

**ECONOMIC ANALYTICAL UNIT
WORKING PAPER**



**AUSTRALIA'S TRADE IN
ENVIRONMENTAL GOODS AND SERVICES**

EXECUTIVE SUMMARY

Environmental goods and services, EGS, are a growing part of the international economy, expected to reach \$US600 billion worldwide by 2010. The Doha Declaration, launching a new round of World Trade Organization, WTO, negotiations, includes reference to negotiations to liberalise trade in EGS. Understanding the industry is therefore particularly important to parties to the negotiations.

Defining Environmental Goods and Services

Many obstacles prevent reliable definition of the EGS industry. These include the multiple possible end uses of many EGS and incompatibility with standard industry classification systems, which mostly categorise by key constituents or appearance and lack the required level of detail. Many multilateral and national agencies are pursuing efforts to further define the industry, of which the Organisation for Economic Cooperation and Development, OECD, has the broadest currency. The OECD defines the industry as follows:

“The environmental goods and services industry consists of activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use.”

Considerable debate surrounds the scope of the EGS industry, especially whether it should include so called environmentally friendly goods. Environmentally friendly goods are goods produced, used or disposed of in a way that has a reduced or minimal impact on the environment. The OECD definition of EGS does not include environmentally friendly goods defined as such due to their environmentally friendly production processes.

The paper seeks to circumvent some of the other definitional issues with environmental goods by measuring trade using the concept of potential environmental goods. Potential environmental goods are defined as those goods identified as having possible end uses in environmental management or protection, and are those goods listed on OECD and Asia Pacific Economic Cooperation, APEC, concordance lists between their respective classification systems and the Harmonised System used by customs authorities. Potential environmental goods, that is, including dual use goods, represent a larger group of goods than environmental goods, but since it is not currently possible to quantify accurately trade in environmental goods, they provide the only way of approximating trade in the industry. This concept may also simplify the implementation of trade liberalisation measures by eliminating the need for new regulations governing goods with multiple end uses.

Australia's Trade in Environmental Goods and Services

While Australia's precise exports of EGS cannot be quantified exactly, they are thought to be between \$A150 million and \$A300 million per annum. Exports of the broader category of potential environmental goods exceed \$A2 billion. Domestically, Australia's EGS industry has an estimated turnover of over \$A10 billion. Australia imports almost \$A7 billion in potential environmental goods, giving a sectoral trade deficit in potential environmental goods approaching \$A5 billion per annum.

Inadequate data prevent any reliable efforts at estimating the size of Australia's trade in environmental services. Nevertheless, various qualitative sources suggest Australia's sectoral strengths are concentrated in the larger segments of the industry, such as water treatment, wastewater management and waste management, and in mine rehabilitation.

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Australian Environmentally Friendly Goods Industry

Environmentally friendly goods are goods produced, used or disposed of in a way that has a reduced or minimal impact on the environment. Demarcating between environmentally friendly goods and normal goods is difficult, as measures of environmental impact are always relative and community standards and technology are constantly evolving.

Australia has a strong and expanding capacity to produce a wide range of environmentally friendly agricultural goods using improved production methods. Australia is also a world leader in meeting the ISO 14000 standards of environmentally friendly management practices. Levels of ISO 14000 certification are an indication of an economy's potential and preparedness to measure up to international standards for environmentally friendly goods. Some European economies have the highest very high levels of certification, while the developing world and the United States have quite low rates of certification.

Implications for Trade Negotiations

Due to difficulties in demarcating between EGS and other goods and services, there may be merit in taking an inclusive approach to the negotiations to avoid the need to apply and enforce tariffication according to end use. Such an approach would include any goods and services that may be used as end use EGS into the liberalisation negotiations.

Australia is supporting the use of the APEC classification list as the basis for WTO negotiations on increased liberalisation of environmental goods given the focus of this list on end use criteria. This approach however does not discount negotiations on potential environmental goods that may not be covered by the APEC list due to the development of new technologies. Australia does not support the use of the OECD list of environmental goods as a negotiating tool; although it is a useful tool to assist in terms of definitional and classification issues. The OECD indicated at the February 2003 WTO trade and environment negotiations that they did not support using the OECD as a negotiating tool as that was never its purpose and it was intended for analysis only. One of the problems with the OECD list was that it was created through a developed country forum, as opposed to the APEC list which was created through developed and developing country input.

Australia is not supporting WTO negotiations on environmentally friendly goods due to practical problems associated with regulating trade on this basis and the potential to distort trade without achieving environmental gains. The Australian government does however support market driven efforts by commercial interests to trade in environmentally friendly goods, consistent with the outcomes of the World Summit on Sustainable Development Plan of Implementation.

As Australia has considerable strength in environmentally friendly agricultural products, there is significant rationale for forming alliances with developing countries with regard to the WTO negotiations, particularly regarding any moves to expand the negotiations to include environmentally friendly goods. Many developing countries are not placed strongly to meet current or new international standards on environmentally friendly goods. Controlling trade in favour of environmentally friendly goods by regulating production methods would interfere with national sovereignty and be deleterious to international trade and the interests of developing countries.

I. DEFINING THE ENVIRONMENTAL GOODS AND SERVICES INDUSTRY

KEY POINTS

- **Environmental goods and services are a growing part of the international economy, expected to reach \$US600 billion worldwide by 2010.**
- **The World Trade Organization is conducting specific negotiations on trade and the environment, including trade in environmental goods and services, making understanding of the industry particularly important to parties to the negotiations.**
- **Many obstacles prevent reliable definition of the environmental goods and services industry. The Organisation for Economic Cooperation and Development classification system is the most advanced in developing a comprehensive system for the industry.**
- **Considerable debate surrounds the scope of the environmental goods and services industry, especially whether it should include so called environmentally friendly goods. World Trade Organization rules suggest trade cannot be restricted in favour of environmentally friendly goods defined by their process and production methods, as they are not materially different to their non-environmentally friendly counterparts.**
- **Broadly defined potential environmental goods may provide a way of circumventing definitional and data problems, by including all goods that could potentially be used for environmental purposes. It may also simplify the implementation of trade liberalisation measures.**

At the start of the twenty-first century, industry of all kinds, from agriculture to transport, along with urban sprawl, continue to exert pressure on air and water quality, biological diversity and resources. In response, there has been an increasing use of technology to remedy or ameliorate the resulting environmental challenges.

The goods and services used to address such challenges, termed environmental goods and services, EGS, form an expanding industry worth in excess of \$A10 billion in Australia in 2001 and projected to reach \$US600 billion worldwide by 2010 (Trade Promotion Coordinating Committee, 2000). Some have even predicted the shift towards more environmentally sustainable development will have such important impacts on accepted business models as to be considered part of the sixth wave of technological change since the Industrial Revolution (Department of Industry, Science and Resources, 2000).

Of course, substantial and increasing international trade in EGS exists, and concurrent with the industry's development, a long running debate continues about the relationship between trade and the environment, an issue that is a major part of the broader globalisation debate. The World Trade Organization, WTO, among other multilateral organisations, has sought to address the issue of trade and the environment through a standing committee, the Committee on Trade and Environment, whose members and observers are in ongoing discussions about the environmental effects of trade. In addition, the WTO's Doha Ministerial Declaration mandated specific negotiations on the trade and environment issue (see Box). Clause 31 refers to negotiations as part of the new Doha round to be conducted by the Committee on Trade and Environment in Special Session. Clause 32 instructs the standing committee to focus on a number of issues in its normal

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discussions. Discussions have commenced within the bounds of this mandate, focussing initially on the method and scope of the negotiations.

EXCERPT FROM THE DOHA MINISTERIAL DECLARATION:

31. With a view to enhancing the mutual supportiveness of trade and environment, we agree to negotiations, without prejudging their outcome, on:
- (i) the relationship between existing WTO rules and specific trade obligations set out in multilateral environmental agreements, MEAs. The negotiations shall be limited in scope to the applicability of such existing WTO rules as among parties to the MEA in question. The negotiations shall not prejudice the WTO rights of any Member that is not a party to the MEA in question;
 - (ii) procedures for regular information exchange between MEA Secretariats and the relevant WTO committees, and the criteria for the granting of observer status;
 - (iii) the reduction or, as appropriate, elimination of tariff and non-tariff barriers to environmental goods and services.
32. We instruct the Committee on Trade and Environment, in pursuing work on all items on its agenda within its current terms of reference, to give particular attention to:
- (i) the effect of environmental measures on market access, especially in relation to developing countries, in particular the least-developed among them, and those situations in which the elimination or reduction of trade restrictions and distortions would benefit trade, the environment and development;
 - (ii) the relevant provisions of the Agreement on Trade-Related Aspects of Intellectual Property Rights; and
 - (iii) labelling requirements for environmental purposes. (WTO, 2001)

Australia's Environment Industry

As Australia does not possess particular strengths in major EGS industries to support exports on a large scale, it is probably a net importer of EGS (see Chapter 2). Waste management and water treatment constitute a majority of Australia's EGS industry, as they do in many economies around the world. Nevertheless, in some segments, such as mine site management and rehabilitation, Australia's experience means it is well placed to export its goods and services. Both as an exporter and as an importer of foreign expertise and management, Australia's interests lie with a liberalised trading environment for EGS in order to further promote international best practice environmental management.

WHAT ARE ENVIRONMENTAL GOODS AND SERVICES?

Of pivotal relevance to the Doha negotiations is the definition of the EGS industry. For various reasons, many EGS are difficult to identify. The evolving nature of the industry and the potential for to use particular goods and services to improve environmental outcomes from almost every human economic activity create difficulties in drawing the boundaries between environmental and other goods and services.

Classification Issues

A number of obstacles arise in putting together any comprehensive definition of EGS. The need to differentiate goods and services by their end use rather than their physical characteristics, the embedded nature of environmental technology and the wide-ranging nature of the EGS industry, all present many challenges in classification of EGS. The evolving nature of the industry will also require its classification to change with it.

Incompatibility with Existing Classification Systems

EGS does not appear as its own category in any industrial or trade classification system. Rather, EGS are spread through the existing categories, often divided by what they are made of or what they look like. In addition, such classification systems often are not detailed enough to be able to identify the precise types of goods which may be used as EGS. For example, the Harmonised System used for traded goods by customs authorities is only harmonised internationally up to the 6 digit level, so while classifications beyond that, up to 12 digits, may exist, they are not internationally comparable. This has obvious impacts for measurement of the industry, but also means that liberalisation of trade in EGS in any precise way would require modification of customs authorities' classification systems.

End Use

Many environmental goods also have other uses; it is their particular usage which sets them apart as environmental. For example, one use of a centrifuge is for separating harmful waste products from a mixture, but a wide range of other industrial uses also exist. Existing classification systems often do not classify goods by their usage. This problem of establishing the usage of goods complicates the process of estimating the size of the EGS industry, and creates the possibility of either excluding some products with environmental uses or including some trade in products not being used for environmental purposes.

Embedded Technology and Integrated Services

Cleaner production methods often use embedded technology, which in some circumstances involves little more than the use of a particular substance or technique at a particular stage of production. Often neither the substance nor the standard equipment are environmental goods, but the particular production method has a smaller 'environmental footprint' than conventional methods. Similarly, providers of environmental services increasingly provide integrated commercial services which may include non-environmental construction, engineering or managerial services. These issues complicate the valuation of the good, service or technology for the purposes of inclusion in EGS.

Definition by Outcome or by Motivation?

A final complication in defining the industry is determining whether to include some cost-reducing technologies and practices which have the convenient effect of being less polluting than alternative methods, but whose utilisation could easily be motivated by good management or good house keeping. For example, are goods which reduce use of an expensive and polluting substance environmental goods or not? These may be termed win-win outcomes, in the sense that both the producer and the environment win. More problematically, is a product that assists with processing recycled paper but also produces toxic by-products an environmental good or not? In this case, the forests win but the waterways may lose.

Numerous parties have endeavoured to surmount the problems, presenting further standardisation problems. Combined, these problems make it difficult to grasp the size and importance of EGS activity in the economy and as part of trade with other economies.

Classification Efforts

Multiple parallel efforts at defining the industry are underway, at multilateral, regional and national levels. Major organisations pursuing efforts to define the industry are as follows.

- The Organisation for Economic Co-operation and Development, OECD, and the Statistical Office of the European Communities, Eurostat, have published *The environmental goods and services*

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industry: Manual for data collection and analysis (OECD, 1999) which many OECD members, including the United States, Canada, France, Germany and Australia, use as a basis for surveying their own industries. Many WTO members also use the OECD categories in their submissions to the new round of negotiations. The OECD defines the EGS industry as follows:

“The environmental goods and services industry consists of activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use (OECD, 1999).”

- With respect to environmental services, the WTO employs the evolving GATS W/120 classification list, which is derived from the United Nations Central Product Classification, UN CPC (General Agreement on Tariffs and Trade, 1991).
- In 1997, the leaders of the Asia Pacific Economic Cooperation, APEC, economies meeting in Vancouver endorsed the inclusion of the EGS sector in its early voluntary sectoral liberalisation initiative. A panel of technical experts produced a list of environmental goods, based on the OECD definition of the industry (WTO, 2002a). The list also included the Harmonized System codes for concordance with the customs classification system, but work on the list ceased in 1998 when leaders handed early voluntary sectoral liberalisation in EGS to the WTO.
- The Australian Department of Industry, Science and Resources and Environment Australia have published an *Environment Industry Action Agenda*, which adopts the OECD definition of the EGS industry (Department of Industry, Science and Resources, 2001). However in some areas additional emphasis has been given to potential growth areas.

An ongoing debate exists about the relative virtues of the particular classification systems. For example, OECD (2001) provides a detailed critique of the deficiencies of the W/120 system and suggests a number of ways it could be revamped (pp. 17–25). The OECD classification system seems to be the most widely used at this stage, but the W/120 system continues to be used at the WTO and the United Nations, particularly for services. Negotiations on environmental goods are currently examining both the APEC and OECD lists.

In addition to efforts to classify the EGS industry, other international and domestic systems to quantify expenditure on environmental protection also are being developed. At the international level, the United Nations' Classification of Environment Protection Activities exists, while domestically, the Australian Bureau of Statistics, ABS, compiles statistics on Environment Protection in Mining and Manufacturing Industries (Australian Bureau of Statistics, 2002). The resulting measures are somewhat comparable but the different methodology and substantial difficulties in defining and collecting data mean they must be treated separately. For example, the Australian EGS industry considers the ABS figures to underestimate considerably the size of the industry (Environment Australia, 2001).

OECD/Eurostat Classification System Comprehensive and Wide Ranging

The OECD/Eurostat Classification System is the most advanced and comprehensive of all efforts to classify and define the industry. It divides the EGS industry into three major groups: the pollution management group, the cleaner technologies and products group and the resource management group. Each of these groups are sub-divided into a number of categories and subcategories (Table 1.1).

Table 1.1

OECD/Eurostat Environmental Goods and Services Industry Manual Classification

The 'Pollution Management' Group	Environmental equipment and specific materials	Air pollution control
		Wastewater management
		Solid waste management
		Remediation and clean-up of soil, surface water and groundwater
		Noise and vibration abatement
		Environmental monitoring, analysis and assessment
		Other
	Environmental services	Air pollution control
		Wastewater management
		Solid waste management
		Remediation and clean-up of soil, surface water and groundwater
		Noise and vibration abatement
		Environmental R&D
		Environmental contracting and engineering
		Analytical services, data collection, analysis and assessment
Education, training and information		
Other		
Construction and installation		
The 'Cleaner Technologies and Products' Group		Cleaner/resource-efficient technologies and processes
		Cleaner/resource-efficient products
The 'Resource Management' Group		Indoor air pollution control
		Water supply
		Recycled materials
		Renewable energy plant
		Heat/energy saving and management
		Sustainable agriculture and fisheries
		Sustainable forestry
		Natural risk management
		Eco-tourism
	Other	

Source: OECD, 1999. Included in full at Appendix A.

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Are Environmentally Friendly Goods included?

A key issue in the definition of EGS is whether *environmentally friendly* goods, EFG, form a part of EGS. EFG are goods that through their life cycle, that is their production, use and/or disposal, have lower environmental impacts than their non-EFG counterparts. EFG that have reduced impacts through their use and/or disposal are included in the OECD/Eurostat classification of EGS and represent an area of overlap between EFG and EGS. However, EFG defined as such due to their environmentally friendly production methods do not currently feature in the OECD/Eurostat system.

WTO Rules Exclude Production Method Based EFG

With respect to goods *produced* in an environmentally friendly way, WTO rules, as they have been interpreted to date, stipulate that trade in goods and services cannot be restricted on the basis of the process and production methods, PPMs, used to produce them, if those PPMs are 'non-incorporated'. A non-incorporated PPM is one that has no discernable impact on the final product – i.e. it is impossible to tell the PPM used by examining the final product. In many cases, EFG are distinguishable from their non-environmentally friendly counterparts by the way that they are produced, and hence, it is thought WTO rules would disallow any barriers to international trade in favour of them. Therefore, the reference to EGS in clause 31 (iii) of the WTO declaration would generally not be thought to include PPM-based EFG.

Goods that are used or can be disposed of in a more environmentally friendly way, for example energy or water efficient equipment or recyclable computer equipment, could be argued to be discernibly different from their non-EFG counterparts, and as such would not fall foul of WTO rules.

It is important to note that while the OECD/Eurostat classification system seems to be consistent with WTO rules at this stage, it is still evolving and Australian policymakers need to keep a watching brief on any changes that may include PPM-based EFG in the list in the future.

Pitfalls in PPM Based Liberalisation

Leaving aside WTO rules, any attempt to liberalise trade in PPM based EFG would not be feasible without impinging on the sovereignty of members to determine their own environmental objectives. Given the site specific nature of many environmental problems, countries' different natural and human environments, not to mention developmental priorities, give rise to widely different environmental standards with respect to water, air and land use. This in turn leads to different priorities in determining what are environmentally friendly PPMs. Multilateral liberalisation in favour of PPM based EFG would effectively impose WTO based standards on PPMs, providing protection for those with PPM standards matching or exceeding the WTO standards at the expense of those with lower standards, regardless of the pressing environmental problems of each.

Voluntary Eco-labelling

Suppliers of PPM based EFG may of course use voluntary eco-labelling as a marketing tool, as is common in many developed countries. Compulsory eco-labelling would not be enforceable in a WTO compliant manner, since a product that is eco-labelled to indicate it has been produced in a particular way is not materially different from one that is not labelled. This is distinct from energy efficiency and nutrition labelling, both of which are product-incorporated and intended to facilitate better communication to the consumer of the nature of the product itself. The experience with eco-labelling of timber in Europe demonstrates that eco-labelling also can be subject to fraud and misrepresentation.

The WTO's Committee on Technical Barriers to Trade is conducting ongoing discussions on eco-labelling to ensure it does not become trade restricting while continuing to better inform consumers and assist EFG

producers in extracting a 'green' premium. In addition, the Doha declaration included a commitment in clause 32 (iii) that the Committee on Trade and Environment give particular attention to labelling.

Schemes from different countries facilitating mutual recognition between each other may help reduce the degree to which voluntary eco-labelling is a barrier to entry for outsiders. Counterproductively, larger, more onerous schemes may present even more significant barriers to entry, particularly developing country exporters. As eco-labelling becomes more common, the share of the world marketplace available to producers of unlabelled goods is smaller. In this case, more assistance may be required for developing country producers to inform them of the requirements in order to qualify for eco-labelling.

IMPLICATIONS FOR TRADE NEGOTIATIONS

Despite the various efforts to develop cohesive classification systems to characterise the EGS industry, these systems do not neatly match the approach used in classification of goods and services for customs and tariffication purposes. This has important implications for trade negotiations on EGS. While end use is rarely of any consequence to customs agencies, many EGS (eg. pumps, filters, extractors, etc.) have multiple uses, only some of which are for environmental management. It is logistically unwieldy to apply different tariffs on goods and services as they cross the border according to whether their end use is for environmental management or not. Enforcement of EGS' actual end usage is not likely to be worthwhile.

That being the case, if tariff and non-tariff barriers to EGS are reduced or eliminated as set out in the Doha declaration, what about the myriad goods and services that have multiple possible uses? Given that reduction in barriers to trade is the intent of the Doha mandate, an all-inclusive approach would suggest that trade in any good or service that could possibly be used as an EGS could be liberalised. Where the EGS does not have product incorporated features indicating that it is only used as an EGS, this would result in goods and services that ultimately are not used as EGSs being included in the liberalisation, but it appears better to err on the side of liberalising trade and include these than exclude goods or services that may play an important role in environment protection or management.

Potential EGS

Given the logic and possibility of an inclusive approach to trade liberalisation in this area, where EGS specific information is not available, this report takes a broader approach, including any goods and services that are in some cases used for environmental management. Such goods and services are termed *potential* EGS in this report¹. Characterisations of Australia's trading position in these goods and services will not reflect perfectly the position with respect to EGS, but this trading position would actually be more relevant to negotiators were the inclusive approach to be accepted in the negotiations. It is reasonable to assume that at least the direction of the trading position, if not the magnitude, will be the same for actual EGS and the broader *potential* EGS industries.

With environmental goods, the detailed categorisation that exists within the Harmonized System used by customs agencies around the world provides some ability to narrow down the kinds of goods used for environmental management. Existing WTO submissions list concordance annotation for the Harmonized System to both the OECD and the APEC classifications of environmental goods (WTO, 2002b). This enables the compilation of *potential* environmental goods data, which are referred to in this report. For environmental services, however, trade data is relatively scarce and less detailed, preventing even this approach.

¹ *Potential* EGS are goods or services which could be EGS but also include non-EGS due to reliance on a customs data. Data are calculated using a combination of OECD and APEC concordance lists (See Appendix B). Detailed negotiations on EGS has the potential to narrow this list further by specifying more detailed lists of goods than is possible using 6 digit Harmonised System categories.

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II. ENVIRONMENTAL GOODS AND SERVICES

KEY POINTS

- Australia's EGS industry has an estimated turnover of over \$A10 billion. Worldwide, the industry is estimated at \$US600 billion (around \$A1000 billion).
- Australia's precise exports of EGS cannot be quantified exactly but are thought to be between \$A150 million and \$A300 million per annum. Exports of broader potential environmental goods exceed \$A2 billion.
- Australia imports almost \$A7 billion in potential environmental goods, giving a sectoral trade deficit in potential environmental goods approaching \$A5 billion per annum.
- Inadequate data prevent any reliable efforts at estimating the size of Australia's trade in environmental services.
- Australia's sectoral strengths are concentrated in the larger segments of the industry, such as water treatment, wastewater management and waste management, and has expertise in mine rehabilitation.

SIZE OF THE INDUSTRY

The EGS industry accounts for between one and two per cent of GDP for most countries around the world, including Australia, making it a significant part of the economy.

Australian Market

Total expenditure on environment protection was estimated at \$A8.6 billion, 1.6 per cent of GDP, in 1996-97 (Australian Bureau of Statistics data reported in Department of Industry, Science and Resources, 2000). The majority of environment protection expenditure was on wastewater management and water protection, \$A3 billion, and waste management activities, \$A2.5 billion. Expenditure to protect biodiversity and landscape accounted for \$A1.5 billion, with the remaining \$A1.6 billion spent on protection of ambient air, climate, soil and groundwater, research and development, noise and vibration abatement and other environment protection activities not separately identified. While the Australian Bureau of Statistics no longer compiles this data for the whole economy, in 2001-02, 1.6 per cent of GDP equated to around \$A11.4 billion.

The Australian Bureau of Statistics continues to compile data on environment protection expenditure in the mining and manufacturing industries, two key consumers of environmental goods and services. This was estimated at \$A1.5 billion in 2000-01, or 1 per cent of their total expenditure. This included \$A482 million on solid waste management, \$A402 million on liquid waste and waste water management, \$A222 million on air emissions management and \$A105 million on mine rehabilitation (Australian Bureau of Statistics, 2002).

Other estimates of the size of the Australian EGS industry also exist. Environment Business Australia estimated the turnover of the Australian industry in 2000 to be between \$A8 billion and \$A11 billion (Environment Management Industry Association of Australia, 2000). An input-output analysis of the industry estimated direct expenditure on the environment was \$A7.9 billion in 1995-96 (Industry Policy Consultants, 1998).

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International Market

The US Department of Commerce estimated the global environment market to be \$US513 billion, almost \$A1000 billion, in 2000 (US Department of Commerce, 2000). The European Commission estimated that the size of the global EGS market in 1998 was around €330 billion, around \$A550 billion, and forecasts it will increase to €439 billion, around \$A750 billion, by 2010 (European Union, 1999).

The international market can be divided into two broad segments:

- in developing economies, basic needs like clean water delivery and waste-water treatment form the majority of demand, which normally is limited to around 1 per cent of GDP; international aid agencies often provide the necessary funding
- in developed economies, a more sophisticated range of environmental goods and services are in demand from a wider range of government agencies and firms, pushing demand to up to 2 per cent of GDP.

This dichotomy stems from the 'luxury good' characteristic of environmental protection; as the incomes of economies and populations increase, they are prepared to spend more on protecting the environment (World Bank, 1992). Hence, the majority of the global environment market exists in the richer countries, not only because they account for a majority of global GDP but also because they are more able to divert resources to solving environmental problems. Developed countries' ability to implement environmental regulations is also higher because enforcement agencies are often better funded and more transparent. More market driven regulatory infrastructure means economic incentives also often operate better in more developed economies, translating regulations into demand for EGS. However, the fastest growth of market size occurs in rapidly developing economies, both because of their increased income and their increased ability to afford to protect the environment.

In many less developed economies, international aid agencies have an important role in funding environmental protection and in some cases donor industrialised economies also influence decision making regarding environment projects. A recent European Union, EU, report estimated that up to 40 per cent of EU exports of EGS may be as a result of 'tied aid' to developing countries (European Union, 1999). EU tied aid is highest to Central and Eastern Europe, South East Asia, India, Africa and South America. Such aid can advantage EU firms at the expense of others, including Australian ones.

TRADE IN EGS

Estimation of Australia's trade in EGS is difficult; hence estimates are scarce (see Chapter 1). Given the vastly different approach to defining the EGS industry compared to conventional industries, accurate quantification of the industry would require a separate statistical survey. Nevertheless, a number of more approximate measures of the industry exist.

Australian Exports

A number of estimates of the size of EGS exports exist, but little supporting data or methodology is available to substantiate or elaborate on many of these estimates. In 1994, a report by the Australian Council of Trade Unions and the Australian Conservation Foundation Green Jobs Unit estimated industry exports at around \$A200 million (Cook, 1994). In the same year, the Environment Management Industry Association of Australia suggested EGS exports exceeded \$A300 million (Environment Management Industry Association of Australia, 1994). More recently in 2000, the Environment Management Industry Association of Australia Chair, Paul Perkins, estimated EGS exports at around \$A140 million (Department of Industry, Science and Resources, 2000).

Using the broader definition of *potential* EGS, which includes any good with a substantial component of environmental end use, generates an estimate of Australia's trading position in the industry. The logic of an inclusive approach to trade liberalisation policy means that such estimates are useful in their own right (see Chapter 1).

Analysis of Australian trade data indicates that in the 2001/02 financial year, Australia exported \$A2.1 billion in potential environmental goods (Table 2.1).¹² This includes \$A882 million in machinery, \$A650 million in precision equipment and \$A208 million in chemicals similar to the types of goods used in environmental management. When compared to Australia's imports, it is apparent that Australia does not have a comparative advantage in any of the goods categories used in environmental management. Anecdotal evidence suggests that, as is the case in most Australian manufacturing sectors, Australia produces and exports specialised environmental goods in niche markets but as a whole it is a net importer.

Table 2.1

Australia's Trade in Potential Environmental Goods^a, \$A million, 1997/98 and 2001/02

	Exports		Imports		Trade balance	
	1997/98	2001/02	1997/98	2001/02	1997/98	2001/02
Chemicals (eg. catalysts)	115	208	353	641	-238	-434
Plastic and rubber products	97	159	431	548	-334	-388
Machinery	849	882	3 083	3 252	-2 234	-2 370
Electrical machinery	56	116	415	491	-359	-375
Precision equipment	392	650	1 381	1 703	-989	-1 053
Other	101	108	244	270	-143	-162
Total	1 610	2 123	5 907	6 906	-4 297	-4 783

Notes: ^a Potential environmental goods are all goods which could potentially be used for environmental management, as far as is possible to ascertain using the Harmonized System of classification and concordance with the OECD and APEC environmental goods classifications.

Services data are much less detailed, making analysis of even potential environmental services difficult. It is not possible to concord the sectoral data compiled by the Australian Bureau of Statistics with the end-use based OECD environmental services classification or any other classification system. This applies to exports, imports and, by implication, the trade balance. As such, the various estimates above of combined EGS exports are the only estimates available.

Australian Imports

An input-output analysis conducted for the Environment Industry Action Agenda suggested that in 1996, imports of EGS amounted to about \$A4 billion (Industry Policy Consultants, 1998). Australian industry also has considerable investment from foreign sources in a number of areas, suggesting there may be significant levels of import penetration in the Australian environmental services industry, particularly of overseas technology and know-how. For example, subsidiaries of two of the largest environmental companies in the world, Vivendi and Suez Lyonnaise des Eaux, are leading firms in the waste management and water treatment sectors of the Australian EGS industry (Department of Industry, Science and Resources, 2000).

¹ Some reports term represent this as trade in environmental goods per se, but this is not entirely accurate (see for example Centre for Strategic Economic Studies, 2001).

² This is substantially larger than the less precise estimates of environmental goods alone that appear above, perhaps indicating that some further refinement of the classification of potential environmental goods is required.

Trade in Environmental Goods and Services

In 2001/02, Australia imported around \$A6.9 billion of potential environmental goods, including \$A3 252 million in machinery, \$A1 703 million in precision equipment and \$A641 million in chemicals (Table 2.1). Taking its exports into account, Australia is a net importer of \$A4 to 5 billion per year in potential environmental goods across all major categories of manufactured goods. This trading position has not changed significantly over the last five years.

As noted earlier, no data on Australia's trade in environmental services exist.

AUSTRALIA'S TARIFF LEVELS

Australia already has very low tariffs on potential environmental goods, reflecting the low general tariff arrangements across most industrials. The weighted average tariff on Australia's imports of potential environmental goods is 2.9 per cent. Of the 170 Harmonized System 6-digit categories classed as potential environmental goods, 81 lines enter Australia tariff-free, 84 are taxed at 5 per cent, with the remaining 5 taxed at 15 per cent. These 5 lines generally incur the higher tariff as they are considered to be of a kind potentially used as components in passenger motor vehicles. Tariffs vary across industry groupings, with chemicals and precision equipment generally entering tariff-free, while plastics and machinery are generally taxed at 5 per cent (Table 2.2).

Table 2.2

Australian Tariff Levels on Potential Environmental Goods^a, per cent, 2002

	Simple average tariff	Weighted average tariff ^b
Chemicals	0.8	0.7
Plastic and rubber products	5.0	5.0
Machinery	4.8	4.4
Electrical machinery	2.0	1.4
Precision equipment	0.6	0.4
Other	4.4	4.5
All	2.9	2.9

Notes: ^a Potential environmental goods are all goods which could potentially be used for environmental management, as far as is it is possible to ascertain using the Harmonized System of classification and concordances with the OECD and APEC environmental goods classifications. ^b Weighted by imports in 2002.

Major Overseas Exporters of EGS

During the early 1990s, the OECD considered the US, German and Japanese environmental industries to be the largest exporters of EGS, narrowly defined (OECD, 1996). More recently, Environment Business International estimated that in 1998, the US environment industry earns export revenue of almost \$US19 billion, followed by the Japanese industry with around \$US15 billion and Germany with a little over \$US9 billion (Environmental Business Journal, 2000). Some other European countries, such as Finland and Norway, also have internationally focussed industries, but have a smaller market share.

As such, EGS seem to be concentrated in capital and technology rich economies. Despite the lack of data, basic trade theory would suggest that, given the outcomes, Australia does not appear likely to become a major net exporter of EGS. As Australia possesses large amounts of capital and a highly skilled workforce, it is quite capable of producing EGS for *domestic* consumption and provision and exporting small amounts in particular niche markets where firms possess particular skills or technology. However, given its relatively more abundant resources and land, in terms of comparative advantage it is more likely to continue to concentrate on resource

and land intensive products, and products of associated industries, for the bulk of its export revenue. In some cases, Australia's niche EGS markets will lie in agriculture or mining related areas where it is able to exploit particular environmental know-how.

AUSTRALIAN SECTORAL ASSESSMENTS

Environmental Goods

A breakdown of the number of firms in the Interdata Environment Handbook in 1996 revealed that 477 out of 1674 firms, 28 per cent, were involved in the supply of environment management equipment (Industry Policy Consultants, 1998). However, the proportion of firms that produced or otherwise sourced the equipment in Australia is not clear from this study.

In a study of the EGS industry using Porter attractiveness ratings, Industry Policy Consultants concluded Australia had relatively few strengths in the provision of environmental equipment, i.e. goods (Industry Policy Consultants, 1998)^{3,4}. This is primarily due to the small size of the Australian market, the economies of scale that exist in the production of most environmental goods and the dominance of those markets by large multinational companies. However, Australia does have positive attributes, such as good domestic capability in niche equipment and technology, medium scale metals and engineering fabrication and information technology, communications and software, all of which support the development of capacity in selected sectors of environmental goods production. In particular, the analysis suggests Australia is competitive in the provision of water equipment, air pollution control equipment and instrument manufacture.

The Porter attractiveness ratings suggest Australia possesses less strength in waste management and process and prevention technologies, largely because of the economies of scale in those industries and the small and diffuse nature of the Australian market (Industry Policy Consultants, 1998). On the other hand, a more recent APEC survey of environmental markets in APEC economies concluded waste management was an area of potential high growth for Australia (APEC, 2001). The importance of this segment within the EGS industry means that even modest growth for the segment could be significant for the Australian EGS industry as a whole.

Environmental Services

As recently as 2000, a comprehensive review of the Australian services sector by the Department of Industry, Science and Tourism did not specifically include the environmental services industry as one of 20 sectors covered in the report (Department of Industry, Science and Tourism, 2000). This indicates the difficulty of separating out environmental services, which tend to be spread right across a wide range of management, engineering and ancillary services. Despite this, some, mostly qualitative, information on the industry exists.

Statutory authorities, including government research and development corporations, supply many of Australia's environmental services. More broadly, Australia's strong educational infrastructure in environmental sciences and environmental engineering and professional skills provide an important source of strength for the industry (Centre for Strategic Economic Studies, 2001). Environmental research from the Commonwealth Scientific and Industrial Research Organisation, the Cooperative Research Centres and universities has encouraged innovation in the industry. In the private sector, according to a breakdown of the

³ Porter attractiveness ratings assess industry competitiveness based on four sets of conditions; factors of production, the size and rate of growth of domestic demand, the presence of internationally competitive supplier industries and 'firm strategies and structure' (Porter, 1990).

⁴ Fifteen industry segments were considered in the study, five equipment segments, five services segments and five 'resources' segments. For the purposes of this report, the 'resources' segments are also classed as services.

Trade in Environmental Goods and Services

number of firms in the Interdata Environment Handbook in 1996, a majority of Australian firms, 1197 out of 1674 firms, 72 per cent, were involved in the provision of environment management services (Industry Policy Consultants, 1998)³. The Industry Policy Consultants study found Australia was particularly strong in providing environmental services, particularly analytical services and consulting and engineering, due to the significant potential domestic demand and high skill base of university trained people (Industry Policy Consultants, 1998). (See Box).

Other factors, such as public pressure, have given impetus to the environmental services industry, developing some strengths. For example, in the late 1980s and 1990s, opposition to using high temperature incinerators for waste disposal spurred the development of alternative technologies. Australia's waste management industry is now noted to be a world leader in technology for the disposal of some toxic wastes such as polychlorinated biphenyls, PCBs (APEC, 2001). Australia has a wide range of sensitive environments and a considerable number of environmental problems in common with many countries, providing another source of competitive strength.

Particular industry segments where Australia is noted to have some strengths or future potential include solid waste management including organic waste processing and recycling, contaminated site rehabilitation, water resource management, marine resource management, hazardous waste management services, waste water management, water protection, arid land management, clean mining and mineral processing, pollution monitoring and control, airport noise abatement, eco-tourism and renewable energy such as photovoltaics (Industry Policy Consultants, 1998; APEC, 2001; Department of Foreign Affairs and Trade, 2001; Centre for Strategic Economic Studies, 2001).

AUSTRALIAN EXPERTISE IN SERVICES WIDE RANGING

Aquatec-Maxcon is a provider of water and wastewater technology, equipment and associated services from pilot studies to process selection and design, construction and installation, commissioning, operation and maintenance. It has exported to many countries, including New Zealand, Papua New Guinea, Indonesia, Singapore, Vietnam, China and India and has established a sister company in Indonesia.

Coffey Geosciences is a company of specialist consulting engineers and scientists, maintaining offices throughout Australia and in Jakarta, Kuala Lumpur, Manila, Bangkok, Hanoi and Hong Kong. Its international clients include agencies such as the Asian Development Bank, the World Bank, the United Nations Agencies and AusAID.

Egis Consulting Australia is an environmental engineering and management consultancy. The environmental group has been active in the international market for 30 years and had undertaken many environmental engineering, management and scientific projects in Indonesia, the Philippines, Malaysia, Thailand, Papua New Guinea, Vietnam, Laos, China, Pakistan and other countries for the major aid agencies and major private and public sector clients.

The United Nations Environment Programme has engaged Environment Australia to develop training materials on improved mining practices for use in developing countries. The training kit will build on the knowledge of Australian industry practitioners and regulators and be based on the Best Practice in Environmental Management in Mining series currently in use in Australia. The kit will highlight Australia's high quality environmental technology and mining support services.

Fisher Stewart is an environmental management consultancy. In the past two years, Fisher Stewart has completed project management, design and construction of over 30 water and wastewater treatment plants

in Indonesia, China, Vietnam and the Philippines; and over 300 specialist natural resource studies and projects in Australia, Asia Pacific and Europe.

Geo2 is a waste management company. Geo2 has joint ventures in China and the United States transferring knowledge and technology from the minerals industry into reprocessing plastic scrap from the information technology industry. It also re-engineered a gold and copper processing operation with financial and waste problems at Huludao in China to give economies of scale and produce a near zero discharge system.

Landfill Management Services is a specialist landfill gas company. It has been involved in many projects abroad, including in Taiwan, Thailand, Philippines, Hong Kong, India, Indonesia, Europe and North America.

Lochard supplies noise and flight track monitoring systems to airports. Its current installation base covers twelve countries on four continents and includes airports in Chicago, London and Hong Kong.

GRD Minproc is involved in waste and water treatment, particularly for the minerals resources sector. The company has completed two recycling facilities in China and a mercury scrubbing facility in Indonesia.

MPL is a risk management consultancy and laboratory. Its international projects include corrosion control for a mine and township in Papua New Guinea, surveys for a new copper mine in Mauritania and an environmental impact study of drainage from coal mines in Indonesia.

Natural Technology Systems is transferring its expertise in remote Australia communities to the remote areas of South East Asia. In 1995, the Forestry Department of Brunei Darussalam commissioned them to design and install a renewable energy power system for a national park.

Oceans Environmental Engineering is a waste management company using a unique reed bed technology in Great Britain, New Zealand, India and Indonesia.

OPEC Systems are marine and industrial pollution experts specialising in the treatment of spills and leaks. They have offices throughout Australia and South East Asia.

Sepa Waste Water Treatment designs, manufactures and installs water and wastewater treatment plants. It operates throughout Australia, New Zealand and South East Asia, and has built treatment plants in 15 countries. Recent projects include a complete wastewater and sludge dewatering plant for BHP's Thailand flat products steel mill, a plant for treating oil refinery wastewater for the Petron Corporation in the Philippines and a dissolved air flotation plant for waste treatment at Northlands Dairies in New Zealand.

Sinclair Knight Merz provides engineering and other professional services. It undertakes a considerable volume of consultancy work abroad, particularly for the major multilateral agencies. One of its more noteworthy recent projects is the Samut Prakarn Wastewater Project in Bangkok.

SMEC is a multi-disciplinary consultancy group with offices throughout Australia, Asia, Oceania, Africa and the Middle East. SMEC Environmental has undertaken a range of landmark projects, including Ho Chi Minh City Environmental Improvement Program in Vietnam, environmental and social impact assessment of roads in India and Nepal, the Cagayan Economic Development Zone Masterplan in the Philippines, the Rabaul Zoning Development Plan in Papua New Guinea, undertaken post volcanic destruction, project preparation to support the Mekong River Commission's Water Utilisation Program, the Coral Reef rehabilitation and management project in Indonesia and flood control projects in Java, Indonesia and Thailand.

Source: Centre for Strategic Economic Studies, 2001; Environment Australia, 2001

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III. ENVIRONMENTALLY FRIENDLY GOODS

KEY POINTS

- **Environmentally friendly goods are goods produced, used or disposed of in a way that has a reduced or minimal impact on the environment. Demarcating between environmentally friendly goods and normal goods is difficult, as the environmental impact is always relative.**
- **Australia has a strong and expanding capacity to produce a wide range of environmentally friendly agricultural goods using improved production methods.**
- **Australia is a world leader in meeting the ISO 14000 standards of environmentally friendly management practices. Some European economies also have very high levels of certification, while the developing world and the United States have much lower rates of certification.**
- **Levels of ISO 14000 certification are a good indication of an economy's potential and preparedness to measure up to international standards that might in future be instituted for environmentally friendly goods.**

WHAT ARE ENVIRONMENTALLY FRIENDLY GOODS?

For the purposes of this paper, environmentally friendly goods, EFG, are goods that through their life cycle, that is their production, use and/or disposal, have lower environmental impacts than their non-EFG counterparts. Producers of EFG may use environmental goods and services, EGS, in their production in order to reduce the environmental impacts. As discussed in chapter 1, goods that have reduced or minimal impact on the environment in their use or their disposal are incorporated into the definition of EGS. Goods produced in a more environmentally friendly way, or process and production method, PPM, based EFG may not be materially different from their standard counterparts, and may rely on labelling or the reputation of the producer to enable their identification. Trade restrictions in favour of PPM based EFG would not be WTO compliant.

Where to Draw the Line

Another major problem with defining EFG is the relative nature of environmentally friendly production, usage and disposal processes. The production, use and disposal of most EFG could be even more environmentally friendly. Where to draw the line is a key consideration. Should any step towards being more environmentally friendly qualify the product for categorisation as an EFG? In addition, as the benchmark of the 'normal' good changes by itself becoming more environmentally friendly, for example by the adoption of unleaded fuel, so does the appropriate definition of environmentally friendly. Therefore by its nature, what is or is not an EFG will always be an issue of debate.

Environmentally Friendly Agricultural Goods

One of the most prominent producers of EFG in Australia is the agriculture industry and its associated service industries. Organic food production is expanding, while many farms are setting a good example with particular aspects of their production processes (see Box).

The organic food industry is a growing part of Australian agriculture, comprising approximately 2000 certified producers, exporters, processors and retailers and seven certifying organisations (Agriculture, Forestry and Fisheries Australia, 2003). Significantly, Australia has the largest area of land in the world under organic

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production, 7.6 million hectares. The Australian Quarantine Inspection Service has estimated the value of Australian organic production at about \$200 million, including \$40 million in exports.

EXAMPLES OF FARM PRODUCED ENVIRONMENTALLY FRIENDLY GOODS

- Tamburlaine Manufacturing Pty Ltd of Stockton, in the Hunter region, received Government funding to implement a total waste management program for small to medium viticulture enterprises. The program reduces packaging, improves chemical use in the winery and implements a solid waste and water remediation/reuse strategy.
- Bau Farm in NSW built a containment pond and an artificial wetland to store and treat the nutrient load from irrigation run-off and to reuse the water. The system is new to the horticultural industry and provides environmental benefits and cost savings.
- Castlesteads Partnership of Boorowa, NSW developed a cropping zone management package that enables farmers to identify different soil types and conditions within the farm and enable the correct amount of fertilizer and seed to be distributed to achieve the best crop results and long term, sustainability of the land.
- Glenvar Pastoral Company Pty Ltd in WA uses a technique that mechanically captures all harvest residue from a crop, removes potentially damaging herbicide-resistant weed seeds from paddocks and then uses the material for value-adding into stock feed. The project has excellent flow-on economic and environmental benefits at the regional, state and national levels.
- Taylor 's Island Fisheries from Port Lincoln, SA has developed new techniques for pilchard fishing, which reduce the impact on the environment. Instead of mesh scoops, a large vacuum pump transfers pilchards from the boat to shore where they are collected in a special tanker truck. Pumping the pilchards to shore reduces damage to the catch and blood spill at the dock, which is an environmental issue.
- Sunsalt based in Victoria produce fertiliser from salt bittern. The salt is extracted from saline groundwater, aiding in salt mitigation. It is then processed to remove the magnesium sulphate component, which is then used for fertiliser.

Source: Agriculture, Forestry and Fisheries, Australia, 2003.

Eco-labelling

A number of voluntary eco-labelling and environmental standards exist to assist firms acquire a reputation as environmentally friendly producers or to certify certain goods have been produced using environmentally friendly practices. Locally, the Australian Environmental Labelling Association is one of a number of organisations offering standards for eco-labelling, using its Environmental Choice label (Australian Environmental Labelling Association, 2002). Their certification scheme is established under the International Organization for Standardization, ISO. In addition, they comply with the WTO Guidelines for Standard Development Bodies in regard to Technical Barriers to Trade.

Particular industries also seek to label their goods to highlight environmentally friendly aspects of their production, including for export markets. For example, an Australian pork product manufacturer has adjusted its packaging for the Japanese market, while a number of Australian regions are keen to promote a clean, green image. Anecdotal evidence suggests food retailers increasingly request food producers to include environmental information on their packaging.

Internationally, most developed countries have some kind of government, non-government or quasi government coordinated eco labelling system (United States Environmental Protection Agency, 1998). Most are voluntary.

MEETING INTERNATIONAL STANDARDS

One of the only sources of aggregated data on EFGs is the number of international standard certificates granted for the environmental management standards contained in the ISO 14000 series (ISO, 2002). ISO 14000 certifies that the applicant organisation meets certain criteria on minimising the harmful effects on the environment caused by its activities and improving its environmental performance. As such, certification does not necessarily signify 'environmental friendliness, but that the applicant has procedures in place to improve its environmental performance from existing levels.

The ISO publishes annual data on the number of certificates issued broken down by the originating economy. The number of ISO 14000 certificates issued is a good indicator of the level of international recognition for the degree of environmental consciousness in management found in an economy or region. If international coordination efforts toward supporting EFGs take hold, the ISO 14000 standards could play a key role, as environmentally friendly management techniques could be used to produce EFGs.

Australia in Top 10 ISO 14000 Economies

Australia has the ninth highest rate of ISO 14000 certification in the world with about 3.5 certifications per \$US million of GDP, behind a handful of European and South East Asian economies (Table 3.1). While the appearance of greener Northern European economies such as Sweden and Denmark in the top 10 is not surprising, a notable trend is for some developing and transition economies, such as Slovenia and Hungary in Europe and Malaysia and Thailand in South East Asia, also to be at the forefront of environmentally friendly management techniques. However, the majority of developing countries, especially those in Eastern Europe and the Former Soviet Union, Africa and Central and South America, are lagging, with around 0.5 certifications per \$US million of GDP. Interestingly, North America, and in particular the United States, has one of the lowest rates of certification for a major economy, with only 0.2 certifications per \$US million of GDP. As the largest economy in the world, its firms probably rely less on international reputation building and hence have a reduced need for certification by the ISO.

Trade in Environmental Goods and Services

Table 3.2

ISO 14000 Certifications, level and ratio to GDP, regions and selected economies, 2001

	Certifications	Ratio to GDP ^a , number per \$US million
Western/Northern/Central Europe	18243	2.1
Sweden	2070	9.1
Slovenia	136	7.5
Hungary	340	7.5
Denmark	919	5.7
Finland	687	5.7
Spain	2064	3.7
Eastern Europe and Former Soviet Union	274	0.4
North America	2700	0.2
East/South East Asia	12796	1.8
Malaysia	367	4.1
Thailand	485	4.0
Africa and West Asia	923	0.5
Central and South America	681	0.5
Australia and New Zealand	1422	3.2
Australia	1370	3.5
Developed Economies	32576	1.3
Developing Economies	4463	0.7

Source: ISO, 2002; World Bank World Tables, 2002 accessed via dX Database.

Notes: ^a GDP levels are 2000 figures.

Implications of ISO Certification Results

Were ISO certification to become a form of eco-labelling in support of EFGs, Australia would be well placed along with most of Europe. The United States' current level of certification is low, making them less well placed, but this may simply reflect a low level of recognition of ISO standards in that economy. If required, it is likely many more US firms could conform to the required standards. Most developing countries would be particularly disadvantaged, as their rates of certification are low compared to Europe. Some developing economies are suspicious of international standards, claiming they are largely established by and for developed economies with not enough consideration for developing economies' implementation capacity (Laird, 2002). Given the emphasis on development in the Doha Development Round, it would be inconsistent to impose another barrier to developing country trade.

The level of certification under ISO 14000 also has implications for the potential for countries in meeting other standards, for example for the ecolabelling of particular EFGs. The higher rates of certification in Australia and other countries is an indication of the potential and preparedness to meet other EFG standards as they are developed. However, Australia would be well placed to seek alliances with developing countries and the United States against introducing any compulsory environmental standards, such as those of the ISO, into world trade.

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IV. IMPLICATIONS

KEY POINTS

- **There may be merit in taking an inclusive approach to the negotiations to avoid the need to apply and enforce tariffication according to whether a good or service is used for environmental management. Such an approach would include any goods and services that may be used as EGS into the liberalisation negotiations.**
- **Given Australia appears to have a large trade deficit in EGS, Australia should take a positive approach to liberalising its EGS tariff arrangements in the WTO negotiations, in order to reduce costs of EGS inputs to the economy and to industry in particular.**
- **There is scope to form alliances with developing countries in WTO negotiations regarding EFG, along similar lines to agricultural trade, as regulating trade in favour of EFG would be deleterious to their interests.**

There are a number of implications arising from this paper affecting the approach Australia could take to negotiations on trade and environment in the WTO.

Advantages in an All-Inclusive Approach

As outlined in chapter 1, EGS do not fit easily within the standard classification systems used for international trade, such as those used by customs agencies. This is partly because many EGS have multiple possible uses, both environmental and non environmental, and singling out environmental uses for classification or differential tariffication is difficult. Therefore, the merits of such special treatment need to be weighed up against the merits of liberalising all goods and services with possible environmental uses. Given the unwieldiness and low enforceability of special treatment, an inclusive approach to liberalisation would seem to be more attractive.

Australia Should Approach Liberalisation Positively

This paper shows that Australia almost certainly imports more EGS than it exports, making it a net importer. This is not surprising given Australia's broad comparative advantage in land and resource-intensive exports such as agriculture, mining and tourism. Therefore, it is in the interests of the Australian economy that EGS are allowed to be imported freely, to minimise costs for Australian industry and Australian exporters. Moreover, the land-intensive export industries are all dependent on a clean environment, making it all the more essential to Australia's export success.

A positive approach to the negotiations regarding the liberalisation of trade in EGS will therefore support the Australian economy and Australian exporters. Multilateral liberalisation of EGS markets will also support the small but not insignificant number of Australian exporters of EGS in niche markets such as mine site rehabilitation and the like.

Developing Economies are Australia's Allies on EFG

Australia is developing its EFG production capacity, and demonstrates a high readiness to meet environmental standards should they be brought in, as demonstrated by our high rate of ISO 14000

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compliance and significant organic food industry. Nevertheless, Australia's opposition to process and production method based trade restrictions should and will no doubt continue.

In this debate, Australia could seek the cooperation of developing economies. Developing economies often do not have the resources to produce in more environmentally friendly ways and have less capacity to comply with standards, particularly those written to suit foreign markets. Therefore, developing economies stand to lose considerably from any authorisation of compulsory environmental standards and would be highly suitable as allies in any debate on such standards.

APPENDIX A

OECD/EUROSTAT ENVIRONMENTAL GOODS AND SERVICES INDUSTRY MANUAL CLASSIFICATION

THE "POLLUTION MANAGEMENT" GROUP

A. Environmental Goods

Air pollution control

This class includes any activity that produces equipment, technology or specific materials for the treatment and/or removal of exhaust gases and particulate matter from both stationary and mobile sources. It includes air-handling equipment, dust collectors, precipitators, filters, catalytic converters, chemical treatment and recovery systems, specialised stacks incinerators, scrubbers, odour control equipment, environmentally less-damaging specialised fuels.

Waste water management

This class includes any activity that produces equipment, technology or specific materials for collection, treatment and transport of waste water and cooling water. It includes pipes, pumps, valves, aeration equipment; gravity sedimentation equipment, chemical treatment and recovery equipment; biological recovery systems, oil/water separation systems, screens/strainers, sewage treatment equipment, waste water reuse equipment; water purification equipment and other water handling systems.

Solid waste management

This class includes any activity that produces equipment, technology or specific materials for collection, treatment, transport, disposal and recovery of hazardous and non-hazardous solid waste. It includes waste storage and treatment equipment (thermal, biological, chemical), waste collection equipment, waste disposal equipment, waste handling equipment, waste separation and sorting equipment, recovery equipment. It also includes equipment for outdoor sweeping and watering of streets, paths, parking lots, etc. It includes equipment, technology or specific materials for treatment of low level nuclear waste. It excludes high level nuclear waste. Recycling activities excludes manufacture or production of new materials or products from recovered waste or scrap and subsequent use of these materials or products.

Remediation and cleanup of soil, surface water and groundwater

This class includes any activity that produces equipment, technology or specific materials to reduce the quantity of polluting materials in soil and water, including surface water, groundwater and sea water. It

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includes absorbents, chemicals and bio-remediators for cleaning-up, as well as cleaning-up systems either in situ or in appropriate installations.

Noise and vibration abatement

This class includes any activity that produces equipment, technology or specific materials to reduce or eliminate the emission and propagation of noise and vibration both at source and dispersed. It includes mufflers/silencers, noise deadening material, noise control equipment and systems vibration control equipment and systems.

Environmental monitoring, analysis and assessment

This class includes any activity that produces equipment, technology or specific materials for sampling, measurement, and subsequent recording, analysis and assessment of various characteristic of environmental media. It includes measuring and monitoring equipment, sampling systems, data acquisition equipment, other instruments or machines for measurement. Environmental information systems, analytical software, specific safety and personal protection are included.

B. Environmental Services

Air pollution control

This class includes any activity that designs, manages systems or provides other services for treatment and/or removal of exhaust gases and particulate matter from both stationary and mobile sources.

Waste water management

This class includes any activity that designs, operates systems or provides other services for collection, treatment and transport of waste water and cooling water. It includes design, management or other services for sewage treatment systems, waste water reuse systems, water handling systems.

Solid waste management

This class includes any activity that designs, operates systems or provides other services for the collection, treatment, management, transport, storage and recovery of hazardous and non-hazardous solid waste. It includes design, management or other services for waste handling (collection, transports separation, sorting and disposal), operation of sites, recycling (including collection of waste and scrap), operation of recycling plants. It includes services for outdoor sweeping and watering of streets, paths, parking lots, etc. Services for treatment of low-level nuclear waste are included. It excludes high-level nuclear waste. It excludes services for manufacture of new materials or products from recovered waste or scrap and subsequent use of these materials or products.

Remediation and cleanup of soil, surface water and groundwater

This class includes any activity that designs, manages systems or provides other services to reduce the quantity of polluting materials in soil and water, including surface water, groundwater and sea water. It includes cleaning-up systems either in situ or in appropriate installations, emergency response and spills cleanup systems. Treatment of water and dredging residues are included.

Noise and vibration abatement

This class includes any activity that designs, manages systems or provides other services to reduce or eliminate the emission of noise and vibration both at source and dispersed. It includes designing, management or other services for acoustic and sound-proof screens and street covering.

Environmental R&D

This class includes any systematic and creative activity which is concerned with the generation, advancement, dissemination and application of scientific and technological knowledge to reduce or eliminate emissions in all environmental media and to improve environmental quality. It includes creative scientific and technological activities for the development of cleaner products, processes and technologies. It includes non-technological research to improve knowledge on ecosystems and the impact of human activities on the environment.

Environmental contracting and engineering

This class includes any activity that investigates feasibility, designs and manages environmental projects which are not included elsewhere. It includes multidisciplinary environmental contracting and engineering. Environmental management consulting, and auditors are included.

Analytical services, data collection, analysis and assessment

This class includes any activity that designs, manages systems or provides other services to sample, measure, and record various characteristics of environmental media. It includes monitoring sites, both operating singly and in networks, and covering one or more environmental medium. Health, safety, toxicology studies, and analytical laboratory services are included. Weather stations are excluded.

Education, training, information

This class includes any activity that provides environmental education or training or disseminates environmental information and which is executed by specialised institutions or other specialised suppliers. It includes education, training, and information management for the general public, and specific environmental work-place education and training. The activities of the general educational system are excluded.

C. Construction

This class includes any activity for the construction and installation of facilities for: air pollution control; waste water management; solid waste management; remediation and cleanup of soil, water and groundwater; noise and vibration abatement; environmental monitoring, analysis and assessment; other environmental facilities.

THE "CLEANER TECHNOLOGIES AND PRODUCTS" GROUP

This group includes any activity which continuously improves, reduces or eliminates the environmental impact of technologies, processes or products.

Cleaner/resource efficient technology

Cleaner and resource efficient technologies decrease material inputs, reduce energy consumption, recover valuable by-products, reduce emissions, minimise waste disposal problems, or some combination of these.

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Cleaner/resource efficient product

Cleaner or resource efficient products decrease material inputs, improve product quality, reduce energy consumption, minimise waste disposal problems, reduce emission during use, or some combination of these.

THE "RESOURCES MANAGEMENT" GROUP

Indoor air pollution control

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for the treatment and renewal of indoor air to remove pollutants. It excludes air-conditioning.

Potable water treatment and distribution

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for water supply and delivery systems, both publicly and privately owned. It includes any activities aiming to collect, purify and distribute potable water to household, industrial, commercial or other users.

Recycled materials

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for manufacturing new materials or products, separately identified as recycled, from recovered waste or scrap, or preparation of such materials or products for subsequent use.

Renewable energy plant

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for the generation, collection or transmission of energy from renewable sources, including biomass, solar, wind, tidal, or geothermal sources.

Heat /energy saving and management

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services to reduce heat and energy use or minimise heat and energy loss (e.g. co-generation). It includes equipment, technology or specific materials to reduce climate change.

Sustainable agriculture and fisheries

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for systems which reduce the environmental impact of agriculture and fishery activities. It includes biotechnology applied to agriculture and fishery activities.

Sustainable forestry

This class includes any activity that produces equipment, technology, or specific materials, designs, constructs or installs, manages or provides other services for programmes and projects for reforestation and forest management on a long term sustainable basis.

Natural risk management

This class includes any activity that produces equipment, technology, or specific materials, designs, constructs or installs, manages or provides other services for systems to prevent or reduce the impact of natural disasters (storms, floods, volcanic eruptions, etc.).

Eco-tourism

This class includes any activity that designs, constructs, installs, manages or provides other services for tourism that involves protection and management of natural and cultural heritage, or education and interpretation of the natural environment, and that do not damage or degrade the natural environment.

Other

This class includes any activity that measures, prevents, limits or corrects environmental damage to air, water, and soil, as well as problems related to waste, noise and eco-systems, which is not included in any other class. These activities should be separately specified and listed.

Source: OECD 1999, *The Environmental Goods & Services Industry: Manual for Data Collection and Analysis*, Paris.

APPENDIX B

POTENTIAL ENVIRONMENTAL GOODS AND SERVICES

Below is a full list of potential environmental goods and services, representing a combination of categories from the concordance lists with APEC and OECD classification systems.

Table B.1

Potential Environmental Goods and Services

Harmonised System Code	Description
CHEMICALS	
220100	Water
220710	Undenatured ethyl alcohol of an alcoholic strength by volume of 80% vol or higher
230210	Bran, sharps and other residues, whether or not in the form of pellets derived from the sifting, milling or other working of maize (corn)
252100	Limestone flux; limestone and other calcareous stone used for the manufacture of lime or cement
252220	Slaked lime (excl. calcium oxide and hydroxide of 2825)
280110	Chlorine
281410	Anhydrous ammonia
281511	Solid sodium hydroxide (caustic soda)
281512	Sodium hydroxide (caustic soda) in aqueous solution (soda lye or liquid soda)
281610	Hydroxide and peroxide of magnesium
281830	Aluminium hydroxide
282010	Manganese dioxide
282090	Manganese oxides (excl. manganese dioxide)
282410	Lead monoxide (litharge, massicot)
283210	Sodium sulphites
283220	Sulphites, inorganic, metallic (excl. sodium sulphites, hydrosulphites and concentrated sulphite lye)
283510	Phosphinates (hypophosphites) and phosphonates (phosphites), metallic
283521	Phosphates of triammonium
283523	Trisodium phosphate
283524	Potassium phosphate
283525	Calcium hydrogenorthophosphate ("dicalcium phosphate")
283526	Calcium phosphates (excl. calcium hydrogenorthophosphate ("dicalcium phosphate"))

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283529	Phosphates, inorganic, metallic, nes
285100	Inorganic compounds nes, liquid air; compressed air; amalgams (excl. amalgams of precious metals)
290511	Methanol (methyl alcohol)
320910	Paints, varnishes, enamels and lacquers based on acrylic or vinyl polymers, dispersed or dissolved in an aqueous medium
320990	Paints, varnishes, enamels and lacquers based on synthetic polymers nes or chemically modified natural polymers, dispersed or dissolved in an aqueous medium
380210	Activated carbon (excl. those having the character of medicaments or put up in retail packs as deodorisers)
381500	Catalysts
PLASTICS AND RUBBER	
391400	Ion exchangers based on polymers of 3901 to 3913, in primary forms
392020	Plates, sheets, film, foil and strip nes, of polymers of propylene, non-cellular and not reinforced, laminated, supported or similarly combined with other materials
392490	Household articles (excl. tableware and kitchenware) and toilet articles of plastics
392690	Articles of plastics and articles of other materials of 3901 to 3914 nes
WOOD AND STRAW	
460120	Mats, matting and screens of vegetable materials
TEXTILES	
560314	Nonwovens, whether or not impregnated, coated, covered or laminated, of man-made filaments, weighing more than 150/g/m ²
580190	Woven pile fabrics and chenille fabrics (excl. fabrics of 5802 or 5806) of textile materials nes
591190	Textile products and articles for technical uses, nes
ARTICLES OF STONE, CEMENT, CERAMIC and GLASS	
681099	Articles of cement, concrete or of artificial stone nes
690210	Refractory bricks, blocks, tiles and similar refractory ceramic constructional goods nes, containing by weight, singly or together, more than 50% of the elements magnesium, calcium or chromium
690220	Refractory bricks, blocks, tiles and similar refractory ceramic constructional goods nes, containing by weight more than 50% of alumina, of silica or of a mixture or compound of these products
690290	Refractory bricks, blocks, tiles and similar refractory ceramic constructional goods (excl. those of siliceous fossil meals or similar siliceous earths) nes
690310	Refractory ceramic goods nes, containing by weight more than 50% of graphite or other forms of carbon or of a mixture of these products
690320	Refractory ceramic goods nes, containing by weight more than 50% of alumina or of a mixture or compound of alumina and of silica
690390	Refractory ceramic goods (excl. constructional and those of siliceous fossil meals or of similar siliceous earths) nes
690919	Ceramic wares for laboratory, chemical or other technical uses (excl. porcelain or china)
700800	Multiple-walled insulating units of glass
701710	Laboratory, hygienic or pharmaceutical glassware of fused quartz or other fused silica
701720	Laboratory, hygienic or pharmaceutical glassware of glass having a linear coefficient of expansion not exc 5 millionths per Kelvin within a temperature range of 0 degrees C to 300 degrees C nes
701790	Laboratory, hygienic or pharmaceutical glassware nes

701990	Glass fibres (incl. glass wool) and articles thereof, nes
ARTICLES OF BASE METALS	
730900	Reservoirs, tanks, vats and similar containers for any material (excl. compressed or liquefied gas) of iron or steel, exc 300 l capacity, not fitted with mechanical or thermal equipment
731010	Tanks, casks, drums, cans, boxes and similar containers for any material (excl. compressed or liquefied gas) of iron or steel, 50 l or more but not exc 300 l capacity, not fitted with mechanical or thermal equipment
731021	Cans which are to be closed by soldering or crimping, for any material (excl. compressed or liquefied gas) of iron or steel, of a capacity of less than 50 l, whether or not lined or heat insulated but not fitted with mechanical or th
731029	Tanks, casks, drums, cans, boxes and similar containers for any material (excl. compressed or liquefied gas) of iron or steel, of a capacity of less than 50 l, whether or not lined or heat insulated but not fitted with mechanical or
732510	Cast articles of iron or steel nes of non-malleable cast iron
780600	Articles of lead nes
MACHINERY	
840410	Auxiliary plant for use with boilers of 8402 or 8403 (eg economisers, super-heaters, soot removers and gas recoverers)
840420	Condensers for steam or other vapour power units
840510	Producer gas or water gas generators; acetylene gas generators and similar water process gas generators
840991	Parts suitable for use solely or principally with spark-ignition internal combustion piston engines (for other than aircraft)
840999	Parts for internal combustion piston engines (excl. spark-ignition or aircraft)
841090	Parts for hydraulic turbines and water wheels (incl. regulators)
841011	Hydraulic turbines and water wheels of a power not exc 1,000 kW
841012	Hydraulic turbines and water wheels of a power exc 1,000 kW but not exc 10,000 kW
841013	Hydraulic turbines and water wheels of a power exc 10,000 kW
841090	Parts for hydraulic turbines and water wheels (incl. regulators)
841320	Hand pumps for liquids (excl. those of 8413.11 or 8413.19)
841350	Reciprocating positive displacement pumps (excl. those for internal combustion piston engines)
841360	Rotary positive displacement pumps (excl. those for internal combustion piston engines)
841370	Centrifugal pumps, nes for liquids
841381	Pumps for liquids nes
841410	Vacuum pumps (not of glass)
841430	Compressors of a kind used in refrigerating equipment
841440	Air compressors mounted on a wheeled chassis for towing
841459	Fans nes
841480	Air pumps, air or other gas compressors and fans and ventilating or recycling hoods incorporating a fan nes
841490	Parts, of air or vacuum pumps, air or other gas compressors and fans, ventilating or recycling hoods incorporating a fan
841780	Industrial or laboratory furnaces and ovens nes (incl. incinerators), non-electric
841790	Parts of non-electric industrial or laboratory furnaces and ovens, incl. incinerators
841911	Instantaneous gas water heaters, non-electric

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841919	Instantaneous (excl. gas water heaters) or storage water heaters, non-electric
841940	Distilling or rectifying plant
841950	Heat exchange units
841960	Machinery for liquefying air or other gases
841989	Machinery, plant and equipment, for the treatment of materials by a process involving a change of temperature (eg cooking, roasting or cooling) nes (excl. machinery or plant of a kind used for domestic purposes)
841990	Parts for machinery, plant or laboratory equipment, for the treatment of materials by a process involving a change of temperature and for non-electric instantaneous or storage water heaters
842119	Centrifuges (excl. centrifugal cream separators and clothes-dryers)
842121	Machinery and apparatus for filtering or purifying water
842129	Filtering or purifying machinery and apparatus for liquids nes
842139	Filtering or purifying machinery and apparatus for gases (excl. intake air filters for internal combustion engines)
842191	Parts of centrifuges (incl. centrifugal dryers)
842199	Parts of filtering or purifying machinery and apparatus for liquids or gases
842220	Machinery for cleaning or drying bottles or other containers
842381	Weighing machinery nes having a maximum weighing capacity not exc 30 kg
842382	Weighing machinery nes having a maximum weighing capacity exc 30 kg but not exc 5,000 kg
842389	Weighing machinery (excl. balances of a sensitivity of 5 cg or better but incl. weight operated counting or checking machines) nes
842490	Parts for mechanical appliances for spraying etc liquids or powders, fire extinguishers, spray guns and the like and steam or sand blasting machines and the like
842833	Continuous-action elevators and conveyors nes, belt type
843680	Agricultural, horticultural, forestry or bee-keeping machinery (incl. germination plant fitted with mechanical or thermal equipment) nes
846291	Hydraulic presses (excl. those of 8462.10 to 8462.49) for working metal or metal carbides
847290	Other office machines (excl. duplic. mach., addressing mach. and address plate emboss. mach., mach. for sorting or folding mail or for inserting mail in envelopes or bands, mach. for opening, closing or sealing mail and mach. affix o
847410	Machinery for sorting, screening, separating or washing earth, stone, ores or other mineral substances, in solid (incl. powder or paste) form
847432	Machines for mixing mineral substances with bitumen
847439	Machinery for mixing or kneading earth, stone, ores or other mineral substances (excl. concrete or mortar mixers and machines for mixing mineral substances with bitumen), in solid (incl. powder or paste) form
847982	Machines and mechanical appliances for mixing, kneading, crushing, grinding, screening, sifting, homogenising, emulsifying or stirring nes
847989	Machines and mechanical appliances having individual functions nes
847990	Parts for machines and mechanical appliances having individual functions nes
848110	Pressure-reducing valves
848130	Check valves for pipes, boiler shells, tanks, vats or the like
848140	Safety or relief valves for pipes, boiler shells, tanks, vats or the like
848180	Valves nes, taps, cocks and similar appliances for pipes, boiler shells, tanks, vats or the like (incl. thermostatically controlled valves)

ELECTRICAL MACHINERY

850231	Wind-powered generating sets
850590	Electro-magnets; electro-magnetic or permanent magnet chucks, clamps and similar holding devices (incl. parts for goods of 8505)
851410	Industrial or laboratory electric resistance heated furnaces and ovens
851420	Industrial or laboratory induction or dielectric furnaces and ovens
851430	Industrial or laboratory electric furnaces and ovens (excl. resistance heated or induction or dielectric types)
851490	Parts for industrial or laboratory electric (incl. induction or dielectric) furnaces and ovens; parts for other industrial or laboratory induction or dielectric heating equipment
851629	Electric soil heating apparatus and space heating apparatus (excl. storage heating radiators)
853931	Fluorescent, hot cathode discharge lamps (excl. ultra-violet lamps)
854140	Photosensitive semi-conductor devices (incl. photovoltaic cells); light emitting diodes
854389	Electrical machines and apparatus, having individual functions, not specified elsewhere in AHECC chapter 85

TRANSPORT EQUIPMENT

870892	Silencers and exhaust pipes for motor vehicles for the transport of persons or goods and special purpose motor vehicles (excl. for tractors used on railway station platforms)
890710	Inflatable rafts
890790	Floating structures (eg tanks, coffer-dams, landing-stages, buoys and beacons but excl. inflatable rafts)

PRECISION EQUIPMENT

901320	Lasers (excl. laser diodes)
901540	Photogrammetrical surveying instruments and appliances
901580	Surveying (excl. photogrammetrical surveying), hydrographic, oceanographic, hydrological, meteorological or geophysical instruments and appliances (excl. theodolites, tachometers, levels and compasses)
901590	Parts and accessories for surveying (incl. photogrammetrical surveying), hydrographic, oceanographic, hydrological, meteorological or geophysical instruments and appliances (excl. compasses) and rangefinders
902229	Apparatus based on the use of alpha, beta or gamma radiations (excl. those for medical, surgical, dental or veterinary uses but incl. radiography or radiotherapy apparatus)
902511	Liquid-filled thermometers, for direct reading, not combined with other instruments
902519	Thermometers and pyrometers, not combined with other instruments (excl. liquid-filled thermometers, for direct reading)
902580	Hydrometers and similar floating instruments, pyrometers, hygrometers and psychrometers and any combination of these instruments and combinations of thermometers and barometers with these instruments
902590	Parts and accessories for hydrometers and similar floating instruments, thermometers, pyrometers, barometers, hygrometers and psychrometers and any combination of these instruments
902610	Instruments and apparatus for measuring or checking the flow or level of liquids (eg flow meters, level gauges, manometers, heat meters) (excl. instruments and apparatus of 9014, 9015, 9028 or 9032)
902620	Instruments and apparatus for measuring or checking the pressure of liquids or gases (eg flow meters, level gauges, manometers, heat meters) (excl. instruments and apparatus of 9014, 9015, 9028 or 9032)
902680	Instruments and apparatus for measuring or checking variables (excl. flow, level or pressure) of liquids or gases (eg heat meters) (excl. those of 9014, 9015, 9028 or 9032)

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902690	Parts and accessories for instruments and apparatus for measuring or checking the flow, level, pressure or other variables of liquids or gases (eg flow meters, level gauges) (excl. those of 9014, 9015, 9028 or 9032)
902710	Gas or smoke analysis apparatus
902720	Chromatographs and electrophoresis instruments for physical or chemical analysis
902730	Spectrometers, spectrophotometers and spectrographs using optical radiations (UV, visible, IR)
902740	Exposure meters
902750	Instruments and apparatus using optical radiations (UV, visible, IR) (excl. spectrometers, spectrophotometers, spectrographs and exposure meters)
902780	Instruments and apparatus for physical or chemical analysis, for measuring or checking viscosity, porosity, expansion, surface tension and the like and quantities of heat or sound nes
902790	Microtomes; parts and accessories for instruments and apparatus for physical or chemical analysis, for measuring or checking viscosity, porosity, expansion and the like, quantities of heat, sound or light and microtomes
902810	Gas meters (incl. calibrating meters therefor)
902820	Liquid meters (incl. calibrating meters therefor)
902830	Electricity supply or production meters (incl. calibrating meters therefor)
903010	Instruments and apparatus for measuring or detecting ionising radiations (eg alpha, beta, gamma, X-ray, cosmic)
903020	Cathode-ray oscilloscopes and cathode-ray oscillographs
903031	Multimeters
903039	Instruments and apparatus nes, for measuring or checking voltage, current, resistance or power, without a recording device (excl. meters of 9028)
903083	Instruments and apparatus for measuring or checking electrical quantities (excl. meters of 9028); instruments and apparatus for measuring or detecting alpha, beta, gamma, x-ray, cosmic or other ionising radiations; with a recording
903089	Oscilloscopes, spectrum analysers and other instruments and apparatus for measuring or checking electrical quantities (excl. meters of 9028) nes
903089	Oscilloscopes, spectrum analysers and other instruments and apparatus for measuring or checking electrical quantities (excl. meters of 9028) nes
903090	Parts and accessories for instruments and apparatus for measuring or checking electrical quantities (excl. meters of 9028) and for measuring or detecting alpha, beta, gamma, x-ray, cosmic or other ionising radiations
903110	Machines for balancing mechanical parts
903120	Test benches
903130	Profile projectors
903149	Optical instruments and appliances nes (excl. those for inspecting semiconductor wafers or devices or for inspecting photomasks or reticles used in manufacturing semiconductor devices)
903180	Measuring or checking instruments, appliances and machines nes
903190	Parts and accessories for measuring or checking instruments, appliances and machines nes
903210	Thermostats
903220	Manostats
903281	Hydraulic or pneumatic automatic regulating or controlling instruments and apparatus (excl. thermostats and manostats)
903289	Automatic regulating or controlling instruments and apparatus (excl. thermostats, manostats and hydraulic or pneumatic)

903290	Parts and accessories for automatic regulating or controlling instruments and apparatus
903300	Parts and accessories nes for machines, appliances, instruments or apparatus of Chapter 90
960310	Brooms and brushes, consisting of twigs or other vegetable materials bound together
MISCELLANEOUS MANUFACTURES	
960350	Brushes constituting parts of machines, appliances or vehicles (excl. brushes for use on the person)

Source: OECD, 1999; APEC, 2001.