seen that 34 of the economic policy instruments have the form of "administrative charges" which shift the cost of environmental administration from the community who own the environment to those wishing to use it for their private gain.

Table D.2: **Number, type and magnitude of economic policy instruments**

Type	*Number*	*Magnitude*
		A$ millions
User charge	2	1620 - 1820
Effluent charge/tax	4	2131
Product charge/tax	13	8520
Deposit charge	2	na
Dispensation charge	6	na
Sanction charge	2	na
Damage/compensation	5	na
Administrative charges	22	na
Administrative charges (application fees)	12	na
Subsidies/grants	11	na
Total	**79**	

na not available
Source: SNV 1993.

Table D.3 indicates that economic policy instruments have greater application in the areas of waste and pollution control.

Table D.3: **Number and area of application of economic policy instruments**

Area of application	*Number*
Nature conservation	8
Natural resources	5
Agriculture	6
Forestry	5
Hunting	7
Environmental protection	13
Hazardous goods/chemicals	14
Solid wastes	14
Energy	14
Radiation protection	8
Other	4

Note: Some economic policy instruments are shown in more than one area of application.
Source: SNV 1993.

A brief description of a selection of these 79 economic policy instruments is given in Table D.4.

Table D.4: **Brief description of each economic policy instrument**

	Economic policy instrument	
	Waste service charge	*Water and sewage charge*
Type	User service charge	User service charge
Objective	Finance solid waste management service	Finance water and sewage services
Brief description	A local authority charge to cover planning, capital and operational costs. From 1991 the charge could also include a component to 'stimulate' reuse, recycling and related programs.	A local authority charge to cover the necessary planning, capital and operating costs. It is divided into a water supply charge and a sewage charge.
Coverage	Households and business	Households and businesses connected to the systems.
Price charged	Varies from local authority to local authority	Approximately \$1.00-1.40/m^3 sewage. Water supply charge usually a fixed base charge plus a usage based charge.
Income/revenue	Approximately \$600-800 million in 1992	Operating budget in 1991 was \$1019 million.
Application of income/ revenue	See 'Objective' above	See 'Objective' above

	Economic policy instrument	
	Carbon dioxide tax (introduced 1/1/91)	*Nitrogen oxides charge/tax (introduced 1/1/92)*
Type	Effluent tax/charge	Effluent discharge tax/charge
Objective	Reduce discharge of CO_2 and generate government revenue	To reduce discharges from large burners and power stations
Brief description	The CO_2 tax is payable: • \$185/m^3 for oil products (kerosene, motor fuel, oil and furnace oil) • \$160/tonne coal • \$0.10/litre diesel used for transport vehicles • \$192/tonne diesel used in operations other than transport vehicles • \$0.15/litre petrol No tax is levied on methanol and ethanol used as motor fuel. For industry and nursery operations the taxes are reduced by 75% except for petrol. A pro rata rebate is available to individuals and firms who reduce their CO_2 discharges. There is an upper limit on the CO_2 tax paid by manufacturing firms equal to 1.2% of there manufactured products' sales value.	Burners and power stations with a capacity of 10 MW and a yearly production greater than 50 GWh pay for measured discharges of nitrogen oxides (measured as NO_2). For discharges which are not measured deemed values of 0.6 gram and 0.25 gram per megajoule for gas turbines and 'others' respectively are assigned. The charge does not apply to direct processing or chemical reaction heating. The revenue derived from the charge is redistributed to those who pay the charge in proportion to the total useable energy produced by each facility.
Coverage	See SFS 1957:262 on energy tax and above	Energy producers as described above
Price charge	See 'Brief description'. The tax is equivalent to \$0.02/kg for all users except industry and nursery operations where is A\$0.004/kg of CO_2 discharged.	\$8/kg of discharged nitrogen oxides (measured as NO_2)
Income/revenue	\$1822 million in 1991/92	The charge is income neutral. Turnover for 1992 is estimated to be \$220 million
Application of income/ revenue	Government revenue	Redistributed to those who pay the charge
Effects		A significant decrease in NOx discharges from approximately 150 mg NOx/mj from 1990 to 1992 from the eligible facilities.

	Economic policy instrument	
	Sulphur charge/tax (introduced 1/1/91)	*Environmental tax on domestic air travel (introduced 1/3/89)*
Type	Effluent discharge charge/tax	Effluent discharge charge/tax
Objective	Contribute to a cost effective reduction of Sweden's sulphur discharges, facilitate a more rapid reduction to the sulphur discharge levels which apply from 1/1/93 and encourage even further reductions.	Air travellers are to pay for the environmental damage they cause.
Brief description	The tax is to be paid on the sulphur content in coal, peat, motor fuel oil and heating oil. Regulations permitting deductions gives exemption from the tax on fuel used for certain industrial processes eg pig iron, cement, calcium and bricks. The tax is refunded in proportion to the quantity of sulphur abated and no tax is levied on oil with a sulphur content up to 0.1%.	This environmental tax is levied on all domestic regular flights, by aircraft weighing over 5700 kg. It is estimated by the civil aviation authority using data on fuel usage and corresponding discharge of hydrocarbons and nitrogen oxides, for each aircraft type during an average flight. If reliable data on discharges of carbon monoxide and sulphur oxides for a particular aircraft type is not available, the tax is calculated using the maximum take off weight as a basis.
Coverage	All users of coal, peat, motor fuel oil and heating oil except those industries who qualify for an exemption.	All domestic airline companies.
Price charged	\$5.40/m^3 oil 0.1% by weight sulphur content in the oil. \$6.00/kg sulphur in coal and peat.	\$2.40/kg hydrocarbons and nitrogen oxides discharged plus \$0.20/kg fuel used.
Income/revenue	\$58 million in 1991-92	\$32 million in 1992
Application of income/ revenue	General government revenue	General government revenue
Effects	The total discharge of sulphur from burning oil in 1991 was approx. 10 000 tonnes. In 1992 the total discharge was estimated at 5000 tonnes with 2500 tonnes reduction due to abatement and use of lower sulphur oils and 2500 tonnes due to reduced oil consumption.	The tax prompted the largest domestic carrier (Linjeflyg AB) to have the combustion chambers on its Fokker F28 engines modified resulting in a 90% reduction in hydrocarbon emissions.

	Economic policy instrument	
	Chemical fertiliser tax/charge	*Pesticide/weedicide tax (introduced 1/7/84)*
Type	Product/Input tax (introduced 1/7/84)	Product/Input tax
Objective	Achieve a reduction in the impact of chemical fertilisers on the environment	To reduce the use of pesticides and weedicides
Brief description	The tax is to be paid to the government on the sale of importation of chemical fertilisers	The tax is to be paid to the government on the sale or importation of the product
Coverage	Producers and importers of chemical fertilisers	Producers and importers of pesticides and weedicides
Price charged	$0.12/kg nitrogen if the proportion of nitrogen is more than 2%. $0.24/kg phosphorus if the proportion of phosphorus is more than 2%.	$1.60/kg active ingredient in the pesticide/weedicide
Income/revenue	$14.2 million in 1991-92	$13.2 million in 1991-92
Application of income/ revenue	The funds are to be used to provide advice and demonstrations on the 'environmentally friendly' use of chemical fertilisers, mapping of areas sensitive to eutrophication and for research and studies on way of reducing the use of chemical fertilisers.	Environmental, forest, and agricultural research
Effects	A study into the reduction in nitrogen use, attributable the tax, estimates a 20% reduction in 1991/92 compared with 1985. No estimate was made for phosphorus (Jordbruks Verket 1992)	The average annual usage of pesticides and weedicides for the period 1981-85 was 4500 tonnes (active ingredient). In 1991 the quantity used had reduced to 1925 tonnes, ie a reduction of 2575 tonnes. However only 70-180 tonnes of this reduction is attributed to the pesticide/weedicide tax. (Jordbruksverket 1992). Other factors such as reduced plantings, and changed farm management practices were more significant.

	Economic policy instrument *Battery charge/tax (introduced 1/4/1987)*
Type	Product charge/tax
Objective	To finance the collection and recycling of used batteries to prevent there disposal in the environment.
Brief description	This charge is to cover the cost of collection, recycling and final disposal of used batteries, provision of public information on the battery collection system.
Coverage	Producers and importers of environmentally dangerous batteries
Price charged	Alkaline and mercury batteries, $4.60/kg; Nical cadmium batteries, $5.00/kg; Lead batteries, $8.00/kg
Income/revenue	Approximately $8 million in 1991
Application of income/revenue	To cover the social cost of collection, recycling and final disposal of environmentally dangerous batteries. The revenue collected is placed in an interest bearing 'battery fund'.
Effects	na

a All monetary amounts are in Australian dollars.
na not available
Source: SNV 1993.

Table D.5: **List of economic policy instruments by type**

Type of charge/tax	*Use*
User charges	waste service charge water and sewage charge
Effluent charge/tax	carbon dioxide tax nitrogen oxides tax sulphur tax environmental tax on domestic air travel (NOx's, CO, and CO_2)
Product charge/tax	chemical fertiliser charge weedicide/pesticide charge sales tax on motor vehicles battery charge import charge on imported aluminium drink cans drink container tax petrol tax bond tax on certain petrol kilometre tax general energy tax hydroelectric power tax special tax on electric power from nuclear power stations charge to finance radioactive waste and nuclear waste disposal
Deposit charge	car wreck charge deposit on recyclable drink containers
Dispensation charges	for car exhaust systems for leaded petrol for CFC for chlorinated solvents for certain goods containing mercury for sulphur fuels
Sanction charge	environmental protection charge water pollution charge
Damage/compensation charge	charge for use water energy charge for use of water body containing a fishery charge for each moose and deer taken from the wild environmental damage insurance atomic facilities insurance

Table D.5: continued

Type of charge/tax	*Use*
Grants/subsidies	grants for calcification of lakes and water
	grants for calcification of lakes and water
	landcare rebates
	funds for nature conservation
	grants for alternative plantings
	grants for environmentally superior agricultural practices
	grants to secure replanting of native forests
	subsidies for forestry
	subsidies for forest conservation in vasterbottens and norrbottens hinterland
	subsidies for forest conservation in vasterbottens and norrbottens hinterland
	grants for cleanup of oil spills from ships
	subsidies to encourage the use of biomass as fuel
	grants for certain investments in energy supply
	subsidies for new energy technologies
Administration charges	quarrying charge
	quarrying royalty for sand, gravel and stone
	mining application charge
	peat mining charge
	charge for licence to hunt and fish in National Parks
	hunting charge
	hunting licence
	hunting and fishing traps licence
	motor vehicle exhaust emissions test charge
	environmental protection charge
	registration fee for weedicides and pesticides
	chemicals charge
	fee for testing biological weedicides and pesticides
	application fee for use of CFC in refrigeration equipment
	PET drink container charge
	radioactive waste disposal charge
	nuclear power generation charge
	fees paid to radioactive waves protection institute
	application fee peat mining licence
	application for dispensation from nature Protection Act or Regulations
	application fee for testing products under the Forest Conservation Regulations
	application fee for inspection of hunting districts
	application fee for licence to transport and dispose of dangerous goods

APPENDIX E: THE POTENTIAL DEMAND IN SELECTED ASIAN COUNTRIES

Changes in global demand for EWMESS products will be a major factor determining the growth prospects of Australia's EWMESS industry. Of particular interest to Australian producers, is the potential growth in demand in Asian countries — markets in which Australia is well placed to compete.

This appendix initially considers factors influencing demand for EWMESS products in south east and east Asian countries, namely Singapore, Malaysia, Thailand, Indonesia, the Philippines, China and Hong Kong. Section E.2 focuses on market opportunities in the four south east Asian countries — Thailand, Malaysia, Indonesia and Singapore — which the Commission visited in connection with this inquiry.

E.1 Factors influencing demand in Asian countries

As noted in Chapter 2, demand for EWMESS goods or services in any one country, at any point in time, is likely to be a function of the population of the country, its income level, the costs of EWMESS products relative to other goods and services, the extent of the environmental problems the country faces and the country's environmental objectives (as reflected in the extent and stringency of its environmental regulations). However, the need for EWMESS products will only be translated into effective demand if a country has the financial capacity to acquire the products. In the broadest sense, the wealthier a nation is, the greater is its ability to pay for environmental clean-up and protection.

This section examines current levels and expected changes in a number of these variables to help assess likely trends in demand for EWMESS products in the designated Asian countries. The information is largely based on data provided by the United Nations (UNDP 1993) and the Asian Development Bank (ADB 1993). For comparative purposes, data for Japan, USA and Australia are also provided.

National income and trends

Table E.1 shows that there are significant income gaps between some industrialised and developing countries. One consequence is that there are large differences in the ability to pay for environmental clean-up and protection between industrialised countries and developing countries. In recent years,

significant growth in GNP for the majority of the selected developing Asian economies has reduced the discrepancies in income between the two groups. The higher growth rates predicted for developing economies over the period to the end of the century will further reduce the gap. Nevertheless, substantial differences in per capita incomes will remain (see Table E.1).

Table E.1: **Income comparisons and trends in economic indicators**

Country	*Total GNP 1990*	*Annual growth rate in GNP per capita 1980-90*	*Annual growth rate in GNP 1980-90*	*Real GDP per capita[a] 1990*	*Expected GDP growth 1994*
	US$ billion	%	%	US$'000	%
Japan	3141	4.1	3.5	17.6	2.5
USA	5446	3.2	2.2	21.4	3.3
Australia	291	3.2	1.7	16.0	3.4
Hong Kong	67	7.0	5.5	15.5	5.3
Singapore	34	7.0	5.7	15.8	6.0
Malaysia	42	5.1	2.5	6.1	7.8
Thailand	79	7.6	5.6	3.9	8.5
Philippines	44	0.9	-1.5	2.3	4.5
China	416	9.5	7.9	1.9	10.0
Indonesia	101	6.3	4.1	2.1	7.6

a In purchasing power parities.
Source: UNDP 1993, ADB 1993, OECD 1992b.

Population growth, aid and urbanisation

Population growth is also likely to have a significant influence on current and future demand for EWMESS goods and services. This is because larger communities produce greater quantities of waste and pollution.

Table E.2 presents demographic information for the selected Asian countries. It gives an indication of where the greatest needs for EWMESS products may be in future years. In terms of absolute numbers, the enormous population of China stands out, while continuing high population growth rates in Malaysia, the Philippines and Indonesia also signal higher demand for EWMESS products.

The capacity of many Asian countries to undertake environmental projects will largely depend on foreign aid. Table E.2 shows that some of the countries receive substantial aid. In absolute terms, China is the largest recipient (it received over US$2000 million in 1991). However, relative to GDP, the Philippines is the most dependent on foreign aid (approximately 2.8 per cent of GNP in 1991).

Table E.2: **Demographic profiles of selected Asian countries and aid funds received**

Country	*Population 1991*	*Population (estimated) 2001*	*Annual population growth rate 1991-2000*	*Aid funds received 1991*	*Aid funds as a percentage of GNP 1991*
	million	million	%	US$ million	%
Hong Kong	5.8	6.1	0.7	34	0.1
Singapore	2.7	3.0	0.9	na	na
Malaysia	18.4	22.3	2.1	459	1.1
Thailand	55.4	61.2	1.1	738	0.9
Philippines	63.8	76.1	2.0	1231	2.8
China	1170.7	1309.7	1.2	2166	0.5
Indonesia	187.7	218.0	1.7	1733	1.7

na not available
Source: UNDP 1993.

Increasing urbanisation is a feature of many developing Asian economies. It is partly driven by the development process, as well as a range of sociological, economic and technological factors. Increasing urbanisation has magnified environmental waste problems in developing countries. The most obvious problems arise in the slum settlements. These are often characterised by lack of safe water and sanitation, and adverse health impacts (both for slum dwellers and the wider public). Increasing urbanisation in poorer countries has also placed pressures on existing infrastructure (eg roads, water supply and sanitation systems) and resulted in increasing pollution from motor vehicles and declining public health standards (due to insufficient safe drinking water and inadequate sewage and solid waste disposal).

Table E.3 shows that, for the selected Asian nations, significant increases in urbanisation are predicted for all but the two city states of Hong Kong and Singapore. If these expected growth rates eventuate, the demand for environmental infrastructure will increase accordingly.

Table E.3: **Urban population densities and growth** (per cent)

Country	*Urban population as a percentage of total population*		*Estimated annual growth rate of urban population*
	1991	*2000 (est)*	*1991-2000*
Hong Kong	94	96	1.0
Singapore	100	100	1.0
Malaysia	43	51	3.9
Thailand	23	29	4.0
China	33	47	4.9
Indonesia	31	40	4.4

Source: UNDP 1993.

The need for improved environmental services is also illustrated by the data on access to safe water and sanitation (see Table E.4). In China and Indonesia alone, around 450 million people do not have access to safe drinking water and about 150 million are without sanitation.

Table E.4: **Access to safe water and sanitation in selected Asian countries**

Country	*Percentage of population with access to:*		*Number of persons without access to:*	
	Safe water 1988-90	*Sanitation 1988-90*	*Safe water 1988-90*	*Sanitation 1991*
	%	%	million	million
Hong Kong	100	na	nil	na
Singapore	100	96	nil	0.1
Malaysia	78	94	4.0	1.2
Thailand	72	62	15.5	20.8
Philippines	81	70	12.1	19.1
China	71	96	336.0	42.1
Indonesia	42	44	110.0	106.0

na not available
Source: UNDP 1993.

E.2 EWMESS opportunities in selected Asian countries

The remainder of this appendix considers demand for EWMESS products and market opportunities in the four south east Asian countries visited by the Commission — Malaysia, Indonesia, Thailand and Singapore. The discussion draws heavily on a 1992 study by the Canada ASEAN Centre (CAC) and a study by the National Centre for Development Studies (NCDS) at the Australian National University. Estimates of future market opportunities are largely based on those in the CAC study. According to the study (p. 31), "the time frame for all analyses and market projections is 5+ years".

Malaysia

Malaysia is a relatively small country compared to some of its near neighbours. Its population is similar to Australia's, with some 14.5 million people on Peninsular Malaysia, with the remaining 4 million in Sabah and Sarawak. Kuala Lumpur, the capital, is the only city with a population over the one million mark, having some 1.2 million people.

Through the National Development Policy, the Malaysian Government hopes to achieve developed nation status for Malaysia by the year 2020. To achieve this goal, the Malaysian economy must grow rapidly. A concomitant goal stated in the Policy is to ensure that "adequate attention will be given to the protection of the environment and ecology so as to maintain the long-term sustainability of the country's development" (Mahesan 1993 p. 3).

Rapid development is also being encouraged through a number of other policies, such as the National Population Policy (NPP). The goal of the NPP is to achieve a population of 70 million by the year 2100. The target populations for the years 2000 and 2020 are 22.6 and 33.7 million persons respectively.

The major urban areas have been identified as the 'engines' of economic growth. It is envisaged that they will provide the majority of the 7.7 million new jobs needed to absorb the new entrants to the labour force expected by the year 2020. The level of urbanisation is expected to reach 70 per cent or more. At present, the level is estimated to be around 50 per cent (see Table E.3).

The Klang Valley region (near Kuala Lumpur) is expected to generate the largest number of employment opportunities, the highest household income and the most concentrated population density (Mahesan 1993).

The rapid growth planned for Malaysia will place increasing pressure on the present infrastructure, including that associated with environmental waste management. Since the Malaysian Government has limited financial means to provide the infrastructure that increasing development will require, it has

adopted a privatisation policy — divesting itself of certain services and encouraging private development of infrastructure through BOOT projects, including sewerage facilities. For example, a consortium headed by the British firm North West Group has been given the contract to upgrade, extend and operate Malaysia's sewerage system over the next 28 years[1] (see below).

Although a DITAC study (1991b) on the status of waste management in Peninsular Malaysia suggested inadequate enforcement of the country's 14 regulations under the *Environmental Quality Act 1974*, concerted efforts of late to rectify this situation have been reported. For example, in late 1992, the Department of the Environment embarked on a nationwide survey of manufacturing industries to determine their degree of compliance with pollution controls, particularly factories that had a past history of non-compliance.

Additionally, the Science, Technology and Environment Ministry in Malaysia has recently called for an increase in the severity of penalties for non-compliance with the regulations, as well as stricter regulations for land use. These calls followed an eighteen month study by the Environment Law Revision Committee (commissioned by the Environment Ministry). The Environment Minister stated that "rapid development in the country has created a lot of environmental problems to which the existing laws could not be applied effectively" (Jayakrishnan & Yue 1993). The recommendations, if put into effect, will encompass measures to tighten regulation applying to the disposal of solid waste, control over land use and water resources, and the rehabilitation of former mining sites.

A year-long campaign began early in 1993 to address pollution problems in local rivers. The "Love Your River Campaign" will address problems concerning the maintenance and rehabilitation of rivers, including educating the public. Related projects include the "River Watch" and "River Adoption" schemes (similar to those in place in Australia), aimed at involving schools in monitoring water quality and identifying pollutant sources. A pilot garbage separation and recycling project for residential garbage also began earlier this year. It is envisaged that this program will become a more permanent option throughout Malaysia.

Regulations and enforcement

The *Environmental Quality Act 1974* is the main legislation governing environmental protection. All related regulations are gazetted under this Act. There are, however, provisions in the Act which allow establishments which do

[1] To date, no contracts have been signed, but a non-binding Letter of Intent from the Government to the consortium has been issued.

not comply with the regulations to apply for a contravention licence. The licence exempts firms from the provisions of the Act for a designated period to allow them to make the changes required to comply with the Act. The period of the licence is dependent on the given technology available and the economic situation at the time. Although it is anticipated that the Government will eventually require strict compliance with all standards, a recent DITAC study (1991b) suggests that enforcement of the 14 regulations under the Act "is a difficult task" since the enforcement budget has not been increased during a period when the sources of pollution are increasing.

Malaysian legislation requires that all new industrial proposals receive specified environmental approvals through the Malaysian Department of the Environment prior to project implementation. Environmental Impact Assessment reports (for prescribed activities) and site suitability evaluations (for non-prescribed activities) must be carried out and approved by the Director General of Environmental Quality.

The Government of Malaysia is providing a number of incentives to local industry in order to encourage compliance with the regulations. For example, company tax-exemptions, accelerated depreciation allowances and import duty exemptions for machinery, equipment, raw materials and components used for certain waste management plants are available.

Market opportunities in Malaysia

The CAC study provides information on market opportunities for EWMESS firms in Malaysia, particularly in Kuala Lumpur.

The study estimates that future opportunities in Kuala Lumpur for EWMESS activities amounts to approximately US$150-190 million (see Table E.5). Solid waste management, water quality management (river clean-up and flood control) and technical support are said to offer the greatest opportunities for new firms. On the other hand, relatively few opportunities exist in the hazardous waste management sector in the Kuala Lumpur region. With the privatisation of Malaysia's sewerage system, expenditure on public sector waste water projects is expected to be limited, although there will be some opportunities for new firms to access a small share of the private sector waste water segment (ie industrial firms and housing estate developments).

Table E.5: **Future opportunities for EWMESS firms in Kuala Lumpur**

Sector	*Total demand*	*Per cent of market available to new firms*	*New firm opportunity*
	US$ million	%	US$ million
Solid waste management	65-75	100	65-75
Hazardous waste management	80-90	0	0
Waste water treatment	20-30	100	20-30
Water quality management	60-80	100	60-80
Technical support services	5-7	100	5-7
Total	**230-282**		**150-192**

Source: Adapted from CAC 1992.

Solid waste management

The CAC study suggests that the Malaysian Government does not view solid waste management services as a government responsibility. Consequently, funding for solid waste projects is expected to come from the private sector (even though there is also a view that the solid waste market in Kuala Lumpur is too small for private provision of this type of infrastructure and, therefore, not economically viable). There is apparently only limited regulation of solid waste disposal in Malaysia because of the problems of shared responsibility between local governments and the health and engineering departments. According to the study, inter-agency disputes often result in inadequate solid waste management services being provided.

Some plans for the construction of incineration facilities throughout Malaysia have been considered. If adopted, they will generate investment opportunities of some US$60-70 million. The incineration option is being actively explored because of inadequate landfill capacity on the outskirts of Kuala Lumpur and the high cost of land. Within the next 5 years, the closure of existing landfill sites could lead to contracts worth some US$3-5 million being awarded.

Hazardous waste management

At present, hazardous wastes are either stored on-site or dumped into surface drains or unsecured refuse sites throughout Malaysia. However, limited opportunities exist in the Kuala Lumpur region since the Government has already awarded the contract for the construction of the first hazardous waste

treatment facility (at a cost of approximately US$80 million) to a consortium headed by Danish firm I-Krüger.

There is also the possibility of additional collection and transportation services required for hazardous wastes, estimated at US$2-3 million annually. Contracts for these services have not yet been awarded. Some limited opportunities in consulting, relating to specialised processes, may also exist.

Waste water and water quality management

Although only 46 per cent of Malaysia's population is currently connected to the country's main sewerage system, limited opportunity exists for public sector involvement in this segment since the announcement that the country's sewerage system will be privatised. A consortium headed by a British firm — North West Group — with Malaysian partners, has been awarded (in principle) the contract to operate a nationwide sewerage system. The investment over the first 18 years of the contract is estimated to exceed US$1.8 billion, with work focusing on the 43 major cities and towns in Malaysia (Attan 1993). The consortium will construct a new sewerage system for the entire country. It will also take over the responsibility for upgrading and extending existing sewerage systems and the subsequent operation and maintenance of these systems. The consortium will be able to charge a "sewerage tariff" for households linked to the system. However, opportunities will still exist in other areas of waste water management, such as for industrial firms and housing estate developers. These are estimated to be about US$20 million.

The most pressing need in water quality preservation and treatment is for river cleanup and flood control. The Government has identified four rivers for cleanup and has allocated in excess of US$20 million over the next ten years for the cleanup program. A further US$40-50 million has been earmarked for flood control in the Klang Valley area over the next five years.

Air quality management

The Government is looking into the feasibility of establishing an air quality on-line monitoring network. This may provide more timely information for the monitoring and enforcement of air quality regulations.

Technical services

According to the CAC study, demand for environmental impact assessments, training, structural plan studies and geographic information systems should provide opportunities worth US$5-7 million over the next few years.

Indonesia

Indonesia is an archipelago of 13 600 islands. It is a developing country with a population of about 180 million persons (the third most populous country in the world).

Since the early 1970s, the Government's family planning program has reduced population growth. However, the population is still expected to nearly double in size next century (NCDS 1993). The capital, Jakarta, has a population of over 9 million persons. However, according to the NCDS study, it "does not dominate the country to quite the extent of other capital cities in Asia" (1993, p. 2). There are six other centres with more than a million people in Indonesia. While amenities such as sealed streets, electricity supply and telephone systems are quite good, water supplies, waste disposal and sanitation are still rudimentary, particularly in the slum areas.

Indonesia's economy has developed rapidly over the past 30 years. However, development has been accompanied by a variety of rapidly emerging environmental problems. Consequently, the country faces many environmental challenges in the future. For example, according to the NCDS study (1993), the main cities of Java and some on Sumatra and Kalimantan are facing serious environmental and public health problems due to inadequate waste disposal and sanitation systems. On-site treatment of waste water to standards suitable for discharge is apparently relatively rare. Moreover, it is suggested that, even when equipment is installed for the treatment of waste water, it is often of an inappropriate design or not correctly operated, often resulting in large discharges of pollutants into surface water and groundwater.

As Indonesia enters phase two of the National Long-Term Development (NLD) Plan, the focus will be on the support of economic development and national welfare, with attention to human resource, technological and infrastructure development. Royat (1993) states that one of the main challenges of the second phase (which runs until 2018) is to address the "huge need" for a range of infrastructure to support urban and regional development in Indonesia . This will be particularly important over the next 25 years as urban areas attempt to cope with large population increases. Limitations on the availability of government finance are likely to result in the majority of infrastructure being provided by private investors (both domestic and foreign) and, to a lesser extent, through international aid programs. To facilitate this, the Indonesian Government has also adopted special policies to promote development by foreign investors in certain regions (eg allowing 100 per cent foreign ownership).

The NLD plans are segmented into five year terms (or *Repelitas*). According to the NCDS study, successive *Repelitas* have recognised the need to incorporate measures to protect the environment. For example, in the current plan — *Repelitas V* (1989-90 to 1993-94) — techniques for waste and pollution control are targeted, such as the development of regulations on maximum waste threshold levels, economic incentives to utilise waste management technology, new processing methods for industrial wastes and the development of techniques for recycling of waste in urban areas (NCDS 1993). Additionally, an Indonesian Environment Protection Agency (Bapedal) was established in 1990 with aid from Australia, the USA and Japan, to coordinate environmental regulation and legal and regulatory enforcement.

Regulations and enforcement

The *Indonesia Act No. 4*, formulated in 1982, established the basic framework for environmental management. A number of laws and regulations incorporated within the Act cover specific environmental issues. Stringent penalties for environmentally destructive activities are also incorporated in the Act. Environmental Impact Assessment (EIA) provisions were provided for in the Act in 1986. This requires that EIA procedures be followed for all new and existing projects which may have important environmental impacts. However, the NCDS study (1993) suggests that successful implementation of the EIA process has been hindered by institutional weaknesses.

There is an absence of any comprehensive land-use planning system in Indonesia. Consequently, urban, industrial and infrastructure developments often have detrimental environmental consequences for valuable watershed and agricultural lands. For example, the absence of any separate land use zoning between industrial and residential areas has resulted in groundwater supplies, which provide more water than piped water supply systems to the population, becoming contaminated with agricultural chemicals and industrial and urban wastes.

While comprehensive and integrative land-use planning should be a priority in Indonesia, the NCDS study stated that:

> A major impediment to this so far, has been the fragmentation of responsibility and authority between many different Ministries and the weakness of co-ordinating mechanisms between agencies (1993 p. 20).

Market opportunities in Indonesia

The CAC provides information on market opportunities for EWMESS firms in Indonesia, particularly in Jakarta. The study estimates that future opportunities

for EWMESS firms in Jakarta are estimated to be between US$373-497 million (see Table E.6). The largest investment opportunities are in the waste water area. Only limited opportunities will be available in the hazardous and solid waste management segments of the market in the Jakarta region, although opportunities may be available elsewhere in Indonesia.

Table E.6: **Future opportunities for EWMESS firms in Jakarta**

Sector	*Total demand*	*Per cent of market available to new firms*	*New firm opportunity*
	US$ million	%	US$ million
Solid waste management	20-30	100	20-30
Hazardous waste management	35-40	11	3-5
Waste water treatment	335-435	100	335-435
Water quality management	50-75	20	10-20
Technical support services	7-10	70	5-7
Total	**447-590**		**373-497**

Source: CAC 1992.

Solid waste management

The CAC study suggests that demand for solid waste services is not likely to be significant in the near future. The World Bank and the Asian Development Bank have been funding "Integrated Urban Infrastructure Development Programs". These programs are addressing the solid waste needs of Jakarta. Consequently, solid waste management is not considered a pressing problem by local authorities and new international aid for solid wastes is not a priority. Existing landfill capacity is considered adequate for Jakarta's needs at present. However, as existing landfills become saturated (after 1995), demand for one or two new landfill sites is expected.

While need exists for more efficient collection and disposal of wastes, the CAC study suggests that an inadequate local government tax base yields insufficient revenue for improvement in these services. The study also suggests that BOOT incineration projects are unlikely to be economically viable, and that a highly active and efficient scavenging industry makes recycling unnecessary.

Hazardous waste management

Few opportunities in Jakarta currently exist for foreign firms to enter the hazardous waste market as the Bimantara Group (an Indonesian conglomerate), in partnership with Waste Management Incorporated of the United States, has secured the rights to build and operate the proposed hazardous waste treatment and disposal facility near Jakarta, estimated to be worth about US$33 million. However, opportunities may still exist outside Jakarta for the occasional small scale private project (estimated at no more than US$3-5 million).

Waste water and water quality management

According to the CAC study, some estimates indicate that less than 1 per cent of industries in certain highly polluting sectors — such as textiles — have satisfactory effluent treatment facilities. In addition, sewerage facilities are estimated to be accessible to less than 10 per cent of Jakarta's population.

The study suggests that demand for industrial waste water treatment is expected to be the most dominant need in the next few years in Indonesia. For example, as environmental legislation becomes better enforced, opportunities in consulting services, presently estimated at US$2-3 million annually, will experience "dramatic" increases in demand. Private sector engineering and construction services, believed to be worth around US$15-20 million annually, are expected to increase at approximately 10-15 per cent per year. Annual equipment purchases by industry for waste water treatment is estimated at about $15-20 million. Additionally, the World Bank has a planned US$100 million assistance program for controlling industrial pollution, of which about half may go to Jakarta. This should present a range of market opportunities accessible to interested firms.

Although centralised sewerage is envisioned for the Jakarta area, the estimated US$2.25 billion cost could defer construction. However, it has been estimated that private sector upgrading and expansion projects for sewerage treatment in Jakarta are likely to provide opportunities worth US$350-400 million over the next few years.

The Prokasih (Clean River) Program, formulated in 1989, is attempting to address pollution in 22 Indonesian rivers. The Prokasih program brings together multilateral and bilateral aid from all over the world to address point sources of pollution and provide sampling and monitoring infrastructure. It is estimated that 20 per cent of the funds available through this project, some US$10-20 million, will be available to new firms.

Technical services

The main opportunities in the technical support services area are environmental impact assessments and training. It is expected that 80 per cent of the demand for technical services will be available to new firms, representing some US$5-7 million worth of possible contracts in the future.

Thailand

Thailand has a population of 55.4 million people, and an expected annual growth rate of the urban population of 4 per cent. In 1990, the country generated GDP of US$79 billion. GDP growth in 1994 is expected to be in the vicinity of 8.5 per cent.

With Thailand experiencing high growth rates, and increasing rates of urbanisation, effective waste management is becoming increasingly important. Consequently, Thailand is beginning to enforce stricter environmental legislation, and is investing more heavily in pollution abatement technologies.

At the launch of the 1992 World Bank Development Report in Bangkok in mid-July, the (then) Minister of Finance, Dr Panas Simasathien described some of the fundamental changes in Thailand's approach to the environment:

> Two or three years ago only the most dedicated environmentalists were crying for immediate action to stop environmental degradation. One of our senior politicians even declared that the environment was a concern only for rich nations. Well, we have either become rich or we have become wise. I think it is a bit of both. But we have jumped into action.

This points to the two main precursors for a growing market for environmental products and services: the ability to pay for environmental improvement and protection, and the recognition — translated into legislation and enforcement — that a problem exists.

The Thai Government has recognised that there is a problem, and has recently established an Environment Fund of 5 billion Baht (US$200 million) to support industries and municipalities in pollution control. Former Prime Minister Panyarachun declared at the time of the establishment of the Fund that the country needed to place more emphasis on sustainable development.

In recognising the extent of environmental degradation, the Government has revitalised its environmental policy to take account of the "polluter pays" principle. Those who benefit from degradation of the environment must now pay for its rehabilitation.

As indicated earlier, Thailand has experienced relatively high rates of income growth. The structure of the Thai economy has also changed. In particular, the

industrial and tourism sectors have increased in importance. The latter, for instance, attracts over 5 million foreign visitors per year. This has led, among other things, to waste disposal problems in the main tourist centres such as Phuket and Pattaya and, thus, opportunities for the waste disposal industry.

Thailand's ability to sustain past levels of economic growth is dependent on a range of factors. For example, the ADB points to inadequate infrastructure, skill shortages and rising labour costs which could erode some of the country's present competitive advantage and slow its GDP growth (ADB 1993).

Regulation and enforcement

More stringent environmental laws and enforcement are driven by the demands of the middle class of Thai society. This is a group growing in size and influence. The political response has been to recognise, in the country's Seventh National Plan (1992-1996), the need for increased environmental protection and improvements in the quality of life as one of the nation's top three objectives.

It is recognised in the Plan that productivity will be reduced if there are adverse health impacts through pollution, if urban congestion is not addressed, and if natural resources (eg forests, water and soils) continue to be depleted. It is basically a recognition that the nation's so far successful and ambitious economic development thrust has led to environmental problems which are threatening, or have the potential to threaten, further growth.

In 1992, the *National Environmental Quality Act* came into effect. This has given authorities powers to ensure comprehensive environmental impact assessments are carried out at various stages of project implementation (Fahn 1992). In addition, there are now maximum fines of 100 000 Baht (US$4000) and one years jail available for polluters. Under the new legislation, those who illegally exploit forests are liable for a maximum of 500 000 Baht (US$20 000) and a five year jail sentence.

With the inception of the *National Environmental Quality Act*, the Thai Government has adopted a stricter approach with regard to enforcement of environmental regulations. For example, as a result of increasing public pressure for improved environmental quality, the Department of Industrial Works in 1992 issued closure orders on six factories for releasing polluted waste water into public water systems. Continued tightening of environmental regulation is expected to create further demand for waste prevention and treatment systems (Fahn 1992).

Market opportunities in Thailand

Population growth will mean increased demand for food, water, housing, energy and transport. It is extremely difficult to provide these without adding to pollution. In Thailand's favour, population growth is slowing. However, population growth is not even across the country, with some rural and tribal communities experiencing high growth rates, and migration to the cities being a not unrelated occurrence. Collectively, these factors point to a growing demand for EWMESS products.

Table E.7: **Future opportunities for EWMESS firms in Bangkok**

Sector	*Total demand*	*Per cent of market available to new firms*	*New firm opportunity*
	US$ million	%	US$ million
Solid waste management	6-12	100	6-12
Hazardous waste management	25-50	100	25 -50
Waste water treatment	1200-1500	12	150 - 200
Water quality management	10-20	70	7 - 15
Technical support services	1-3	100	1 - 3
Total	**1242-1585**		**186-273**

Source: Adapted from CAC 1992.

The CAC study estimates that future ("5 + years") demand for EWMESS products in Bangkok could exceed US$1.5 billion. Of this, up to US$270 million is expected to be available for overseas firms (see table E.7).

Solid waste management

Bangkok generates 6000 tonnes of solid waste daily, of which 80 per cent (5400 tonnes) is collected. With such large volumes of solid waste being generated, it is anticipated that Bangkok's current landfill capacity will be exceeded in 6 or 7 years. As the current stock of landfill sites are exhausted, replacements will be required. Demand for EWMESS products will be created by the remedial work required at old landfill sites and by work associated with developing new sites. It is expected that the closure of an existing site, and the preparation of a new one will require consulting services estimated at US$1-2 million, and engineering and construction services to the value of US$5-10 million. The estimated cost of a new landfill is US$20 million.

Hazardous waste management

Thai industry is estimated to generate approximately 2 million tonnes of hazardous and toxic waste annually — three-quarters of which is generated in the Bangkok area. On the basis of current trends, this is expected to increase to around 3.5 million tonnes per year by 1996, and 6 million tonnes by 2001.

A waste treatment facility designed to deal with heavy metal contaminated waste water and solid wastes was established by the Ministry for Industry in 1988. The facility treated 50 000 tonnes of waste in 1990, and has a capacity to treat 110 000 tonnes per year. The need to develop new facilities will, however, generate additional demand for EWMESS products. The Government has announced the construction of three additional treatment facilities around Bangkok. A fourth plant — which may be fully privatised — is envisaged after experience is gained with the first three facilities. Realistically, in light of siting concerns and other factors (eg sequential construction in order to benefit from past experience), it is likely that only 1 or 2 new facilities will be operational by 2000 (CAC 1992). This should result in design, equipment and construction opportunities in the vicinity of US$25-50 million.

Based on the estimates for future waste generation, the capital costs for facilities to cope with Thailand's projected generation of hazardous waste could approach US$150 million by 1996, and could exceed $300 million by 2001. However, in view of the likely availability of financial resources, these figures almost certainly overestimate future government outlays. For example, realistic opportunities for consulting services currently amount to less than $1 million, and less than $5 million in construction or equipment sales (CAC 1992).

Waste water and water quality management

Households, businesses and industries generate up to 1.5 million cubic metres of waste water per day. The Industrial Works Department is in the process of developing two centralised waste water treatment plants which will receive non-hazardous industrial waste. The plants are expected to cost US$16 million each. The Department will consider establishing two similar plants in outer Bangkok after an assessment of the first two. Fourteen existing small treatment plants operated by the National Housing Authority are in the process of being transferred to the Bangkok Metropolitan Authority (BMA), which intends to improve and upgrade the plants. Five other regional sewage treatment plants in Bangkok are in various stages of implementation. The BMA is proposing a two stage sewerage and treatment plant, worth more than US$800 million in total. The first stage is intended to service densely populated areas in central Bangkok, while the second stage will service lightly populated outer zones.

Residential/commercial demand for waste water treatment services are forecast to amount to about US$50 million over the next few years. However, opportunities for overseas companies to participate in the design and installation of 'packaged' sewage treatment tanks may be limited by the relative competitiveness of the local sector. According to the CAC, foreign firms may need to bring expertise to a local partner if they are to successfully enter this market.

Meeting the waste water needs of the industrial sector is expected to require investment of at least US$50 million annually, rising to around US$85-90 million by 1995. Overseas firms are expected to compete strongly in this market segment.

Singapore

Singapore is a rapidly growing economy — one of the so-called 'Asian Tigers'. Singapore's real GDP per capita is comparable to Australia's — US$15 800 to US$16 000 respectively (see Table E.1). Future growth is expected to be strong — around 6.0 per cent in 1994.

In contrast to other countries in the ASEAN region, Singapore has few environmental waste management problems. All of Singapore's residents live in urban centres and have access to safe drinking water (see Table E.4).

Regulation and enforcement

Singapore has the most environmentally stringent standards of any country in the ASEAN region and in some cases stricter standards than many industrialised European countries. Singapore has employed international environmental regulations (eg EC vehicle emission standards and US water quality standards) as a model for its own environmental regulations, modified where necessary to take account of Singapore's particular circumstances.

Stringent regulation applies to some activities. For example, pig farming has been banned and strict controls have been applied to poultry farming (traditionally the two largest generators of agricultural waste). Singapore has also introduced the polluter pays principle in waste pricing. This has resulted in some industries — such as the tanning industry — moving out of Singapore as the cost of waste treatment has made local operations too costly.

The Ministry of the Environment, which was established in the early 1970s, is responsible for overseeing Singapore's environmental regulations and laws. The Ministry of the Environment has a policy of actively enforcing Singapore's environmental regulations.

Market opportunities in Singapore

The Singapore and Australian governments have signed a memorandum of understanding (MOU) relating to environmental management and protection. This involves the two governments exchanging information on research and development, technology and waste management policy. The MOU also provides for collaboration between the two governments in providing infrastructure, technology, research and training. Austrade and the Singapore Institute of Standards and Industrial Research (SISIR) are the two intermediaries for the respective countries. Milltox (an Australian toxic waste firm) has gained contracts through the MOU.

The SISIR is a government statutory board with two main functions. First, the SISIR sets standards for quality and industrial technology. Second, it acts as a link between Singapore firms and their development needs. In some cases, the SISIR arranges contracts between the firms (mainly for small to medium sized firms).

During the Commission's visit to Singapore, the SISIR stated that it was interested in seeking the involvement of Australian firms. According to the SISIR, this is because of the advantages of being in the same time zone and geographic proximity, plus the fact that Australian firms offer competitively priced products and services. The SISIR currently has a collaboration agreement with ICI Australia to provide technical expertise for environmental audits.

Several Australian firms such as Milltox (hazardous waste treatment), Collex (waste collection services) and Kinhill (sewerage treatment systems) are already operating in the Singapore environmental waste management industry. Information on opportunities in different market segments is outlined in the CAC report. Relevant information in the solid waste, hazardous waste, waste water treatment, water quality and technical support services market segments is briefly summarised below.

Solid waste management

Domestic and commercial establishments in Singapore produce 2 800 tonnes of waste each day. Industrial waste is the fastest growing waste segment, presently generating 2 500 tonnes each day.

It is estimated that Singapore has only two years of landfill capacity remaining. However, an offshore landfill site with an expected of life 10 - 20 years is currently being established.

Three waste incineration plants are presently in operation. While these three plants meet all present incineration needs, the CAC predicts that the Ministry of

the Environment will commission another incineration plant before the year 2000. Until the commissioning of the new incineration plant, it is expected that there will be few market opportunities in Singapore's solid waste management sector.

Hazardous waste management

Manufacturing industry in Singapore generates 25 - 35 000 tonnes of hazardous waste per annum. As no centralised treatment facility exists, hazardous waste treatment is undertaken on site.

The construction of hazardous waste treatment facilities may offer opportunities for Australian (and other) EWMESS firms. The CAC estimates that the new plant — expected to be commissioned within the next 5 years — will cost between US$20-30 million.

The CAC study estimates the hazardous waste treatment market to be worth US$9-10 million annually, although one firm — Tenochem — has a 50 per cent share of the market. The Singapore Research Development Corporation informed the Commission that it is seeking Australian firms to form partnerships in the hazardous waste market.

Waste water and water quality management

Singapore has made a large investment in infrastructure to collect and treat waste water. Its sewerage system meets approximately 96 per cent of Singapore's existing needs. Singapore has established strict limits on discharges to sewer. Consequently, most manufacturing plants needing waste water treatment have installed treatment facilities.

Ongoing expenditure on waste water treatment in the order of US$15-25 million per year is expected. In addition, the CAC estimates total demand for water quality improvement to be US$10-15 million per year.

Technical support services

Currently Singapore is not a large market for technology and services. However, the SISIR informed the Commission that the market for monitoring equipment offers opportunities for Australian firms.

Market opportunities for EWMESS related investment in Singapore are shown in Table E.8. The most significant opportunities are estimated to arise in the waste water treatment segment in which investment of between US$75-100 million is expected to be required over the next five years.

Table E.8: **Future opportunities for EWMESS firms in Singapore**

Sector	*Total demand*	*Per cent of market available to new firms*	*New firm opportunity*
	US$ million	%	US$ million
Solid waste management	0	na	0
Hazardous waste management	45-55	100	45-55
Waste water treatment	75-100	100	75-100
Water quality management	10-15	100	10-15
Technical support services	2-4	100	2-4
Total	**132-174**	**100**	**132-174**

Source: CAC 1992.

APPENDIX F: ASSISTANCE AVAILABLE TO THE EWMESS INDUSTRY

This appendix summarises the various Commonwealth Government industry assistance schemes which are available to the EWMESS industry. Many have already been mentioned throughout the report eg government procurement in Chapter 8, research and development in Chapter 9, capital for commercialisation in Chapter 10, and foreign aid and industry development in Chapter 11.

The EWMESS industry cannot be classified to a specific Australian Standard Industry Classification (ASIC). Instead the industry falls within a number of ASIC industries, including manufacturing and service sector industries. In most cases, the contribution of EWMESS to the value of output of those ASIC industries is small.

F.1 Assistance issues

The terms of reference for the inquiry request that the Commission quantify the extent of any assistance provided to the EWMESS industry, identify if it is offered in a discriminatory manner within the industry and report on ways in which:

(a) that assistance could be better used to promote the long term development of the industry and economy; and

(b) the costs of adjusting to lower levels of assistance can be minimised.

Due to the diverse and fragmented nature of the EWMESS industry, it is not possible to quantify the extent of assistance provided to the EWMESS industry. Nevertheless, it is possible to identify and assess major forms of assistance available to EWMESS. In most cases, these assistance measures are generally available and do not specifically target EWMESS industries.

Tariffs

Tariffs on imported EWMESS products, which range from zero to 15 per cent, are a discriminatory form of assistance. The tariffs result in significant differences, not only between the assistance afforded different EWMESS products, but also in the level of assistance provided to EWMESS goods sold in the domestic market as compared with those sold on the export market (ie in

most cases, substantially higher assistance is provided to goods marketed locally).

Tariff assistance provided to other goods disadvantages EWMESS firms. For example, tariffs inflate the cost of many inputs used by EWMESS firms. However, to some extent, other forms of assistance may ameliorate this penalty.

Disparities such as those outlined above, can significantly impede economic efficiency. However, as the program of phased tariff reductions proceeds, the disparities will be reduced. Under this program, most tariffs will be reduced to 5 per cent or lower by July 1996.

F.2 Export assistance

Commonwealth export marketing and financial assistance is available to Australian industry, including EWMESS, through a variety of programs. These include the trade development and promotion activities of Austrade (including the Export Market Development Grants Scheme), Austemex, a EWMESS industry initiative, and the Export Access program. Other financial assistance is provided by the export finance and insurance services provided by the Export Finance and Insurance Corporation (EFIC), a mixed credit facility under the Development Import Finance Facility (DIFF) and the Private Sector Linkages Program — the latter two being foreign aid initiatives. Programs which aim to both promote Australia as an exporting country and improve the knowledge of exporters' about overseas markets include the Market Australia Campaign and the Australia in Asia Program.

Funding details for export assistance schemes are provided in Table F.1.

Austrade

Austrade is a Commonwealth statutory authority which provides export market intelligence for Australian firms and promotes Australian exports.[1] Austrade also administers a range of export assistance schemes which provide grants (discretionary and non-discretionary) and/or concessional finance to approved exporters.

A summary of export financial assistance schemes administered by Austrade is provided in Table F.2.

[1] These services are provided at less than full cost-recovery.

Blackwattle Environmental Consultants criticised the threshold set down for the EMDG Scheme as being too high and claimed that it was an impediment to the development of small firms as exporters. However, recent changes to the scheme have included provision for payments to joint ventures and consortia in order to assist small firms to collaborate with other firms to meet the threshold.

Table F.1: **Generally available export assistance** ($ millions)

Type of assistance	*1992-93*	*1993-94*[a]
Direct financial assistance		
Export Market Development Grants	148.0	209.7
International Trade Enhancement Scheme	20.8	31.7
Project Marketing Loan Facility	0.9	0.6
Asia-Pacific Fellowship Program	3.2	3.3
Australian International Management Exchange Program[b]	na	1.4
Marketing, promotional and intelligence services		
Austrade: International Business Services	119.8	127.0
Export Access	4.2	6.2
Market Australia Campaign	na	5.0
Australia in Asia Program	1.5	14.8
Export Finance and Insurance Corporation		
Commonwealth subsidy	9.4	7.6
Export assistance and foreign aid		
DIFF	120.0	120.0
Private Sector Linkages Program	5.0	6.0

na not available

a estimate

b The details of this recently announced scheme are to be finalised between Austrade and the business community.

Sources: Commonwealth of Austrlaia 1993a, 1993b, Commission estimates and personal communication with DITRD and Austrade.

Table F.2: **Export financial assistance schemes administered by Austrade**

Name of scheme	*Type of assistance*	*Purpose of assistance*	*Minimum eligible expenditure and/or projected earnings*	*Value of assistance available*
Export Market Development Grants Scheme	Non-discretionary taxable cash grants based on export market development expenditure in the previous financial year.	To encourage Australian exporters who have export earnings of less than $25 million per year to develop overseas markets.	Minimum eligible expenditure of $30 000 per grant year is required.	The grant rate is half of any eligible expenditure above a threshold of $15 000, with a maximum grant of $250 000.
International Trade Enhancement Scheme	Discretionary concessional loans and/or advances (made subject to the payment of royalties on revenue received).	To assist firms develop export markets. Funds are directed at specific projects expected to earn significant foreign exchange.	Qualifying projects must have expenditure of at least $100 000 a year. The project must have projected foreign earnings of at least $20 million over 5 years (some exceptions may be allowed).	Up to 5 per cent of the projected net foreign exchange earnings (NFEs) to a maximum funding of $2.25 million over the 5 year period. In exceptional circumstances (eg projected NFEs in excess of $45 million over 5 years), funding of up to $5 million may be provided.
Project Marketing Loan Facility	Interest free discretionary loans. If the project is unsuccessful, then only 50 per cent of the loan is repayable.	To support marketing activities for specific projects in overseas markets.	The applicant needs to demonstrate a significant sharing of the costs and risks associated with the marketing exercise.	There are no fixed limits. The typical range for loans is $50 000 to $100 000.
Asia-Pacific Fellowship Program	Financial assistance as: • Graduate Business Fellowships; • Management Executive Fellowships.	To provide training assistance to Australian organisations. The fellowships enable selected key staff to work and study in targeted Asian markets and, thus, gain experience in local business practices and cultures.	Not applicable.	Graduate Business Fellowships cover 75 per cent of agreed costs, including a salary component. Management Executive Fellowships cover 50% of agreed non-salary costs.

Austemex

Austemex, which was established by the EMIAA, is an 'export group cluster' or industry network made up of EMIAA members who pay an additional subscription fee to belong. It works closely with the Trade Development Working Group of the EMIAA.

The Export Development Manager employed by Austemex is also the National Manager, Environment Industries for Austrade. Austrade provides support by funding Austemex's associated operating expenses.

The aim of Austemex is to improve the export performance of its members. Services provided to members include the following:

- priority access to the information generated by Austrade's market intelligence network;
- member networking and exchange of information;
- assistance in forming coordinated trade responses and consortia to take advantage of overseas market opportunities; and
- priority consideration for industry and government support for export marketing activities such as trade missions.

Austemex has a close relationship with DITRD and various state government business development organisations.

Export Access

This is a joint initiative between the Commonwealth Government and private sector industry associations which is designed to help small to medium sized firms to export. The program is coordinated on behalf of the private sector by a National Office which works in close consultation with the Small Business Support and Infrastructure Section of DITRD, and also with Austrade and DFAT.

It provides training and practical assistance designed to help firms develop export strategies. Training covers areas such as: the development of strategies for international marketing; business conditions and practices in target overseas markets; assistance in obtaining overseas market information; and assistance with the preparation of business plans.

The Program also helps firms to identify sources of government assistance, such as Austrade and NIES, and assists them to set up individual business appointments.

Export Finance Insurance Corporation (EFIC)

EFIC provides export credit insurance, export finance, overseas investment insurance and security bonds to overseas buyers to support Australian produced exports (including capital goods and services). EFIC can assist exports by accepting a higher level, and variety, of risk than can be accepted by private insurers and financiers.

EFIC borrows on the commercial market and lends to eligible clients, often at subsidised interest rates. Any shortfall between the borrowing rates and the concessional lending rates is met by an export finance subsidy payment from the Commonwealth to EFIC. As EFIC's borrowings are backed by government guarantee, its borrowing rates are lower than those available to private firms.

Export assistance and foreign aid

As outlined in Chapter 11, Australian firms supply a significant proportion of the goods and services provided by Australia's foreign aid program. Two foreign aid programs which provide direct export assistance to Australian suppliers of goods and services are the DIFF and the Private Sector Linkages Program.

Development Import Finance Facility

The DIFF, which is administered by AIDAB, enables grants of aid funds to be combined with concessional loans provided through EFIC. This mixed credit package assists Australian firms to compete in markets in developing countries where other governments provide subsidised finance.

As noted in Chapter 11, DIFF funding in 1992-93 included $12 million for environmentally beneficial projects.

Private Sector Linkages Program

The Private Sector Linkages Program forms part of Australia's foreign aid program. It aims to enhance trade and investment links between Australia and developing countries in Asia.

Assistance of up to 50 per cent of approved costs (eg consultant's fees and economy airfares), to a maximum of $250 000, may be provided to Australian firms.

Market Australia Campaign

The primary aim of this recently introduced campaign is to promote Australia as a source of "sophisticated manufactures and services". Some of the aims of the program include the projection of Australia's:

- strengths in the education and related skills areas;
- research and development capacities; and
- ability to produce high technology products.

An important aspect of the program is the intention that it will be closely coordinated with other Australian international promotional efforts. Consultations are to take place with business organisations and representatives of new exporters to help with the design of the campaign.

The program will be launched in the Asia-Pacific region. Major promotions are to take place in Japan in November this year and in Indonesia in June 1994.

Australia in Asia Program

The Australia in Asia Program is a combination of Asia-related initiatives which were announced by the Australian Government in March 1993. These initiatives include:

- increasing business information about Asia;
- the expansion of business networks in Asia;
- broadening Australia's image in Asia; and
- fostering a better understanding of Asia in Australia.

The program includes the establishment of an Asia Economic Centre to provide high quality business-oriented economic analysis of Asian countries.

F.3 Government procurement

The Commonwealth and state governments have undertaken a number of initiatives designed to assist Australian and New Zealand firms to obtain government contracts for supply of goods and services. While the general emphasis of government purchasing policies is on obtaining value for money, considerable effort has been made to ensure that purchasing procedures do not discriminate against Australian and New Zealand suppliers. Programs which are designed to improve the opportunities for local supply are outlined in Table F.3.

Table F.3 **Procurement programs**

Scheme/program	*Type of assistance*	*Purpose*	*Government agency*
Industrial Supplies Offices (ISOs) in Australia and New Zealand	Provision of an ISO network which provides a link between major government purchasers and local suppliers.	Assist local participation in government procurement.	States and territories
Purchase Australia Campaign	Motivational/informational campaign.	Encourage the purchase of Australian and New Zealand goods and services which represent value for money.	States, territories and local government
Meet the Buyers Program	• organisation of events linking government and business; • Purchasing Australia, DAS, maintain a calendar of events.	• identify business opportunities for local suppliers; • provide information about government purchasing.	States and territories

F.4 Research and development

The Commonwealth provides funding for major research agencies (eg CSIRO and CRCs) and for higher education research (eg university operating grants and the Australian Research Council). Research assistance which is available to EWMESS firms is summarised in Table F.4.

Table F.4: **Commonwealth R&D assistance**

Scheme/program	*Type of assistance*	*Purpose*	*Government agency*
Taxation concessions	A 150% tax concession applies to expenditure on R&D.	To encourage firms to undertake R&D.	Australian Taxation Office
Grants for Industry Research and Development (GIRD)	• discretionary grants of up to 50% of eligible R&D project costs; • environment technology is a targeted technology for support under the Advanced Manufacturing Technology Grants component of the scheme.	To assist firms which are unable to benefit from the 150% taxation concession	Industry Research and Development Board

GIRD schemes include: the Discretionary Grants Scheme, the Generic Technology Scheme, the Advanced Manufacturing Technology Grants Scheme and the National Procurement Development Program (see Chapter 9 for details).

F.5 Commercial assistance

The Commonwealth Government provides a number of industry-wide development assistance programs which are relevant to the EWMESS industry. These programs may be categorised as follows:

- assistance to industry for the commercialisation of new Australian technology (see Table F.5); and
- financial assistance, which is available through the National Industry Extension Service (NIES) and the Best Practice Environmental Management Program (see table F.6).

Initiatives which presently assist small and medium sized enterprises include Export Access (see Section F.2) and the Pooled Development Fund (see Table F.5). Planned initiatives include First Stop Shops and the Businesslink Australia Service.

First Stop Shops are to be established to improve access to information about the full range of Commonwealth and state government programs. Closely linked is the Businesslink Australia Service. Its phased implementation is expected to commence in mid 1994. It aims to provide a national business information and referral service. The service will link government and private

sector information and referral databases through a single point of access, either on-line or by telephone.

Table F.5: **Commonwealth assistance for the commercialisation of technology**

Scheme/program	*Type of assistance*	*Purpose*	*Government agency*
Pooled Development Fund (PDF)	Taxation concessions are provided to investment companies that provide 'patient' equity capital to companies with assets not greater than $30 million.	To improve the availability of capital to small firms to assist them commercialise new technology.	Australian Taxation Office
Australian Technology Group (ATG)	Provision of a one-off payment of $30 million to set up the ATG. The ATG is to operate as a 'technology transfer company'.	To assist with the commercialisation of Australian research by: • identifying research with commercial potential; • providing seed capital to bring ideas to the stage where they are attractive to private organisations.	DITRD

Table F.6: **Financial assistance schemes**

Scheme/program	*Type of assistance*	*Purpose*	*Government agency*
National Industry Extension Service (NIES)	Advice, services and support, including a subsidy of up to 50% of specialist consulting services.	To help firms become internationally competitive, particularly through assistance with management training.	Commonwealth, state and territory governments
Best Practice Environmental Management (BPEM)	Financial assistance for half the cost of a BPEM program (up to $5000) for companies with less than 150 employees — to a limit of 40 companies.	To assist firms to identify cost savings which would be accompanied by a decrease in their detrimental environmental impacts.	DITRD

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