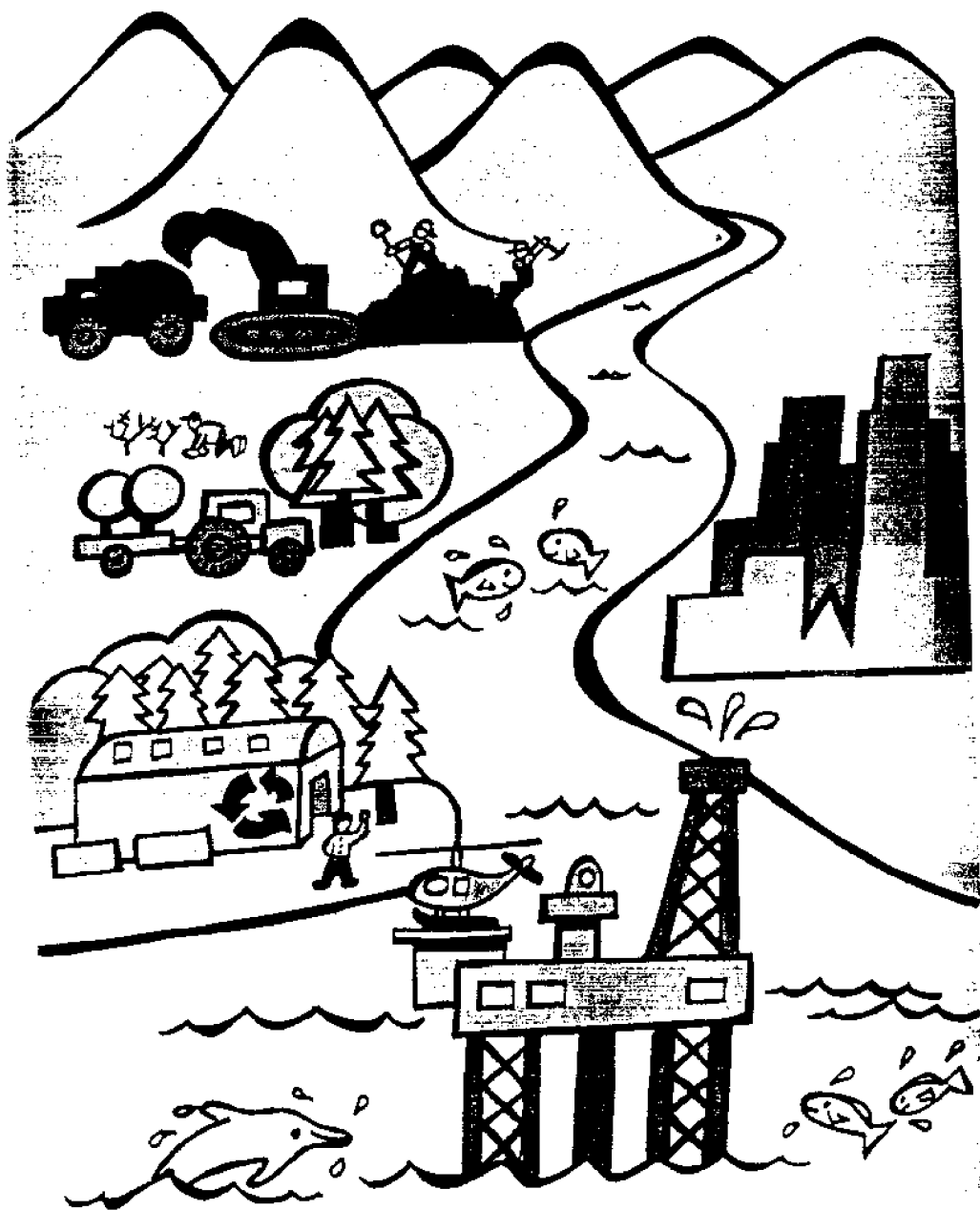




COST OF ENVIRONMENT PROTECTION, AUSTRALIA

SELECTED INDUSTRIES 1990-91



A research project of the Australian Bureau of Statistics

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NEW ISSUE

**COST OF ENVIRONMENT PROTECTION, AUSTRALIA
SELECTED INDUSTRIES
1990-91**

A Research Project of the Australian Bureau of Statistics

IAN CASTLES
Australian Statistician

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INQUIRIES

- *for further information about statistics in this publication and the availability of related unpublished statistics contact Heather Olley in Canberra on (06) 252 7874 or any other state ABS office.*
 - *for information about other ABS statistics and services, please refer to the back cover of this publication.*
-

PREFACE

Cost of Environment Protection presents, for the first time, estimates of costs incurred by manufacturing and mining industries and the public sector on environment protection measures. The purpose of collecting such data and the conceptual basis are discussed at some length in the first chapter.

This is the first edition of this publication, and the Australian Bureau of Statistics intends to update the data at regular intervals.

This edition is developmental in nature. In particular, the estimates are only partial because of incomplete coverage of the private sector on this occasion.

Given the exploratory nature of this work, the ABS will welcome feedback from readers regarding the range and quality of the data and the explanations provided. Please send any comments to the Director, Environment and Natural Resource Statistics Unit at the address below.

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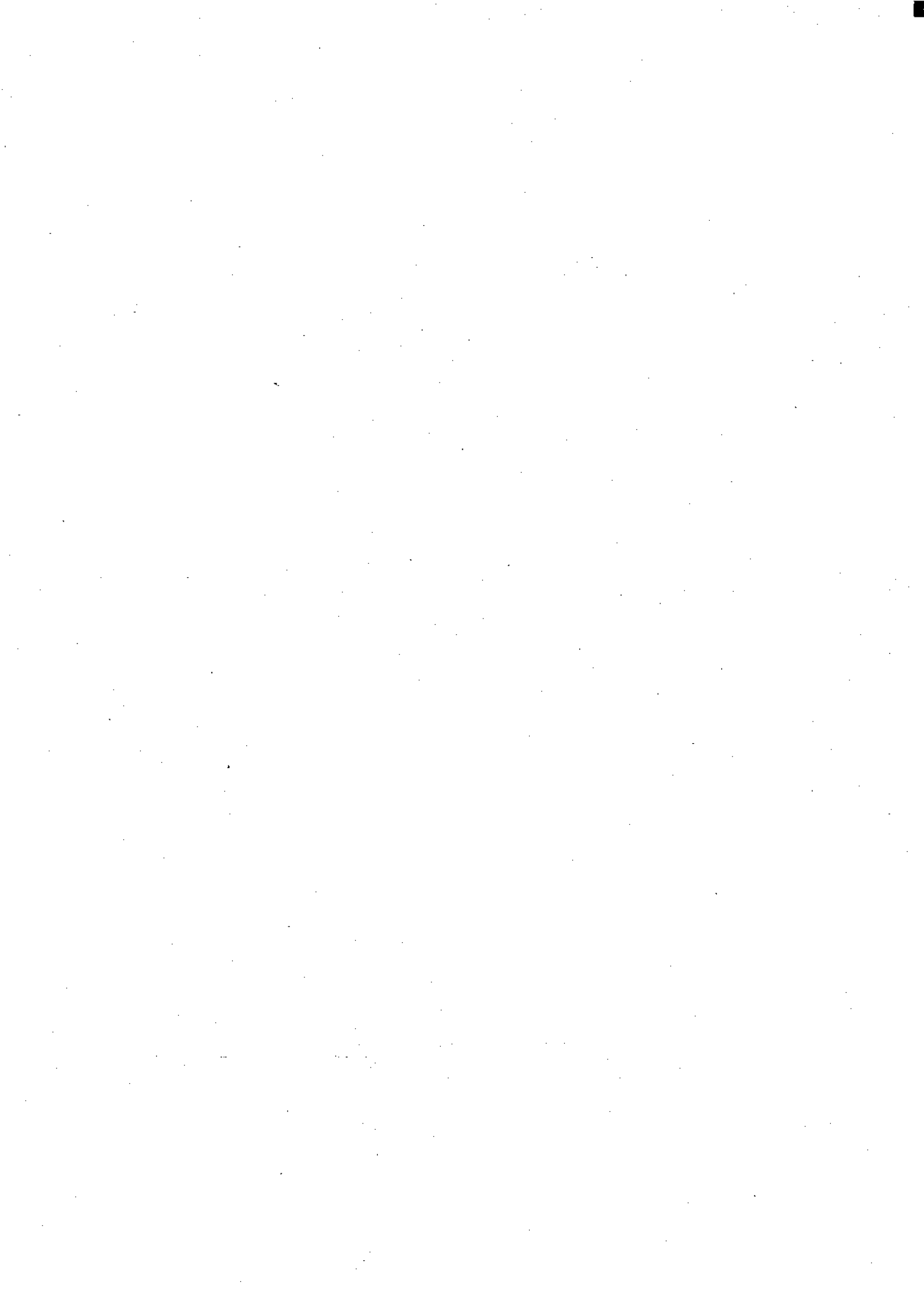
Australian Bureau of Statistics
PO Box 10,
Belconnen, ACT, 2616

January 1994



CHAPTER 1

STATISTICAL FRAMEWORK AND APPROACHES TO DATA COLLECTION



STATISTICAL FRAMEWORK AND APPROACHES TO DATA COLLECTION

1.1 Introduction

This publication presents data on costs incurred by the manufacturing and mining industries and government for protection of the environment. At the core of the publication is the OECD methodology for collection of data on Pollution Abatement and Control (PAC) expenditure.

Statistics on this topic are important for a number of reasons, particularly the following:

- the statistics are indicative of the response of various sectors to environment protection regulations and policies
- the data will be input to the environment satellite accounts proposed as part of the Revised System of National Accounts
- the statistics provide some indication of the flow-on demand on the suppliers of goods and services for environment protection (the so-called environment management industry).

The OECD's definition of pollution abatement and control is '*... purposeful activities aimed at the prevention, reduction and elimination of pollution or nuisances that could have a harmful effect on the environment.*'¹ This publication presents initial, but only partial, estimates of these expenditures for Australia, with an explanation of PAC data collection and rationale.

The publication goes beyond the PAC framework to consider estimates of some non-PAC environmental expenditures, and provides other costs data such as expenditure on environmental licences and expenditure on environmental research and development. This additional information gives a broader coverage of the costs of environment protection to industry and government than PAC estimates alone.

1.2 Background to the Pollution Abatement and Control (PAC) Framework

The 1993 OECD publication *Pollution Abatement and Control Expenditure in OECD Countries* presented the results of the 1992 survey of member countries. At that time, Australia had not published any data on pollution abatement and control (PAC) costs, however some PAC data for the 1990-91 financial year has now become available from ABS collections. The present publication presents the Australian data and provides comparisons with other countries through the OECD framework.

PAC activities (as defined above) are not a complete measure of all expenditures incurred by an economy to protect and maintain the environment. In developing the PAC model, the OECD was specifically designing a baseline tool through which international comparisons on a significant and relatively easy to identify component of total environmental expenditures could be measured. With this purpose in view, the OECD focussed on PAC costs only. For example, the PAC definition excludes natural resource management and activities such as the protection of endangered species, the establishment of national parks and green belts and activities to exploit natural resources. Expenditures intended either for workplace protection or for the improvement of production processes for commercial or technical reasons are also excluded, even though they may have environmental benefits.² PAC estimates also fail to capture the costs of changes in product quality which have more environmentally benign impacts, for example the introduction of vehicles using unleaded petrol in the mid 1980s.

1. *Pollution Abatement and Control Expenditure in OECD Countries*, OECD, Paris, 1993

2. *ibid.*

There is also a pragmatic issue which has further excluded some expenditures from calculation of PAC for most OECD countries. The issue is whether only expenditure explicitly for PAC purposes should be included, or whether all expenditures with positive environmental effects are included. In order to achieve a degree of certainty and international comparability, the OECD guidelines define PAC fairly narrowly with the result that most OECD countries include only explicit PAC expenditures. To ensure that Australia's figures are comparable with international data, the approach taken in the calculation of Australia's PAC expenditure has also been to include only explicit PAC expenditures. Future editions of this publication will improve collection of non-PAC expenditures, especially through the public sector.

1.3 The OECD Pollution Abatement and Control Framework

Table 1.1 presents the PAC framework. From this, it can be seen that total PAC expenditure comprises the flow of capital and current expenditures incurred by the public and private sectors directly aimed at pollution abatement and control.

The framework identifies flows between the private and public sectors. These inter-sectoral flows occur in the form of government subsidies to the private sector for undertaking pollution abatement and control activities, and fees and charges paid to the public sector for items such as environmental licences, charges etc. They assist in avoiding any double counting which may otherwise occur in the calculation of PAC, and in determining which sector undertakes the PAC activity and which sector finances the activity.

The framework explicitly requires the addition of capital and current expenditures to determine a single dollar value in a particular period. Although this is not standard 'accrual' accounting practice in which capital expenditures would normally be amortised across time, it is consistent with National Accounting GDP estimates.

Table 1.1. shows that the PAC model embodies two bases of measurement; the Abater principle and the Financer principle.

TABLE 1.1 THE POLLUTION ABATEMENT AND CONTROL FRAMEWORK(a)

<i>Public Sector</i>	<i>Private Sector</i>
\$ investment expenditure	\$ investment expenditure
+	+
\$ current expenditure	\$ current expenditure
-	-
\$ PAC by-products	\$ PAC by-products
=	=
\$ PAC Abater Principle	\$ PAC Abater Principle
+	-
\$ subsidies to the private sector	\$ subsidies from the public sector
-	+
\$ fees/charges from the private sector	\$ fees/charges to the public sector
=	=
\$ PAC Financer Principle	\$ PAC Financer Principle

(a) *ibid.*

The elements of the **Abater Principle** identify *where* the PAC activity occurs (i.e. public or private sector). Investment (capital) expenditure plus current expenditure, minus receipts from by-products of PAC activities comprise expenditures in this section of the framework.

The **Financer Principle** is obtained by adjusting data on the Abater principle to indicate which sector is *paying* for the PAC activity. This is achieved by taking account of financial transfers, such as subsidies, fees and charges between the public and private sectors.

Data constraints make PAC calculations in accordance with the Financer principle difficult, and therefore uncommon. In fact, few countries evaluate PAC expenditure to the Financer principle, but where this work has occurred, in the Netherlands for example, it has emerged that differences between the value of the two estimates can be significant.³

The Australian Bureau of Statistics has been co-ordinating collection of data at the Financer level in the private sector and should have such figures available for the 1991-92 financial year, although public sector data in Chapter 3 is presented at the Financer level, that is, it uses outlays rather than expenditures. On this occasion, this was the only level of data which would permit analysis of the items contributing to that sector's expenditure. Chapter 2 presents public sector gross expenditure figures (that is, data at the Abater level), as most countries at present provide data to the OECD at this level.

Data on capital expenditure for PAC can be divided into two components; expenditure for end-of-line and expenditure for change-in-production (or integrated) techniques. End-of-line techniques treat pollutants after generation in production processes by the use of separately identifiable abatement facilities. These are installed exclusively for the purpose of abating pollutant streams. Change in production processes reduce or eliminate the generation of pollutants by employing material substitution, improved catalysts, re-use of water and equipment alteration. These changes may involve converting equipment to handle the use of substitute fuels that generate less pollutants. Typically, industry undertakes end-of-line expenditures in the initial stages of pollution abatement activity, and moves to change-in-production processes as industry's PAC activity matures.

The difficulty associated with change-in-production (or integrated) technologies is establishing what proportion of the total cost should be allocated to PAC, given that there could be other reasons for the acquisition of the new equipment, for example higher production capacity to meet expanding demand. An alternate approach is to allow the business to identify the primary reasons for obtaining the equipment, for example higher production capacity to meet expanding demand. If it was primarily for PAC purposes (e.g. to accommodate new regulations) then all the expenditure would be attributable to pollution abatement and control. Not all countries include these costs of integrated technologies in their PAC estimates; this complicates the process of international comparisons (see Chapter 2). For the reasons discussed here, the estimates are likely to be understated by comparison with what the figure would be if the establishment were able to examine every purchase and allocate a proportion of the expenditure for the environment.

The other element in the PAC framework requiring explanation is the receipts from by-products of PAC activity. Theoretically, this is required to off-set the costs of both capital and current expenditures. It represents the income for the business which is obtained by selling the material that may be trapped by PAC devices. An example of this situation would be when a business invests in capital equipment which enables it to stop releasing industrial wastes into waterways, with the waste being sold to chemical companies for re-processing. Hence the by-products of PAC activity would be generating income for the business which incurred the PAC capital expenditure, and such income should offset the costs of the PAC activity.

1.4 Australia's Pollution Abatement and Control Expenditure

Australian PAC data presented in this publication has been compiled in accord with the OECD framework outlined above, but at this stage, estimates are based on an incomplete coverage of industries. To this extent, the estimates are partial. However, the sectors covered in this publication (manufacturing, mining and the public sector) are expected to be major contributors to PAC expenditure.

(3) *ibid.*

PAC data for 1990-91 was collected from the mining industry, the manufacturing industry and the public sector. Chapters 3, 4 and 5 discuss in detail the collections from the public, manufacturing and mining sectors. The nature of the collections in each of these sectors necessarily differed, reflecting the varying nature of capital and current expenditures in these sectors.

Table 1.2 indicates that Australia's PAC expenditure (on a partial coverage basis) in 1990-91 was \$3,234.5 million, (the public sector accounted for 76% of this expenditure), representing 0.9 per cent of GDP. This was the lowest percentage recorded amongst all OECD countries, where PAC expenditures range up to 1.6% of GDP. Chapter 2 explores the international PAC data in more detail.

Table 1.2 also indicates the breadth of planned future collections, with additional data from agriculture, construction, retail, wholesale and household sectors yet to come.

TABLE 1.2 PARTIAL ESTIMATE OF AUSTRALIA'S POLLUTION ABATEMENT AND CONTROL EXPENDITURE, 1990-91

<i>Public Sector</i>	<i>Private Sector</i>
\$ investment expenditure (gross fixed capital exp.) = \$1,439m	\$ investment expenditure
	mining = \$170.2 m
	manufacturing = \$256.7 m
	agriculture = unknown
	construction = unknown
	retail = unknown
	wholesale = unknown
	household = unknown
	+
\$ gross current expenditure = 1,033.3m	\$ current expenditure
	mining = \$91.8 m
	manufacturing = \$243.5 m
	agriculture = unknown
	construction = unknown
	retail = unknown
	wholesale = unknown
	household = unknown
—	—
\$ receipts of by-products of PAC activity = unknown	\$ receipts of by-products of PAC activity = unknown
\$ PAC expenditure according to the Abater Principle = \$2,472.3 m	\$ PAC expenditure according to the Abater Principle = \$762.2 m
Total PAC Expenditure (Abater Principle) = \$ 3,234.5 m	

1.5 Australia's non-PAC environmental expenditures

Table 1.3 indicates the elements which are covered by the PAC framework, and the possible components of non-PAC environmental expenditures for both the public and the private sectors.

TABLE 13 COST OF ENVIRONMENT PROTECTION FRAMEWORK

<i>Public Sector federal state and local</i>	<i>Private Sector mining, manufacturing, agriculture, construction, retail, wholesale, households</i>
<i>PAC Expenditures</i> — current — capital — by-products — subsidies — fees/charges	PAC FRAMEWORK
<i>Non-PAC Environmental Expenditures</i> — national parks — research and development — landcare — environment activities /EIA — policy development — regulation	NON-PAC EXPENDITURES

For the mining industry, non-PAC environmental expenditure data was collected for 1990-91 which indicated that \$5.2 million was spent on research and development activities related to the prevention or reduction of pollution in the mining industry. At this stage of the development of PAC estimates in the international community, it is unclear whether research and development expenditures are being classified consistently. This publication has taken the approach that they are non-PAC environmental expenditures, as they do not necessarily result in the reduction of pollution levels (at least in the year of expenditure). Non-PAC environmental expenditures were not collected for the manufacturing industry in 1990-91.

Government outlays in 1990-91 occurred for a range of items which can be termed non-PAC environmental expenditures. These items include expenditures on national parks and wildlife, agricultural research, and a range of other government environmental initiatives and programs. The classification system for public accounts used by the Australian Bureau of Statistics means that many of the environmental activities are located in categories which also include non-environmental expenditures, and expenditures which could be considered to be environmentally destructive. For example, the code for agricultural land management also includes grants for tree clearing programs.

On this occasion, the only ABS government finance code considered to fall primarily under the definition of non-PAC environmental expenditures was that of national parks and wildlife. For 1990-91 expenditures in this category amounted to \$360.2 million. Chapter 3 examines these expenditures in more detail.

1.6 Future directions and initiatives

In 1991-92 ABS collections, items have been gathered which will enable estimates of the flows of PAC finance between the public and private sectors. This will enable Australia's PAC expenditure to be calculated at the Financer and the Abater levels for both public and private sectors, thereby giving a clearer indication of the sectoral distribution of funding for PAC activities.

Industry coverage has been improved since the collection of the 1990-91 data. Data collection has occurred (or is in progress) for the retail sector, the wholesale sector, the construction sector (1992-93) and the agricultural sector. Data from these collections will be available for later issues of this publication. There are also plans to include data from the household sector on costs incurred at that level for abating and controlling pollution, and conserving resources.

Future publications will also address the issue of non-PAC environmental expenditures, drawing on a wider range of sources than was possible on this occasion. This will enable determination of a figure which better reflects the true cost of environmental protection to the Australian economy. These statistics will ultimately feed through to the

set of environmental satellite accounts proposed as subsidiary elements of the national accounts under the internationally agreed Revised System of National Accounts.

A related issue, namely, the development and growth of the environment management industry is also being addressed in the ABS. The environment management industry is that section of the economy providing goods and services to protect, monitor or maintain the environment. It is not entirely a clearly differentiated industry in the sense defined by *Australian and New Zealand Standard Industry Classification (ANZSIC)* since important elements of the activity occur across a range of industries. The 1991-92 industry collections have gathered data which may give some indication of the size and nature of such activity. Results of these collections will be released in future editions of this publication.

The environment management industry is also being measured through collections from the service sector of the Australian economy. This is being done by determining the number of staff and proportion of turnover provided as environment management services.

The results of this range of initiatives will begin to emerge in the next issue of 'Cost of Environment Protection'. These improvements should ensure that estimates of Australia's PAC and non-PAC environmental expenditures are improved and continued. Such initiatives should also enable Australia to make a contribution to the international community in terms of resolution of some of the methodological and collection difficulties of the OECD PAC framework, and determining total costs of environmental protection.

CHAPTER 2

INTERNATIONAL COMPARISON



INTERNATIONAL COMPARISON

2.1 Introduction

A common way of comparing pollution abatement and control (PAC) expenditures across countries is to relate them to gross domestic product (GDP) and to total gross fixed capital formation (GFCF). The OECD has pursued work on pollution abatement and control expenditure for over ten years to enable such comparisons to become standardised. Tables 2.1 and 2.2 compare time-series data of pollution abatement and control expenditure as a percentage of GDP, and PAC investment expenditure as a percentage of gross fixed capital formation, for various countries.

PAC "investment" expenditure for Australia relates to the amount of gross fixed capital expenditure on pollution abatement and control as reported by the public sector, and the amount of capital expenditure on PAC activities by the manufacturing and mining industries (major contributors in the private sector). Total PAC expenditures for Australia's public sector refer to the sum of gross current expenditure and gross fixed capital expenditure.

In many instances coverage, definitions and methodologies remain diverse across OECD member countries and international comparisons should therefore be made with caution. Over the last few years, coverage and comparability of international data have improved as a result of OECD efforts to develop a core set of environmental data using a commonly agreed questionnaire. Further development of international definitions and classifications will continue to assist the process.

2.2 Total PAC expenditures — public and private

Relative levels of total PAC expenditure can have two quite opposite interpretations. High PAC expenditure may be associated with low environmental quality indicating that such levels of expenditure are necessary. Alternatively, high PAC expenditure may be associated with high environmental quality indicating improvement as a result of increased PAC expenditure. PAC data is best analysed by examining expenditure data alongside environmental indicators and looking at trends over time. A particular figure may be a reflection of the level and composition of industrial activity of the country as well as a reflection of the nature of its environmental policies and regulations.

Table 2.1 shows Australia's total PAC expenditure for the public and private sectors to be the lowest in comparison with other OECD member countries in terms of percentage of GDP (0.9%) for figures reported in 1990. West Germany has the highest level of PAC expenditure (1.6% GDP) for this year. However, differences in collection methodologies and coverage account for some of the variation.

Amongst countries for which statistics for 1990 are available, total PAC expenditures (Figure 2.1) show far less variation than the public and private sector components separately. The ratio of private to public sector expenditures is affected by factors such as the degree of privatisation of the utilities industries. For example, public water authorities in some parts of the UK became privatised in 1989. Hence, better comparisons can be made between countries by looking at total PAC expenditures.

2.3 Private sector PAC expenditures

Table 2.1 shows Australia and Japan to have the lowest PAC expenditures in the private sector (0.2% and 0.1% of GDP respectively). Japan's extremely low PAC expenditure would reflect, in part, undercoverage in this sector. Figures for Japan include only capital and not current expenditure for the private sector. Other countries represented, including Australia, include both current and capital expenditures.

Australia includes only data for the manufacturing and mining industries whereas countries with higher PAC expenditures include other non-manufacturing industries such as utilities (UK and Germany); agricultural, hunting and fishing (UK); agricultural feedlot operators (US); and construction (Germany).

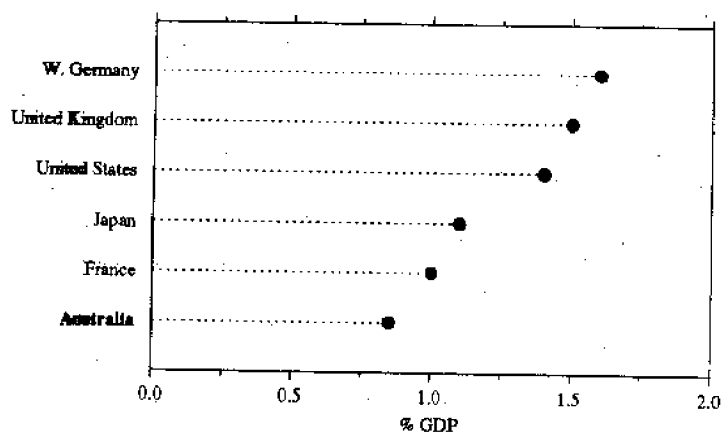
TABLE 2.1 PAC EXPENDITURE AS A PERCENTAGE OF GDP(a)

	1985	1987	1988	1989	1990
PRIVATE SECTOR					
Australia	—	—	—	—	0.2
Canada	—	—	—	0.3	—
United States	0.8	0.8	0.8	0.8	0.8
Japan	—	0.1	0.1	0.1	0.1
Austria	—	0.7	0.7	—	—
France	0.2	0.3	0.3	0.3	0.5
W. Germany	0.8	0.8	0.8	0.8	0.8
Netherlands	0.5	0.6	—	0.6	—
Portugal	—	—	—	0.2	—
United Kingdom	0.6	—	—	—	1.1
PUBLIC SECTOR					
Australia	—	—	—	—	0.7
Canada	0.7	0.7	0.7	0.8	0.9
United States	0.6	0.6	0.5	0.6	0.6
Japan	0.9	1.0	1.0	1.0	1.0
Austria	1.0	1.0	1.0	—	—
Denmark	0.7	0.8	0.9	0.9	1.0
France	0.6	0.7	0.7	0.7	0.5
W. Germany	0.7	0.8	0.8	0.8	0.8
Italy	—	—	0.2	0.2	—
Netherlands	1.0	0.9	—	0.9	—
Portugal	—	—	0.5	0.4	—
Spain	—	0.5	0.5	0.6	0.6
Sweden	—	0.7	—	—	—
Switzerland	0.7	—	0.7	—	—
United Kingdom	0.7	—	—	0.8	0.4
PUBLIC AND PRIVATE SECTORS					
Australia	—	—	—	—	0.9
Canada	—	—	—	1.1	—
United States	1.4	1.4	1.3	1.4	1.4
Japan	—	1.1	1.1	1.1	1.1
Austria	—	1.7	1.7	—	—
France	0.8	1.0	1.0	1.0	1.0
W. Germany	1.5	1.6	1.6	1.6	1.6
Netherlands	1.5	1.5	—	1.5	—
Portugal	—	—	—	0.6	—
United Kingdom	1.3	—	—	—	1.5

(a) See Explanatory Notes for differences in country coverage and methodologies

(Source: OECD, 1993b)

FIGURE 2.1 TOTAL PAC EXPENDITURES AS A PERCENTAGE OF GDP, 1990 (a)

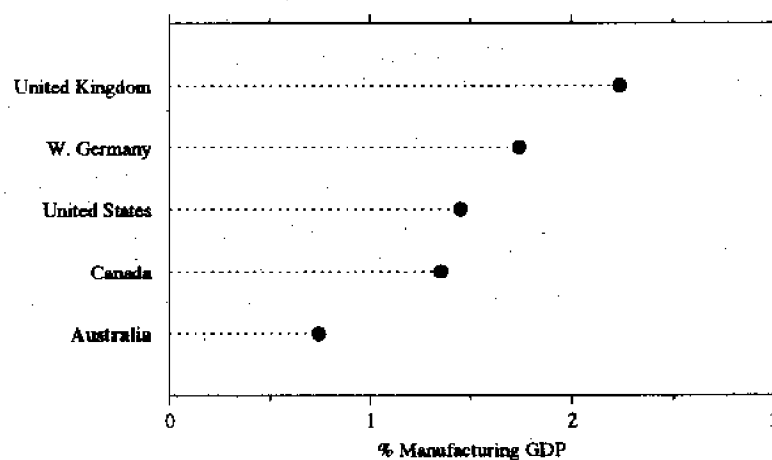


(a) See Explanatory Notes for differences in country coverage and methodologies.
Source: OECD 1993b

The manufacturing industry is the largest contributor to total PAC expenditures in the private sector for all countries described (OECD 1993b). All countries include PAC expenditures by the manufacturing industry, and Figure 2.2 shows the relative levels of PAC expenditure by the manufacturing industry as a percentage of that industry's contribution to GDP for a number of member countries. These figures show Australia's PAC expenditure by the manufacturing industry to be low relative to other countries for which statistics were available. International comparison of mining PAC expenditures is limited by the availability of data (Figure 2.3).

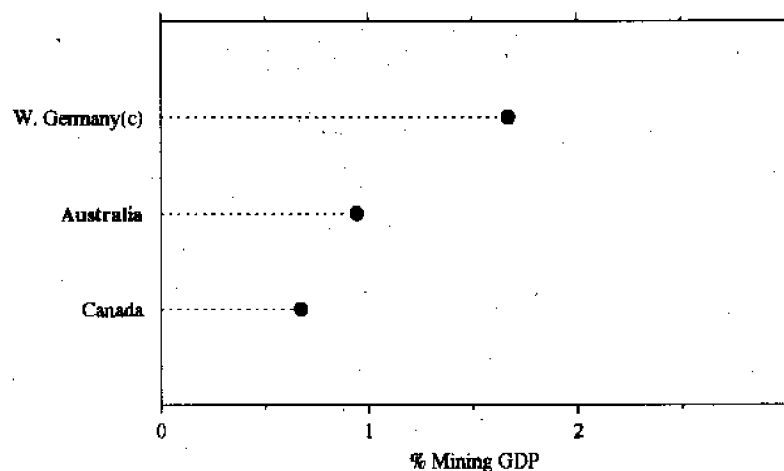
To facilitate international comparisons of mining and manufacturing data, 1989 data have been used for United States, West Germany and Canada. Figures for 1990 were only available for Australia and the United Kingdom.

FIGURE 2.2 MANUFACTURING PAC EXPENDITURE AS A PERCENTAGE OF MANUFACTURING GDP (a,b)



(a) See Explanatory Notes for differences in country coverage and methodologies.
 (b) Figures for UK and Australia are for 1990. Figures for W. Germany, US and Canada are for 1989.
 Source: OECD 1991a,b,c,c, 1992 and 1993a,b,d,c

FIGURE 2.3 MINING PAC EXPENDITURE AS A PERCENTAGE OF MINING GDP (a,b)



(a) See Explanatory Notes for differences in country coverage and methodologies.
 (b) Figures for W. Germany and Canada are for 1989. Figures for Australia are for 1990.
 (c) PAC expenditure is a percentage of energy, water supply and mining component of GDP.
 Source: OECD 1991a&b, 1992 and 1993a&b

2.4 Public sector PAC expenditures

Australia's public sector expenditure on pollution abatement and control is in line with other member countries (Table 2.1). This figure (0.7% GDP) comprises gross fixed capital expenditure by both general government and public trading enterprises (PTE's), and gross current expenditure on PAC activities by the general government. Gross operating costs of PTE's are not included.

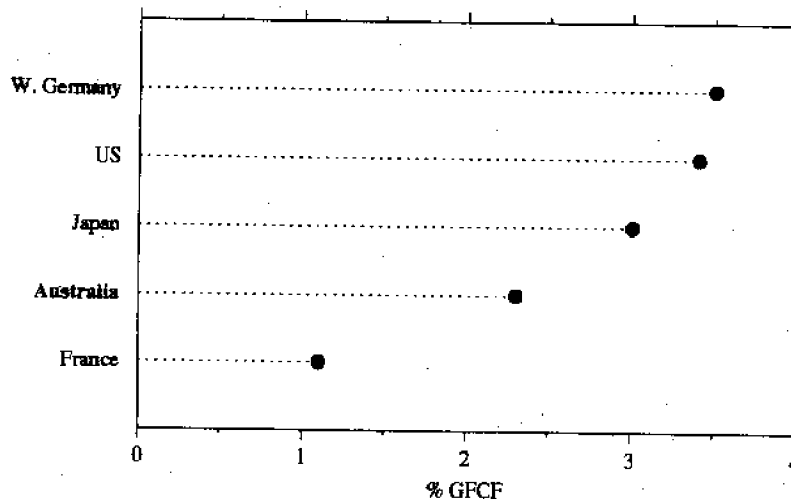
Australia's higher public sector PAC expenditure as a proportion of total PAC expenditures would reflect, in part, the fact that utilities (electricity, water and gas) are predominantly provided by the public sector. This is not the case with most other member countries, whose utilities industries are at least partly privatised and expenditures have been allocated accordingly.

A factor of 50 per cent has been applied to remove the water supply component in the Australian public sector data to bring the figures more in line with the OECD definition of pollution abatement and control.

2.5 Investment (Capital) PAC expenditures as a proportion of Gross Fixed Capital Formation

Figure 2.4 shows Australia's PAC investment expenditure as a proportion of gross fixed capital formation to be lower than most other member countries for which data were available in 1990 (US, Japan and Germany), but substantially greater than France. France's relatively low investment expenditure may reflect the fact that figures do not include expenditure for integrated technologies. Figures reported by the other countries include integrated technologies (OECD 1993b). This is a conceptual issue associated with the statistical treatment of PAC expenditure which impacts on comparisons of

FIGURE 2.4 TOTAL PAC INVESTMENT EXPENDITURES AS A PERCENTAGE OF GROSS FIXED CAPITAL FORMATION, 1990 (a)



(a) See Explanatory Notes for differences in country coverage and methodologies.
Source: OECD 1993b

international expenditures (see Chapter 1).

The distributions of public and private sector PAC investment expenditures as a percentage of gross fixed capital formation show a great deal of variation between countries (Table 2.2). Most noticeable are the extremes in distribution of PAC expenditure between the public and private sectors for Japan (2.6% and 0.3% of GFCF respectively) and, to a lesser extent, Australia (1.8% and 0.5% of GFCF respectively). Australia's inclusion of the utilities industries in the public sector has been discussed previously.

Japan's PAC statistics for the private sector reflect an undercoverage of the manufacturing industry, such that no figures are available for large companies in certain industries such as food and tobacco, and wood and wood products (OECD 1993b).

TABLE 2.2 PAC INVESTMENT EXPENDITURE AS A PERCENTAGE OF GROSS FIXED CAPITAL FORMATION(a)

	1985	1987	1988	1989	1990
PRIVATE SECTOR					
Australia	—	—	—	—	0.5
Canada	—	—	—	0.8	—
United States	2.0	1.9	1.9	1.9	2.0
Japan	0.5	0.3	0.3	0.3	0.3
Austria	—	1.4	1.4	1.1	1.0
France	0.4	0.4	0.4	0.4	0.4
W. Germany	1.6	2.0	2.0	1.7	1.4
Netherlands	1.0	1.6	—	1.3	—
Portugal	—	—	0.5	0.7	—
Sweden	0.8	—	1.2	—	—
PUBLIC SECTOR					
Australia	—	—	—	—	1.8
United States	1.1	1.4	1.2	1.3	1.4
Japan	2.9	3.2	3.0	2.9	2.6
Austria	2.7	2.5	2.1	—	—
Denmark	1.0	1.2	1.8	1.9	1.8
France	0.8	0.8	0.9	0.8	0.7
W. Germany	1.9	2.1	2.0	2.0	2.1
Italy	—	—	1.0	0.9	—
Netherlands	2.2	1.3	—	1.0	—
Portugal	—	—	1.0	1.0	—
Spain	—	0.6	0.6	0.8	0.8
PRIVATE AND PUBLIC					
Australia	—	—	—	—	2.3
United States	3.1	3.3	3.1	3.2	3.4
Japan	3.4	3.5	3.3	3.2	3.0
Austria	—	3.9	3.5	—	—
France	1.2	1.3	1.3	1.2	1.1
W. Germany	3.5	4.1	4.0	3.7	3.5
Netherlands	3.2	2.9	—	2.3	—
Portugal	—	—	1.5	1.6	—

(a) See Explanatory Notes for differences in country coverage and methodologies

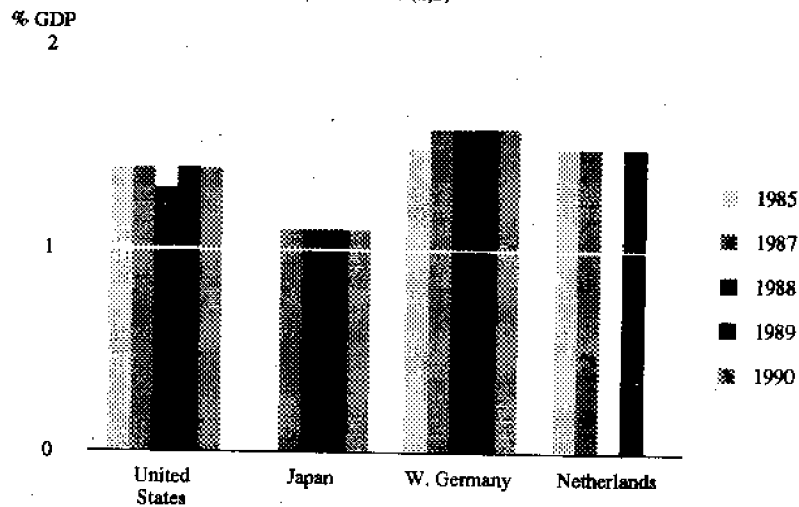
(Source: OECD, 1993b)

2.6 Capital and current PAC expenditure comparisons

The distinction between capital and current expenditure can indicate the pattern of abatement and control efforts over time. Typically, capital expenditure accounts for a larger share of total PAC expenditure when pollution abatement measures are first implemented (OECD 1993b). The implications are that initial financial outlays on pollution abatement and control generally involve the purchasing of abatement technologies and equipment, after which operating (current) expenditures on facilities and equipment become increasingly important.

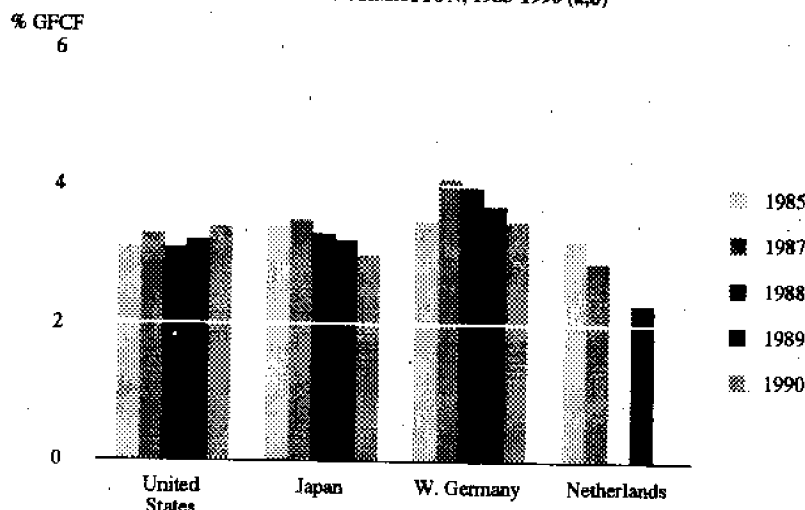
Figures 2.5 and 2.6 show time series data between 1985 and 1990 of PAC expenditure for selected countries (other than Australia for which the comparison is not available) as a percentage of GDP (Figure 2.5) and GFCF (Figure 2.6). Over this period total PAC expenditure as a percentage of GDP appears to have remained static. PAC investment expenditure as a percentage of gross fixed capital formation appears to be less stable over the same period, as would be expected with the lumpy nature of capital investment. Some countries appear to show a trend towards decreased investment expenditure between 1985 and 1990, however the volatile nature of capital expenditure prevents the drawing of conclusions from time-series data spanning such a short period.

FIGURE 2.5 PAC EXPENDITURE AS A PERCENTAGE OF GDP, 1985-1990 (a,b)



(a) See Explanatory Notes for differences in country coverage and methodologies.
 (b) No data is available for 1986.
 Source: OECD 1993b

FIGURE 2.6 PAC INVESTMENT EXPENDITURE AS A PERCENTAGE OF GROSS FIXED CAPITAL FORMATION, 1985-1990 (a,b)



(a) See Explanatory Notes for differences in country coverage and methodologies.
 (b) No data is available for 1986.
 Source: OECD 1993b

2.7 Environment Management Industry

Measures to protect the environment create demand for abatement technologies, clean production technologies, environmental consulting services, and promote environment-related research and development. National and international statistics on PAC expenditure provide the basic information to estimate the size and evolution of markets and potentials for the environment management industry.

The largest national market is that of the US, which accounts for about 40% of the world environment management market. Certain European countries such as Germany (4.0%), Denmark (2.2%) and the Netherlands (4.1%) are forecast to have lower than average growth in this industry due to their relatively mature markets and comprehensive environmental policies in the past two decades (OECD, 1991d). Southern European countries (Greece, Portugal and Spain), and Canada are projected to have relatively high

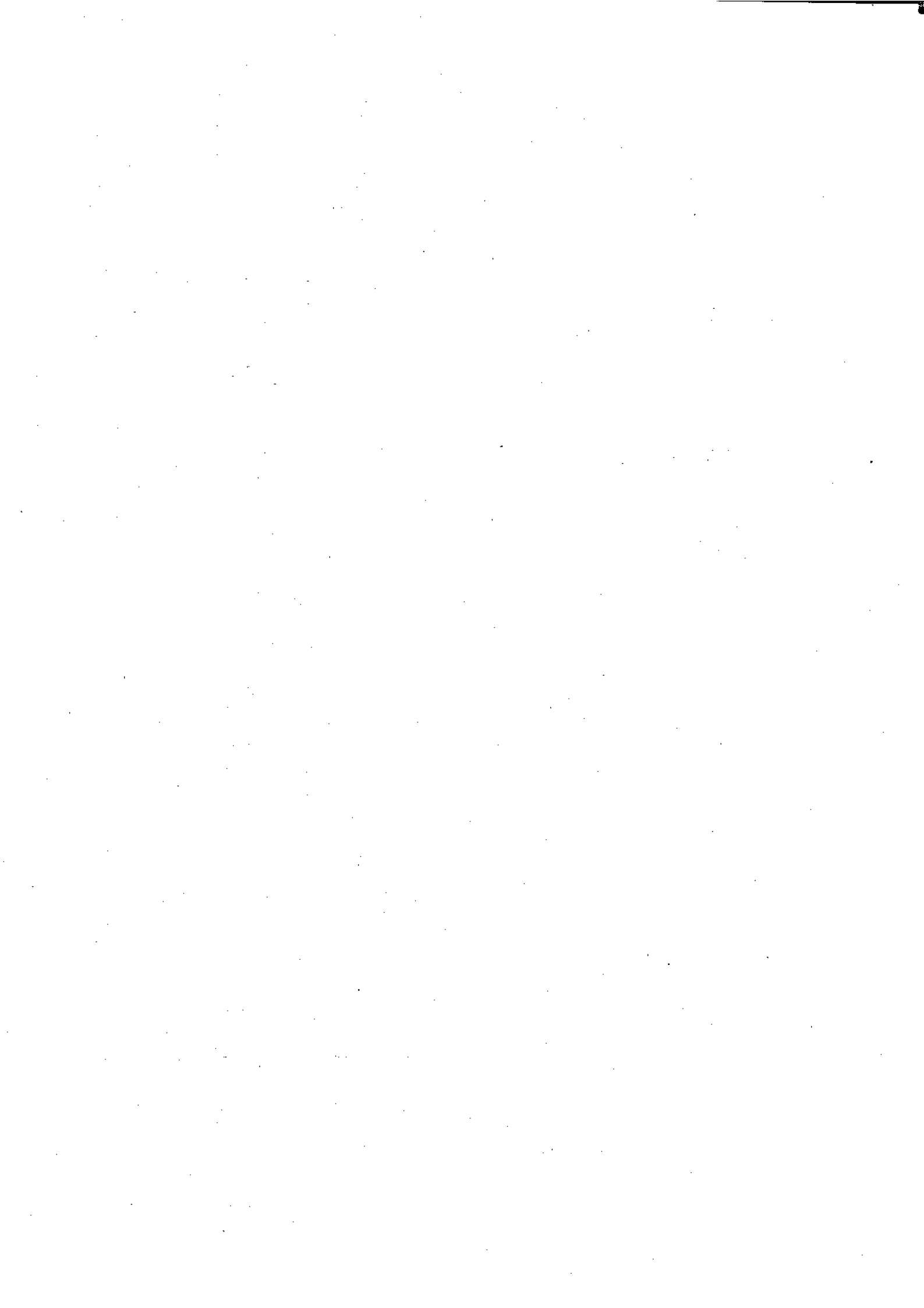
growth rates (7.4%, 8.3% and 7.4%, and 7.9% respectively) as they initiate compliance with environmental legislation and standards (Table 2.3).

The value of the environment management industry in Australia in 1990 was estimated by the OECD (1991d) at \$US 2 billion. Annual growth in the market for environmental equipment and services is projected to be 4.4 per cent for Australia to the year 2000.

TABLE 2.3 FORECASTS OF MARKET TRENDS FOR THE ENVIRONMENT MANAGEMENT INDUSTRY (\$US billion)

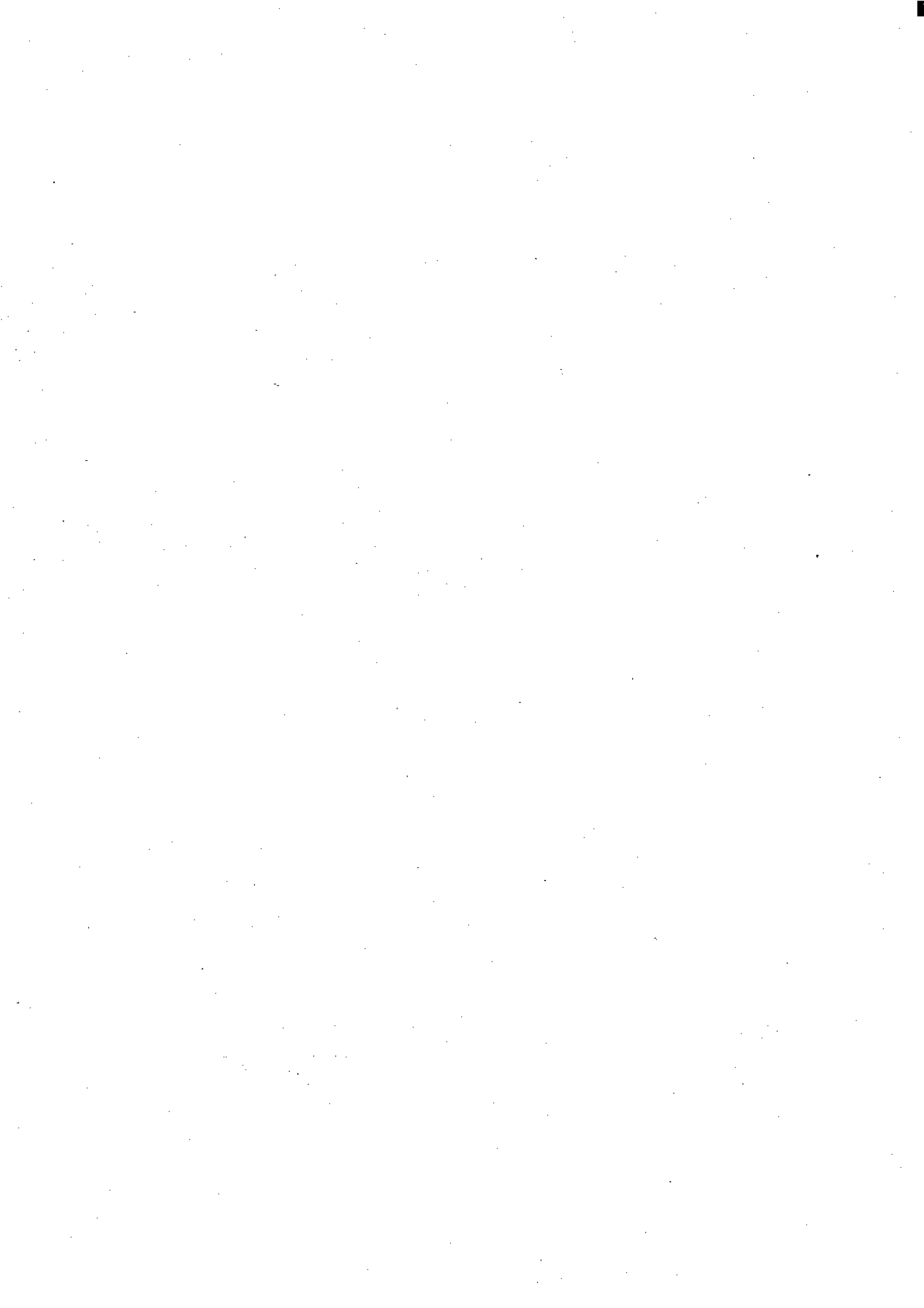
	1990	2000	Annual Estimated Growth %
Australia	2.0	2.8	4.4
United States	78.0	113.0	5.0
Canada	7.0	12.0	7.9
Germany	17.0	23.0	4.0
France	10.0	15.0	5.5
United Kingdom	7.0	11.0	6.3
Netherlands	2.7	3.7	4.1
Italy	5.0	7.7	6.0
Denmark	1.0	1.2	2.2
Greece	0.3	0.5	7.4
Portugal	0.4	0.7	8.3
Spain	1.8	3.0	7.4
Belgium	1.4	2.3	6.4
Ireland	0.3	0.5	6.5
Austria	1.3	1.8	4.3
Switzerland	1.9	2.5	3.5
Sweden	1.5	2.0	3.7
Finland	1.0	1.3	3.3
Norway	0.7	1.0	4.4
Asia-Pacific	26.2	42.0	6.2
Japan	24.0	39.0	6.7
East Europe/Soviet Union	15.0	21.0	4.0

(Source: OECD, 1991d)



CHAPTER 3

THE PUBLIC SECTOR AND ENVIRONMENT PROTECTION



THE PUBLIC SECTOR AND ENVIRONMENT PROTECTION

3.1 Introduction

This chapter examines the cost of environment protection to the public sector in 1990-91. The cost has been estimated using unpublished public sector accounts data held by the Australian Bureau of Statistics (ABS).

The first part of the chapter focuses on the cost of pollution abatement and control (PAC) activities to the public sector while the second part of the chapter explores the data availability problems which restrict analysis of some non-PAC environmental expenditures. The chapter examines outlays for national parks and wildlife by the public sector as a case study on non-PAC environmental expenditures.

The ABS public accounts data classifies government transactions by purpose according to the Government Purpose Classification (GPC). To facilitate international comparisons, the GPC closely follows the principles of the United Nations Classification of the Functions of Government (COFOG). The transactions classified by the GPC represent the current and capital outlays of general government and the capital outlays and income transfers of public trading enterprises (PTE's). Operating costs of PTE's are not included.

Only data for GPC codes which cover outlays specifically relating to environment protection have been used in this chapter. These GPC codes are:

0720	Water Supply
0730	Sanitation and protection of the environment
0731	Household garbage
0732	Other sanitation
0733	Sewerage
0734	Urban stormwater drainage
0739	Protection of the environment not elsewhere classified
0813	National parks and wildlife

(See Explanatory Note 3.3 for a more detailed discussion of GPC's.)

For water supply (GPC code 0720), only half of all outlays have been taken into account when estimating the cost of PAC to the public sector. This is because the OECD framework does not recognise activities involving the supply of drinking water (for example, the enlargement of a reservoir to meet urban water requirements) as PAC activity.

3.2 Methodology

The ABS public sector accounts data separately identifies the estimated cost of each environment protection activity (as defined by the above GPC codes) to the three levels of government — Commonwealth, State and local. For each environment protection activity, it is likely the Commonwealth and State government estimates are more comprehensive than those of local government. This is because at the local government level there are fewer data sources from which to classify transactions and these tend to rely on financial records which are less detailed than those of Commonwealth and State governments.

For all levels of government the cost of each environment protection activity is split by State and for the section on PAC, current and capital outlays are distinguished. Current outlays refer to the sum of net current expenditure on goods and services and net current transfer payments. Capital outlays refer to the sum of expenditure on new fixed assets, net purchases of other capital assets (for example, buildings and land), increases in stocks and net transfer payments to other bodies to fund capital expenditure.

Outlays, be they current or capital, are net figures which take into account the flow of funds between the public and private sectors and transfer payments involving the public sector. As such, the statistics provide an estimate of the cost of environment protection

according to the financier principle outlined in the OECD framework for measuring PAC. There are few countries which measure the cost of PAC at the financier level. Those which do, (for example the Netherlands, Denmark and Sweden) also measure PAC using gross expenditure.

On this occasion, it was not possible to analyse gross expenditures at the level of detail at which this chapter examines the public sector data. Given this, outlay figures on PAC for the public sector, as estimated in this chapter, are not directly comparable to the PAC expenditure figures of other countries included in chapter 2. That chapter uses gross expenditure figures on PAC for Australia's public sector which are comparable to public sector PAC estimates of other countries.

3.3 Total outlays on PAC

Total net outlays on PAC by the public sector in 1990-91 amounted to \$2,193 million, representing 1.5 per cent of public sector outlays for all program areas by all levels of government (on a gross basis the figure was \$2,472 million). An estimated 42 per cent of net outlays (\$931 million) were for sewerage collection, treatment and disposal operations while another 23 per cent (\$505 million) were for water treatment. The remaining 35 per cent (\$757 million) were for other PAC activities, including the provision of household garbage and other sanitary services.

TABLE 3.1 PUBLIC SECTOR PAC OUTLAYS(a) BY LEVEL OF GOVERNMENT AND PURPOSE, 1990-91
(\$ million)

Level of government	Government purpose classification						Total
	0720 Water treatment(b)	0731 Household garbage	0732 Other sanitation	0733 Sewerage	0734 Urban stormwater drainage	0739 Other environment protection(c)	
Commonwealth							
Current outlays	4	—	—	—	—	21	25
Capital outlays	5	—	—	-2	—	7	10
Total outlays	9	—	—	-2	—	28	35
State							
Current outlays	87	—	2	33	1	161	283
Capital outlays	296	—	11	683	45	65	1,101
Total outlays	383	—	13	716	46	226	1,384
Local(d)							
Current outlays	21	112	139	-2	92	13	375
Capital outlays	92	18	14	219	45	11	399
Total outlays	113	130	153	217	137	24	774
All levels							
Current outlays	112	112	141	31	93	195	684
Capital outlays	393	18	25	900	90	83	1,509
Total outlays	505	130	166	931	183	278	2,193

Where figures have been rounded, discrepancies may occur between sums of the component items and totals.

(a) Outlays exclude some current and capital transfer payments (for example, taxes paid by general government).

(b) This figure represents half the value of water supply.

(c) Includes outlays coded to 0730 rather than one of the four digit level codes.

(d) There are some concerns regarding the accuracy of coding for local government outlays at the four digit level so these figures should be treated with caution.

Of total PAC outlays in 1990-91, 69 per cent (\$1,509 million) were capital outlays and 31 per cent were current outlays (\$684 million).

An estimated 63 per cent of public sector outlays on PAC in 1990-91 (\$1,384 million) were made by State government while most of the remaining outlays were made by local government (\$774 million). Some of these outlays would have been funded by untied Commonwealth grants which the State and local governments spent on PAC activities. Given that untied grants are for unspecified purposes, they are necessarily coded to the 'other' category in the public finance coding system.

Of State government outlays, 52 per cent (\$716 million) were for sewerage operations and 28 per cent (\$383 million) were for water treatment. Most of the remaining outlays were for other protection to the environment (\$226 million). State government outlays represented a substantial proportion of total PAC outlays for each of these three activities, ranging from 76 per cent for water treatment to 81 per cent for other protection of the environment.

Given that caution needs to be exercised when interpreting the local government data, analysis of this data has been restricted to the broad level codes 0720 (Water treatment) and 0730 (Sanitation and protection of the environment). An estimated 85 per cent of local government outlays (\$661 million) were for sanitation and protection of the environment (GPC code 0730). These outlays comprised 39 per cent of total outlays for sanitation and protection of the environment. In contrast, local government outlays on water treatment (\$113 million) only accounted for 22 per cent of total outlays for this PAC activity.

Commonwealth outlays amounted to \$35 million, representing 2 per cent of public sector outlays on PAC in 1990-91. These outlays were for specific purpose payments to the States and Territories and national initiatives and policy formation on water treatment and other environment protection activities. Most of the specific purpose payments for water treatment were distributed through the Federal Water Resources Assistance Program (FWRAP).

Table 3.2 examines PAC outlays by all levels of government in each State. Of these outlays, some 44 per cent were expended in New South Wales (\$961 million). Victoria (\$544 million) and Queensland (\$259 million) were the only other States accounting for greater than 10 per cent of total public sector PAC outlays. The Australian Capital Territory had the lowest level of outlay on PAC (\$7 million).

In New South Wales, Victoria, South Australia, Western Australia and the Northern Territory more than two-thirds of total PAC outlays were State government outlays. In contrast, 90 per cent of Queensland's total PAC outlays and 76 per cent of Tasmania's total PAC outlays were local government outlays.

The highest levels of per capita outlay on PAC (based on 1991 Census population counts) occurred in the Northern Territory (\$204.67 per person) and New South Wales (\$167.65 per person). The lowest levels of per capita outlay were recorded in the Australian Capital Territory (\$24.99 per person), Tasmania (\$83.92 per person) and Queensland (\$86.98 per person).

The low per capita outlay recorded by the Australian Capital Territory may well be an underestimate of the actual figure. The 1991-92 Australian Capital Territory environmental budget statement indicates the Territory government had expenditure on household garbage collection and disposal, sewerage operations and urban stormwater drainage during 1990-91 yet such expenditure does not appear to have been recorded to GPC codes covering these activities in the public accounts data. It is likely this is because the government units incurring these expenses, be they offices or programs within a department, whole departments or authorities, were responsible for a range of activities and that all transactions by these government units were classified to the predominant purpose they served rather than each individual purpose.

TABLE 3.2 PUBLIC SECTOR PAC OUTLAYS(a) BY LEVEL
OF GOVERNMENT, BY STATE, 1990-91
(\$ million)

Type of outlay	State								
	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Aust(b)
<i>Current outlays</i>									
Commonwealth	—	—	1	—	—	—	—	—	25
State	169	29	10	35	14	4	18	4	283
Local	153	127	42	40	3	10	1	—	375
Total	323	156	53	75	17	14	19	4	684
Per capita outlay (\$)	56.35	36.76	17.80	53.55	10.71	30.92	108.02	14.28	40.59
<i>Capital outlays</i>									
Commonwealth	8	1	1	1	—	—	—	—	10
State	482	370	15	69	142	4	16	3	1,101
Local	149	17	190	13	10	19	—	—	399
Total	638	387	206	83	152	24	17	3	1,509
Per capita outlay (\$)	111.30	91.18	69.18	59.26	95.79	53.00	96.65	10.71	89.55
<i>Total outlays</i>									
Commonwealth	8	1	3	1	—	—	—	—	35
State	651	399	24	104	156	8	34	7	1,384
Local	302	143	232	53	13	29	2	—	774
Total	961	544	259	158	169	38	36	7	2,193
Per capita outlay (\$)	167.65	128.17	86.98	112.81	106.50	83.92	204.67	24.99	130.15

Where figures have been rounded, discrepancies may occur between sums of the component items and totals.

(a) Outlays exclude some current and capital transfer payments (for example, taxes paid by general government).

(b) Includes Commonwealth outlays spent at the national level.

Table 3.3 shows that in most States, sewerage operations and water treatment were the two PAC activities for which the highest proportion of total outlays were spent. More than one-third of total outlays in all States except South Australia, the Northern Territory and the Australian Capital Territory were expended on sewerage operations while over 20 per cent of total outlays in all States except Tasmania and Victoria were expended on water treatment.

Outlays on household garbage collection and disposal comprised a higher proportion of total outlays expended in Tasmania (21%) and South Australia (16%) than the other States. Similarly, Victoria (11%) was the only State in which greater than 10 per cent of its total outlays were spent on other sanitation services. Queensland (15%) and South Australia (11%) were the only States in which greater than 10 per cent of their total outlays were spent on urban stormwater drainage.

TABLE 3.3 PUBLIC SECTOR PAC OUTLAYS(a) BY TYPE OF OUTLAY,
STATE AND PURPOSE, 1990-91
(\$million)

State	Government purpose classification						Total
	0720 Water treatment(b)	0731 Household garbage	0732 Other sanitation	0733 Sewerage	0734 Urban stormwater drainage	0739 Other environment protection(c)	
<i>New South Wales</i>							
Current outlays	52	21	55	32	68	94	323
Capital outlays	158	-	14	411	16	39	638
Total outlays	210	21	69	443	85	133	961
<i>Victoria</i>							
Current outlays	5	62	54	9	7	19	156
Capital outlays	76	1	7	251	31	21	387
Total outlays	81	63	62	260	38	40	544
<i>Queensland</i>							
Current outlays	21	-1	9	-6	12	18	53
Capital outlays	61	7	2	98	28	10	206
Total outlays	82	7	12	92	40	27	259
<i>South Australia</i>							
Current outlays	8	26	13	-2	4	27	75
Capital outlays	35	1	1	29	13	4	83
Total outlays	43	26	14	27	17	31	158
<i>Western Australia</i>							
Current outlays	-	-4	6	-1	1	15	17
Capital outlays	47	8	1	94	1	1	152
Total outlays	48	5	7	93	2	16	169
<i>Tasmania</i>							
Current outlays	2	8	2	-1	1	2	14
Capital outlays	5	-	-	17	1	-	24
Total outlays	7	8	2	16	2	2	38
<i>Northern Territory</i>							
Current outlays	16	-	2	-	-	2	19
Capital outlays	4	-	-	3	-	9	17
Total outlays	21	-	2	3	-	11	36
<i>Australian Capital Territory</i>							
Current outlays	4	-	-	-	-	-	4
Capital outlays	3	-	-	-	-	-	3
Total outlays	7	-	-	-	-	-	7
<i>Australia(d)</i>							
Current outlays	112	112	141	31	93	195	684
Capital outlays	393	18	25	900	90	83	1,509
Total outlays	505	130	166	931	183	278	2,193

Where figures have been rounded, discrepancies may occur between sums of the component items and totals.

(a) Outlays exclude some current and capital transfer payments (for example, taxes paid by general government).

(b) This figure represents half the value of water supply.

(c) Includes outlays coded to 0730 rather than one of the four digit level codes.

(d) Includes Commonwealth outlays spent at the national level.

3.4 Current outlays on PAC

Total current outlays by the public sector on PAC in 1990-91 were \$684 million, representing 31 per cent of total outlays. Of total current outlays, 29 per cent (\$195 million) were for other protection of the environment, 21 per cent (\$141 million) were for other sanitation services and 16 per cent (\$112 million) were for household garbage collection and disposal.

Those PAC activities for which total outlays were least, tended to include higher proportions of current outlays. For example, current outlays comprised more than half the total PAC outlays for household garbage services (86%) and other sanitation services (85%) but only 22 per cent of total PAC outlays for water treatment and 3 per cent of

total PAC outlays for sewerage operations. This reflects the fact that activities such as household garbage collection and disposal and other sanitation have a larger recurrent cost base than water treatment and sewerage operations which are more capital intensive.

Current outlays were more likely to occur at the local government level. An estimated 55 per cent of current outlays (\$375 million) were by local governments even though local government outlays accounted for just 35 per cent of total outlays (Table 3.1).

The Northern Territory (\$108.02 per person), New South Wales (\$56.35 per person) and South Australia (\$53.55 per person) had the highest per capita outlay on current items. Western Australia had the lowest per capita outlay on current items (\$10.71 per person) (Table 3.2).

The low level of per capita current outlay in Western Australia appears to relate to the almost exclusive responsibility for water treatment, sewerage operations and urban stormwater drainage held by the Water Authority of Western Australia (WAWA) — a PTE. Only the transfer payments of the PTE contributed to Western Australia's current outlays. Other States also operate PTE's for water and sewerage undertakings, however, general government (whose operating costs contribute to current outlays) seems to have more involvement in these and other PAC activities in these States than is the case in Western Australia.

3.5 Capital outlays on PAC

Total capital outlays by the public sector on PAC in 1990-91 were \$1,509 million, representing 69 per cent of total PAC outlays. An estimated 60 per cent of these outlays (\$900 million) were for sewerage operations while another 26 per cent (\$393 million) were for water treatment (Table 3.1).

Capital outlays accounted for almost all outlays relating to sewerage collection, treatment and disposal operations (97%) and 78 per cent of all water treatment outlays. Given these two areas of funding also accounted for the bulk of total outlays (65%), it indicates investment in these areas dominated PAC outlays by governments (Table 3.1).

More than 70 per cent of all capital outlays (\$1,101 million) were expended at the State government level. This reflects the fact that outlays for water treatment and sewerage operations, the two largest contributors to capital outlays, were primarily the responsibility of State government in all States except Queensland and Tasmania.

Some of the major water treatment projects funded by State government capital outlays during 1990-91 were:

- the Orchid, Nepean and Cascades water treatment works (New South Wales);
- the Wurdee-Buloc water treatment works (Victoria); and
- the Happy Valley water filtration plant (South Australia).

Major sewerage projects funded by State government capital outlays during 1990-91 included:

- the Hunter sewage project and upgrading of Sydney's inland and ocean sewage works (New South Wales);
- the Western Trunk Sewer and North Western Sewer (Victoria);
- the Golden Grove trunk sewer (South Australia); and
- the Woodman Point wastewater treatment plant (Western Australia).

On a per capita basis, New South Wales (\$111.30 per person), the Northern Territory (\$96.65 per person), Western Australia (\$95.79 per person) and Victoria (\$91.18 per person) had the highest capital outlays. All the other States had per capita outlays of less than \$70.00 per person (Table 3.2).

3.6 Non-PAC environmental protection outlays

Table 3.4 shows total outlays by State and Commonwealth governments on national parks and wildlife (GPC 0813), an example of public sector non-PAC environmental expenditure outlays which have positive environmental benefits. Outlays on national parks and wildlife represent only a proportion of total expenditures on conservation and natural resource management activities which also include the promotion and adoption of policies and practices designed to achieve ecologically sustainable development of each State's forest, land, vegetation, water, fisheries and wetland resources.

Other non-PAC environmental outlays exist under a variety of government purpose classifications (eg agricultural land management 1011, forestry 1021 etc) but the environmental components of such codings are unable to be distinguished. Future publications will attempt to address this issue by use of annual reports and State budget papers.

TABLE 3.4 PUBLIC SECTOR OUTLAYS ON NATIONAL PARKS AND WILDLIFE
BY STATE, 1990-91
(\$million)

State(a)	GPC 0813	
	Total outlay	Per capita outlay
New South Wales	67	11.69
Victoria	105	24.74
Queensland	37	12.43
South Australia	17	12.14
Western Australia (b)	18	11.34
Tasmania	17	37.54
Northern Territory	21	119.39
Australian Capital Territory	30	107.11
Commonwealth	49	
Total	360	

Where figures have been rounded, discrepancies may occur between sums of the component items and totals.

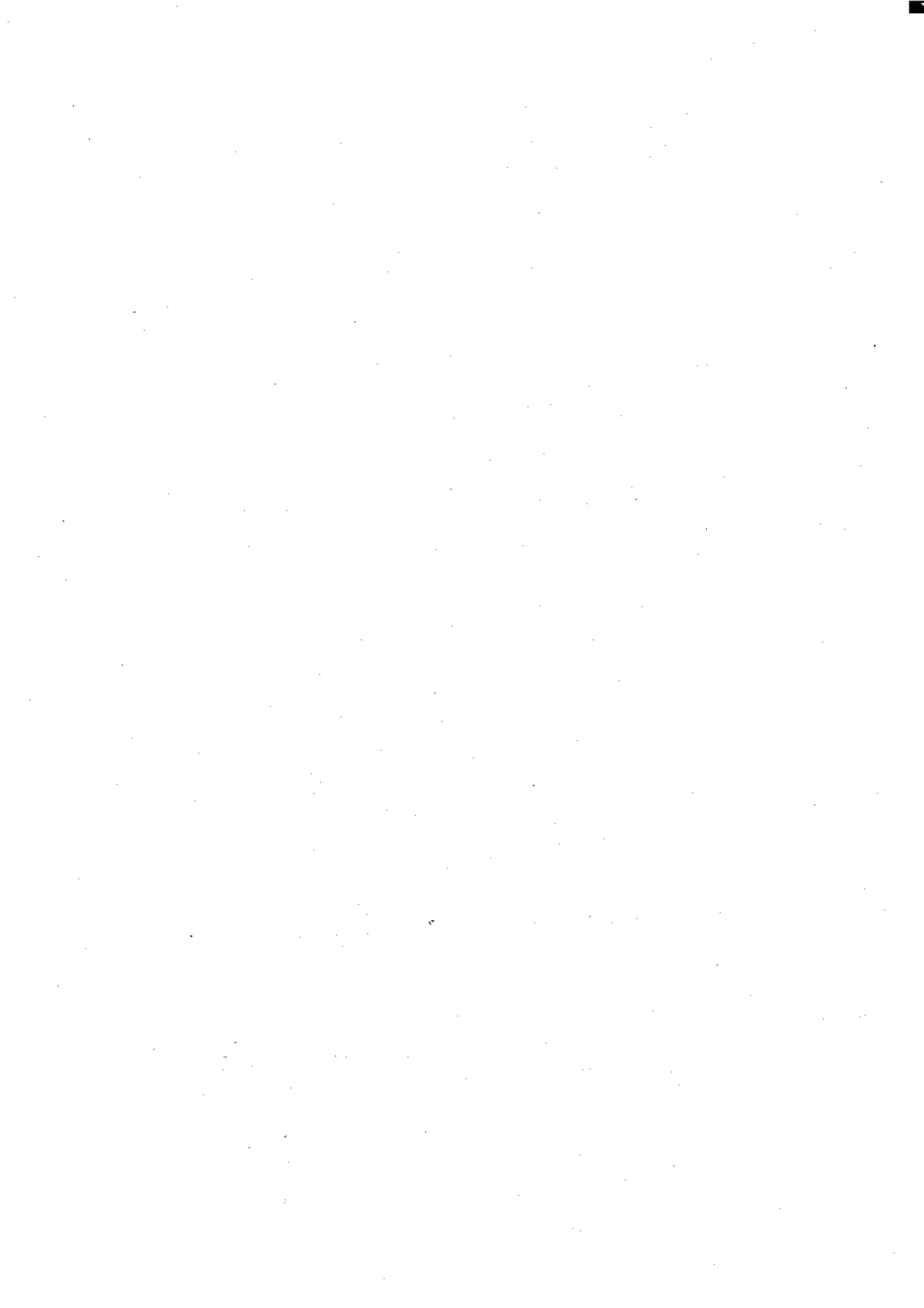
(a) State comparisons at this level of coding should be made with caution. There is no guarantee of consistency in the allocation of outlays to this code between the States and Territories.

(b) WA figure includes \$16.6 million identified through the State budget paper.

Figures for GPC code 0813 show outlays on administration, regulation, support, provision, operation etc of national parks and wildlife services. This includes outlays on aspects of the national estate such as historic houses and sites which are part of national parks and wildlife services.

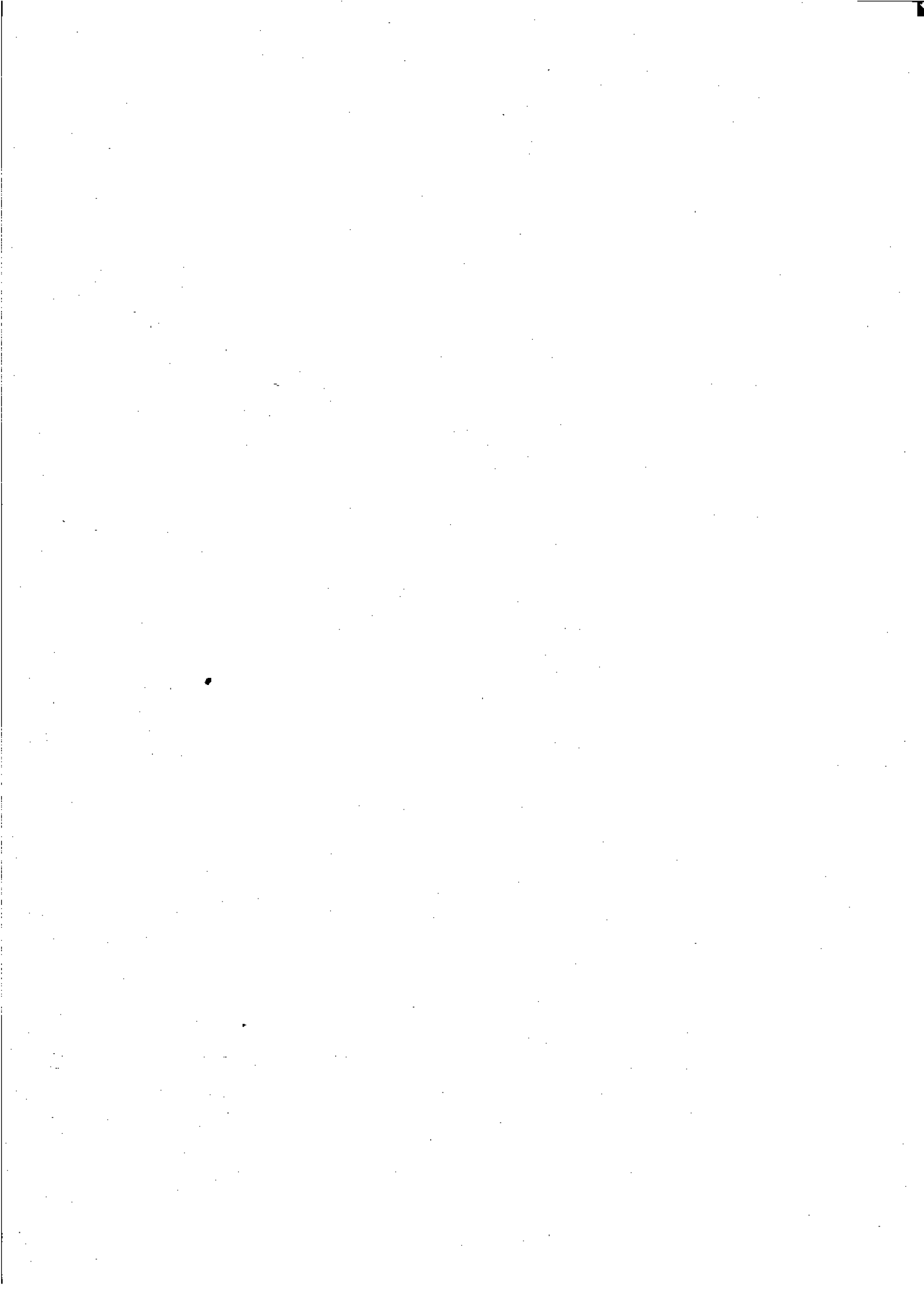
Total outlays for National Parks and Wildlife by all levels of government for 1990-91 was \$360 million.

Per capita outlays show a relatively even distribution across the States with the Northern Territory and Australian Capital Territory displaying particularly high figures. State and Territories comparisons should be made with caution as discussions with various State representatives reveal inconsistencies in coding of outlays at this level. In particular, the high figures for the Australian Capital Territory (where local government does not exist) include outlays relating to the management of open urban space under the 0813 GPC code.



CHAPTER 4

THE MANUFACTURING INDUSTRY AND ENVIRONMENT PROTECTION



THE MANUFACTURING INDUSTRY AND ENVIRONMENT PROTECTION

4.1 Introduction

For the 1990-91 financial year specific manufacturing industry establishments provided data on their capital and current expenditures for pollution abatement and control.

Capital expenditures on pollution abatement and control were defined as: expenditures on abatement control facilities, processes to reduce or eliminate the generation of pollutants by employing material substitution, improved catalysts and equipment alteration and equipment converted to use fuels that generate less pollutants. Current expenditures on pollution abatement and control included payments to contractors to remove and dispose of wastes, levies and fees paid to local government or other agencies for waste water treatment and solid waste disposal, and other operational and maintenance costs incurred by the establishment for the protection of the environment from pollution.

Data collection in the manufacturing industry was restricted to establishments with four or more employees in selected industries identified as being most likely to undertake such capital and current expenditures on abating pollution. This limited approach was taken to ensure that the reporting load on respondents was minimised, whilst still capturing the significant environmental expenditures in the industry.

Some of the tables in this chapter focus on these selected industries where expenditure on pollution abatement and control was relatively high. In addition, data was collected on: number of establishments recycling materials and number of establishments operating special equipment to protect the environment. There were also efforts to collect data on the number of establishments operating under environmental licences, however the question appears not to have been answered in many cases. The data indicated a much lower proportion of establishments operating with environmental licences than other sources (such as State Environment Protection Authorities) indicate may be the case. Consequently these statistics are not presented in the publication.

4.2 Capital and current PAC expenditures

The largest contributor to total PAC expenditures was the basic non-ferrous metals industry (21% of all PAC expenditure). Other significant levels of expenditure on PAC occurred in the petroleum refining, the basic chemicals, and the basic iron and steel industries.

TABLE 4.1 POLLUTION ABATEMENT AND CONTROL EXPENDITURE BY SELECTED MANUFACTURING INDUSTRIES, AUSTRALIA, 1990-91

Asic code	Description	Capital \$000	Per cent of total capital	Current \$000	Per cent of total current	Total \$000	Per cent of total PAC
2631	Pulp, paper and paperboard	14,228	5.5	19,035	7.8	33,263	6.6
275	Basic chemicals	36,213	14.1	30,658	12.6	66,871	13.4
276	Other chemical products	16,362	6.4	20,547	8.4	36,909	7.4
277	Petroleum refining	57,383	22.4	21,194	8.7	78,577	15.7
278	Petroleum and coal products nec	n.p.	n.p.	n.p.	n.p.	1,033	0.2
285	Glass and glass products	1,377	0.5	2,657	1.1	4,034	0.8
286	Clay products and refractories	3,176	1.2	2,316	1.0	5,492	1.1
287	Cement and concrete products	11,493	4.5	19,127	7.9	30,620	6.1
288	Other non-metallic mineral products	3,721	1.4	7,163	2.9	10,884	2.2
294	Basic iron and steel	35,251	13.7	29,401	12.1	64,652	12.9
295	Basic non-ferrous metals	47,191	18.4	56,239	23.1	103,430	20.7
3141	Fabricated structural steel	808	0.3	2,142	0.9	2,950	0.6
3142	Architectural aluminium products	395	0.2	1,885	0.8	2,280	0.5
3151	Metal containers	1,643	0.6	2,887	1.2	4,530	0.9
316	Other fabricated metal products	4,357	1.7	8,909	3.7	13,266	2.7
3452	Leather and leather substitute goods nec	n.p.	n.p.	n.p.	n.p.	166	0.1
346	Rubber products	3,228	1.3	3,598	1.5	6,826	1.4
347	Plastic and related products	19,369	7.5	15,077	6.2	34,446	6.9
Total		256,736	100	243,493	100	500,229	100

TABLE 4.2 CURRENT EXPENDITURE ON PAC BY SELECTED MANUFACTURING INDUSTRIES BY STATE, AUSTRALIA, 1990-91

Asic code	Description	New South Wales		Victoria		Queensland		South Australia		Western Australia		Tasmania		Australia(a)	
		Estab-lish-ments	\$000	Estab-lish-ments	\$000	Estab-lish-ments	\$000	Estab-lish-ments	\$000	Estab-lish-ments	\$000	Estab-lish-ments	\$000	Estab-lish-ments	\$000
2631	Pulp paper and paperboard	12	6,748	13	9,323	7	370	—	—	1	n.p.	3	n.p.	36	19,035
275	Basic chemicals	57	11,207	76	11,134	27	2,385	18	1,667	13	2,734	8	1,531	199	30,658
276	Other chemical products	190	9,152	145	8,930	47	1,581	21	323	37	522	5	39	445	20,547
277	Petroleum refining	2	n.p.	5	11,558	2	n.p.	2	n.p.	1	n.p.	—	—	12	21,194
278	Petroleum and coal products nec	6	n.p.	4	214	1	n.p.	1	n.p.	1	n.p.	—	—	13	n.p.
285	Glass and glass products	21	735	15	568	4	206	3	n.p.	7	1,029	2	n.p.	52	2,657
286	Clay products and refractories	51	1,007	48	770	23	211	10	n.p.	16	285	2	n.p.	151	2,316
287	Cement and concrete products	126	3,638	98	3,833	61	2,218	31	8,295	40	909	9	103	380	19,127
288	Other non-metallic mineral products	51	3,405	45	1,885	20	475	19	572	25	784	5	38	166	7,163
294	Basic iron and steel	103	15,858	89	8,774	56	1,097	27	2,228	25	647	6	780	310	29,401
295	Basic non-ferrous metals	20	8,545	16	5,205	10	9,692	9	3,315	3	n.p.	3	n.p.	61	56,239
3141	Fabricated structural steel	164	783	112	373	96	589	51	154	68	204	16	31	512	2,142
3142	Architectural aluminium products	129	607	74	323	65	324	38	464	32	132	12	22	359	1,885
3151	Metal containers	29	632	22	1,133	10	689	5	43	6	n.p.	1	n.p.	73	2,887
316	Other fabricated metal products	375	2,812	309	3,800	161	858	95	874	92	486	15	69	1,048	8,909
3452	Leather and leather substitute goods nec	15	32	10	65	6	n.p.	2	n.p.	—	—	—	—	33	n.p.
346	Rubber products	57	557	48	1,661	15	76	12	1,227	9	n.p.	1	n.p.	143	3,598
347	Plastic and related products	242	4,948	246	7,059	80	989	60	1,175	44	n.p.	3	n.p.	677	15,077
Total		1,650	77,944	1,375	76,608	691	22,839	404	21,173	420	33,423	91	11,309	4,670	243,493

(a) Australian total includes NT and ACT.

TABLE 4.3 CAPITAL EXPENDITURE ON PAC BY SELECTED MANUFACTURING INDUSTRIES BY STATE, AUSTRALIA, 1990-91

Asic code	Description	New South Wales		Victoria		Queensland		South Australia		Western Australia		Tasmania		Australia(a)	
		Estab-lish-ments	\$000	Estab-lish-ments	\$000	Estab-lish-ments	\$000	Estab-lish-ments	\$000	Estab-lish-ments	\$000	Estab-lish-ments	\$000	Estab-lish-ments	\$000
2631	Pulp paper and paperboard	5	2,741	6	3,030	2	n.p.	—	—	—	—	2	n.p.	15	14,228
275	Basic chemicals	35	16,168	45	11,722	12	2,011	7	359	5	3,109	6	2,844	110	36,213
276	Other chemical products	95	9,057	69	5,424	14	1,033	7	n.p.	15	372	3	n.p.	204	16,362
277	Petroleum refining	3	n.p.	4	4,474	2	n.p.	2	n.p.	1	n.p.	—	—	12	57,383
278	Petroleum and coal products nec	4	n.p.	—	—	—	—	1	n.p.	—	—	—	—	5	n.p.
285	Glass and glass products	5	n.p.	5	745	—	—	—	—	2	n.p.	—	—	12	1,377
286	Clay products and refractories	23	1,371	13	369	7	511	3	n.p.	3	n.p.	—	—	49	3,176
287	Cement and concrete products	56	3,304	32	4,553	25	2,442	8	175	21	892	4	39	155	11,493
288	Other non-metallic mineral products	16	1,749	15	704	7	120	6	n.p.	10	1,078	1	n.p.	55	3,721
294	Basic iron and steel	30	28,223	19	2,627	11	666	8	1,910	9	n.p.	2	n.p.	79	35,251
295	Basic non-ferrous metals	4	2,906	6	2,204	6	15,051	3	n.p.	3	n.p.	3	n.p.	25	47,191
3141	Fabricated structural steel	11	300	21	182	15	132	7	n.p.	11	126	3	n.p.	68	808
3142	Architectural aluminium products	12	212	6	n.p.	6	9	4	10	2	n.p.	2	n.p.	32	395
3151	Metal containers	13	869	8	621	3	n.p.	3	n.p.	1	n.p.	—	—	28	1,643
316	Other fabricated metal products	74	1,108	78	1,999	27	670	26	297	20	n.p.	1	n.p.	226	4,357
3452	Leather and leather substitute goods nec	2	n.p.	1	n.p.	—	—	—	—	—	—	—	—	3	n.p.
346	Rubber products	9	140	10	2,542	5	n.p.	6	467	1	n.p.	—	—	32	3,228
347	Plastic and related products	50	11,864	68	6,686	15	288	12	464	10	67	—	—	155	19,369
Total		447	85,630	406	48,017	157	29,655	103	17,665	114	52,489	27	23,179	1,265	256,736

(a) Australian total includes NT and ACT.

Highest levels of capital expenditure on environment protection occurred in the petroleum refining (\$57m) and the basic non-ferrous metals (\$47m) industries. Highest levels of current expenditure occurred in the basic non-ferrous metals, basic chemicals and the basic iron and steel industries.

Capital expenditures in New South Wales were highest for the basic iron and steel, basic chemicals and the plastic and related products industries. In Victoria, the basic chemicals and the plastic and related products industries also had high levels of capital expenditure. In Queensland, the basic non-ferrous metals industry had the highest level of capital expenditure.

4.3. Current expenditure for waste management and other environment protection

Overall, the manufacturing industry spent half its current PAC expenditure on waste management (49.9%) and half (50.1%) on expenditure on other environment protection. Waste management included payments to contractors to remove and dispose of wastes, and levies and fees paid to local government or other agencies for waste water treatment and solid waste disposal. Other current expenditures on environment protection included labour costs, materials and amounts paid to other business for the protection of the environment.

TABLE 4.4 CURRENT PAC EXPENDITURE FOR WASTE MANAGEMENT AND OTHER ENVIRONMENT PROTECTION BY SELECTED MANUFACTURING INDUSTRIES, AUSTRALIA, 1990-91

Asic code	Description	\$000	Waste Management		Other Environment Protection			Total establishments
			No.	%	\$000	No.	%	
2631	Pulp, paper and paperboard	11,333	36	46.8	7,702	10	13.0	77
275	Basic chemicals	18,632	187	57.4	12,026	118	36.2	326
276	Other chemical products	13,379	426	55.5	7,168	222	28.9	767
277	Petroleum refining	9,167	12	80.0	12,027	10	66.7	15
278	Petroleum and coal products nec	130	12	41.4	n.p.	9	31.0	29
285	Glass and glass products	2,316	49	28.3	341	12	6.9	173
286	Clay products and refractories	1,672	139	38.4	644	66	18.2	362
287	Cement and concrete products	6,557	342	42.1	12,570	219	27.0	812
288	Other non-metallic mineral products	3,877	151	43.3	3,286	74	21.2	349
294	Basic iron and steel	14,665	299	54.1	14,736	106	19.2	553
295	Basic non-ferrous metals	16,921	59	60.8	39,318	30	30.9	97
3141	Fabricated structural steel	1,587	492	39.7	555	109	8.8	1,240
3142	Architectural aluminium products	1,517	350	43.3	368	51	6.3	809
3151	Metal containers	2,247	72	68.6	640	28	26.7	105
316	Other fabricated metal products	6,135	1,019	35.5	2,774	315	11.0	2,868
3452	Leather and leather substitute goods nec	95	32	22.9	n.p.	6	4.3	140
346	Rubber products	1,977	140	54.7	1,621	52	20.3	256
347	Plastic and related products	9,242	657	47.3	5,835	209	15.0	1,389
Total		121,449	4,474	43.2	122,044	1,646	15.9	10,367

Current expenditure on waste management was highest in the basic chemicals, basic non-ferrous metals, and basic iron and steel industries. The highest percentage of establishments with expenditure on waste management was the petroleum refining (80% of establishments), the metal containers (69% of establishments) and the basic non-ferrous metals industries (61% of establishments). Highest levels of current expenditure on other environment protection occurred in the basic non-ferrous metals, the basic iron and steel, cement and other concrete products, petroleum refining and the basic chemicals industries. The highest percentage of establishments incurring such expenditure were in the petroleum refining (67%) and the basic chemicals industries (36%).

4.4. Capital Expenditure for environment protection by techniques

Capital expenditures on pollution abatement and control can be classified on the broad technique used, as either end-of-line or change-in-production (see Chapter 1). The highest levels of change-in-production expenditures to protect air and/or water occurred in the petroleum refining industry and to a lesser extent the basic non-ferrous metals industry. The petroleum refining industry also recorded by far the highest percentage of establishments undertaking capital expenditure to protect air and/or water (67% of establishments).

Total end-of-line expenditures to protect air and/or water were highest in basic chemicals, basic non-ferrous metals, and the basic iron and steel industries. In terms of the proportion of establishments undertaking end-of-line expenditure to protect air and/or water, participation was highest for the petroleum refining industry (60% of establishments), the basic chemicals industry (30% of establishments), the basic non-ferrous metals industry (25% of establishments) and the other chemical products industry (22% of establishments).

TABLE 4.5.1 CHANGE-IN-PRODUCTION CAPITAL EXPENDITURE BY SELECTED MANUFACTURING INDUSTRIES(a), AUSTRALIA, 1990-91

Asic code	Description	CIP to protect air			CIP to protect water			Total CIP to protect air and/or water		
		\$000	Establishments		\$000	Establishments		\$000	Establishments	
			No.	%		No.	%		No.	%
2631	Pulp paper and paperboard	n.p.	6	7.8	n.p.	2	2.6	6,412	8	10.4
275	Basic chemicals	2,841	33	10.1	7,187	32	9.8	10,028	49	15.0
276	Other chemical products	1,518	59	7.7	4,033	38	5.0	5,551	80	10.4
277	Petroleum refining	42,028	8	53.3	5,172	9	60.0	47,200	10	66.7
278	Petroleum and coal products nec	n.p.	1	3.4	n.p.	3	10.3	n.p.	3	10.3
285	Glass and glass products	n.p.	5	2.9	—	—	—	n.p.	5	2.9
286	Clay products and refractories	410	9	2.5	175	5	1.4	585	13	3.6
287	Cement and concrete products	2,129	38	4.7	499	25	3.1	2,628	51	6.3
288	Other non-metallic mineral products	882	14	4.0	87	9	2.6	969	19	5.4
294	Basic iron and steel	6,071	19	3.4	1,254	7	1.3	7,325	23	4.2
295	Basic non-ferrous metals	11,762	13	13.4	11,166	6	6.2	22,928	14	14.4
3141	Fabricated structural steel	209	20	1.6	37	4	0.3	246	22	1.8
3142	Architectural aluminium products	n.p.	5	0.6	n.p.	5	0.6	127	9	1.1
3151	Metal containers	395	9	8.6	125	5	4.8	520	13	12.4
316	Other fabricated metal products	1,046	71	2.5	603	41	1.4	1,649	97	3.4
3452	Leather and leather substitute goods nec	n.p.	1	0.7	—	—	—	n.p.	1	0.7
346	Rubber products	1,491	11	4.3	73	5	2.0	1,564	14	5.5
347	Plastic and related products	10,132	55	4.0	87	16	1.2	10,219	63	4.5
Total		87,290	377	3.6	31,548	212	2.0	118,838	494	4.8

(a) The separate cells in this table are not mutually exclusive i.e. an establishment may have capital expenditure to protect air only, water only or both air and water

TABLE 4.5.2 END-OF-LINE CAPITAL EXPENDITURE BY SELECTED MANUFACTURING INDUSTRIES(a), AUSTRALIA, 1990-91

Asic code	Description	EOL to protect air			EOL to protect water			Total EOL to protect air and/or water		
		\$000	Establishments		\$000	Establishments		\$000	Establishments	
			No.	%		No.	%		No.	%
2631	Pulp paper and paperboard	n.p.	5	6.5	n.p.	6	7.8	7,636	9	11.7
275	Basic chemicals	8,712	85	26.1	12,448	60	18.4	21,160	98	30.1
276	Other chemical products	2,724	124	16.2	6,625	85	11.1	9,349	165	21.5
277	Petroleum refining	2,171	6	40.0	4,965	7	46.7	7,136	9	60.0
278	Petroleum and coal products nec	n.p.	3	10.3	n.p.	3	10.3	n.p.	4	13.8
285	Glass and glass products	n.p.	10	5.8	n.p.	1	0.6	532	10	5.8
286	Clay products and refractories	2,020	32	8.8	526	10	2.8	2,546	38	10.5
287	Cement and concrete products	4,637	117	14.4	2,527	69	8.5	7,164	141	17.4
288	Other non-metallic mineral products	1,261	34	9.7	536	14	4.0	1,797	41	11.7
294	Basic iron and steel	12,023	61	11.0	3,581	24	4.3	15,604	66	11.9
295	Basic non-ferrous metals	9,357	20	20.6	7,331	14	14.4	16,688	24	24.7
3141	Fabricated structural steel	326	39	3.1	77	9	0.7	403	47	3.8
3142	Architectural aluminium products	n.p.	25	3.1	n.p.	2	0.2	250	25	3.1
3151	Metal containers	332	14	13.3	431	10	9.5	763	17	16.2
316	Other fabricated metal products	1,387	131	4.6	647	62	2.2	2,034	164	5.7
3452	Leather and leather substitute goods nec	n.p.	2	1.4	—	—	—	n.p.	2	1.4
346	Rubber products	1,450	25	9.8	57	6	2.3	1,507	26	10.2
347	Plastic and related products	4,964	105	7.6	518	23	1.7	5,482	115	8.3
Total		52,338	838	8.1	48,165	405	3.9	100,503	1,001	9.7

(a) The separate cells in this table are not mutually exclusive i.e. an establishment may have capital expenditure to protect air only, water only or both air and water

TABLE 4.5.3 TOTAL CAPITAL EXPENDITURE BY SELECTED MANUFACTURING INDUSTRIES (a)
AUSTRALIA, 1990-91

Asic code	Description	Total to protect air			Total to protect water			Total protect air and/or water			Total no. estab- lish- ments
		Establishments			Establishments			Establishments			
		\$000	No.	%	\$000	No.	%	\$000	No.	%	
2631	Pulp paper and paperboard	5,733	10	13.0	8,315	6	7.8	14,048	14	18.2	77
275	Basic chemicals	11,553	95	29.1	19,635	70	21.5	31,188	108	33.1	326
276	Other chemical products	4,242	148	19.3	10,658	100	13.0	14,900	190	24.8	767
277	Petroleum refining	44,199	10	66.7	10,137	10	66.7	54,336	12	80.0	15
278	Petroleum and coal products nec	n.p.	3	10.3	n.p.	4	13.8	n.p.	5	17.2	29
285	Glass and glass products	n.p.	12	6.9	n.p.	1	0.6	1,377	12	6.9	173
286	Clay products and refractories	2,430	37	10.2	701	14	3.9	3,131	46	12.7	362
287	Cement and concrete products	6,766	128	15.8	3,026	85	10.5	9,792	151	18.6	812
288	Other non-metallic mineral products	2,143	40	11.5	623	21	6.0	2,766	51	14.6	349
294	Basic iron and steel	18,094	66	11.9	4,835	26	4.7	22,929	71	12.8	553
295	Basic non-ferrous metals	21,119	22	22.7	18,497	16	16.5	39,616	25	25.8	97
3141	Fabricated structural steel	535	51	4.1	114	13	1.0	649	57	4.6	1,240
3142	Architectural aluminium products	223	27	3.3	154	6	0.7	377	28	3.5	809
3151	Metal containers	727	17	16.2	556	14	13.3	1,283	22	21.0	105
316	Other fabricated metal products	2,433	163	5.7	1,250	81	2.8	3,683	200	7.0	2,868
3452	Leather and leather substitute goods nec	n.p.	3	2.1	—	—	—	n.p.	3	2.1	140
346	Rubber products	2,941	27	10.5	130	10	3.9	3,071	31	12.1	256
347	Plastic and related products	15,096	122	8.8	605	35	2.5	15,701	137	9.9	1,389
Total		139,628	981	9.5	79,713	512	4.9	219,341	1,163	11.2	10,367

(a) The separate cells in this table are not mutually exclusive i.e. an establishment may have capital expenditure to protect air only, water only or both air and water

4.5. Capital expenditure on hazardous and non-hazardous wastes

Seventy-six per cent of capital expenditures to abate wastes were for hazardous wastes (\$28.2m). The industry contributing most to total expenditure was the basic iron and steel industry (33% of all waste management expenditures). This industry's main costs were for hazardous waste management, where it accounted for 40 per cent of all hazardous waste costs.

TABLE 4.6 PAC CAPITAL EXPENDITURES TO ABATE OR CONTROL HAZARDOUS AND NON-HAZARDOUS WASTES BY SELECTED MANUFACTURING INDUSTRIES, AUSTRALIA, 1990-91

Asic code	Description	Hazardous waste management			Non-hazardous waste management			Total waste management			Total no. establishments
		Establishments			Establishments			Establishments			
		\$000	No.	%	\$000	No.	%	\$000	No.	%	
2631	Pulp paper and paperboard	n.p.	3	3.9	n.p.	3	3.9	180	4	5.2	77
275	Basic chemicals	3,937	23	7.1	1,088	20	6.1	5,025	34	10.4	326
276	Other chemical products	980	35	4.6	482	33	4.3	1,462	58	7.6	767
277	Petroleum refining	n.p.	3	20.0	n.p.	3	20.0	2,868	5	33.3	15
278	Petroleum and coal products nec	n.p.	2	6.9	n.p.	1	3.4	n.p.	3	10.3	29
285	Glass and glass products	—	—	—	—	—	—	—	—	—	173
286	Clay products and refractories	n.p.	2	0.6	n.p.	5	1.4	45	6	1.7	362
287	Cement and concrete products	n.p.	5	0.6	n.p.	23	2.8	n.p.	28	3.4	812
288	Other non-metallic mineral products	n.p.	2	0.6	n.p.	13	3.7	955	14	4.0	349
294	Basic iron and steel	11,277	8	1.4	1,045	16	2.9	12,322	22	4.0	553
295	Basic non-ferrous metals	6,064	7	7.2	1,511	8	8.2	7,575	11	11.3	97
3141	Fabricated structural steel	42	7	0.6	117	10	0.8	159	17	1.4	1,240
3142	Architectural aluminium products	n.p.	2	0.2	n.p.	4	0.5	18	6	0.7	809
3151	Metal containers	316	9	8.6	44	6	5.7	360	13	12.4	105
316	Other fabricated metal products	477	27	0.9	197	39	1.4	674	60	2.1	2,868
3452	Leather and leather substitute goods nec	—	—	—	—	—	—	—	—	—	140
346	Rubber products	n.p.	5	2.0	n.p.	3	1.2	157	6	2.3	256
347	Plastic and related products	2,130	16	1.2	1,538	32	2.3	3,668	41	3.0	1,389
Total		28,168	156	1.5	9,048	219	2.1	37,216	328	3.2	10,367

4.6. Other indicators

4.6.1 Recycling

Establishments were asked to indicate whether they recycled any materials, including processing of previously used materials or collection of materials for recycling. Highest levels of recycling occurred in the basic metal products; the paper, paper products, printing and publishing; and the chemical petroleum and coal products sub-divisions. At a State level, these industries were the significant recyclers in New South Wales, Western Australia and Victoria.

4.6.2 Special equipment to protect the environment

Establishments were asked to indicate whether they were operating any special equipment to protect the environment. The proportion of establishments with environment protection equipment was highest in the basic metal products (69% of establishments), the chemical, petroleum and coal products (68% of establishments) and the transport equipment industries (60% of establishments). With the exception of the clothing, footwear and textiles industries, all other industries reported at least half their establishments to be operating special equipment to protect the environment. This situation applied in New South Wales, Victoria, Queensland and Western Australia. In South Australia, a high percentage of the wood, wood products and furniture industry reported using special equipment (65% of establishments). Tasmania reported a similar pattern of establishments in these industries operating special equipment to protect the environment; however it was noticeable in this State that much higher percentages of establishments in most industries reported operating such equipment.

TABLE 4.7 MANUFACTURING ESTABLISHMENTS: SUMMARY OF ENVIRONMENTAL INDICATORS, AUSTRALIA, 1990-91

Asic code	Description	Recycling establishments		Not recycling establishments		Special equipment establishments		No special equipment establishments	
		No.	%(a)	No.	%(a)	No.	%(a)	No.	%(a)
21	Food beverages and tobacco	910	22.8	2,623	65.7	2,014	50.4	1,511	37.8
211	Meat products	115	19.0	405	66.8	376	62.0	144	23.8
212	Milk products	96	47.3	95	46.8	153	75.4	39	19.2
213	Fruit and vegetable products	65	33.2	116	59.2	136	69.4	46	23.5
214	Margarine and oils and fats nec	16	47.1	17	50.0	29	85.3	4	11.8
215	Flour mill and cereal food products	40	27.4	96	65.8	84	57.5	52	35.6
216	Bread cakes and biscuits	220	13.0	1,230	72.9	581	34.4	864	51.2
217	Other food products	182	24.6	494	66.8	412	55.8	259	35.0
218	Beverages and malt	174	46.0	167	44.2	238	63.0	103	27.2
219	Tobacco products	2	40.0	3	60.0	5	100.0	—	—
23	Textiles	256	26.5	606	62.8	444	46.0	413	42.6
234	Textiles fibres yarns and woven fabrics	106	36.4	154	52.9	175	60.1	85	29.2
235	Other textile products	150	22.3	452	67.1	269	39.9	328	48.7
24	Clothing and footwear	305	11.8	1,823	70.6	700	27.1	1,419	55.0
244	Knitting mills	45	16.9	178	66.7	79	29.6	141	52.8
245	Clothing	221	10.5	1,510	71.5	524	24.8	1,201	56.9
246	Footwear	39	19.2	135	66.5	97	47.8	77	37.9
25	Wood, wood products and furniture	1,181	17.5	4,814	71.2	3,727	55.1	2,251	33.3
253	Wood and wood products	622	17.9	2,494	71.7	1,973	56.7	1,133	32.6
254	Furniture and mattresses	559	17.0	2,320	70.6	1,754	53.4	1,118	34.0
26	Paper, paper products, printing and publishing	2,065	43.8	2,367	50.2	2,463	52.3	1,964	41.7
263	Paper and paper products..	174	60.2	89	30.8	192	66.4	71	24.6
264	Printing and allied industries	1,891	42.7	2,278	51.5	2,271	51.3	1,893	42.8
27	Chemical, petroleum and coal products	458	40.3	586	51.5	771	67.8	269	23.7
275	Basic chemicals	126	38.7	174	53.4	228	69.9	71	21.8
276	Other chemical products	312	40.7	393	51.2	517	67.4	186	24.3
277	Petroleum refining	12	80.0	2	13.3	12	80.0	1	6.7
278	Petroleum and coal products	8	27.6	17	58.6	14	48.3	11	37.9
28	Non-metallic mineral products	502	29.6	1079	63.6	947	55.8	631	37.2
285	Glass and glass products	78	45.1	82	47.4	92	53.2	68	39.3
286	Clay products and refractories	158	43.6	184	50.8	208	57.5	134	37.0
287	Cement and concrete products	185	22.8	568	70.0	452	55.7	299	36.8
288	Other non-metallic mineral products	81	23.2	245	70.2	195	55.9	130	37.2
29	Basic metal products	378	46.1	382	46.6	565	68.9	195	23.8
294	Basic iron and steel	237	42.9	278	50.3	375	67.8	140	25.3
295	Basic non-ferrous metals	52	53.6	34	35.1	70	72.2	16	16.5
296	Non-ferrous metal basic products	89	52.4	70	41.2	120	70.6	39	22.9
31	Fabricated metal products	1,808	27.2	4,240	63.7	3,727	56.0	2,317	34.8
314	Structural metal products	669	27.2	1,561	63.5	1,340	54.5	887	36.1
315	Sheet metal products	374	28.2	848	63.9	814	61.3	407	30.7
316	Other fabricated metal products	765	26.7	1,831	63.8	1,573	54.8	1,023	35.7
32	Transport equipment	657	32.4	1,189	58.6	1,219	60.1	624	30.8
323	Motor vehicles and parts	458	35.6	721	56.1	827	64.3	350	27.2
324	Other transport equipment	199	26.8	468	63.1	392	52.8	274	36.9
33	Other machinery and equipment	1,688	29.4	3,482	60.5	3,073	53.4	2,089	36.3
334	Photographic, professional and scientific equipment	322	35.8	432	48.0	465	51.7	288	32.0
335	Appliances and electrical equipment	521	29.0	1,120	62.4	876	48.8	762	42.5
336	Industrial machinery and equipment	845	27.6	1,930	63.1	1,732	56.7	1,039	34.0
34	Miscellaneous manufacturing	1,266	33.6	2,159	57.3	1,935	51.3	1,478	39.2
345	Leather and leather products	52	22.5	155	67.1	107	46.3	100	43.3
346	Rubber products	86	33.6	141	55.1	152	59.4	71	27.7
347	Plastic and related products	608	43.8	667	48.0	889	64.0	383	27.6
348	Other manufacturing	520	27.4	1,196	63.1	787	41.5	924	48.8
Total		11,474	28.1	25,350	62.0	21,585	52.8	15,161	37.1

(a) The sum of the percentages does not equal 100% as not all respondents answered each question.

TABLE 4.8 MANUFACTURING ESTABLISHMENTS: RECYCLING BY INDUSTRY SUBDIVISION AND STATE, 1990-91

Asic code	Description	New South Wales				Victoria				Queensland			
		Recycling establish- ments		Not recycling establish- ments		Recycling establish- ments		Not recycling establish- ments		Recycling establish- ments		Not recycling establish- ments	
		no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)
21	Food, beverages and tobacco	236	22.0	693	64.0	260	22.0	776	67.0	181	23.0	488	63.0
23	Textiles	88	31.0	165	58.0	102	26.0	251	64.0	16	13.0	93	76.0
24	Clothing and footwear	94	10.0	658	72.0	139	12.0	808	70.0	33	12.0	201	74.0
25	Wood, wood products and furniture	379	18.0	1,444	70.0	311	16.0	1,378	71.0	222	18.0	913	73.0
26	Paper, paper products, printing and publishing	839	45.0	909	49.0	610	42.0	748	51.0	245	41.0	311	52.0
27	Chemical, petroleum and coal products	186	42.0	223	50.0	145	39.0	201	54.0	52	37.0	77	54.0
28	Non-metallic mineral products	162	30.0	337	62.0	166	36.0	272	59.0	68	24.0	195	68.0
29	Basic metal products	136	48.0	129	46.0	115	42.0	133	49.0	49	40.0	62	51.0
31	Fabricated metal products	652	26.0	1542	63.0	456	25.0	1,209	66.0	312	30.0	653	62.0
32	Transport equipment	192	33.0	334	57.0	207	36.0	329	57.0	119	30.0	241	60.0
33	Other machinery and equipment	654	31.0	1252	59.0	497	27.0	1,146	63.0	182	28.0	406	61.0
34	Miscellaneous manufacturing	425	32.0	763	57.0	455	38.0	653	55.0	168	29.0	357	61.0
Total		4,043	29.0	8,449	60.0	3,463	27.0	7,904	63.0	1,647	26.0	3,997	64.0
Asic code	Description	South Australia				Western Australia				Tasmania			
		Recycling establish- ments		Not recycling establish- ments		Recycling establish- ments		Not recycling establish- ments		Recycling establish- ments		Not recycling establish- ments	
		no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)
21	Food, beverages and tobacco	100	24.0	278	67.0	82	21.0	269	70.0	38	28.0	93	67.0
23	Textiles	18	26.0	43	61.0	24	32.0	41	55.0	8	42.0	9	47.0
24	Clothing and footwear	21	16.0	83	62.0	14	15.0	63	67.0	4	36.0	6	55.0
25	Wood, wood products and furniture	98	18.0	389	72.0	97	14.0	489	73.0	56	25.0	151	66.0
26	Paper, paper products printing and publishing	128	43.0	159	53.0	172	49.0	162	46.0	33	46.0	35	49.0
27	Chemical, petroleum and coal products	34	47.0	32	44.0	35	41.0	42	49.0	6	38.0	10	63.0
28	Non-metallic mineral products	43	29.0	95	64.0	42	23.0	131	73.0	16	40.0	23	58.0
29	Basic metal products	38	61.0	21	34.0	24	41.0	30	51.0	12	71.0	4	24.0
31	Fabricated metal products	159	31.0	327	63.0	173	29.0	380	64.0	36	27.0	85	65.0
32	Transport equipment	52	30.0	104	59.0	70	31.0	147	64.0	8	23.0	25	71.0
33	Other machinery and equipment	147	31.0	279	59.0	167	31.0	315	58.0	27	29.0	56	60.0
34	Miscellaneous manufacturing	97	33.0	183	62.0	93	35.0	150	56.0	16	30.0	33	61.0
Total		935	29.0	1993	62.0	993	28.0	2219	63.0	260	30.0	530	62.0
Asic code	Description	Northern Territory				Australian Capital Territory							
		Recycling establish- ments		Not recycling establish- ments		Recycling establish- ments		Not recycling establish- ments					
		no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)				
21	Food, beverages and tobacco	5	25.0	14	70.0	8	33.0	12	50.0				
23	Textiles	—	—	3	75.0	—	—	1	100.0				
24	Clothing and footwear	—	—	1	100.0	—	—	3	100.0				
25	Wood, wood products and furniture	8	27.0	19	63.0	10	22.0	31	67.0				
26	Paper, paper products printing and publishing	10	42.0	14	58.0	28	47.0	29	48.0				
27	Chemical, petroleum and coal products	—	—	1	100.0	—	—	—	—				
28	Non-metallic mineral products	3	17.0	12	67.0	2	12.0	14	82.0				
29	Basic metal products	3	60.0	2	40.0	1	50.0	1	50.0				
31	Fabricated metal products	10	21.0	35	74.0	10	50.0	9	45.0				
32	Transport equipment	4	33.0	7	58.0	5	56.0	2	22.0				
33	Other machinery and equipment	7	41.0	10	59.0	7	25.0	18	64.0				
34	Miscellaneous manufacturing	7	37.0	12	63.0	5	33.0	8	53.0				
Total		57	29.0	130	66.0	76	34.0	128	57.0				

(a) The sum of percentages does not equal 100% due to non-response category

TABLE 4.9 MANUFACTURING ESTABLISHMENTS: SPECIAL EQUIPMENT TO ABATE POLLUTION BY INDUSTRY SUBDIVISION AND STATE, 1990-91

Asic code Description	New South Wales				Victoria				Queensland			
	Special equipment establish- ments		No special equipment establish- ments		Special equipment establish- ments		No special equipment establish- ments		Special equipment establish- ments		No special equipment establish- ments	
	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)
21 Food, beverages and tobacco	536	50.0	392	36.0	571	49.0	464	40.0	376	49.0	291	38.0
23 Textiles	136	48.0	115	40.0	187	48.0	165	42.0	47	39.0	62	51.0
24 Clothing and footwear	235	26.0	513	56.0	303	26.0	641	55.0	80	30.0	154	57.0
25 Wood, wood products and furniture	1,114	54.0	704	34.0	1,045	54.0	639	33.0	702	56.0	428	34.0
26 Paper, paper products, printing and publishing	950	51.0	793	43.0	759	52.0	597	41.0	331	56.0	227	38.0
27 Chemical, petroleum and coal products	307	69.0	100	22.0	254	68.0	92	25.0	93	65.0	35	25.0
28 Non-metallic mineral products	321	59.0	176	32.0	260	56.0	177	38.0	140	49.0	124	43.0
29 Basic metal products	196	69.0	69	24.0	173	64.0	75	28.0	86	71.0	25	21.0
31 Fabricated metal products	1,337	54.0	852	35.0	1,016	56.0	650	36.0	601	57.0	362	34.0
32 Transport equipment	351	60.0	173	30.0	370	64.0	165	28.0	231	57.0	129	32.0
33 Other machinery and equipment	1,143	54.0	757	36.0	944	52.0	697	38.0	339	51.0	249	38.0
34 Miscellaneous manufacturing	674	50.0	513	38.0	641	54.0	465	39.0	276	47.0	243	42.0
Total	7,300	52.0	5,157	37.0	6,523	52.0	4,827	36.0	3,302	53.0	2,329	37.0
Asic code Description	South Australia				Western Australia				Tasmania			
	Special equipment establish- ments		No special equipment establish- ments		Special equipment establish- ments		No special equipment establish- ments		Special equipment establish- ments		No special equipment establish- ments	
	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)
21 Food, beverages and tobacco	220	53.0	155	37.0	206	54.0	144	38.0	86	62.0	45	33.0
23 Textiles	30	43.0	30	43.0	33	45.0	31	42.0	11	58.0	6	32.0
24 Clothing and footwear	49	37.0	54	40.0	26	28.0	50	53.0	6	55.0	4	36.0
25 Wood, wood products and furniture	352	65.0	133	25.0	352	52.0	235	35.0	125	55.0	80	35.0
26 Paper, paper products, printing and publishing	172	58.0	116	39.0	164	47.0	170	49.0	46	65.0	21	30.0
27 Chemical, petroleum and coal products	43	59.0	23	32.0	58	67.0	18	21.0	15	94.0	1	6.0
28 Non-metallic mineral products	81	54.0	57	38.0	101	56.0	71	39.0	24	60.0	15	38.0
29 Basic metal products	48	77.0	11	18.0	45	76.0	9	15.0	13	76.0	3	18.0
31 Fabricated metal products	332	64.0	153	29.0	337	57.0	219	37.0	69	53.0	52	40.0
32 Transport equipment	100	57.0	56	32.0	138	60.0	79	34.0	17	49.0	16	46.0
33 Other machinery and equipment	284	61.0	141	30.0	286	53.0	196	36.0	54	57.0	30	32.0
34 Miscellaneous manufacturing	159	54.0	119	40.0	144	54.0	99	37.0	28	52.0	21	39.0
Total	1,870	58.0	1,048	33.0	1,890	54.0	1,321	37.0	494	58.0	294	34.0
Asic code Description	Northern Territory				Australian Capital Territory							
	Special equipment establish- ments		No special equipment establish- ments		Special equipment establish- ments		No special equipment establish- ments					
	no.	%(a)	no.	%(a)	no.	%(a)	no.	%(a)				
21 Food, beverages and tobacco	9	45.0	10	50.0	10	42.0	10	42.0				
23 Textiles	—	—	3	75.0	—	—	1	100.0				
24 Clothing and footwear	—	—	1	100.0	1	33.0	2	67.0				
25 Wood, wood products and furniture	12	40.0	15	50.0	25	54.0	17	37.0				
26 Paper, paper products, printing and publishing	10	42.0	14	58.0	31	52.0	26	43.0				
27 Chemical, petroleum and coal products	1	100.0	—	—	—	—	—	—				
28 Non-metallic mineral products	7	39.0	8	44.0	13	76.0	3	18.0				
29 Basic metal products	3	60.0	2	40.0	1	50.0	1	50.0				
31 Fabricated metal products	20	43.0	25	53.0	15	75.0	4	20.0				
32 Transport equipment	7	58.0	4	33.0	5	56.0	2	22.0				
33 Other machinery and equipment	11	65.0	6	35.0	12	43.0	13	46.0				
34 Miscellaneous manufacturing	10	53.0	9	47.0	3	20.0	9	60.0				
Total	90	45.0	97	49.0	116	52.0	88	39.0				

(a) The sum of percentages does not equal 100% due to non-response category

4.7 Resource and energy intensities of manufacturing industries

The preceding sections of this chapter have examined the expenses incurred by the manufacturing industry to reduce levels of pollution, or, more generally, to contribute to improved environment protection. This analysis attempts to show the contribution to the economy by manufacturing industries within the context of their resource and energy use.

The following analysis firstly groups manufacturing industry subdivisions into categories (low, medium or high) based on energy intensity and resource intensity calculations. Next certain data for these groups, namely employment, GDP and exports were computed for each group. In addition, imports from manufacturing industries overseas were also classified by the same method. This approach gives some insight into the contribution of manufacturing industries, as employers, providers of export revenue and as competitors to imports for domestic demand, in terms of a classification which indicates some demand on environmental resources.

4.7.1 Energy intensity for selected industries.

Energy intensity data has been derived from the Australian Bureau of Agricultural and Resource Economics (ABARE) publication *Energy Demand and Supply Projections*. Energy intensity figures measure the total energy consumed (petajoules) to output produced (GDP).

For the purposes of this analysis, the ABS has devised high, medium and low groupings of manufacturing industries on the basis of their energy intensities. The groupings in Table 4.10 have been achieved through exploratory data analysis, and by minimising the variance within any one grouping whilst maximising the variance between the groups. This process results in the following categorisations.

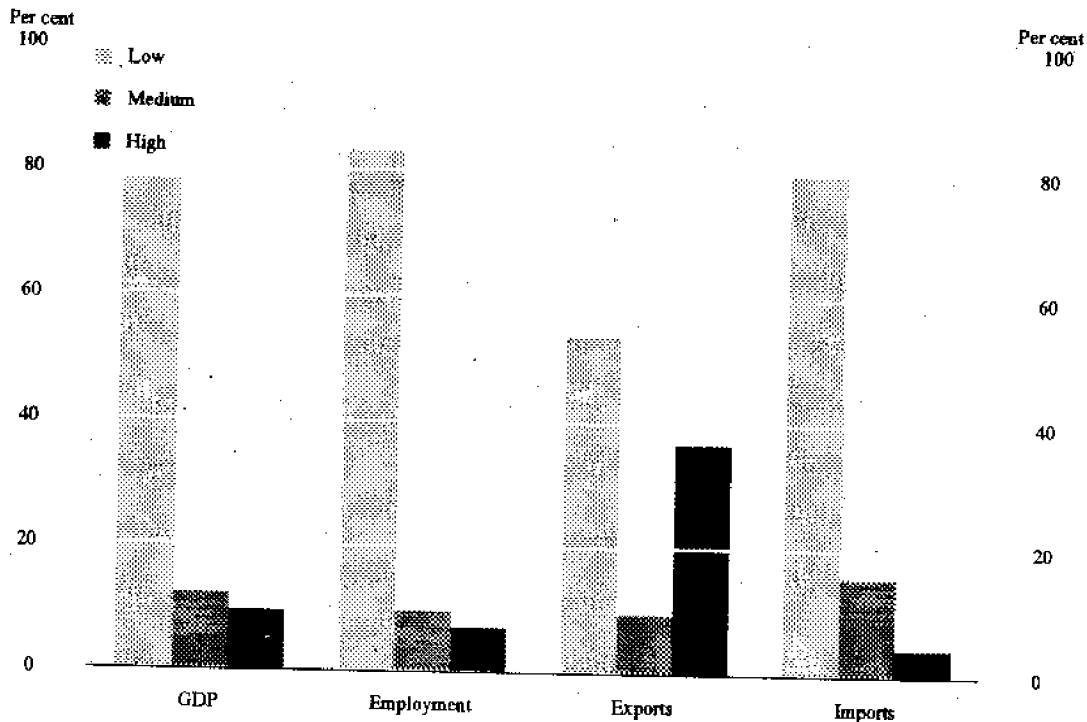
TABLE 4.10 ENERGY INTENSITY

Industry description	1990/91 Pj per \$bill GDP	Group
Basic metal products	119.7	high
Chemical, petroleum and coal products	70.8	medium
Non-metallic mineral products	48.5	medium
Food beverages and tobacco	14.9	low
Paper paper products printing and publishing	9.5	low
Wood, wood products & furniture	6.2	low
Textiles clothing and footwear	4.9	low
Transport equipment	3.8	low
Miscellaneous manufacturing	3.5	low
Fabricated metal products	2.8	low
Other machinery and equipment	1.6	low

(Source: ABARE)

Figure 4.1 illustrates that low energy intensity industries are the major contributors to manufacturing GDP and employment. Over three quarters of manufactured imports were derived from manufacturing industry groups that would be classified to the low energy intensity category and therefore would be viewed as competing with low energy intensity manufacturers in Australia.

FIGURE 4.1 MANUFACTURING INDUSTRY: CONTRIBUTION TO GDP, EMPLOYMENT AND EXPORTS, AND IMPORT COMPETITION, BY ENERGY INTENSITY GROUPINGS, AUSTRALIA, 1990-91



NOTE: This figure represents contributions to the manufacturing component of GDP, employment and exports. The imports section of the graph represents imports from overseas manufacturers competing with Australian produced goods in the intensity sectors indicated.

The medium energy intensity industries (chemical, petroleum and coal products, and non-metallic mineral products) account for a further 12 per cent of the contribution to manufacturing's GDP, 9 per cent of manufacturing's employment and 9 per cent of manufacturing's exports. Overseas industries in these categories (hence competing with these medium intensity industries in Australia) accounted for 16 per cent of all manufactured imports.

The most notable contribution of the high energy intensity industry of basic metal products was as an exporter. Australia's comparative advantage of relatively cheap energy enables this industry to contribute over a third (36%) of manufacturing industry exports. Imports from manufacturers competing with this industry in the Australian market represented only 4 per cent of all imports from overseas manufacturers.

4.7.2 Non-energy resource intensity for selected industries

Adapting the energy intensity methodology, resource intensity has been determined by identifying the dollar value of resources used by a particular industry, and calculating an index based on that value as a proportion of the industry's contribution to GDP. In principle, this method assumes a competitive market in which the cost of all resources (renewable and non-renewable) can be determined, and reflects their value to society.

In practice however the resource intensity index was derived from data from the ABS 1989-90 manufacturing census, which identified the cost of materials used to produce the value added by each manufacturing industry, including those materials produced as intermediate products of the production process. Materials used excluded electricity and fuels used in the production of that output, and hence excludes energy resources (covered above). The 1990-91 Census did not collect data at the level of detail required to identify materials used by each industry, hence the 1989-90 data has been used as the nearest available.

The ranking and division of each industry was determined through exploratory analysis of the data, and application of the principle of minimising the variation within each grouping, whilst maximising the variation between the indexed groups. This process resulted in the following groupings on the basis of resource intensities.

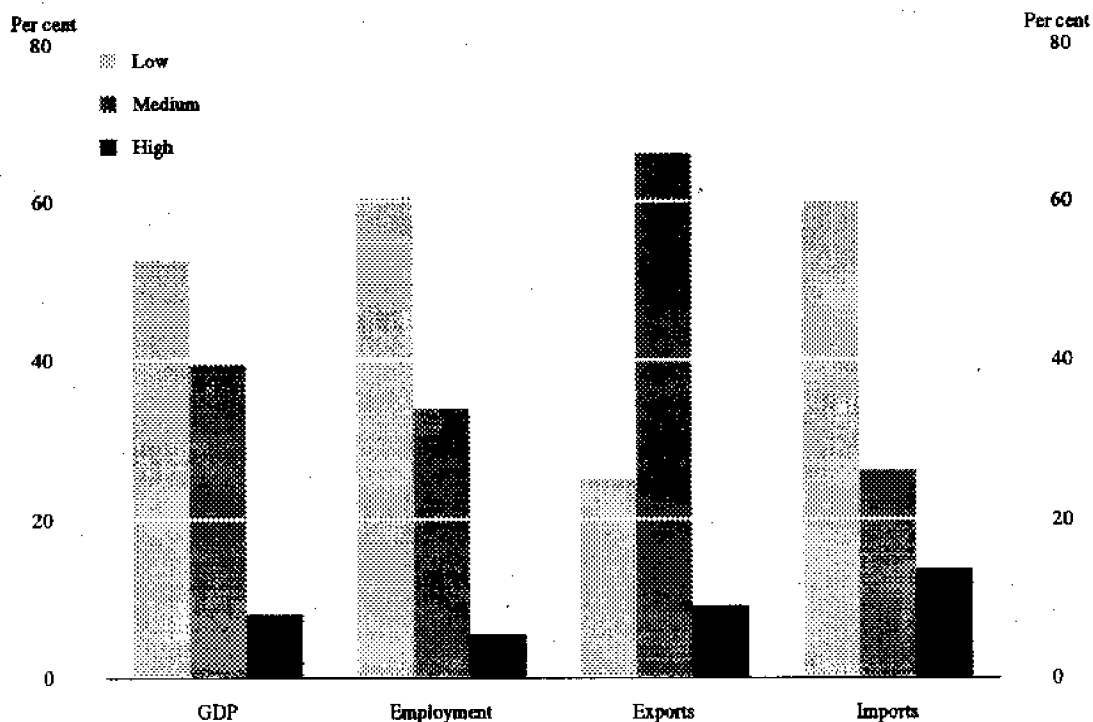
TABLE 4.11 RESOURCE INTENSITY

Industry description	Value of materials used (\$'000)	Contribute to GDP (\$m)	Index	Group
Chemical, petroleum coal products	11,125	3,200	3.5	high
Basic metal products	10,338	4,027	2.6	medium
Transport equipment	8,383	3,412	2.5	medium
Food beverages and tobacco	17,639	8,526	2.1	medium
Textiles clothing and footwear	3,627	2,201	1.6	low
Other machinery and equipment	7,013	4,620	1.5	low
Miscellaneous manufacturing	3,520	2,321	1.5	low
Fabricated metal products	5,562	4,015	1.4	low
Non-metallic mineral products	2,635	2,044	1.3	low
Wood, wood products and furniture	3,305	2,612	1.3	low
Paper paper products printing and publishing	4,586	4,903	0.9	low

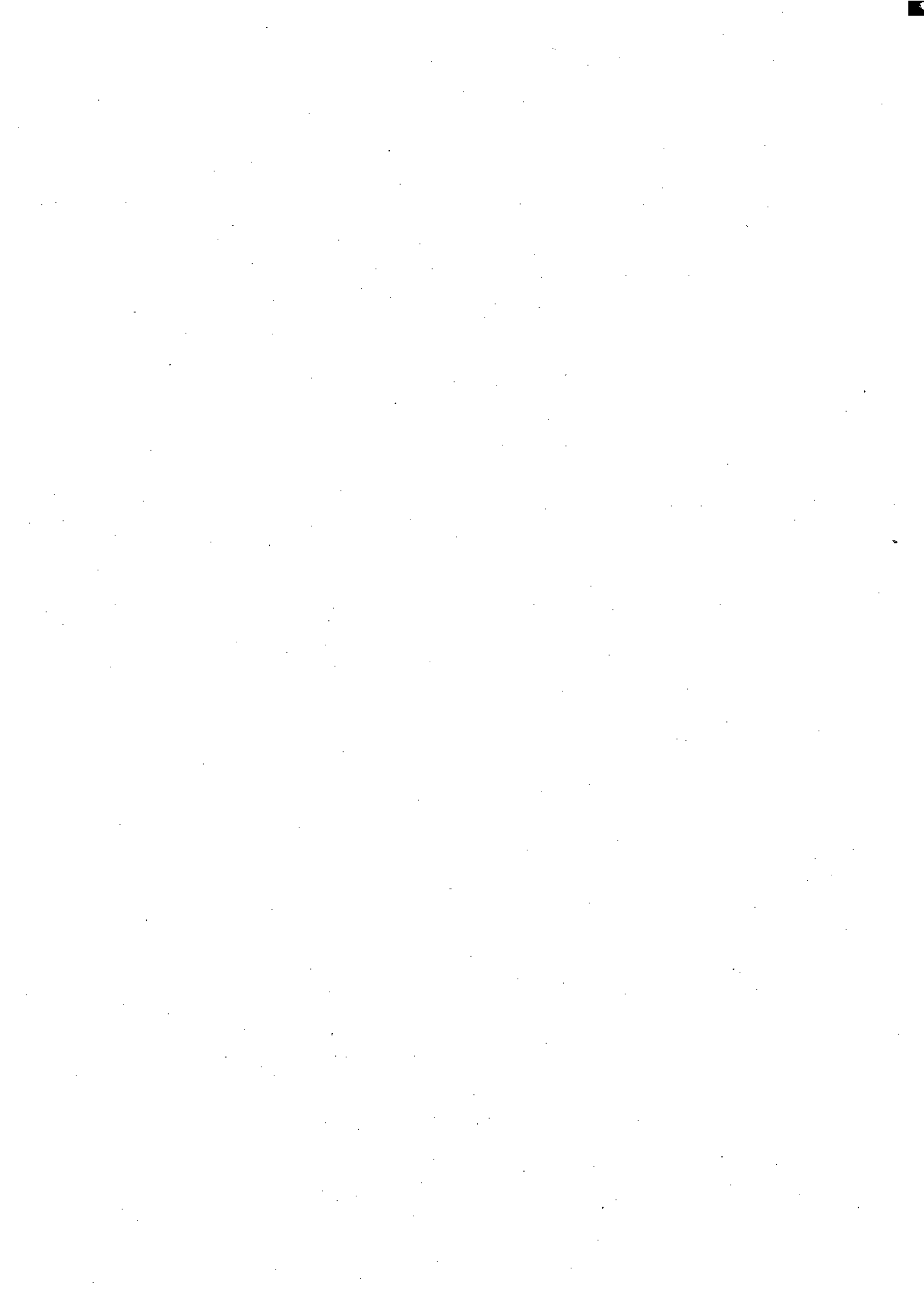
Using this classification, Figure 4.2 illustrates that low resource intensity industries account for over 50 per cent of manufacturing's contribution to GDP and employment, while accounting for less than one-third of manufacturing's exports. Conversely, imports from industries competing with low-resource intensity industries in Australia account for almost 60 per cent of manufacturing imports, indicating the competitiveness of these imports with the Australian low resource intensity industries.

The high resource intensity industries contributed least to manufacturing's proportion of GDP, employment and exports. Imports of goods competing with the products of Australia's high resource intensity industries represented the smallest proportion of manufactured imports into Australia.

FIGURE 4.2 MANUFACTURING INDUSTRY: CONTRIBUTION TO GDP, EMPLOYMENT AND EXPORTS, AND IMPORT COMPETITION, BY RESOURCE INTENSITY GROUPINGS, AUSTRALIA, 1990-91



Note: This figure represents contributions to the manufacturing component of GDP, employment and exports. The imports section of the graph represents imports from overseas manufacturers competing with Australian produced goods in the intensity sectors indicated.



CHAPTER 5

THE MINING INDUSTRY AND ENVIRONMENT PROTECTION



THE MINING INDUSTRY AND ENVIRONMENT PROTECTION

5.1 Introduction

Establishments in the mining industry were asked to provide data on their capital and current expenditure for abating or reducing pollution, and for a number of other items referred to below.

Capital expenditure on environment protection in the mining industry was defined as expenditure for new plant, machinery and equipment designed to abate and control pollution. This included expenditures on any element of the production process specifically attributable to protecting the environment through the reduction or elimination of pollutants and waste emitted by the establishment's operations.

Current expenditure on environment protection in the mining industry was defined as operating and maintenance costs for pollution abatement and control. This included expenditure to operate and maintain plant and equipment that abates pollution, payments to contractors to remove and dispose of waste arising from production processes, expenditure to prevent wind and water erosion, on-going mine site rehabilitation and regular sampling tests.

In addition to the PAC data, additional data were collected on:

- number of establishments recycling materials;
- number of establishments holding environmental licences;
- number of establishments operating special equipment to protect the environment;
- research and development expenditure for the prevention or reduction of pollution;
- planned measures and expenditure by establishments to 1994-95 for the protection of the environment; and
- Federal and/or State Acts under which mining establishments operate.

5.2 Pollution abatement and control expenditure

Total PAC expenditure (capital and current) in the mining industry was \$262.1 million. Capital expenditure in 1990-91 was \$170.2 million and current expenditure was \$91.8 million. Highest PAC expenditure was recorded in the non-ferrous metals (\$125.2 million) and the coal industries (\$120.4 million). There were higher levels of expenditure in capital, rather than current categories. Seventy-five per cent of PAC expenditure in the oil and gas sector were of a capital nature. The ferrous and non-ferrous metals industry expended 72 per cent of PAC costs on capital items, and capital expenditure in the coal sector was a noticeably lower proportion at 56% of all PAC expenditures.

State analysis indicates that PAC current expenditure was highest in the major mining states of Western Australia (\$34.7 million), New South Wales (\$26.1 million) and Queensland (\$16.0 million). Capital expenditures were highest in Western Australia (\$84.8 million), followed by New South Wales (\$42.2 million) and Queensland (\$30.2 million).

TABLE 5.1 PAC EXPENDITURE BY SELECTED MINING INDUSTRY GROUPS, AUSTRALIA, 1990-91

Asic code	Description	Capital expenditure	Current expenditure	Total expenditure
		\$000	\$000	\$000
111	Ferrous metals	9,597	3,660	13,257
112	Non-ferrous metals	90,451	34,763	125,214
120	Coal	67,823	52,620	120,443
130	Oil and gas	2,366	806	3,172
Total		170,237	91,849	262,086

TABLE 5.2 PAC CURRENT EXPENDITURE BY STATE BY SELECTED MINING INDUSTRY GROUPS, AUSTRALIA, 1990-91

Asic code	Description	New South Wales		Victoria		Queensland		South Australia		Western Australia		Tasmania		Northern Territory		Australia(a)	
		No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000
111	Ferrous metals	—	—	—	—	—	—	—	—	3	n.p.	2	n.p.	—	—	5	3,660
112	Non-ferrous metals	6	1,296	2	n.p.	11	n.p.	1	n.p.	43	15,239	7	1,070	8	2,723	78	34,763
120	Coal	43	24,808	—	—	15	8,500	1	n.p.	2	n.p.	1	n.p.	—	—	62	52,620
130	Oil and gas	—	—	—	—	2	n.p.	1	n.p.	4	734	—	—	—	—	7	806
Total		49	26,104	2	n.p.	28	15,961	3	7,181	52	34,655	10	5,165	8	2,723	152	91,849

(a) The Australian total includes the ACT

TABLE 5.3 PAC CAPITAL EXPENDITURE BY STATE BY SELECTED MINING INDUSTRY GROUPS, AUSTRALIA, 1990-91

Asic code	Description	New South Wales		Victoria		Queensland		South Australia		Western Australia		Tasmania		Northern Territory		Australia(a)	
		No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000	No. of establishments	\$000
111	Ferrous metals	—	—	—	—	—	—	—	—	2	n.p.	1	n.p.	—	—	3	9,597
112	Non-ferrous metals	6	2,060	1	n.p.	11	n.p.	—	—	34	67,391	4	n.p.	7	n.p.	63	90,451
120	Coal	32	40,136	—	—	9	21,740	1	n.p.	1	n.p.	—	—	—	—	43	67,823
130	Oil and gas	—	—	—	—	1	n.p.	—	—	4	2,079	—	—	—	—	5	2,366
Total		38	42,196	1	n.p.	21	30,285	1	n.p.	41	84,787	5	6,094	7	n.p.	114	170,237

(a) The Australian total includes the ACT

5.3 PAC Current expenditure for waste management and other environment protection

Current PAC expenditure for the mining industry in 1990-91 was \$91.8 million. Expenditure on waste management was \$68.9 million (75%), with \$23.0 million being expended on other pollution abatement and control. The highest level of expenditure on waste management was recorded in the coal industry (\$40 million).

TABLE 5.4 PAC CURRENT EXPENDITURE FOR WASTE MANAGEMENT AND OTHER ENVIRONMENT PROTECTION, AUSTRALIA, 1990-91

Asic code	Description	Waste management		Other PAC expenditure		Total \$000
		No. of establishments	\$000	No. of establishments	\$000	
111	Ferrous metals	4	3,454	4	206	3,660
112	Non-ferrous metals	70	25,300	41	9,463	34,763
120	Coal	58	40,028	32	12,592	52,620
130	Oil and gas	4	98	4	708	806
Total		136	68,880	81	22,969	91,849

5.4. PAC capital expenditures

Table 5.5 presents capital expenditure in terms of expenditure on buildings and equipment, and in terms of techniques used, namely end-of-line and change-in-production (see Chapter 1). Of the \$170.2 million of capital expenditure, \$49.4 million (29%) was expended on buildings, and \$120.9 million (71%) was expended on machinery.

TABLE 5.5 PAC CAPITAL EXPENDITURE, CHANGE-IN-PRODUCTION AND END-OF-LINE AUSTRALIA, 1990-91

Technique	Buildings		Machinery		Total \$000	
	No. establishments	\$000	No. establishments	\$000		
Change-in-Production (CIP) (all groups)	15	17,008	26	56,996	74,004	
End-of-Line (all groups)	52	32,362	77	63,871	96,233	
Total capital expenditure (CIP and/or EOL)						
Asic code	Description					
111	Ferrous metals	1	n.p.	3	n.p.	9,597
112	Non-ferrous metals	33	23,969	49	66,482	90,451
120	Coal	24	24,752	32	43,071	67,823
130	Oil and gas	1	n.p.	5	n.p.	2,366
Total		59	49,370	89	120,867	170,237

Other environmental expenses and indicators

5.5 Research and development expenditure for the prevention or reduction of pollution

\$5.3 million was spent in 1990-91 by the mining industry on research and development in relation to the reduction of pollution. Table 5.6 presents the data in terms of intra-mural and extra-mural research. Intra-mural research is that conducted within the establishment, extra-mural research is carried out by other organisations on behalf of the establishment.

TABLE 5.6 RESEARCH AND DEVELOPMENT EXPENDITURE FOR THE PREVENTION OR REDUCTION OF POLLUTION, AUSTRALIA, 1990-91

Asic code	Description	Intra-mural		Extra-mural		Total \$000
		No. of establishments	\$000	No. of establishments	\$000	
111	Ferrous metals	2	n.p.	—	—	n.p.
112	Non-ferrous metals	22	849	26	2,392	3,241
120	Coal	13	n.p.	11	n.p.	1,854
130	Oil and gas	3	n.p.	1	n.p.	n.p.
Total		40	1,922	38	3,358	5,280

5.6 Environmental indicators for the mining industry

5.6.1 Recycling

Establishments were asked to indicate whether they recycled materials in the mining process, including collection, return or processing and re-use of secondary materials in the production of new materials. The highest rates of recycling were recorded in the coal (31% of establishments) and metals industries (30% of establishments). Conversely, very low rates of recycling were recorded in the oil and gas industry (4% of establishments), reflecting the nature of the product being produced.

TABLE 5.7 SUMMARY OF ENVIRONMENTAL INDICATORS BY INDUSTRY SUB-DIVISION, AUSTRALIA, 1990-91

Asic code	Description	Recycling		Environmental licence		Licence cost \$000	Special equipment	
		yes %	no %	yes %	no %		yes %	no %
11	Metallic minerals	30.0	57.0	48.0	36.5	2,937	46.5	39.5
12	Coal	30.5	58.1	56.2	32.4	2,117	64.8	23.8
13	Oil and gas	4.1	65.3	14.3	44.9	162	20.4	44.9
Total						5,216		

TABLE 5.8 ESTABLISHMENTS RECYCLING BY STATE BY INDUSTRY SUB-DIVISION, AUSTRALIA, 1990-91

Asic code	Description	New South Wales		Victoria		Queensland		South Australia		Western Australia		Tasmania		Northern Territory		Australia	
		yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no
11	Metallic minerals	3	8	1	2	8	19	3	4	36	63	4	6	5	12	60	114
12	Coal	25	31	—	1	5	26	1	—	1	1	—	2	—	—	32	61
13	Oil and Gas	—	—	—	1	1	16	—	3	1	10	—	—	—	2	2	32
Total		28	39	1	4	14	61	4	7	38	74	4	8	5	14	94	207

5.6.2 Environmental licences

Establishments were asked to indicate whether they operated any sites which were licensed under Federal or State Acts relating to the environment. The highest percentage of establishments reported operating under environmental licence were in the coal industry (56% of establishments), closely followed by the metals industries (48% of establishments). Total reported costs of these environmental licences in the mining industry was \$5.2 million. Over half of this (56%) was paid by the metallic minerals industry, and 41% was paid by the coal industry.

TABLE 5.9 ESTABLISHMENTS OPERATING UNDER ENVIRONMENTAL LICENCE BY STATE AND INDUSTRY SUB-DIVISION, AUSTRALIA, 1990-91

Asic code	Description	New South Wales		Victoria		Queensland		South Australia		Western Australia		Tasmania		Northern Territory		Australia	
		yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no
11	Metallic minerals	9	2	2	1	11	16	2	5	63	32	6	3	3	14	96	73
12	Coal	47	9	—	1	8	23	—	1	2	—	2	—	—	—	59	34
13	Oil & Gas	—	—	—	1	2	14	1	2	4	4	—	—	—	1	7	22
Total		56	11	2	3	21	53	3	8	69	36	8	3	3	15	162	129

5.6.3 Special equipment used to reduce pollution

Establishments were asked to indicate whether they operated any equipment or used any processes to reduce, eliminate or control pollutants or wastes. The coal industry reported almost two-thirds of establishments using special equipment or processes, almost half of establishments in the metallic minerals industry using special equipment and a lower level of use recorded in the oil and gas industry (20% of establishments).

TABLE 5.10 ESTABLISHMENTS OPERATING POLLUTION ABATEMENT EQUIPMENT BY STATE BY INDUSTRY SUB-DIVISION, AUSTRALIA, 1990-91

Asic code	Description	New South Wales		Victoria		Queensland		South Australia		Western Australia		Tasmania		Northern Territory		Australia	
		yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no
11	Metallic minerals	8	3	2	1	16	11	1	6	49	48	8	2	9	8	93	79
12	Coal	45	11	—	1	19	12	1	—	2	—	1	1	—	—	68	25
13	Oil and Gas	—	—	—	1	3	13	1	2	5	6	—	—	1	—	10	22
Total		53	14	2	3	38	36	3	8	56	54	9	3	10	8	171	126

5.7. Measures planned for the protection of the environment

Establishments were asked to indicate any measures they had planned for the protection of the environment, which would become operational by 1994-95. Fifty-one per cent of establishments planning to implement environment protection measures were in the metallic minerals industry, 43% were in the coal industry, and 6% were in the oil and gas industry.

The specific measures were as follows:

- 33 per cent of establishments were undertaking activities to protect water
- 29 per cent were implementing monitoring or treatment of solid waste
- 13 per cent of establishments were undertaking activities to protect the air
- 8 per cent were implementing monitoring or treatment of liquid waste
- 4 per cent were undertaking monitoring or treatment of noise pollution.

In the metallic minerals industry the emphasis was on treatment of solid wastes (37% of metallic minerals establishments) and treatment of water (29%). In the coal industry the main intended activities were treatment of water (39% of establishments) and treatment of solid wastes (23% of establishments). Major planned initiatives in the oil and gas industry also related to treatment of water, with the other main area being treatment of waste liquids.

TABLE 5.11 PROTECTION OF THE ENVIRONMENT: MEASURES THAT WILL BECOME OPERATIONAL BY 1994-95

Description	Metallic minerals establishments		Coal establishments		Oil and gas establishments		Total establishments		
	no.	%	no.	%	no.	%	no.	%	
Air	Monitoring	Dust monitor	2		1			3	
		SO2 monitor	1					1	
		Pollutant impact monitor							
		Others	3			1		4	
	Treatment	Dust Extractor/suppressor	8		6		1	15	
		Waste gas scrubber	1		1			2	
		High Stack							
		Others	2		1			3	
Total	17	15.3	9	9.6	2	14.3	28	12.8	
Water	Monitoring	Water floor gauges						1	
		Hydrographic monitor	1					1	
		Borehole monitor	1					1	
		Cyanide monitor	1					1	
		Others	2		2			4	
	Treatment	Water Treatment plant	1		4		1	6	
		Filter							
		Tailing dam or pond	14		9		1	24	
		Sediment control system			6			6	
		Water Recycle system	2		3			5	
		Water discharge system	3		9			12	
		Others	7		4		1	12	
Total	32	28.8	37	39.4	3	21.4	72	32.9	
Waste- solids	Monitoring	Monitoring equipment							
		Treatment	Waste dump and mine rehab.	39		18		57	
		Recovery system			1		1		
		Waste Removal equipment	1		1		2		
		Radio-active protector	1				1		
		Others			2		2		
Total	41	36.9	22	23.4			63	28.8	
Waste- liquids	Monitoring	Monitoring equipment							
		Treatment	Oil refurbishment system						
		Oil Boom or separator			2		3		
		Waste disposal equipment	2		5		7		
		Others	1		4		7		
Total	3	2.7	11	11.7	3	21.4	17	7.8	
Noise	Monitoring	Blast monitor							
		Vibration monitor	1				1		
		Others	1		1		2		
	Treatment	Noise suppressor	2		1		3		
		Cladding or building			1		1		
	Others			1		1			
Total	4	3.6	4	4.3			8	3.7	
Other		14	12.6	11	11.7	6	42.9	31	14.2
Total		111		94		14		219	
Per cent of total establishments		50.7		42.9		6.4			

5.8 Estimated expenditure on environmental measures to 1994-95

Establishments were asked to estimate any expenditures on environmental measures anticipated for the three years ending 1994-95. Total estimated expenditure was \$73.9 million.

TABLE 5.12 ESTIMATED EXPENDITURE ON ENVIRONMENTAL MEASURES FOR THE THREE YEAR PERIOD ENDING 1994-95, AUSTRALIA (\$000)

Asic code	Description	End-of-line techniques	Change-in production	Total expenditure
11	Metallic minerals	15,820	33,013	48,833
12	Coal	10,456	10,260	20,716
13	Oil and gas	1,695	2,609	4,304
Total		27,971	45,882	73,853

5.9 Establishments operating under Federal or State Acts relating to the environment

Sixty per cent of establishments operating under environmental licences were in the metallic minerals industry, 37 per cent were in the coal industry and 3% were in the oil and gas industry.

TABLE 5.13 NUMBER OF ESTABLISHMENTS LICENCED TO OPERATE UNDER FEDERAL OR STATE ACTS RELATING TO THE ENVIRONMENT, 1990-91

State	Act	Metallic mineral establishments		Coal establishments		Oil and gas establishments		Total establishments	
		no.	%	no.	%	no.	%	no.	%
New South Wales	Environmental Planning and Assessment Act 1979	—		1		—		1	
	Environmentally Hazardous Chemicals Act 1985	1		—		—		1	
	Environmental Offences and Penalties Act 1989	—		—		—		—	
	Clean Air Act 1961	8		25		—		33	
	Clean Waters Act 1970	5		25		—		30	
	State Pollution Control Act 1970	3		13		—		16	
	Mining Act 1973	1		3		—		4	
	Coal Mining Act 1973	—		2		—		2	
	Dangerous Goods Act 1975	2		8		—		10	
	Other	5		10		—		15	
	Total	25	15.5	87	86.1	—	—	112	41.5
Victoria	Planning and Environment Act 1988	—		—		—		0	
	Environment Effects Act 1978	—		—		—		0	
	Environment Protection Act 1970	—		—		—		0	
	Soil Conservation and Land Utilisation Act 1958	—		—		—		0	
	Mines Act 1958	—		—		—		0	
	Extractive Industry Act 1966	—		—		—		0	
	Other	1		—		1		2	
	Total	1	0.6	—	—	1	12.5	2	0.7
Queensland	State Environment Act 1988	3		—		—		3	
	Clean Air Act 1963	1		—		—		1	
	Clean Waters Act 1971	2		5		—		7	
	Water Act 1926	—		—		—		0	
	Mineral Resources Act	1		1		—		2	
	Other	7		3		—		10	
	Total	14	8.7	9	8.9	—	—	23	8.5
South Australia	Clean Air Act 1984	1		—		1		2	
	Planning Act 1982	1		—		—		1	
	Water Resources Act 1990	—		—		—		0	
	Other	2		—		2		4	
	Total	4	2.5	—	—	3	37.5	7	2.6
Western Australia	Environment Protection Act	49		—		2		51	
	Radiation Safety Act 1975	1		—		—		1	
	Poisons Act 1964	6		—		—		6	
	Rights in Water and Irrigation Act 1914	9		—		—		9	
	Dangerous Goods Act	14		—		1		15	
	Other	27		4		1		32	
	Total	106	65.8	4	4.0	4	50.0	114	42.2
Tasmania	Environment and Protection Act 1973	4		1		—		5	
	Mining Act 1929	1		—		—		1	
	Local Government Act 1962	1		—		—		1	
	Other	—		—		—		0	
	Total	6	3.7	1	1.0	—	—	7	2.6
Northern Territory	Environmental Assessment Act 1982	—		—		—		0	
	Soil Conservation and Land Utilisation Act 1970	1		—		—		1	
	Control of Waters Act 1985	1		—		—		1	
	Mine Safety Control Act	1		—		—		1	
	Mining Act 1982	1		—		—		1	
	Other	1		—		—		1	
	Total	5	3.1	—	—	—	—	5	1.9
	Total	161		101		8		270	
	Per cent of total estabs	59.6		37.4		3.0			



EXPLANATORY NOTES

Chapter 2 — International Comparison

Introduction

2.1. This chapter presents comparative statistics on pollution abatement and control expenditures compiled by the OECD in OECD Environment Monographs No. 75 *Pollution Abatement and Control Expenditures in OECD Countries*, June 1993. Figures in Tables 2.1 and 2.2 (excluding Australia) have been taken directly from this paper and include expenditures at the abater level only.

Australian data

2.2. Figures for Australian private sector used in this chapter refer to capital and current expenditures on pollution abatement and control activities as reported by the mining and manufacturing industries for 1990-91.

2.3. Figures for public sector refer to the consolidated total (general government and public trading enterprises) of gross fixed *capital* expenditure on water supply, and sanitation and protection of the environment, by the Commonwealth, State, Territory, and local governments combined; and gross *current* expenditure on water supply, and sanitation and protection of the environment by the Commonwealth, State, Territory and local governments combined for 1990-91. Gross current expenditure figures refer to general government only. Public trading enterprise operating expenditures are excluded.

Gross fixed capital expenditure figures are published in *Government Finance Statistics Australia, 1990-91 and 1991-92* (5512.0); and gross current expenditure data has been obtained from ABS Public Finance statistics unpublished data. These figures differ slightly from figures reported in the public sector chapter (see Explanatory Note 3.13).

2.4. Public sector data refers only to expenditures on water supply, and sanitation and protection of the environment based on the Government Purpose Classification (see Explanatory Note 3.13).

2.5. PAC expenditure calculations as a percentage of GDP for Australia (Table 2.1) are based on GDP(I) (original) figures for 1990-91 as reported in *Australian National Accounts, March quarter 1993* (5206.0).

2.6. PAC investment expenditure calculations as a percentage of gross fixed capital formation are based on total gross fixed capital expenditure (original) figures for 1990-91 as reported in *Australian National Accounts, March quarter 1993* (5206.0).

Calculation of international mining and manufacturing statistics

2.7. Percent of industry contribution to GDP figures for the manufacturing and mining industries (Figures 2.2 and 2.3) are taken from OECD Economic Surveys (OECD 1991a,b&c, 1992 and 1993c) for each country. PAC expenditure as a percentage of industry contribution to GDP calculations are based on expenditure statistics compiled by the OECD (1993b) and GDP figures reported by the OECD in *Main Economic Indicators, May 1993*. For the purpose of consistency, Australian figures have been calculated using the GDP figure reported in this publication also.

2.8. PAC expenditure figures for the manufacturing and mining industry for West Germany, US and Canada are for 1989, and 1990 for United Kingdom, at 1985 prices. To calculate PAC as a percentage of the manufacturing and/or mining industry's contribution to GDP, 1989 GDP shares have been used for West Germany and United States; 1990 GDP shares for Canada, and 1991 GDP shares for the United Kingdom. Calculations for Australia are based on original 1990-91 PAC expenditures and GDP, and 1989 GDP shares. The "mining" industry contribution to GDP for West Germany includes energy and water supply.

Comparability of international statistics

2.9. International figures used in this chapter are based on results provided by OECD member countries to the OECD Group on Economic and Environment Policy Integration in 1992. Their questionnaire reflected developments and comments from member countries since the last survey in 1988; however, definitions and methodologies remain diverse across countries. Following are notes on differences in collection methodologies and definitions for each of the contributing countries as reported in the OECD (1993b) paper.

2.10. *Canada*: Capital expenditure on non-residential construction, fees for selected professional services, and interest charges on loans used to finance construction and capital purchases, are all taken into account. These expenditure figures exclude land purchases, remediation activities, monitoring, integrated technologies, and research and development.

Public sector data are based on Secretariat estimates which include all outlays by federal, provincial, and local governments. A factor of 50 per cent has been applied to remove the water supply component from the expenditure on "water purification/supply".

Private sector figures include subsidies and grants and are based on the mining, manufacturing, utilities, and services (including institutions) industries.

2.11. *United States*: PAC data comprise pollution abatement, and regulation and monitoring.

Public sector expenditure includes expenditure at the federal, state and local levels. Current and investment expenditure of government enterprises were allocated to the public sector.

Private sector comprises manufacturing and non-manufacturing establishments, including agricultural feedlot operators. Data on PAC expenditure for individual manufacturing industries include about 60 per cent of figures from a number of primary sources (such as the survey on Pollution Abatement Costs and Expenditure carried out by the Bureau of the Census) and 40 per cent are estimates based on indirect methods. These expenditures include costs incurred for integrated technologies.

2.12. *Japan*: Public sector data include investment and current expenditure by both the central and local governments. These have been adjusted to avoid double-counting, particularly with respect to the flow of subsidies from the central government to the local governments.

PAC statistics for the private sector include outlays by large companies in the energy, mining and most manufacturing industries. No figures are available for large manufacturers of food and tobacco, wood and wood products. All private sector figures are for investment expenditure only.

2.13. *Austria*: PAC activities include direct pollution abatement and control, planning, monitoring and regulatory activity. Research and development expenditures were excluded. PAC statistics reflect end-of-pipe measures rather than integrated technologies. Double counting occurs due to the addition of wastewater fees and waste fees in both the private and public sector expenditure.

Public sector expenditures covers all levels of government, ie, the federal, state, municipalities, and special institutions such as the "Ecofund".

Private sector expenditure covers mining and quarrying, electricity and manufacturing.

2.14. *Denmark*: Data are available only for the public sector and utilities. Utilities expenditure is directed exclusively towards the mitigation and prevention of air pollution.

2.15. *France*: Public sector expenditure includes all levels of government. Figures include street cleaning from 1987. Data for private sector PAC expenditure are only partially derived from a direct, regular survey of establishments. Estimation methods are used to evaluate expenditure.

2.16. *Germany*: PAC expenditure figures relate to West Germany only. Expenditure statistics cover direct pollution abatement and control, monitoring and control, and research and development.

Public sector current and investment expenditures are based on estimates and includes the different levels of government.

PAC investment expenditure for the private sector is compiled from annual surveys of the business community and includes expenditure for end-of-pipe technologies as well as the additional cost incurred for integrated technologies. PAC investment expenditure includes expenditure for capital goods in order to produce more environmentally friendly products. This item, however, accounts for less than one per cent of overall PAC investment expenditure in industry. Estimates are carried out for industrial current expenditure. Private sector PAC expenditures include quarrying and mining, manufacturing, construction and utilities.

2.17. *Italy*: Only public sector expenditure figures are available. This includes expenditure by the central government, the regional governments, and the Agency for the Promotion of the Development of Southern Italy and includes subsidies for environmental purposes. PAC expenditure for Italy includes conservation of soil.

2.18. *Netherlands*: PAC expenditure statistics include direct pollution abatement and control, regulation and monitoring, co-ordination of PAC activities, and research and development. Environmental media include soil. Investment expenditure includes end-of-pipe as well as expenditure for integrated technologies.

Public PAC expenditure include expenditure by the central government, provinces, water boards, municipalities and inter-municipal corporations.

The private sector includes agriculture, fishing, hunting and forestry; mining and quarrying; utilities; construction; transport, storage and communication; and manufacturing.

2.19. *Portugal*: Public sector expenditure includes expenditure at the central government level, at the departmental level and at the municipality level.

Private sector expenditure comprises: mining, food, textiles and leather, chemicals, machinery, iron and steel, non-ferrous metals, wood, pulp and paper, and utilities. Only investment expenditure is available.

2.20. *Spain*: Only public sector expenditure is available, and includes all levels of government.

2.21. *Sweden*: Public sector data are based on the expenditure of the central regional and local governments. Investment expenditure statistics are not always available and capital costs are used in their place. In some cases, this substitution may significantly underestimate the true investment expenditure.

Private sector expenditure data explicitly excludes interest payments on capital purchases, fines related to infractions of environmental regulations, and expenditure on remediation.

2.22. *Switzerland*: PAC expenditure data for the public sector is available based on public finance statistics detailed by function. These statistics account for PAC activities at the federal government, the cantons, and the community levels. The reporting method controls for double-counting.

Figures for private sector PAC expenditure are not currently being compiled.

2.23. United Kingdom: PAC expenditure statistics for 1990 are based on a combination of published information, market research and estimates. PAC statistics should be considered as orders of magnitude only and the overall estimate in a given year may be subject to an error band of 10 per cent. The privatisation of water and electricity supply industries during the 1980's make temporal comparisons of public or private expenditure impossible. In particular, in 1989 public water authorities in England and Wales became privately owned companies; water authorities in Scotland and Northern Ireland remain public.

Private sector data include agriculture, hunting and fishing; mining and quarrying; utilities; and manufacturing industries.

Chapter 3 — The Public Sector and Environment Protection

Introduction

3.1. This chapter gives details of net outlays of Commonwealth, State and local governments and their public trading enterprises on environment protection.

3.2. Only transactions classified to Government Purpose Classification (GPC) codes specifically involving environment protection have been included in this chapter.

GPC codes used

3.3. A brief description of each of the GPC codes used in this chapter follows:

0720 Water supply

Relates to outlays on administration, regulation, research and support of water supply services. This includes grants, subsidies or other assistance for the development, expansion or operation of water supply services such as water purification and distribution.

0730 Sanitation and protection of the environment

A broad level code which covers outlays on administration, regulation and support of sanitation and protection of the environment activities. Outlays for this code are equal to the aggregate of outlays for codes 0731, 0732, 0733, 0734 and 0739 (described below).

0731 Household garbage

Includes outlays, be they subsidies, grants, advances or other assistance on administration, regulation and support of household garbage collection and disposal services.

0732 Other sanitation

Relates to outlays on administration, regulation and support of sanitary services other than household garbage such as the disposal of industrial waste and radioactive waste and cleaning of streets and gutters.

0733 Sewerage

Relates to outlays for administration, regulation and support of sewerage collection, treatment and disposal operations. This includes grants, subsidies, advances and other assistance for development, expansion and operation of effluent drainage systems and deep main town systems.

0734 Urban stormwater drainage

Includes outlays on administration, regulation, support and operation of urban stormwater drainage services such as the linking or lining of creeks and provision of open or deep draining systems.

0739 Protection of the environment not elsewhere classified

Relates to outlays on administration, regulation, support and operation of specific PAC activities which the other detailed level project codes do not cover. These activities include the development and operation of monitoring equipment for measuring air and noise quality. The category is also often used to code outlays on PAC activities for which there is not sufficient information to allow coding to one of the other four digit codes. For this reason, the category should be treated as a non-specific category which may include 'other' environment outlays.

0813 National parks and wildlife

Includes outlays on administration, regulation, support and operation of national parks and wildlife services.

Units included

3.4. This chapter gives details of outlays by units which are owned and/or controlled by Commonwealth, State and local governments. These units are grouped into two institutional sectors as follows:

- public trading enterprises — undertakings which aim at covering most of their expenses by revenue from sales of goods and services;
- general government — all of the agencies of government not classified as either public trading or financial enterprises, i.e. all government departments, offices and other bodies engaged in providing services free of charge or at prices significantly below their cost of production.

Current and capital outlays

3.5. For all levels of government, current and capital outlays are distinguished for the section on PAC.

3.6. Current outlays refer to the sum of net current expenditure on goods and services and net current transfer payments. Current expenditure on goods and services are payments made by general government to administer the good or service concerned (for example, sewerage operations). These payments may include wages and superannuation contributions. Payments are offset by revenue received from sales of the good or service, by way of fees and charges, to other areas of government and the private sector. Current expenditure transfer payments may include current grants paid from one level of government to another, subsidies paid to the private sector or public trading enterprises (PTE's) and income transfers from PTE's to their parent body or other areas of government in the form of dividends or profit transfers. The only current transfer payments which have not been taken into account are those relating to taxes paid by general government or PTE's.

3.7. Capital outlays cover investment made by general government and PTE's. They refer to the sum of expenditure on new fixed assets, net purchases of other capital assets (for example, buildings and land), increases in stocks and transfer payments to other bodies to fund capital expenditure. Only capital transfer payments relating to grants have been included. Other transfer payments, such as capital levies paid by local government to other levels of government, have been excluded.

3.8. The net purchase of capital assets such as buildings and land do not in themselves contribute to environment protection. By including these capital assets as a component of capital outlays it is likely that capital outlays on environment protection have been overestimated, assuming a positive net purchase value for such assets. Future editions of this publication will probably exclude this component of the capital outlays data.

Grants

3.9. Outlays, be they current or capital, involving the transfer of Commonwealth grants to State governments for specified purposes or State grants to local governments for specified purposes have been assigned to the level of government from which the funds originated. In contrast, where untied Commonwealth grants have been passed on to State or local governments and spent by them for environment protection purposes, the outlays have remained assigned to the level of government at which they were spent. Untied grants, provided by government with no specific intended purpose, are necessarily coded to the 'other' category in the public finance coding system.

Per capita outlay figures

3.10. The per capita figures quoted in this chapter for total outlays, capital outlays and current outlays are based on 1991 Census population counts for each State.

3.11. These figures represent the net amount government spends on PAC activities and national parks and wildlife per person in each State rather than the gross cost of these activities to each person. If gross cost to each person was being estimated the figure would need to include payments made by people, such as water and sewerage rates.

Data comparability with other ABS publications

3.12. Most public finance publications do not include statistics at the four digit level of the GPC (for example, 0731, 0732 etc). Data included in this chapter is presented at a greater level of detail than occurs in ABS public finance publications.

3.13. At the three digit level of the GPC, ie. 0720 and 0730, estimates presented in this chapter vary from those included in public finance publications for two reasons:

- Outlays for 0720 have been halved in an attempt to exclude the water supply component of transactions classified to this code; and
- Outlays for all GPC codes exclude some transfer payments (for example, taxes paid by general government and public trading enterprises).

Related publications

3.14. Readers may wish to refer to the following publications which contain related information:

Classification Manual for Government Finance Statistics, Australia (1217.0)

Government Finance Statistics, Australia, 1990-91 and 1991-92 (5512.0)

Chapter 4 — The Manufacturing Industry and Environment Protection

4.1. The statistics for the manufacturing industry were collected from a small-scale Census of Manufacturing Establishments for 1990-91. Although the census is currently under review, to date a full-scale census has been conducted triennially, with small scale censuses being conducted in each of the intervening years. Preliminary environmental data was released in *1990-91 Manufacturing Industry, Australia (8221.0)* on 3 March 1993.

4.2. Manufacturing, as specified in Division C of the Australian Standard Industrial Classification (ASIC) broadly relates to the physical or chemical transformation of materials or components into new products, whether the work is performed by power-driven machines or by hand.

4.3. All manufacturing establishments in the census were asked to provide a 'yes' or 'no' answer as to whether they undertook recycling, operated under environmental licences or used special equipment to protect the environment.

4.4. Data collection on capital and current expenditures for environment protection was restricted to establishments with four or more employees in selected industries most likely to be undertaking such expenditure. This limited approach was taken to ensure that the reporting load on respondents was minimised. Establishments which did not respond were treated as if they had no current or capital expenditure on environment protection.

Chapter 5 — The Mining Industry and Environmental Protection

5.1. The environment statistics for the mining industry were collected from the 1990-91 Census of Mining Operations. The annual Census of Mining Operations covers the ASIC classes for metallic minerals, coal, oil and gas. Preliminary environment data was released in *1990-91 Mining Operations, Australia* (8402.0) on 6 January 1993.

5.2. Mining broadly relates to the extraction of minerals occurring naturally as solids such as coals and ores, liquids such as crude petroleum, or gases such as natural gas, by such processes as underground mining, open cut extraction methods, quarrying, operation of wells or evaporation pans, dredging or recovering from ore dumps or tailings. Activities such as dressing or beneficiating ores or other minerals by crushing, screening, washing, flotation or other processes (including chemical beneficiation) or briquetting are included because they are generally carried out at or near mine sites as an integral part of the mining operations. Natural gas absorption and purifying plants are also included.

5.3. In the 1990-91 Census, expenditure on environment protection related to expenses associated with the control and abatement of pollution. All activities directly aimed at the prevention, reduction and elimination of pollution arising from the production process or the consumption of goods and services are included. Data was also collected on environmental indicators (number of establishments recycling, number of establishments with environmental licences, and establishments using special equipment to abate pollution) as well as data on research expenses.

5.4. Research expenses include expenses incurred in research and development carried out by the organisation on its own behalf or on the behalf of others. It also includes the funding of other organisations or individuals to carry out research on behalf of the organisations using their own facilities.

Symbols and Other Usages

n.p.	not available for publication but included in totals where applicable.
—	nil or rounded to zero
ASIC	Australian Standard Industrial Classification

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OECD (1991b) *OECD Economic Surveys — Germany*

OECD (1991c) *OECD Economic Surveys — United States*

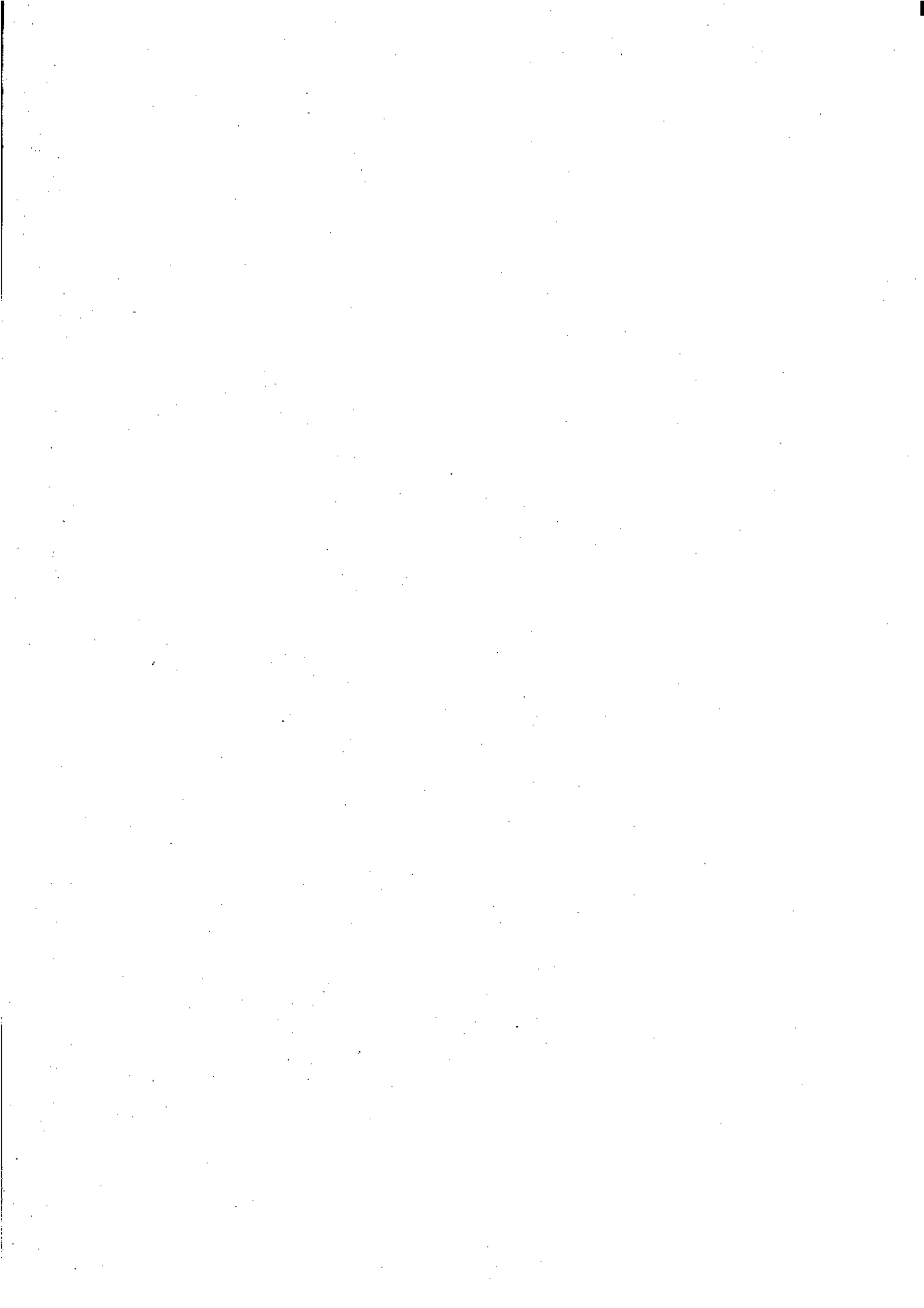
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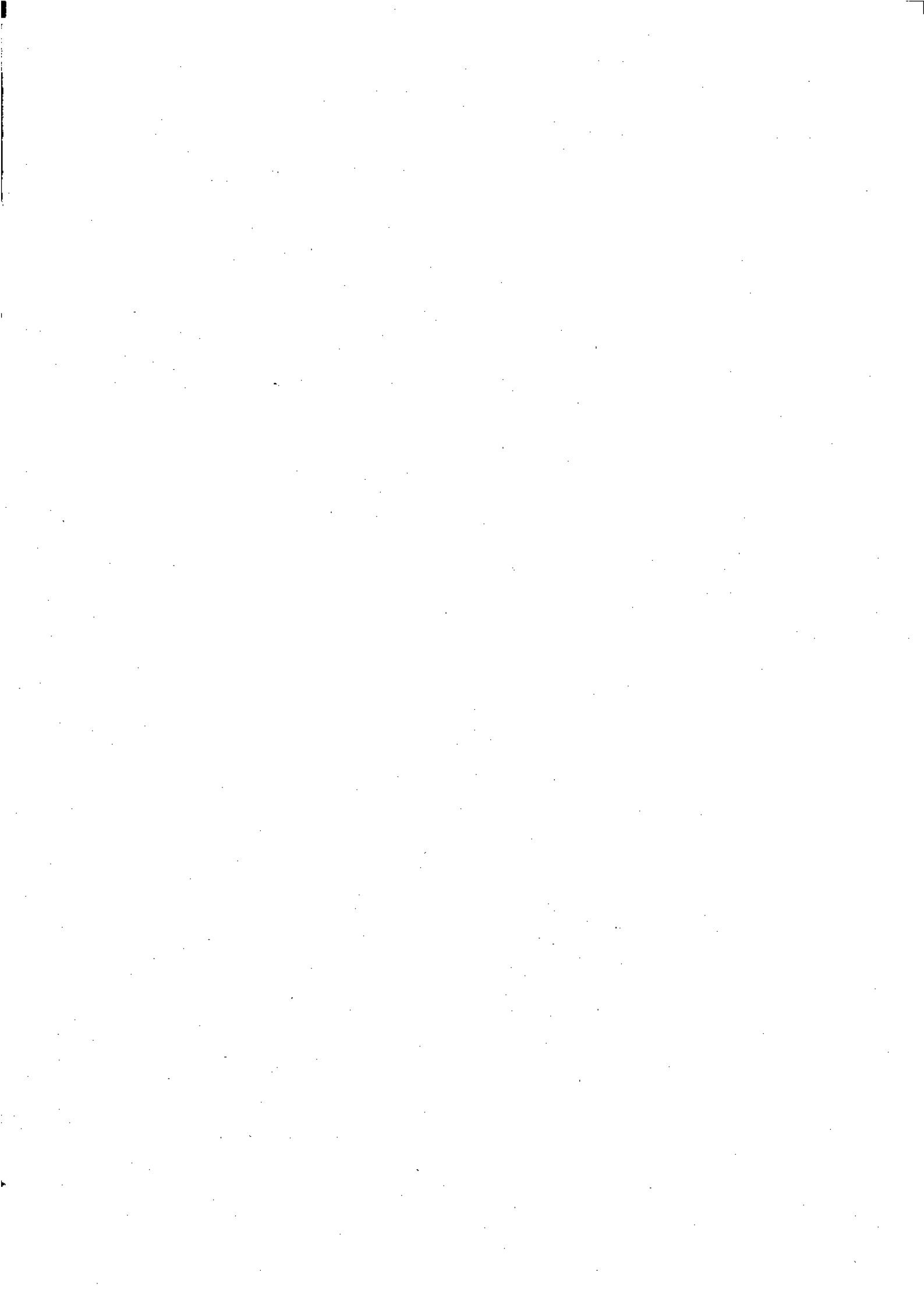
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OECD (1993c) *OECD Economic Surveys — United Kingdom*







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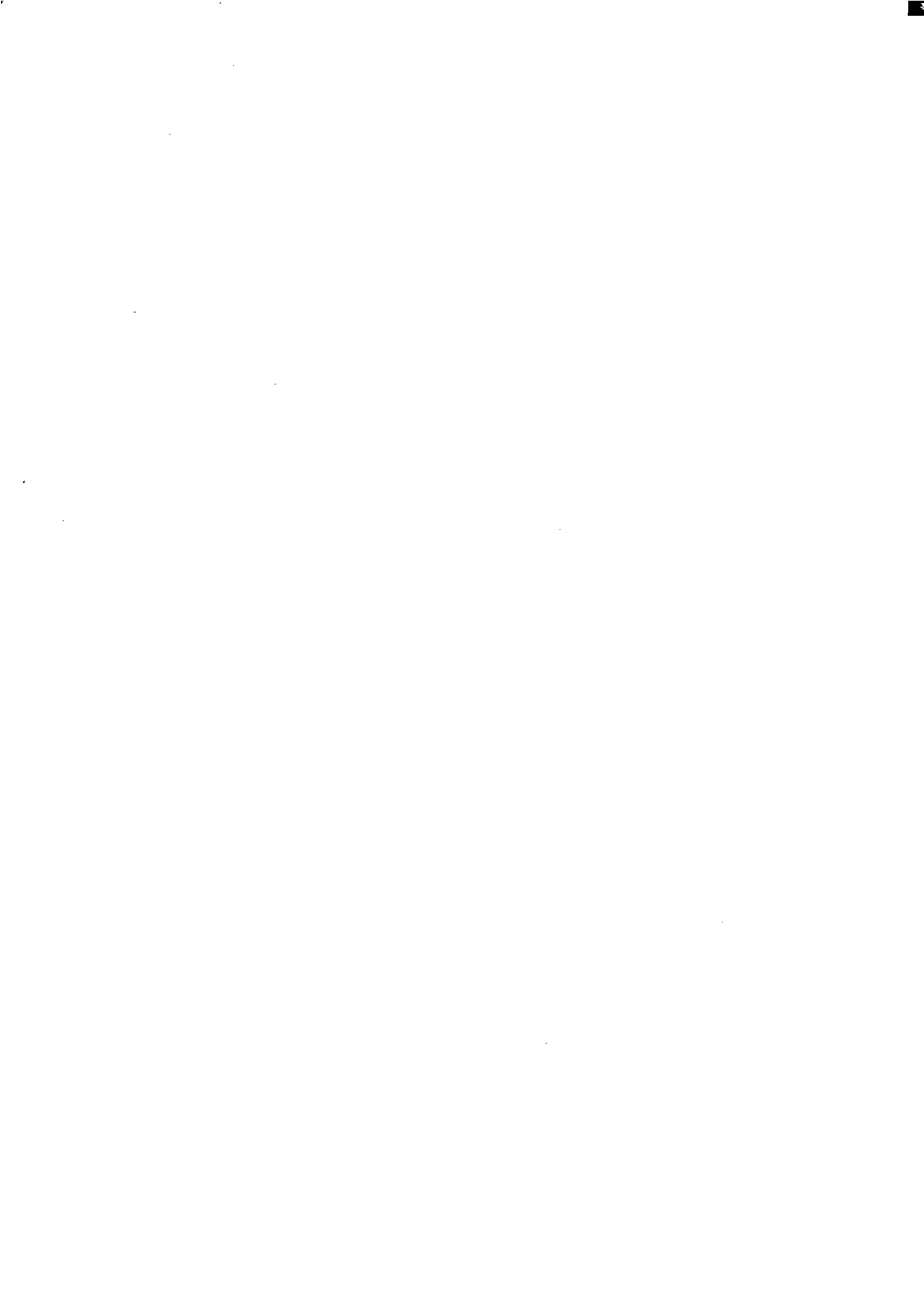
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