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**Submission to the House of Representatives Standing
Committee on Industry, Science and Resources'**

***Inquiry into increasing
value-adding to Australian raw
materials***

Department of Industry, Science and Resources

Table of Contents

- Executive Summary* 1
- Introduction 3
- Importance of raw materials and material processing to Australia 4
 - Output.....4
 - Employment 6
 - Trade.....7
 - International comparison.....8
 - Industry level performance 8
- Increasing value-added to Australian raw materials 10
 - Defining Value Added 10
 - The arguments for further processing of raw materials..... 10
- The encouragement of raw materials processing..... 15
 - The general economic environment..... 15
 - Sovereign risk..... 16
 - Industry Costs & Infrastructure 16
 - Labour and skill issues 17
 - Trade Issues..... 18
- Conclusion..... 19
- Attachment A: Detailed Industry Statistics..... 20
- Attachment B: Examples of Major Commodities Projects..... 23
- Attachment C: The Metals Industry 25

Executive Summary

This paper has been prepared following the Standing Committee on Industry, Science and Resources' call for submissions for the first phase of its inquiry into increasing value adding to Australian raw materials. We understand the Committee has presently called for submissions which evaluate the current state of value adding in Australia, comparing our performance with that of the rest of the world. This will provide the Committee a base from which to evaluate the more specific issues later. The paper has been prepared for this purpose - to provide some broad information to assist the Committee in its evaluation of the current state of value adding in Australia and how it compares internationally.

To aid the Committee's on-going deliberations, the submission also briefly canvasses some of the issues so as to assist it in developing its work program for the inquiry. As the inquiry progresses, if the Committee wishes, the Department will look at providing further input on the specific issues and case studies that the Committee decides to examine in more detail.

To provide some background on the current state of raw material processing industries, the submission commences with a statistical review of Australian industry. It notes that Australia has a long history as a major producer and exporter of raw materials and that the two sectors primarily responsible for this output, agriculture, forestry and fishing; and mining, currently account for some 8.5 per cent of the nation's GDP and around 5.9 per cent of the Australian work force.

Drawing on this strong raw material base, Australia has also had significant success in developing a range of industries which add value to these products through further processing. The raw materials processing industries (defined for this purpose as the manufacturing sub-divisions of food, beverages and tobacco; wood and paper products; petroleum, coal and chemicals; non-metallic mineral products; and metal products) collectively account for some \$37.3 billion in value added, or around 7.9 per cent of total Australian industry output. These industries also contributed 576,800 jobs in 1998, accounting for 6.7 per cent of the work force.

While employment in the raw materials processing industries declined by an average 0.4 per cent over the decade to 1998, their value added increased by an average 1.1 per cent a year over the same period and they have enjoyed substantial export growth. The processing industries have demonstrated an increasing propensity to export in recent years, led by non-metallic mineral products which have achieved average real export growth of 10 per cent a year in the ten years to 1998 and petroleum, coal and chemicals which accomplished 9 per cent average annual growth over the same period.

Indeed, exports of merchandise from Australia in recent years have been predominantly made up of either primary products or processed raw materials. Exports from the agriculture and mining sectors, for example, accounted for almost 36 per cent of merchandise exports in 1998 and exports of processed raw materials (using the definition from above) for some 41 per cent. It is therefore clear that Australia is already adding significant value to the raw materials it produces.

Furthermore, Australia clearly enjoys a number of factors that are likely to contribute to a comparative advantage in a range of raw materials processing areas. In addition to having ready access to the raw materials that form the basis of these industries, it can benefit from the significant transport savings that flow from the reduction in volume that is frequently a feature of basic processing activity. These industries can also benefit from factors such as the relatively low energy costs, well developed infrastructure and the stable political structure in Australia.

Whether these factors are sufficient to justify the outright pursuit of raw materials processing industries, however, is another matter. Any attempt to induce local producers to provide further value adding in the areas where it does not enjoy a natural advantage may simply be counter productive and may have a negative overall impact on economic output. Furthermore, the processing of raw materials involves a range of additional factors and Australia's ability to efficiently produce primary products does not necessarily reflect a comparative advantage further down the value chain.

It is therefore evident that some care needs to be taken in choosing and implementing mechanisms for encouraging further raw materials processing in Australia although additional, astute activity aimed at fostering growth is likely to be worthwhile.

Ultimately a vibrant and healthy raw materials processing industry is more likely to emerge in an environment where firms at all levels are encouraged to adapt to change and market pressures. There are many ways governments can contribute to these ends by effectively addressing market and institutional impediments, including by:

- promoting a conducive economic climate;
- engendering confidence in the Government's decision making processes;
- facilitating the provision of cost effective infrastructure;
- advancing labour relations, flexibility and skill formation; and
- encouraging international free trade.

Given the broad ranging nature of many of these underlying questions, the Committee may wish to choose a few primary issues for further investigation. This approach could also give due recognition to the fact that some of these issues (such as taxation) are already the subject of a current government review and that others have already benefited from on-going concerted government action.

Introduction

While the issue of further valuing adding to Australia's raw materials has been the subject of a number of directly (and indirectly) related reports over the past decade or two,¹ most of these reports are now somewhat dated and it is timely to revisit this issue, and to examine the progress made since then.

As outlined in the next section of this paper (and further discussed in Attachment C), Australia appears to have ready access to the raw materials that provide the underlying basis for developing processing activities and indeed normally represent the major input into them. It is, for example, among the world's leading producers of wool, wheat, coal, bauxite, gold and iron ore, and it is a major exporter of these and a range of other raw materials.

Although Australia's apparent competitive advantage in raw materials production is not necessarily a good indicator of its competitive position further down the value chain, there are a number of other factors that suggest that it should be able to compete in some of these industries. These factors are broadly outlined in the subsequent sections of the submission, together with a discussion of the principal arguments as to why Australia should be taking action to add value to the raw materials it produces.

The submission concludes with a general review of a range of possible policy questions that may be of interest to the Committee. This discussion attempts to identify the mechanisms that could work to improve the environment in which raw material processors operate and those that could assist in the removal of any impediments that inhibit the development of industries in this area.

Three attachments have also been added to the submission to provide the Committee with some basic information on the current state of the raw materials processing industry in Australia and its future prospects. These attachments contain some more detailed industry statistics, including detailed data on the Australian metals industry, and an indicative list of major commodities projects that are being planned or constructed.

¹ See for example the Industry Commission's reports into *Mining and Minerals Processing in Australia* (February 1991) and *Adding further Value to Australia's Forest Products* (September 1993).

Importance of raw materials and material processing to Australia

Australia has a long history as a major producer and exporter of raw materials, largely reflecting the fact that it is well endowed with an abundance of naturally occurring mineral producing ores and with other important factors of production such as land. It also has had significant success in developing a range of industries which add value to these materials through further processing.

Output

As indicated in Table 1, the raw material producing sectors: agriculture, forestry and fishing; and mining, are responsible for some \$17 billion and \$23 billion respectively of the nation's output, representing around 3.6 per cent and 4.9 per cent of its overall industry value added.

Table 1: Industry Gross Value Added, 1998

	Value added 1998	Average annual growth 1988 to 1998	Share of value added 1998
	(\$million)	(per cent)	(per cent)
Agriculture, forestry and fishing	17 010	2.39	3.59
Mining	23 132	4.80	4.89
Manufacturing	66 746	1.16	14.11
Food, beverage and tobacco	12 901	1.81	2.73
Textile, clothing, footwear and leather	3 136	-2.86	0.66
Wood and paper products	3 341	-0.04	0.71
Printing, publishing and recorded media	8 272	2.01	1.75
Petroleum, coal, chemical, etc	7 512	2.23	1.59
Non-metallic mineral products	3 481	-1.45	0.74
Metal products	10 111	0.99	2.14
Machinery and equipment	15 418	1.75	3.26
Other manufacturing	2 577	0.79	0.54
Services	366 295	3.55	77.41
Total All industries^a	473 183	3.19	100.00

Note: a The total gross value added for all industries does not equate with GDP. This figure is adjusted for items such as ownership of dwellings and taxes (less subsidies on products) to estimate the Australian GDP.

Source: ABS 5206

From this table (and from the more detailed information in Attachment A), it is also evident that Australia's success in producing primary products has contributed to significant activity further down the processing stream. Drawing on its endowments of raw materials, Australia has developed raw materials processing industries in a large number of areas ranging from the processing of agricultural produce into food, through to the processing of ores and crude oils.

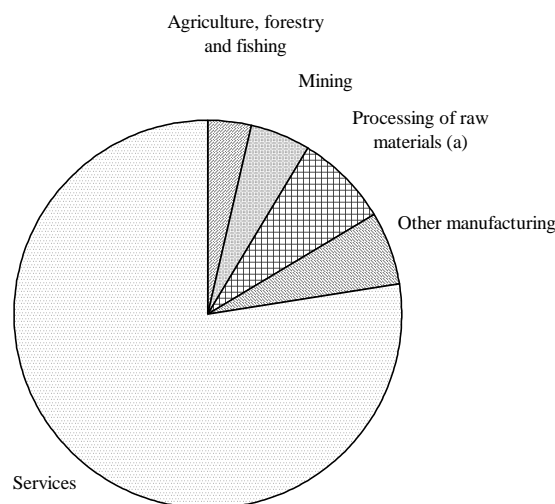
Although the definition of what is considered to be raw materials processing can vary widely (from the basic processing of raw materials through to almost any activity that uses or produces products derived from raw materials), there are a number of useful proxies that illustrate the relative importance of these industries.

One such proxy can be derived by adding together the production of the sub-divisions of the manufacturing sector that appear to have a large component of raw materials processing. For example, if the manufacturing sub-divisions of food, beverages and tobacco; wood and paper products; petroleum, coal and chemicals; non-metallic mineral products; and metal products are added together they collectively account for some \$37.3 billion in value added, or around 7.9 per cent of total industry output.

While this proxy does not provide a precise guide to the level of raw materials processing activity in Australia (for example, it does not include wool scouring and includes production of fabricated metal products such as firearms), it does serve to provide a useful illustration of the order of magnitude of this activity in Australia.

It demonstrates, for example, that raw materials processing is already a significant activity in Australia. As indicated in Figure 1, using this proxy it appears that the processing industries already account for roughly the same proportion of Australia's industry value added as the agriculture and mining sectors combined.

Figure 1: Industry Gross Value Added, 1998



Note: a Includes the manufacturing sub-divisions: Food, beverage and tobacco, Wood and paper products, Petroleum, coal, chemical etc., Non-metallic mineral products and Metal products.

Source: ABS 5206

This figure also demonstrates the overwhelming importance of the services sector to the economy, providing some 77 per cent of the industry value added in 1998. While not trying to downplay the usefulness of a thorough examination of the potential of the raw materials processing industries in Australia, or the linkages and contribution this sector makes to services and vice versa, it does serve to illustrate the need to ensure all parts of the economy are functioning appropriately and not just particular sectors or industries.

Even so, service industries can also be important for adding value to raw materials. For example, growth in international tourism to Australia means increased demand for a wide range of Australian goods consumed by those visitors while they are in this country. Such consumption is recorded as a service credit, or export, but is equivalent in economic impact to a direct export of the goods consumed by the international visitor. Recorded growth in exports of processed raw materials or manufactured goods thus understates the true contribution of value adding activities to total exports.

Turning to growth rates, it also appears from Table 1 that much of Australia's healthy overall growth in recent years has been driven by the services sector (both in absolute and relative terms). The average annual growth of the mining sector at 4.8 per cent over the ten years to 1998, however, has outstripped the average growth in services, and the mining sector has therefore also played a significant part in the Australian economy's overall growth.

While this growth would seem to indicate that Australia has faced increased opportunities to develop its raw materials processing industries, the realisation of this potential is not apparent in the output figures. The average annual growth in the raw materials processing industries (as defined above) at 1.1 per cent over the ten years to 1998, suggests that much of this opportunity has not been realised, although the performance within some of these industries has been better than others. The growth in areas such as petroleum, coal and chemicals (2.2 per cent a year) and of food, beverages and tobacco (1.8 per cent), for example, has been significantly better than that for non-metallic mineral products (-1.5 per cent).

The limited growth in some of the processing industries may, in part, have been influenced by the relatively modest growth in the production of their raw materials inputs. The 2.4 per cent average annual growth in the agricultural sector, for example, may have held back the growth in food, beverages and tobacco, although the growth in the processing of these materials does not appear to have even matched that level of growth.

While it can be dangerous to predict the future growth of the primary and processing industries, there are at least some signs that the minerals and energy industries and their associated processing activities will continue to expand in the coming years. As indicated in the attached abbreviated list of major commodities projects identified by ABARE, there continues to be a significant number of new mining and minerals processing projects either being planned or under construction in regional Australia (Attachment B).

Employment

Australia's primary industry sectors and its raw materials processing industries also provide a significant contribution to the Australian economy through the employment they generate. The employment levels provided by these industries in 1998 are outlined in Table 2 (and over a longer time frame in Attachment A).

Table 2: Industry Employment, 1998

	Average Employment 1998	Average annual growth 1988 to 1998	Share of total employment 1998
	('000)	(per cent)	(per cent)
Agriculture, forestry and fishing	420.6	-0.3	4.9
Mining	83.9	-1.3	1.0
Manufacturing	1 098.2	-0.7	12.8
Food, beverage and tobacco	185.6	1.1	2.2
Textile, clothing, footwear and leather	90.1	-2.8	1.1
Wood and paper products	62.1	-1.8	0.7
Printing, publishing and recorded media	111.8	0.5	1.3
Petroleum, coal, chemical, etc	100.5	-0.5	1.2
Non-metallic mineral products	49.2	-1.0	0.6
Metal products	179.5	-0.9	2.1
Machinery and equipment	227.7	-1.8	2.7
Other manufacturing	91.9	1.2	1.1
Services	6 950.4	2.1	81.3
Total All industries	8 553.1	1.5	100.0

Source: ABS 6203

While it is evident that the services sector has also been the major contributor to industry employment in Australia, the primary industries and the raw materials processing industries have provided a significant contribution to the overall employment levels.

As indicated in Table 2, the agriculture, forestry and fishing and the mining sectors, on average, were collectively responsible for some 504,500 jobs in 1998 or almost 6 per cent of the work force. The raw material processing industries (based on the definition used above) also contributed 576,800 jobs or 6.7 per cent of the work force.

The employment provided by these industries, however, has been declining over the last decade. Despite their growing outputs, employment in the agriculture, forestry and fishing sector declined by an average 0.3 per cent a year over the decade to 1998 and employment in mining declined by an average 1.3 per cent a year. In addition, employment in the raw materials processing industries (using the above definition) declined by an average 0.4 per cent a year over the same period.

While much of this decline appears to have been driven by increasing labour productivity in these industries (and may therefore have added to their competitiveness on world markets), none of them have contributed to the overall employment growth in Australia in recent years.

Trade

The declining employment and the relatively modest output growth in the raw materials processing industries, however, is not reflected in the industries' export performance. As indicated in Table 3, the raw materials processing industries enjoyed substantial real export growth in the decade to 1998.

Table 3: Merchandise trade by industry (current prices^a)

	<i>Imports</i>		<i>Exports</i>	
	1998	Average growth 1988 to 1998 ^b	1998	Average growth 1988 to 1998 ^b
	\$ million	(per cent)	\$ million	(per cent)
Total Agriculture	825	0.8	9 942	2.8^c
Agriculture	734	..	9 304	..
Forestry & fishing	91	..	638	..
Total mining	3 726	10.4	21 929	6.2
Coal mining	20	..	9 838	..
Oil & gas extraction	3 390	..	3 606	..
Metal ore mining	127	..	8 267	..
Other mining	188	..	218	..
Total manufacturing	91 892	8.6	53 149	9.6^d
Food, beverages & tobacco	4 061	6.0	11 433	5.6 ^c
TCF & leather	6 322	5.1	2 717	5.91
Wood and paper product	2 967	1.4	1 186	4.39
Printing & recorded media etc	2 106	8.4	497	11.56
Petroleum, coal, chemical etc	14 597	7.1	5 487	9.13
Non-metallic mineral product	1 262	3.5	324	10.04
Metal product	8 679	11.1	18 364	8.40
Machinery & equipment	48 858	10.3	12 422	14.76
Other manufacturing	3 040	7.9	719	4.52
Other industries^e	407	..	3 961	..
Total	96 850	..	88 982	..

Note: **a** Levels in current prices and growth is in constant prices. **b** In constant prices. The growth rates have only been calculated where trade deflators are available. **c** Average growth for the nine years to 1997 (as deflators are not available for 1998). **d** Excludes food, beverages and tobacco. **e** Other is comprised of miscellaneous and confidential items. Fluctuations in the make-up of these items can have a significant impact on the size of the other categories and on their growth rates.

Source: DFAT International Trade Database, ABS implicit price deflators and DISR calculations.

It appears that the raw materials processing industries have demonstrated an increasing propensity to export in recent years, led by non-metallic mineral products which have achieved average real export growth of 10 per cent a year in the ten years to 1998 and petroleum, coal and chemicals which accomplished 9 per cent average annual growth over the same period.

While the average real growth in exports from the agriculture sector was a relatively modest 2.8 per cent over the nine years to 1997, the average growth in mining exports was a more substantial 6.2 per cent in the decade to 1998.

In terms of relative size, exports of merchandise from Australia in 1998 were predominantly made up of either primary products or processed raw materials. Exports from the agriculture and mining sectors in that year accounted for almost 36 per cent of merchandise exports and exports of processed raw materials (using the definition from above) for some 41 per cent.

Although imports of merchandise trade into Australia continues to outweigh merchandise exports, around half of these imports are in the form of machinery and equipment. Imports of petroleum, coal and chemicals classification, however, also represent a significant proportion of this trade (15 per cent of merchandise imports).

International comparison

A comparison of the relative size of the various sectors in Australia with the contributions they make in a range of OECD countries also demonstrates the relative importance of the primary products sectors in Australia (these figures are not comparable with those used above). While the available figures do not allow comparison of the importance of the raw materials processing industry to economic activity, it is clear that primary industries play a more significant part in the Australian economy than they generally do in other similarly developed economies around the world.

Table 4: Contribution to gross value added, by industry and country, 1995 (per cent)^a

<i>Industry</i>	<i>Australia</i>	<i>Canada</i>	<i>France</i>	<i>Germany</i>	<i>Japan</i>	<i>United Kingdom^b</i>	<i>United States^b</i>
Agriculture, hunting, forestry and fishing	2.4	2.4	3.4	1.6	2.1	1.8	2.0
Mining and quarrying	4.6	4.0	0.5	..	0.2	3.1	1.8
Manufacturing	13.9	17.9	21.1	27.0	25.2	20.4	18.1
Other industries	79.1	75.8	75.0	71.4	72.5	74.7	78.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes: **a** 1990 prices **b** Due to data availability, 1994 data used for the United Kingdom and United States.

Source: *OECD CBS Statwise data*

As indicated in Table 4 (and Table A3 in Attachment A), the mining and quarrying sector represents a more substantial part of the Australian economy (4.6 per cent) than it does in any of the other selected OECD economies. The agriculture, hunting, forestry and fishing sector in Australia is also relatively important compared to these countries. This sector accounts for a larger proportion of economic output in only one of the other countries examined.

Industry level performance

The discussion to date has been designed to give the Committee an overview of the performance of, and general trends in, Australia's primary and resource processing industries and accordingly has focussed at a very broad industry level. To provide the Committee with a sample of the vast

range of statistical information that is available at the industry and commodity level the Department has attached a statistical overview of the Australian metals industry (Attachment C).

This attachment provides detailed information on the major products produced by the Australian metals industry, including comparative information on the Australian industry's relative position in the world markets, information on the location and ownership of the local downstream facilities, details on the percentage of domestically produced ores which are processed in Australia and some basic output information. It also summarises the assistance measures available to the industry.

Increasing value-added to Australian raw materials

In considering how Australia can draw on its natural raw materials base and enhance its overall economic growth by adding further value to these products, there are a range of issues that warrant further examination. These include questions such as: what is meant by the underlying objective of increasing ‘value adding’; is there a prima facie case suggesting that Australia would benefit from further processing of its raw materials; and, leading on from this, what actions could and should government take in promoting the development of raw materials processing industries.

Defining Value Added

The expression ‘value added’ has a variety of meanings, depending on the context in which it is being used. At the most basic microeconomic level, the aim of adding value through raw materials processing is usually interpreted as having the fundamental objective of increasing the economic value provided by these industries.

At this level value added can be defined as the difference between the turnover of an enterprise or industry and the purchases of intermediate inputs of various kinds (after taking account of changes in stocks).² It consists of wages earned by labour, rent for land and returns to capital and other payments to the value-adding factors of production.³ Value added provides a measure of the output of an activity or of the contribution that it makes to economic production.

At any point in time, value added at the macroeconomic (or economy wide) level is essentially the sum of the value added accruing in each industry.

Although these two concepts therefore appear to be essentially the same in a static state, there is a critical difference when any change is introduced into the system. This difference is best illustrated by way of example. While a particular action may lead to an increase in the value added in an industry (for example subsidisation of the production of a particular commodity may lead to an increase in its production), this action does not necessarily lead to an equivalent change in value at the national level because of the impact of the introduced change on other industries. It may for example lead to an increase in the cost of the factors of production in those industries which compete for the same inputs and a subsequent decline in their profitability or a reduction in their throughput. Given the aim of the Committee’s work is to see a net increase in national output, this submission uses the term “value added” in this broader sense.

The arguments for further processing of raw materials

As indicated above, Australia is a major producer of raw materials (in both its mining and agricultural sectors) and has ready access to these inputs. If it can translate its world efficient processes in these primary sectors further up the production chain, it is possible that Australia could add considerable value to them, thus enhancing its overall GDP and standard of living.

Nevertheless, in its study of raw material processing the Economic Planning Advisory Council (EPAC) has argued that the likelihood of comparative advantage in the production of raw

² The Australian Bureau of Statistics has historically used a more precise definition of value added at the enterprise level. Its earlier additions of its Manufacturing Industry publication, for example, estimated the value added for particular industries. More recently, however, its data has been based on industry gross product. While this is seen as a similar concept, this change has brought the measurement of industry output more in line with that used for national accounts purposes.

³ See Productivity Commission, *The Changing of Australian Manufacturing*, December 1996.

materials and unprocessed foodstuffs carrying through to processed products depends essentially on two considerations.⁴ The first is the balance of advantage in locating processing facilities close to the source of supply of the raw materials rather than close to the market for the processed product. The second is the relative abundance, accessibility and quality of the additional resources (such as energy) which need to be employed in order to conduct the processing activity.

Based on this thesis, it can be argued that Australia has a number of advantages as a location for early stage processing of raw materials. According to EPAC, for example, almost all basic processing activity involves a reduction in volume and/or weight of the raw material, and further down stream processing therefore provides the opportunity for a saving in international transport costs when product is exported. Indeed, in some instances, the advantage of this concentration is so overwhelming that it is carried out as a matter of course after mining or harvesting (as can be seen in the initial processing of sugar cane).

EPAC also argued that, in principle, the viability of resource processing in Australia can benefit from relatively low energy costs, relatively low labour intensity, lesser environmental costs, well developed infrastructure and the stable political structure. The rapid recent growth in regional demand (at least until the Asian economic crisis) was also seen as an advantage in the development of these industries.

It is also notable that the Industry Commission, when it last reviewed the minerals processing industry in Australia,⁵ indicated that the full potential of the industry had not yet been realised despite the already significant size of the industry. It suggested that the major reason for this under-performance was that the mining and early stage mineral processing activities were hindered by numerous impediments, including the cost of transport and government regulation. Since this publication in 1991 much microeconomic reform has been achieved. However, there is still more that can be done.

Furthermore, it can be contended that the active pursuit of value adding is justified in Australia come what may. These arguments appear to fall into two camps: those focussing generally on the economic benefits available through increased value adding; and, those specifically focussing on the claim that materials processing is a relatively high value added activity and that these activities are more important than low value added activities because of their capacity to sustain a higher living standard.

(i) The benefits of increasing value adding

The argument that the economic benefits of increased value adding justify more focus being placed on raw materials processing extends from a number of alternative (although often closely related) notions. These range from the suggestion that further processing can help avoid the volatility of raw materials markets through to a simple concentration on potential benefits of the additional value added (principally at the industry level) that appears to be available from further activity in this area.⁶

The first of these arguments centres on a growing recognition that Australia's reliance on export income from raw material production leaves it exposed to the volatility of commodity markets. Given that manufactured goods (or further processed raw materials) tend to trade at less volatile prices, it is suggested that more focus should be placed on raw material processing with a view

⁴ Economic Planning Advisory Council, *Raw Materials Processing; Its Contribution to Structural Adjustment*, April 1988.

⁵ Industry Commission, *Mining and Minerals Processing in Australia*, page 169, Volume 1.

⁶ See, the Industry Commission's discussion of these issues on page 136, Volume 1 of its report on *Mining and Minerals Processing in Australia*.

to reducing this volatility and the impacts it has on Australian industry, exchange rates and the economy more generally.

At the other end of the spectrum, it is argued that any additional value added is good for the economy and that Australia should be pursuing the benefits that raw materials processing can provide in terms of gross national product, income and employment. Proponents of this approach also argue that it can lead to an improved balance of payments (by increasing exports and potentially reducing imports), a stronger Australian dollar, and greater domestic and foreign investment.

While recognising there is prima facie evidence that Australia should be competitive in many areas of raw materials processing and that there is little doubt increased value added can lead to higher living standards, arguments supporting the outright pursuit of this objective need to be examined carefully.

Australia does have a competitive advantage in a number of areas of resource processing and, as noted above, it is already undertaking such activity in a broad range of areas. Any attempt to induce local producers into providing further value adding in this area, however, may simply be counter productive and needs to recognise the wider implications of such action.

In the case of forest products, for example, the Industry Commission found that the existing level of processing probably roughly represented the appropriate level under the current market circumstances.⁷ It argued that it is likely the mix of raw materials production and processing activity represents that which maximises the returns to producers (taking into account the risk involved). The new investment required to increase the output of higher value added products would probably require a change in the underlying economic circumstances or conditions.

If this is the case more generally, and if the further development of the raw materials processing industries is to be pursued by means other than an attempt to change these underlying conditions, it will not necessarily lead to a higher Australian GDP because of the potential negative impacts of such action throughout other parts of the economy. Further processing is only worthwhile if it can be undertaken in a relatively efficient manner in Australia and if the resulting outputs can be sold profitably on the domestic and world markets. The underlying issue is that Australia must enjoy a comparative advantage in the particular area of raw materials processing being pursued.

Yet while Australia has a comparative advantage in large parts of the mining and agriculture sectors, this is primarily because of its abundance of minerals and its access to large tracts of fertile land. Its comparative advantage in these areas is not sufficient reason to expect the country to have healthy and competitive processing industries covering the full spectrum of its raw materials production. The processing of raw materials involves a range of additional factors (such as an efficient local transport system - coastal shipping etc - and access to know-how and technology) with Australia's ability to efficiently produce primary products not necessarily reflecting a comparative advantage further down the value chain.

As such, any attempt to artificially move away from this market mechanism by encouraging value adding activity in areas that can be served more cheaply by imports is unlikely to produce a positive outcome for Australia and may ultimately translate into falling living standards. As indicated by the Centre for International Economics,⁸ in a review of the potential for plantations, government can facilitate the workings of markets by fostering relevant institutional arrangements, but should not distort market signals by using policies designed to select specific industries or products. It suggested markets are better placed than governments to do this.

⁷ See page 218 of the Industry Commission's report *Adding Further Value to Australia's Forest Products*.

⁸ Centre for International Economics, *A Plan to Achieve the Plantations 2020 Vision*, March 1997.

(ii) Raw materials processing as a relatively high value added activity

Another argument that is sometimes used to justify further value adding in raw materials processing is based on the claim that manufacturing is a relatively high value added activity and that this activity is more important than low value added activities because of its capacity to sustain a higher living standard.⁹ Drawing on this argument, it is sometimes suggested that since raw materials processing is likely to have a larger proportion of high value-added activities than other parts of the economy, it is a worthwhile activity to encourage.

Table 5 has been prepared to test the validity of this argument by examining industry gross product¹⁰ (a close proxy for value added) as a percentage of the total income for each industry.

Table 5: Industry gross product to total income - 1996-97

<i>Industry</i>	(per cent)
Agriculture	33.2
Services to agriculture; hunting and trapping	30.7
Forestry and logging	40.1
Commercial fishing	44.5
Agriculture, forestry and fishing	33.8
Coal mining	44.8
Oil and gas extraction	73.1
Metal ore mining	42.9
Other mining	39.7
Services to mining	28.4
Mining	49.4
Food, beverage and tobacco	24.9
Textile, clothing, footwear and leather	31.3
Wood and paper product	35.1
Printing, publishing and recorded media	42.5
Petroleum, coal, chemical and associated products	23.6
Non-Metallic mineral product manufacturing	34.6
Metal product manufacturing	31.0
Machinery and equipment	28.9
Other manufacturing	33.4
Manufacturing	29.3
Services^a	26.4
Total all industries	28.2

Note: a Excludes the Finance and Insurance division, as IGP is not seen as being relevant to these industries
Source: ABS publication *Business Operations and Industry Performance, Australia, 1996-97* (Cat. no. 8140.0).

It appears from this table that industry gross product across the whole economy represented 28.2 per cent of total income in 1996-97. The ratio for the manufacturing sector, at 29.3 per cent, is slightly higher than the national average and is somewhat higher than that recorded for the services sector at 26.4 per cent.

When these results are compared with the ratio for the mining sector, however, it is clear that that mining provides even greater value added as a percentage of total income (49.4 per cent). Similarly, the agricultural sector (33.8 per cent) also enjoys a ratio well above the national average.

The figures for the manufacturing sector as a whole, therefore, do not suggest that manufacturing is a comparatively “high value-added” sector when compared to the industries providing its raw

⁹ See discussion on page 67 of the Productivity Commission’s report, *The Changing of Australian manufacturing*.

¹⁰ These figures do not necessarily fully equate with the GDP figures used elsewhere in this submission.

material inputs. Some parts of the sector, however, have ratios significantly higher than the sector average. These include industries such as wood and paper products (35.1 per cent) and non-metallic mineral product manufacturing (34.6 per cent), which could be described as raw materials processing industries. On the other hand, other of these, including petroleum, coal, chemical and associated products (23.6 per cent) and food, beverage and tobacco (24.9 per cent), have relatively low industry gross product to income percentages.

The Economic Planning Advisory Council, in its 1988 examination of the raw materials processing industries,¹¹ took a slightly different approach to examining the issue by estimating the additional value added provided to specific raw materials at each stage of processing. While there was considerable variation in the coefficients estimated in this work, a number of them (particularly for zirconia and heavy rare earth metals) were very high, indicating that these processing industries, if they can be successfully undertaken in Australia, could provide significant benefits.

A high coefficient, however, is not in itself a justification for taking action aimed at encouraging further processing in these areas. The coefficients do not in anyway reflect Australia's relative comparative advantage (or disadvantage) in these areas and therefore the likely success of its industry undertaking these activities.

¹¹ See EPAC, *Raw Materials Processing: Its contribution to Structural Adjustment*, Appendix 1.

The encouragement of raw materials processing

As discussed above, there may be some factors contributing to Australia having a comparative advantage in a number of raw materials processing areas. If these can be translated into productive investments, the Government's overriding industry policy aim of achieving an annual growth rate of over 4 per cent on average during the decade to 2010 would be enhanced.

In its recent industry policy statement, *Investing for Growth*, the Government affirmed its determination to foster a productive, competitive, outwardly oriented Australian industry. Its underlying aim is to ensure Australia achieves its full economic potential through high levels of productive investment, the encouragement of an innovative and entrepreneurial spirit in businesses enterprises and by facilitating new growth industries.

The most appropriate approach to meeting this objective is to look for mechanisms that help improve the environment in which industry operates. In particular, there would appear to be merit in an approach aimed at identifying mechanisms that would work to improve the productivity of enterprises and ensure they are able to meet world's best practice. This includes enterprises at all stages of raw materials processing and any that provide inputs into these processes. Such an approach would recognise both the broader need for an efficient economy and the fact that many of the resource processing industries need access to competitive inputs from these wider areas of the economy if they are to compete successfully on world markets.

There are many ways governments (and indeed all the groups involved in the production processes) can contribute to these ends by effectively addressing market and institutional impediments, including by:

- promoting a conducive economic climate;
- engendering confidence in the Government's decision making processes;
- facilitating the provision of cost effective infrastructure;
- advancing labour relations, flexibility and skill formation; and
- encouraging international free trade.

An elaboration on the nature of each of these issues and how they impact on the resource processing industries is provided below.

The general economic environment

At a broad economic level, one of the principal aims of governments is to provide an environment that is conducive to business. Raw materials processing tends to involve large scale, capital intensive investments which have long effective lives and relatively long gestation periods. It is therefore essential to have an efficient, vibrant, competitive, predictable and stable economy if Australia is to attract such investment and to ensure that its existing industry remains viable.

While many raw materials processing projects will benefit from being located close to the source of supply of raw materials, many are less dependent on this factor and indeed have a wide range of choice as to where they locate. To attract these plants (and indeed to assist the viability of those that benefit from location close to the source of supply), Australia needs to ensure that it maintains sound monetary and fiscal policies so that its economic environment is conducive to these businesses.

Such an environment also requires other favourable factors such as competitive real interest rates; a stable exchange rate and an efficient tariff regime; low inflation; a healthy capital market with access to foreign capital (which may also yield access to new technology, management skills and overseas markets); a well developed competition policy; appropriate support and protection for research and development activities and reasonable government regulation and imposts.

Also there is growing recognition of the role that knowledge and technology play in economic development. Economic growth is becoming increasingly based on the production, distribution and use of knowledge. The knowledge-driven economy encompasses the exploitation and use of knowledge in all production and service activities, not just those sometimes classified as 'high tech' or 'knowledge intensive'. Hence, value adding is becoming increasingly a knowledge adding activity. Further, the knowledge possessed by Australians can be considered as a raw material and adding value to that knowledge through support for innovation, research, education and skills development and the protection of intellectual property has long been a major function of government.

Sovereign risk

In addition to ensuring it encourages a broad economic environment that is conducive to investment, government needs to engender industry confidence by implementing an open and efficient legal and regulatory framework that lays down transparent and consistent ground rules for the encouragement and equal treatment of all commercial activities. Such policies work to foster the confidence which underpins the successful operation of private markets.

A specific issue that is often raised in this context by potential and existing investors in the raw materials processing is the question of sovereign risk. Industry argues that it needs to be confident in government policy and decision making processes if it is to risk its capital on long term investments in Australia. Among the issues affecting investment decisions in these areas are resource access and environmental constraints, including greenhouse gas emissions policy.

Industry is looking for a consistent, long term policy approach to its activities, under which investment can be made in a timely manner and with a minimum of administrative process. It believes, in particular, that the minimisation of the delays associated with granting access and gaining approvals will greatly assist investment activity in this area. Of course an appropriate policy balance needs to be struck between access, planning and environmental considerations and the broader economic goal of encouraging further value adding through raw materials processing. Such policies also need to be implemented in a consistent manner over the longer term.

Industry Costs & Infrastructure

Any underlying comparative advantage that Australia may have in any area of industry will only be fully realised if these industries have access to the full range of inputs on a world competitive basis. In particular, given that they are frequently highly dependent on significant amounts of infrastructure inputs such as electricity, transport and water, access to efficient sources of these inputs can be of vital importance to the success of mineral and agricultural raw materials processing projects. The Industry Commission,¹² for example, notes that minerals processing is usually energy intensive, with energy costs of some processors constituting up to 40 per cent of variable operating costs.

¹² See Industry Commission, *Mining and Minerals Processing in Australia*, page 141.

While historically government has normally been responsible for the direct provision of much of this infrastructure, more recently provision has increasingly become the domain of private enterprises. With a view to enhancing competition and efficiency in these areas, there has been a growing tendency by governments at all levels to encourage private enterprise to either buy public utilities or to establish entities in competition with existing government producers. As a result, infrastructure provision in Australia has become increasingly efficient and has reduced the costs of production across industry. For example, over the four years to 1996-97, electricity prices for industrial users were reported to have fallen by 19 percent in real terms, and according to the World Competitiveness Yearbook, Australian electricity prices in 1997 were amongst the lowest in Asia.¹³

Although much has therefore been achieved in this area, there is significant scope for further improvements. Indeed, this has been the Government's clearly stated aim in *Investing for Growth*.

If Australian business is to maximise its ability to compete internationally it needs access to essential inputs and infrastructure at prices, quality and service levels equal to the best in the world. Microeconomic reform helps to achieve this by enhancing efficiency, increasing economic flexibility and driving increased productivity and competition. Such reform also supports the Government's macroeconomic policy objectives. Measures that encourage increased productivity and that lower input costs and increase competition allow the economy to grow faster without causing inflationary pressures.(Page 17)

So while governments may have less involvement as providers and financiers of infrastructure, there is a continuing need for governments to ensure that infrastructure is delivered in an appropriate and efficient manner throughout Australia, including remote areas. This is particularly the case for transport, where the size of Australia's land mass and its relatively isolated geographical location makes it vital to ensure it has access to efficient transport networks, including international and coastal shipping as well as road, rail and air.

Although transport accounts for only about 6 per cent of GDP and directly employs less than 400,000 Australians, it influences the cost structure in every sector of the economy and, in particular, industries such as raw materials processing which involve moving large quantities of inputs and product. As noted by EPAC,¹⁴ the viability of raw materials processing in Australia is highly dependent on there being an efficient and cost competitive transport system. Whenever policy decisions are made in relation to the transport industry, it should be kept in mind that the decisions will have implications far beyond the transport industry itself, and that they will impinge particularly on the competitiveness of export industries.

Transport issues that may warrant attention from the Committee include coastal shipping cabotage, road funding, road mass limits, rail freight charges and whether there is a need for a more efficient freight chain system through multi-modal transport networks.

Labour and skill issues

The achievement of effective and productive, enterprise-focussed employee relations within the Australian resources and raw materials processing sectors is seen as critical to the sectors maintaining a competitive edge in the global market. This is particularly the case following the Asian economic downturn and the consequent softening in world demand (and prices) for resources and semi-processed commodities.

¹³ Invest Australia, *A Wealth of Opportunities*, 1999, page 34.

¹⁴ EPAC, *Raw Materials Processing: Its contribution to structural adjustment*, page 38.

The labour issues of significance include such matters as downsizing (including the retrenchment process and redundancy payments), shift roster issues, annual leave provisions for continuous shift employees, performance management, workers' compensation issues, immigration provisions and issues relating to wages and conditions (particularly for new operations). The creation of flexibility within the industrial relations system is seen as the key to settling such issues with minimal industrial disputation.

Equally important is the question of skill formation. As exploration, extraction and processing are increasingly becoming capital and knowledge intensive activities, there is a growing need for more highly skilled and trained workers. Issues such as access to remote education and training, the loss of worker's skills in the bust/boom cycles, the occurrence of skill shortages and the need for multi-skilling of workers to enhance labour flexibility and productivity, are perennial issues for the raw materials processing sector.

Trade Issues

Trade barriers of different types can also work to harm the competitiveness of existing and potential raw materials processing industries. While the tariffs on early stage processed products are generally relatively low, as noted by EPAC,¹⁵ this can still confer a significant level of effective protection when the level of value adding is only modest, as indeed can non-tariff barriers. Furthermore developing and newly-industrialising nations often assist the development of their export processing industries in a variety of other ways, including the underpricing of energy and various substantial tax advantages and incentives. Trade in processed food is also still constrained by the agricultural policies of the industrialised countries.

Given that all these measures can significantly reduce the opportunities to further export value added product, countries such as Australia, that appear to have significant advantages in raw material processing, need to take continuing and meaningful action against these measures. This is probably best achieved through international forums such as the World Trade Organisation and Asia Pacific Economic Co-operation (APEC) (where there already exists an agreed timeframe for achieving free trade). Also bilateral discussions may play a useful part.

It needs to be recognised, however, that efficient production of value added materials and free trade in these goods is not a guarantee of success. Effective marketing and supply mechanisms, particularly overseas, are additional important ingredients. This may be facilitated in certain markets by Government to Government trade relations and promotion.

¹⁵ EPAC, *Raw Materials Processing; Its Contribution to Structural Adjustment*, April 1988, page 27.

Conclusion

There would appear to be a number of potential areas to focus an investigation of the potential for Australia to increase value adding through raw materials processing. As indicated by the Industry Commission when it last examined the question of minerals processing in Australia,¹⁶ the full potential for the processing industries does not yet appear to have been realised, although some progress has been made since then.

In investigating this issue, there are a number of areas which the Committee might wish to explore further including possible measures to enhance the general economic environment for processing activities by the removal of impediments.

Given the broad ranging nature of many of the underlying questions, however, the Committee may wish to choose a few primary issues for further investigation. This approach could also give due recognition to the fact that some of these issues (such as taxation) are already the subject of a current government review and that other issues have already reaped the benefits of on-going concerted government action. In addition, there is no doubt these issues will also be considered in the context of other studies, including the Department's Downstream Petroleum Products and the Liquefied Natural Gas Action Agendas.

Nevertheless, in recent years Australian industry has benefited from low inflation, sustainable growth, and a significant budget surplus at the Commonwealth Government level (contributing to national savings and lower interest rates). Substantial microeconomic reform has also been undertaken in the areas of electricity, gas, workplace relations, communications and transportation, as well as continued tariff reductions. All these initiatives have brought much needed efficiency gains to the economy as a whole.

Recognition also needs to be given in the Committee's deliberations to the fact that all of the issues do not fall exclusively within the realm of the Commonwealth Government, or even that of the States and Territories. The problems identified require action by all parties, including industry, unions, community interest groups as well as the Commonwealth, State, Territory and Local Governments. While governments can take the lead, support and action from a range of other parties will also be required if further value adding activity is to be encouraged. Any recommendations for further action should therefore address these wider responsibilities.

The other potential approach to examining the issue of value adding through raw materials processing is by case study, and we note the Committee's recent press release indicating that it intends to take this course of action. The Department would be pleased to provide a number of case studies which give insight on what can be achieved through focussing on the removal of impediments to growth in resource related industries.

¹⁶ Industry Commission, *Mining and Minerals Processing in Australia*, page 169

Detailed Industry Statistics

Table A1: Gross Value Added by Industry, chain volume measure (\$'million)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Agriculture, forestry and fishing	13 432	13 896	14 793	13 101	14 765	16 792	13 693	13 267	16 443	15 876	17 010
Mining	14 475	15 246	17 268	17 742	18 307	18 287	19 516	20 416	22 284	23 233	23 132
Manufacturing	59 470	60 277	59 563	57 448	57 289	59 328	62 654	61 915	64 025	65 468	66 746
Food, beverage and tobacco	10 786	10 792	11 047	11 095	11 330	11 415	11 946	11 573	12 084	12 506	12 901
Textile, clothing, footwear and leather	4 192	3 920	3 747	3 525	3 298	3 285	3 346	3 348	3 104	3 114	3 136
Wood and paper products	3 356	3 105	2 823	2 772	2 794	2 966	3 045	3 093	3 136	3 290	3 341
Printing, publishing and recorded media	6 781	6 891	6 951	6 514	6 552	6 651	7 361	7 234	7 502	8 274	8 272
Petroleum, coal, chemical, etc	6 025	5 937	6 111	6 091	6 086	6 337	6 697	6 675	7 113	7 274	7 512
Non-metallic mineral products	4 027	4 164	3 952	3 552	3 715	4 044	4 061	3 634	3 384	3 439	3 481
Metal products	9 166	9 713	9 583	9 375	9 409	9 925	9 962	9 928	10 575	9 932	10 111
Machinery and equipment	12 968	13 526	13 082	12 528	12 010	12 496	14 053	14 287	14 836	15 204	15 418
Other manufacturing	2 382	2 320	2 336	1 978	1 996	2 043	2 219	2 162	2 224	2 448	2 577
Services	258 401	272 161	278 135	275 269	280 535	292 356	308 515	322 972	332 676	349 000	366 295
Electricity, gas and water supply	11 155	11 817	12 221	12 410	12 455	13 000	13 354	13 484	13 666	14 108	14 337
Construction	23 063	25 501	24 147	21 958	21 501	23 359	25 401	25 409	25 657	27 953	31 061
Wholesale trade	22 085	23 955	22 783	21 190	21 652	22 041	24 839	26 624	27 948	29 742	31 876
Retail trade	23 182	24 169	24 568	24 312	25 320	25 676	26 869	28 417	29 195	30 072	31 333
Accommodation, cafes and restaurants	8 672	9 249	9 436	9 278	9 372	9 605	10 602	11 089	10 934	11 183	11 701
Transport and storage	25 037	25 501	26 405	26 520	26 824	27 815	29 404	30 742	32 206	32 974	33 962
Communication services	6 768	7 308	7 933	8 547	9 201	10 366	11 262	12 538	13 752	15 172	16 273
Finance and insurance	22 625	24 618	25 714	25 279	24 903	25 332	26 363	28 217	30 172	31 662	33 238
Property and business services©	37 847	39 996	42 235	41 599	43 213	45 368	47 985	50 893	52 435	57 364	61 788
Government administration and defence	19 232	18 912	18 915	19 591	20 090	20 788	21 985	22 214	22 430	22 665	22 646
Education	19 151	19 554	20 709	20 467	21 436	23 296	23 467	24 467	23 928	23 546	23 703
Health and community services	23 441	24 608	25 608	26 682	26 810	27 715	28 419	29 199	29 751	31 184	31 883
Cultural and recreational services	7 366	7 545	7 706	7 838	8 007	8 132	8 435	8 779	9 206	9 662	10 083
Personal and other services	8 777	9 428	9 755	9 598	9 751	9 863	10 130	10 900	11 396	11 713	12 411

Source: ABS 5206

Table A2: Persons employed by Industry ('000s)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Agriculture, forestry, and fishing	433	428	433	421	404	408	403	409	419	431	421
Mining	96	103	101	92	88	89	86	85	89	82	84
Manufacturing	1 177	1 213	1 191	1 103	1 088	1 079	1 111	1 115	1 118	1 135	1 098
Food, beverages & tobacco	167	184	179	168	187	176	176	184	179	180	186
Textile, clothing, footwear & leather	119	121	114	104	98	103	107	100	101	103	90
Wood and paper product	75	82	79	70	69	74	71	73	65	65	62
Printing, publishing & recorded media	106	107	105	105	105	106	109	110	115	126	112
Petroleum, coal, chemical & associated product	105	106	110	99	98	107	105	104	101	104	100
Non-metallic mineral product	55	53	53	54	52	50	48	55	50	44	49
Metal product	196	198	194	182	176	171	185	177	182	180	180
Machinery & equipment	273	279	273	247	227	216	231	229	245	252	228
Other	81	84	86	75	75	77	81	83	79	82	92
Services	5 660	5 972	6 120	6 051	6 032	6 069	6 285	6 610	6 699	6 739	6 950
Electricity, gas and water	121	117	106	102	104	95	90	84	72	66	65
Construction	534	600	598	538	521	549	569	601	596	580	622
Wholesale trade	468	500	513	503	484	500	496	508	490	490	510
Retail trade	1 038	1 096	1 118	1 085	1 096	1 107	1 157	1 199	1 249	1 229	1 265
Accommodation, cafes and restaurants	281	295	315	335	338	341	360	388	378	404	408
Transport and storage	375	386	382	384	361	359	372	386	394	395	395
Communication services	143	149	150	144	132	126	139	151	168	155	150
Finance and insurance	333	351	366	345	325	313	316	315	317	315	322
Property and business services	530	581	607	613	627	610	694	787	811	857	928
Government administration and defence	335	327	354	353	352	376	355	373	373	355	334
Education	481	498	526	525	542	554	548	575	585	578	593
Health and community services	617	652	652	690	693	691	711	744	767	778	811
Cultural and recreational services	140	157	154	160	158	158	179	194	183	202	205
Personal and other services	264	264	277	276	299	291	297	307	314	334	343

Source: ABS 6203

Table A3: Gross value added, by industry and country, 1995 (US\$ million)^a

<i>Industry</i>	<i>Australia</i>	<i>Canada</i>	<i>France</i>	<i>Germany</i>	<i>Japan</i>	<i>United Kingdom^b</i>	<i>United States^b</i>
Agriculture, hunting, forestry & fishing	7 485	11 426	33 173	21 151	52 032	15 504	124 300
Mining and quarrying	14 036	18 998	5 119		4 467	25 982	113 435
Manufacturing	42 686	85 943	205 687	355 754	614 366	173 262	1 120 843
Food, beverages and tobacco		12 641	28 510		63 079	24 953	110 499
Textiles, wearing app. & leather		4 085	11 767		11 694	9 314	56 774
Wood & wood prod., including furniture		5 460	6 359			2 396	44 991
Paper & paper prod., print. & pub.		11 928	15 674		15 049	19 709	119 714
Chemicals & chemical petroleum, etc.		11 381	40 453		77 199	36 688	194 246
Non-metallic mineral products, etc.		2 270	8 283		22 063	5 750	25 681
Basic metal industries		5 714	9 911		46 752	16 862	47 520
Fabricated metal products, etc.		29 801	81 540		291 503	54 538	501 822
Metal products							79 273
Agricultural & industrial machinery						13 274	129 225
Office & data processing machines							45 323
Electrical goods						23 035	141 970
Transport equipment						18 228	99 810
Other manufacturing industries		2 347	3 194		87 028	3 948	20 868
Other Industries	242 612	363 822	730 228	942 561	1 771 553	633 749	4 824 659
Total	306 819	480 189	974 207	1 319 465	2 442 418	848 497	6 183 237

Note **a** 1990 prices **b** Due to data availability, data for the United Kingdom and United States relates to 1994.

Source: OECD CBS Statwise data

Examples of Major Commodities Projects^a identified by ABARE
Attachment B

<i>Project</i>	<i>Company^b</i>	<i>Location</i>	<i>Status^c</i>	<i>Start up</i>	<i>New capacity^d</i>	<i>Capital^e</i>	<i>Employment^f</i>
Darwin LNG Project	Shell/ Woodside	Darwin, NT	New project, pre-feasibility stage	2005	7.5 Mt LNG	\$10b	na
North West Shelf – 2 LNG Trains (4&5) plus Second trunkline	Woodside	North West Shelf WA	Expansion, feasibility study	- Trunkline mid-2001 - LNG by 2003 (fourth train)	7.5 Mt LNG	\$8.5b	2000 C 600 O
Gorgon LNG (staged Development, 2 trains ultimately)	WAPET	Carnarvon Basin, WA	New project, feasibility study under way	LNG exports by 2004	8 Mt LNG ultimately	\$8b	4000 C 300 O
Bayu/Undan LPG/Condensate Field	Phillips/BHP Petroleum	Timor Gap: Zone of cooperation	New project, committed	2002-03	30–50 kbd condensate And LPG	\$2.7b	1380 C 90 O
DRI plant	Australian United Steel Industries	Pilbara, WA	New project, feasibility study completed	na	3.6 Mt DRI	\$1.8b	2000 C 300 O
Pellet, HBI and possibly steel plant	Mineralogy	Pilbara, WA	New project, feasibility study completed	na	6.0 Mt pellets 4.0 Mt HBI	\$1.8b	1700 C 400 O
PNG–Qld gas pipeline	Chevron/ AGL/ Petronas	PNG to QLD	New project, feasibility study under way	mid-2001	300 PJ pa	\$1.5b	1800 C 60 O

<i>Project</i>	<i>Company^b</i>	<i>Location</i>	<i>Status^c</i>	<i>Start up</i>	<i>New capacity^d</i>	<i>Capital^e</i>	<i>Employment^f</i>
Steel plant	Compact Steel	Rockingham, WA	New project, feasibility Study completed	na	1.4 Mt steel	\$1.5b	2000 C 700 O
Comalco Alumina Refinery project	Comalco Aluminium	Gladstone, QLD or Malaysia	New project, location study under way	after 2000	1400 kt alumina	\$1.4b	2000 C 550–900 O
DRI and steel plant	An Feng Kingstream	Geraldton, WA	New project, feasibility study completed	na	2.4 Mt steel	\$1.4b	2000 C 822 O
Laminaria/ Corallina Oilfield	Woodside Consortium	Timor Sea	New project, under construction	late 1999	170 kbd max 140 kbd from Lam/Cor fields	\$1.37b	Na
HBI plant	Mt Gibson Iron	Geraldton, WA	New project, feasibility study completed	na	2.6 Mt HBI	\$1.1b	1100 C 360 O
West Angelas	Robe River	Pilbara, WA	New project, feasibility study under way	2001	5 Mt initially, 20 Mt eventually	\$1b	1200 C 450 O
Hope Downs	Hancock Prospecting	Pilbara, WA	New project, feasibility study under way	na	15–25 Mt	\$0.8–1.6b	300 C 150 O

Note: a Includes projects expected to commence production over the medium term and for which capital expenditure is expected to exceed \$1 billion. *b* Principal operating companies. *c* Type of project and stage of development. *d* Annual incremental capacity expected in terms of contained mineral or product; For oil and condensate kbd ('000 barrels a day) and gas PJ (petajoules a day) and liquid petroleum gas LPG (Mt). *e* Total capital expenditure as reported by the company in current dollars. Includes cost of development, plant and equipment. *f* Reported employment. Where possible, project employment has been shown at both the construction phase (shown as 'C') and operational phase (shown as O).

Source: ABARE, Australian Commodities Forecasts and Issues (June 1998)

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