A report on the economic and social contribution of the Plastics and Chemicals Industries to Victoria and Australia

A report for the:

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Plastics and Chemicals Industries Association (PACIA); and
ACCORD Australasia

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1. The Victorian chemicals sector is one of the most important strategic drivers of Victorian economic activity.

Chemical based products are an essential input into most sectors of the Australian economy. In manufacturing it would not be possible to produce a large proportion of the finished products that are currently produced without the use of chemical products.

In other sectors, the use of chemical products is an important driver of the increase in our standard of living over the past half century. This extends from the use of chemicals in agriculture, which has allowed very large increases in productivity, to the use of chemical products in health and hygiene applications ranging from blood bags to disinfectants and water treatment chemicals.

The importance of chemical products is demonstrated by the scale of use of chemicals in Victoria (the figures below are consumption figures and therefore include local manufactured products, as well as imports). In 2004, it is estimated that:

- $2.3 billion of chemicals sector product was used by the agricultural sector;
- $3 billion of chemicals sector product was used as inputs into the metals, transport and machinery sector;
- $4.8 billion of chemicals sector product was used by the wholesale, retail and business services sector;
- the construction sector spent $1.3 billion on chemical products used for direct construction materials; and
- Australian households spent $8.6 billion on chemicals sector products.

Given this scale of chemical production, not unexpectedly, the chemicals sector is one of the most important drivers of Victorian economic activity.

In 2004 the chemicals sector was directly or indirectly responsible for 7.3 per cent of total Victorian economic activity, as measured by gross State product, and directly or indirectly created 134,000 Victorian employment positions. This increases to 9.1 per cent when account is taken of the productivity enhancing/cost saving benefits the chemicals sector generates for other sectors in the Victorian economy.

Furthermore, the industry generates higher quality (i.e. full-time/high income) employment compared to the average employment conditions for non-chemicals industries. If the above figures were adjusted to reflect chemical industry employment conditions, the Victorian chemicals sector could be credited with the creation of 159,000 average quality adjusted employment positions, or 6.8 per cent of total Victorian standardised employment further emphasising the important position the industry plays in the broader economy.

The chemicals sector has one of the highest local output and employment multipliers in the economy, especially if a broad based manufacturing sector exists.

Industries and parts of industries differ in terms of their strategic value to the Victorian economy. What makes an industry strategic is its:

- capacity to export either interstate or overseas;
- capacity to support the investment effort of the State economy; and
- capacity to support expenditures driven by accumulated wealth.

In terms of its strategic ranking, the Victorian chemicals sector has a strategic value which is:

- the same as the motor vehicles industry;
- at least one and a half times the contribution of the tourism industry;
- three times the contribution of the mining industry; and
- not far behind the contribution of the food industry.

There is a relatively low awareness, among both policy makers and the general public, of the strategic value of the Victorian chemicals sector. Hence, one key objective of this study is to raise the awareness of the strategic value of the industry and the importance of its contribution to Victoria's economic activity.

The Victorian chemicals sector is at the cross-roads. Threats and opportunities give a wide range of possible outcomes for the sector over the next decade.

Whether or not the Victorian chemicals sector can increase, maintain or reduce its strategic value to the Victorian economy over the next decade will depend on how it responds to the threats and opportunities posed by the globalisation of the industry and the rise of China, India and other developing country economies as these build large scale competitive chemical industries with increasing capacities to innovate.

Therefore, additional objectives of the study are: to assess the current performance of the Victorian chemicals sector in the context of the threats of globalisation; assess a current trends future for the sector; and nominate strategies which could improve the future performance of the sector.

This report is based on the findings of a study of the industry undertaken by the National Institute of Economic and Industry Research (NEIR).

2. The chemicals sector consists of integrated industries making intermediate products from minerals, such as oil and gas by-products, and on-selling these products to industries which make finished chemical products to be used as components in other manufactured products or as finished goods for household or investment use.

The analysis contained in the main report of this study was conducted at the 21 chemical industry level using the sector and industry definitions of the ANZSIC system developed by the Australian Bureau of Statistics (ABS). The industry definitions are defined by a four-digit code. Table 1 gives the description and principal products produced by each of the 21 industries comprising the chemicals sector. The list of industry and products also gives an insight into the inter-relationships within the chemicals sector.

The first five industries listed in Table 1 belong to what is called the 'basic chemicals sub-sector'. This sub-sector produces intermediate chemical products such as chlorides, polymers (e.g. polyethylene), acids, dyes, fertilisers, oxides, gases (hydrogen and oxygen) etc. Although some of these products are used by final users (e.g. fertilisers and industrial gases), the majority of the products are inputs into other chemical industries. The different types of polymers, for example, are basic feedstock for the plastic industry.

Products produced by the basic chemicals sub-sector have low degrees of differentiation and high scale. This leads to high capital intensity of production and high levels of concentration within the sub-sector.

The next seven industries listed in Table 1 belong to the 'knowledge product sub-sector'. This sub-sector produces a range of products from antibiotics, insecticides and fungicides to sprays, soaps, detergents, deodorants, skin creams etc. In contrast to the basic chemicals sub-sector, this sub-sector has a high degree of differentiation and competition focuses on producing world best practice products. Successful sustained innovation is the key to maintaining product differentiation and profitable enterprises.

The final sub-sector listed in Table 1 is the 'specialty products sub-sector' that produces products including rubber tyres, adhesives, glues, cleaning agents, and a wide range of plastic products. This sub-sector stands midway between the basic chemicals and knowledge product sub-sectors in terms of production technologies and competitive mechanisms.

The NIEIR report presents detailed tables of the product composition of chemical industries and sub-sectors. The important features of this analysis can be summarised in terms of the fiscal year outcomes in 2003.

- The synthetic resin industry, polyethylene is the major commodity, making up 25 per cent of production. For the organic chemicals industry, ethers and peroxides make up 18 per cent of production.
- Organic chemicals, the largest contribution to production comes from synthetic colouring agents and pigments, which make up 29 per cent of production.
- Inorganic chemicals, synthetic colouring agents and pigments make up 37 per cent of production.
- Paint, the majority of production is for architectural and decorative paints with 52 per cent of production, followed by industrial paints with 22 per cent of production.
- The pesticides industry, 58 per cent of production is in agricultural and pastoral chemical products.
- Fifty per cent of the soap industry's production is for surface washing or cleaning products, with soap and toothpaste contributing 12 and 11 per cent respectively of total production.
- Hair shampoos, conditioners, etc. make up 39 per cent of the cosmetics and toiletry industry production with 36 per cent coming from perfumes and deodorants.
- Rubber sheets, strips and plates make up 24 per cent of other rubber products industry production, while most of the plastic blow moulded product industry makes plastic bottles.
- Most of the products of the plastics extruded products industry is in pipes and hoses.

Table 1	**The sub-sectors, industries and products framework of Australian chemicals**		
Sub-sectors	**Industries**	**Principle products**	**Production and product characteristics**

Basic chemicals sub-sector	Fertilizer manufacturing	Ammonia (fertilizer), ammonium nitrate, ammonium phosphate, superphosphate, urea, fertilizers (fishmeal, potash, etc.).	• Capital intensive – relatively large scale enterprises. • High volume – importance of economies of scale for competitiveness. • Low degree of product differentiation – many products, commodities. • High barriers to entry.
	Industrial gas manufacturing	Acetylene gas, carbon dioxide, carbon monoxide, hydrogen, nitrogen, oxygen.	
	Synthetic resin	Plastic raw materials, polyethylene, polypropylene, polystyrene, polyvinyl chloride, synthetic rubber, etc.	
	Organic industrial chemicals	Organic acids, dye base, phenol, pigment, styrene, urea (high grade), vinyl chloride.	
	Inorganic industrial chemical manufacturing	Chlorine, fluoride, acids (nitric, hydrochloric, phosphoric, sulphuric), sodium (bicarbonate, carbonate, hydroxide), zinc oxide.	
Knowledge products sub-sector	Medicinal and pharmaceutical products	Antibacterial products, antibiotic products, medical gas, ointments, toxins, vaccines, vitamins.	• Very high degree of differentiation between products. • Products focused on delivering specific outcomes for humans, animals, plants, etc. • Sustained innovation necessary for continued competitiveness. • High levels of R&D and marketing expenditures
	Cosmetics and toiletry products	Face, hand or skin lotions or creams, deodorants, hair shampoos and conditioners, nail polish, sunscreen, perfume, lipstick.	
	Soap and other detergents	Detergents, soaps, disinfectants, laundry bleach, toothpaste, washing powders or liquids.	
	Pesticide manufacturing	Dip, fly spray, fungicide, insecticides, insect repellants, animal poisons, weed killer.	
Specialty products sub-sector	Explosives	Dynamite, blasting powder, fuses.	• High degree of product differentiation. • Flexible manufacturing techniques can be employed for economic, relatively low production runs. • Medium levels of R&D and marketing expenditures.
	Paints	Paint, putty, stains, primers, fillers.	
	Rubber product manufacturing	Boots, erasers, gloves, hoses, mattresses, sheeting, sponges, washers, water bottles.	
	Rubber tyres	Motor vehicle tyres, tubes, retreads.	
	Plastic blow moulded products	Bottles.	
	Plastic extruded products	Hoses, pipes.	
	Plastic bags and film manufacture	Bags, food wrapping, film, garbage bags.	
	Plastic product, rigid fibre reinforced products	Automotive components, rigid plastic sheets, swimming pools, water tanks.	
	Plastic foam products	Fast food containers, foam padding.	
	Plastic injection moulded products	Buckets, garbage bins, plastic kitchenware, floor coverings.	
	Ink products	Writing, drawing or printing ink.	
	Other chemical products	Antifreeze, adhesives, glues, dry cleaning components, removers (rust, stain, fat), surface cleaners.	

Summary report industry disaggregation

While this report does not reproduce the commodity and industry detail of the NIEIR report, a substantial degree of data aggregation has been undertaken to present the industry and commodity data into the following sub-sectors:

- synthetic resins;
- other basic chemicals;
- medical and pharmaceutical products;
- pesticides, soap and cosmetics (other knowledge based products);
- plastic products;
- other specialty products.

The synthetic resins industry is explicitly included because of its importance to the Victorian chemicals sector. The remaining sub-sector classification represents the minimum degree of disaggregation that would be required to gain insights into both the structure and structural change in the Victorian chemicals sector from a stand-alone reading of the Summary Report.

The chemicals sector supports activity in a wide variety of industries

At the broader sector level, Table 2 shows the allocation of chemical products in 2004 for Australia. The total allocation of product (excluding exports) comes to $44 billion or about 15 per cent of the turnover of goods in the Australian economy. Approximately 20 per cent of the allocation comes from the other basic chemicals and pharmaceuticals sub-sectors. The important aspects to note from the table, however, are the inter-relationships between the sectors. Thus, the synthetic resin industry basically supports production in the chemicals sector.

From Table 2, 89 per cent of synthetic resin industry products are absorbed by the chemicals sector. That is, the bulk of synthetic resin production supports the production of other intermediate and finished chemical products.

The ‘other basic chemicals’ sub-sector also depends on the chemicals sector as a whole for its product demand. One third of ‘other basic chemical’ sub-sector’s products are used as inputs into the production of chemicals sector products. The next most important general industry sector for the products of the ‘other basic chemicals’ sub-sector is the agricultural sector, which absorbs 13 per cent of the demand. Fertilisers are the most important product group in the agricultural sector’s demand for ‘other basic chemicals’ sub-sector products.

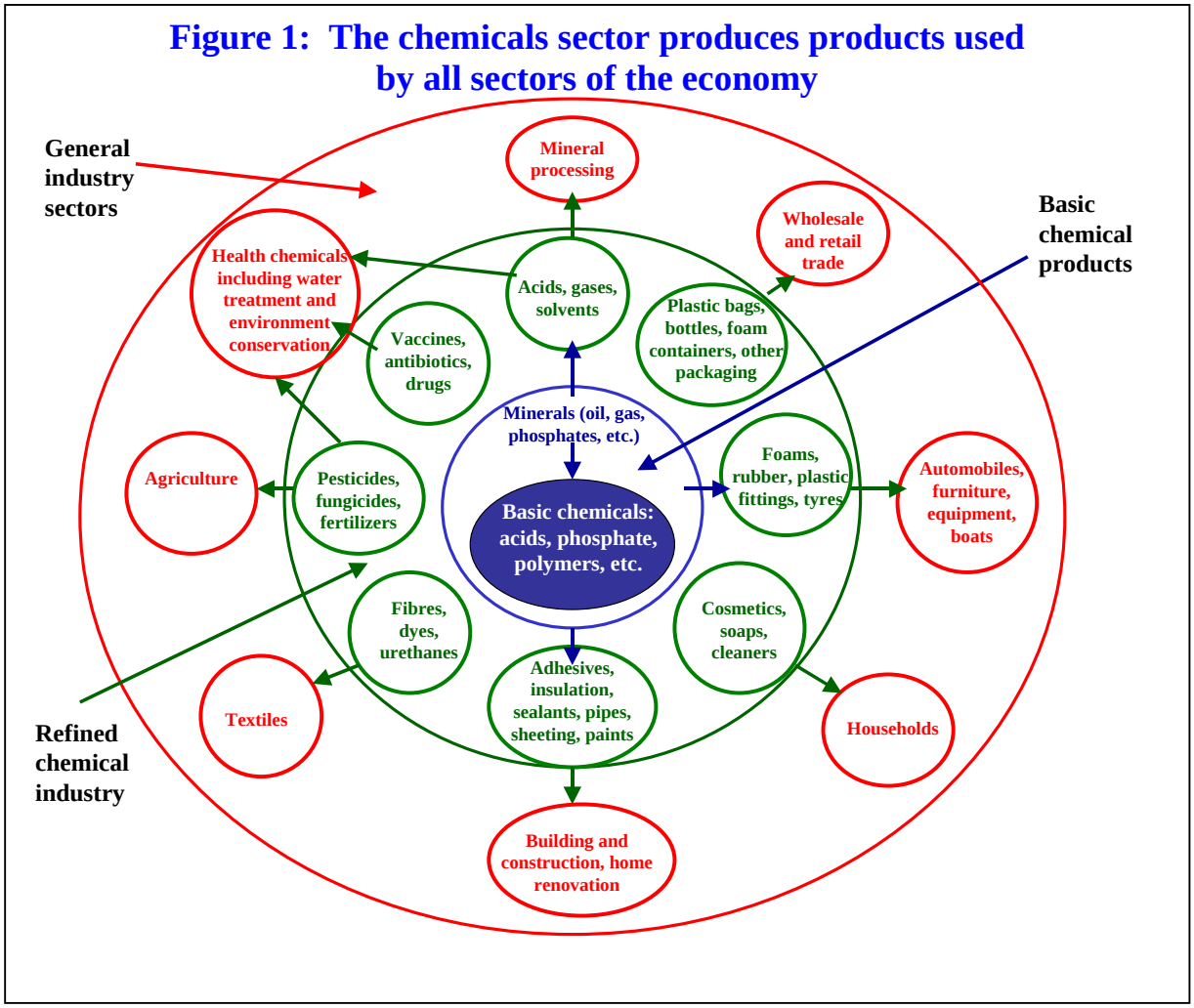
The soap and cosmetic sub-sector are small components of the Victorian chemicals sector. In 2004, the combined output share was 4.7 per cent. This sub-sector is exposed to intensive retail competition so the manufacturing firms need to be knowledge based, understanding both consumer demand and product formulation.

The bulk of the products of the medicinal and pharmaceutical sub-sectors are allocated to the household sector. This is either directly (25 per cent), or indirectly via the government sector (one third), or finally by direct allocation to the health sector (11 per cent).

From Table 2, plastic products are used by most general industry sub-sectors. Almost a quarter of plastic products are absorbed by the other commercial and business services sub-sector, which includes the retail and wholesale sectors.

The products of the 'other specialty products' sub-sector are also allocated widely across general industry sub-sectors.

Figure 1: The chemicals sector produces products used by all sectors of the economy



3. In 2004 the Victorian chemicals sector produced $12 billion of output, representing nearly 40 per cent of production of the Australian sector.

The basic statistical economic data for of the Victorian chemicals sector are profiled in Table 3.

In constant dollar terms, production in the sector rose from just under $10 billion in 1996 to $12.4 billion in 2004. The average annual growth rate within the chemicals sector was 2.7 per cent per annum, which was less than the Victorian GDP growth over the period of 3.9 per cent per annum. The basic chemical sub-sectors grew relatively strongly, as did other specialty products and pharmaceuticals.

The specialty products sub-sector makes up 50 per cent of the sector with more or less equal contributions coming from plastics and other specialty products. The two basic chemical sub-sectors contribute approximately 14 per cent each to overall sector output while the smallest contribution comes from soaps and cosmetics etc. with the 2004 output share being 7.2 per cent.

In terms of the sub-sectors in Table 3 the highest contribution to the national output total comes from the synthetic resins industry, with output share in the national total of 61 per cent in 2004. This represents a 7 percentage point decline since 1996 in Victoria's share of the national total. For the specialty products sub-sectors, Victoria's share in 2004 was in excess of 40 per cent of the national total. The contribution of the other basic chemicals sub-sector and the other knowledge product sub-sector to the national total is close to Victoria's manufacturing share in total national manufacturing output. That is, the two Victorian sub-sectors contribute approximately one quarter to the national total.

The Victorian chemicals sector is inward focused with a large dependency on domestic demand for activity.

From Table 4, in 2004 only 10 per cent of production was allocated to international exports. However, a major contributor here was the pharmaceutical industry, where a quarter of production is allocated to exports. If the pharmaceutical industry is excluded, the export share of domestic production falls to 8 per cent. The change in the export share between 1996 and 2004 was largely due to the increase in pharmaceutical exports. For the rest of the sector the export share has been largely stagnant.

International imports now account for a third of domestic Victorian market, which represents an increase from the quarter contribution from international imports in 1996. Other than for pharmaceuticals, the increases in import share have been for the other knowledge products sub-sector and plastics.

In short, the Victorian chemicals sector is heavily dependent on Australian domestic demand. It is, therefore, highly vulnerable to increases in import penetration.

4. The recent relatively inferior growth of the Victorian chemicals sector has been due to loss of market share to imports, loss of interstate markets and the poor performance of Australian manufacturing generally.

On average over the last decade, the rate of growth of Australian manufacturing has been significantly less than the rate of growth of gross domestic product. In part this has been due to industry contraction due to loss of tariff protection, as is the case for the textiles, clothing and footwear sector.

For other manufacturing sectors, it has simply been due to a relentless growth in import share, which has not been offset by export expansion.

As can be seen from Table 5, the growth in demand for chemical products by Australian manufacturing sectors has been subdued, at best, over the 1996 to 2004 period. To some extent this has been offset by growth in household demand, although the growth here has been significantly less than the overall growth in consumption expenditure, which has been in the vicinity of 4 per cent per annum.

On top of this sluggish demand growth, there has been loss of market share to international imports and, in the case of the Victorian chemicals sector, a decline in absolute allocation of product to interstate markets. In part this has been due to the expansion of the chemicals sector in other States which, in turn, is partly the result of the destruction of national supply chains due to rapid increases in international import penetration in both chemicals and non-chemicals sectors.

Table 2 Allocation of chemicals sector products (domestically produced plus imports): Australian industry and households in 2004 (1999 $ million and per cent of total allocation)

From/To	Agri-culture	Mining	Food, textiles, clothing and footwear	Chemicals	Metals, transport and machinery	Other manu-facturing	Con-struction	Other comm-ercial and business services	Other services	House-holds	Govern-ment and invest-ment	Total
Total allocation (1999 $ million)												
Synthetic resin products (polyethylene, polystyrene etc.)	1.4	8.8	29.1	3013.0	182.6	60.4	10.5	44.0	21.0	0.0	0.0	3370.8
Other basic chemicals	1244.4	246.4	127.3	3197.7	990.5	972.2	95.3	582.2	807.6	1369.3	0.0	9632.8
Medicinal and pharmaceutical product products	653.1	63.8	15.2	1762.1	117.8	145.3	10.3	232.3	1022.6	2432.8	3191.0	9646.4
Soaps, cosmetics and pesticides (other knowledge industries)	285.8	0.9	21.8	135.8	0.3	0.0	4.2	161.5	133.2	3468.3	0.0	4211.9
Plastic products	73.1	12.4	1437.6	939.2	607.3	1265.6	395.6	1799.5	499.0	399.6	303.6	7732.4
Other specialty products	78.9	791.2	94.7	941.7	1056.5	897.0	776.7	2023.4	1330.3	963.4	22.2	8975.9
Total chemicals sector	**2336.7**	**1123.5**	**1725.7**	**9989.5**	**2955.0**	**3340.5**	**1292.6**	**4842.8**	**3813.7**	**8633.5**	**3516.8**	**43570.2**
Total allocation (per cent of total)												
Synthetic resin products (polyethylene, polystyrene etc.)	0.04	0.26	0.86	89.39	5.42	1.79	0.31	1.31	0.62	0.00	0.00	100.00
Other basic chemicals	12.92	2.56	1.32	33.20	10.28	10.09	0.99	6.04	8.38	14.21	0.00	100.00
Medicinal and pharmaceutical product products	6.77	0.66	0.16	18.27	1.22	1.51	0.11	2.41	10.60	25.22	33.08	100.00
Soaps, cosmetics and pesticides (other knowledge industries)	6.79	0.02	0.52	3.22	0.01	0.00	0.10	3.83	3.16	82.35	0.00	100.00
Plastic products	0.95	0.16	18.59	12.15	7.85	16.37	5.12	23.27	6.45	5.17	3.93	100.00
Other specialty products	0.88	8.81	1.05	10.49	11.77	9.99	8.65	22.54	14.82	10.73	0.25	100.00
Total chemicals sector	**5.36**	**2.58**	**3.96**	**22.93**	**6.78**	**7.67**	**2.97**	**11.12**	**8.75**	**19.82**	**8.07**	**100.00**

Table 3 The Victorian chemicals sector: size, scale and share of national total					
				Average annual growth rate (per cent)	
	1996	2000	2004	1990-1996	1996-2004
The Victorian chemicals sector: gross output (1999 $ million)					
Synthetic resin products (polyethylene, polystyrene etc.)	1254	1346	1786	-2.5	4.5
Other basic chemicals	1016	1241	1635	0.8	6.1
Medicinal and pharmaceutical product products	1350	2024	1922	12.1	4.5
Soaps, cosmetics and pesticides (other knowledge industries)	810	995	894	3.6	1.2
Plastic products	3134	3383	2891	2.0	-1.0
Other specialty products	2394	2292	3223	2.2	3.8
Total	**9959**	**11281**	**12351**	**2.4**	**2.7**
The Victorian chemicals sector: gross output (share of total chemicals sector output – %)					
Synthetic resin products (polyethylene, polystyrene etc.)	12.6	11.9	14.5		
Other basic chemicals	10.2	11.0	13.2		
Medicinal and pharmaceutical product products	13.6	17.9	15.6		
Soaps, cosmetics and pesticides (other knowledge industries)	8.1	8.8	7.2		
Plastic products	31.5	30.0	23.4		
Other specialty products	24.0	20.3	26.1		
Total	**100.0**	**100.0**	**100.0**		
The Victorian chemicals sector: gross output (share of corresponding national total – %)					
Synthetic resin products (polyethylene, polystyrene etc.)	68.4	66.1	60.8		
Other basic chemicals	20.9	25.6	25.3		
Medicinal and pharmaceutical product products	35.7	36.8	38.0		
Soaps, cosmetics and pesticides (other knowledge industries)	23.8	26.5	28.2		
Plastic products	43.2	44.4	43.9		
Other specialty products	46.1	44.8	46.1		
Total	**37.8**	**39.1**	**39.6**		

Table 4 The Victorian chemicals sector: trade performance			
	1996	**2000**	**2004**
Exports as a per cent of production			
Synthetic resin products (polyethylene, polystyrene etc.)	12.8	10.1	7.7
Other basic chemicals	10.9	10.1	8.4
Medicinal and pharmaceutical product products	17.2	17.0	25.4
Soaps, cosmetics and pesticides (other knowledge industries)	6.7	5.4	11.2
Plastic products	2.8	3.5	6.3
Other specialty products	5.5	8.6	5.8
Total	**7.8**	**8.7**	**10.0**
Imports as a per cent of domestic supply			
Synthetic resin products (polyethylene, polystyrene etc.)	23.4	26.2	19.1
Other basic chemicals	52.7	52.0	44.8
Medicinal and pharmaceutical product products	26.2	33.9	52.4
Soaps, cosmetics and pesticides (other knowledge industries)	13.0	17.5	25.8
Plastic products	15.7	19.4	25.0
Other specialty products	23.3	28.3	26.4
Total	**25.3**	**29.5**	**32.9**

5. Despite relatively modest recent economic outcomes for the Victorian chemicals sector, in 2004 it still generated 2.3 per cent of national gross domestic product.

The detailed analysis of the plastic and chemical industry's economic significance is contained in the NIEIR report. These have been summarised in Tables 6 and 7, and show that the Victorian chemicals sector contributes:

- $36 billion to national gross output,
- $14.1 billion to national gross product at factor cost (the cost of factors used in production), and
- 201,400 to national employment.

In percentage terms, the Victorian chemicals sector contributes 2.3 per cent to national gross product at factor cost. These estimates are based on the standard type II multiplier methodology, where inter-industry and private consumption flow-on outcomes are also incorporated into the estimates. These flow-ons include the output, value-added or employment generated by the supplying industries and consumption expenditure, as well as those directly generated by the industry. However, ongoing chemicals sector investment, the expenditure of tax receipts generated by the industry or knowledge spillovers from the industry are not accounted for in this multiplier.

Table 5 Structural change in the chemicals sector: demand formation and Victorian chemicals sector output 1996-2004 (expressed as per cent of 1996 national output)

	Agri-culture	Mining	Food, textiles, clothing and footwear	Chem-icals	Metals, transport and machinery	Other manufact-uring	Con-struction	Other commercial and business services	Other services	House-holds	Govern-ment and invest-ment	Inter-national imports	Inter-national exports	Change in Victorian industry market share vis-à-vis industry in other States	Total change in Victorian industry output
Synthetic resin products (polyethylene, polystyrene etc.)	0.1	0.2	0.6	85.0	7.3	2.5	0.4	1.8	0.8	0.0	0.0	-31.8	-6.2	-31.6	29.1
Other basic chemicals	11.2	0.4	-0.2	37.9	15.6	4.0	0.9	0.7	5.7	12.6	0.0	-35.9	-3.5	-33.4	16.0
Medicinal and pharmaceutical product products	7.2	0.8	0.2	24.0	2.5	2.1	0.2	3.5	15.2	27.6	42.6	-131.8	21.0	-0.1	15.1
Soaps, cosmetics and pesticides (other knowledge industries)	-7.6	-0.1	-1.2	-2.9	0.0	0.0	-0.1	-3.8	-4.7	39.0	0.0	-18.3	3.2	-0.9	2.6
Plastic products	-0.1	-0.1	-4.7	-2.5	2.6	2.7	0.7	3.4	-1.2	2.2	1.3	-12.5	4.0	1.6	-2.8
Other specialty products	0.1	5.6	0.5	6.0	6.7	5.4	6.6	11.2	6.7	6.7	0.3	-22.4	2.1	-18.3	17.1
Total	**2.0**	**1.3**	**-1.3**	**16.1**	**5.6**	**3.0**	**1.7**	**3.4**	**3.8**	**13.8**	**7.2**	**-39.4**	**4.2**	**-11.2**	**10.1**

Overall the industry significance estimates are very conservative, with the total actual contribution of the Victorian chemicals sector to national economic activity likely to be significantly greater.

The economic and social significance of the Victorian chemicals sector can be measured in terms of reduction in the level of outcomes that would result if the industry did not exist. For the employment variable, this means that total national employment would be 201,000 lower (at least in the short run) than was the case in 2004.

The Victorian chemicals sector is particularly important, being responsible for generating 7.3 per cent of gross State product in 2004 and 6.8 per cent of total employment.

Crucially, the Victorian chemicals sector generates 158,700 standardised employment positions, or 68 per cent of total Victorian employment. The chemicals sector is indeed an important sector for generating wealth in the Victorian economy.

The analysis considered the contribution of the Victorian chemicals sector to actual employment. This comes to 134,134, or 58 per cent. The difference between the standardised and actual employment level indicates that the chemicals sector directly, and indirectly, generates high income employment positions in the Victorian economy, compared to the non-chemicals sector type industry.

However, while the sector remains significant to the economy, the performance of the Victorian chemicals sector over the last few years has declined. From Table 7, the Victorian chemicals sector contributed 10.1 per cent of total Victorian gross State product at factor cost in 1996, which implies that the fall in the chemicals sector contribution between 1996 and 2004 was 2.8 percentage points. This represents a reduction of more than one quarter in the value of the sector's contribution.

The strategic value of an industry is not necessarily represented by the total value of output of an industry. For example, a large part of Victorian tourism expenditures is derived from the employment and incomes generated from the activities of other Victorian industries. The strategic value of the tourism industry is basically represented by that part of activity that represents the sale of goods and services to interstate and international visitors.

The health sector, although very large, is mainly supported by the incomes and taxes generated from the activities of other industries in the Victorian economy.

For chemicals and motor vehicles, however, where the products produced can be replaced by imports, the strategic value of the industry is represented by total output.

Table 6 Economic significance of Victorian chemicals sector: contribution to national GDP and employment

	National gross domestic product (1999 $ million)		National gross domestic product (per cent)		Total national standarised employment ('000)		Total national standarised employment (per cent of national total)	
	1996	2004	1996	2004	1996	2004	1996	2004
Synthetic resin products (polyethylene, polystyrene, etc.)	1286.5	1475.0	0.3	0.2	19.9	21.0	0.2	0.2
Other basic chemicals	2901.9	3258.6	0.6	0.5	43.7	45.4	0.5	0.5
Medicinal and pharmaceutical products	1928.5	2669.5	0.4	0.4	33.2	37.6	0.4	0.4
Soaps, cosmetics and pesticides (other knowledge industries)	997.7	997.9	0.2	0.2	16.2	13.9	0.2	0.1
Plastic products	4309.6	3570.2	0.9	0.6	71.6	53.3	0.9	0.6
Other specialty products	1889.0	2097.5	0.4	0.3	33.8	30.2	0.4	0.3
Total	**13313.1**	**14068.7**	**2.9**	**2.3**	**218.4**	**201.4**	**2.6**	**2.1**

Table 7 Economic significance of Victorian chemicals sector: contribution to Victorian GSP and employment

	Victorian gross domestic product (1999 $ million)		Victorian gross domestic product (per cent)		Total Victorian standarised employment ('000)		Total Victorian standarised employment (per cent of Victorian total)		Total Victorian employment ('000)	
	1996	2004	1996	2004	1996	2004	1996	2004	1996	2004
Synthetic resin products (polyethylene, polystyrene etc.)	1252.7	1283.2	1.1	0.8	18.8	17.9	0.9	0.8	16.0	13.8
Other basic chemicals	2341.8	2743.6	2.1	1.8	34.2	37.1	1.7	1.6	14.6	15.8
Medicinal and pharmaceutical products	1629.4	1616.6	1.4	1.0	27.0	22.8	1.3	1.0	24.4	19.8
Soaps, cosmetics and pesticides (other knowledge industries)	1076.4	1024.6	0.9	0.7	17.5	14.1	0.8	0.6	16.5	12.9
Plastic products	3625.0	2893.1	3.2	1.9	58.7	42.7	2.8	1.8	54.5	37.2
Other specialty products	1569.8	1645.1	1.4	1.1	28.1	24.1	1.3	1.0	40.5	34.6
Total	**11495.0**	**11206.2**	**10.1**	**7.3**	**184.2**	**158.7**	**8.9**	**6.8**	**166.5**	**134.1**

From Table 8, the following holds. The strategic value of the chemicals sector, in terms of contribution to Victorian gross State product, is:

- the same as the motor vehicles industry;
- at least one and a half times the contribution of the tourism industry;
- three times the contribution of the mining industry; and
- not far behind the contribution of the food industry.

The tourism industry has a high capacity to generate employment because of the relatively high utilisation of part time and casual employment.

Table 8 The economic significance of the chemicals sector compared to the strategic value of other major sectors

Sector	Direct employ-ment ('000)	Indirect employ-ment ('000)	Total direct and indirect employ-ment ('000)	Per cent of total employ-ment (%)	Standard-ised employ-ment ('000)	Standard-ised employ-ment % of total employ-ment (%)	Per cent of gross State product (%)
Chemicals	33.7	100.4	134.1	5.8	158.7	6.8	7.3
Motor vehicles	41.2	102.1	143.3	6.1	151.2	6.5	6.2
Food	44.0	126.5	170.5	7.3	168.9	7.2	8.5
Tourism	not available	not available	131.2	5.6	107.6	4.6	4.5
Mining	6.3	33.7	40.0	1.7	54.7	2.3	4.4
Health	231.4	not applicable	65.8	2.8	64.9	2.8	2.3

The estimate that the Victorian chemicals sector is responsible for 7.3 per cent of Victorian economic activity in 2004 does not include the productivity enhancing opportunities the chemicals sector generates for other sectors in the economy.

The estimate that the Victorian chemicals sector is responsible, directly or indirectly, for generating 7.3 per cent of Victoria's gross State product is based solely on the current production and employment characteristics of the sector.

However, the Victorian non-chemical sectors benefit from the activities of the chemicals sector in a number of other ways. These channels of benefit include:

- the role of the chemicals sector in being the first to introduce new technologies (from overseas) that improve production costs or product characteristics that can also be applied in non-chemical industries to improve productivity and growth opportunities (such as nanotechnology);

- the role of the chemical sector's R and D effort in improving the prospects of successful commercial innovation for the R and D effort of non-chemical sectors; and
- the role of the chemicals sector in training employees in new technologies and giving them the vital initial experience that can be used to advantage by other industries when normal employee turnover occurs.

Figure 2 shows more micro mechanisms of how chemicals sector innovation can impact on other sectors of the economy.

These benefits will be cumulative. That is, once an innovation is made, the cost saving/product enhancement benefits will last up to ten years.

Based on German estimates of these innovation flow-on benefits, the Victorian chemicals sector provided the Victorian non-chemical sectors with innovation spill-overs estimated at $2.8 billion over the last decade. This gives a total economic contribution of the Victorian chemicals sector to Victoria's gross State product of $14 billion, or 9.1 per cent of GSP in 2004.

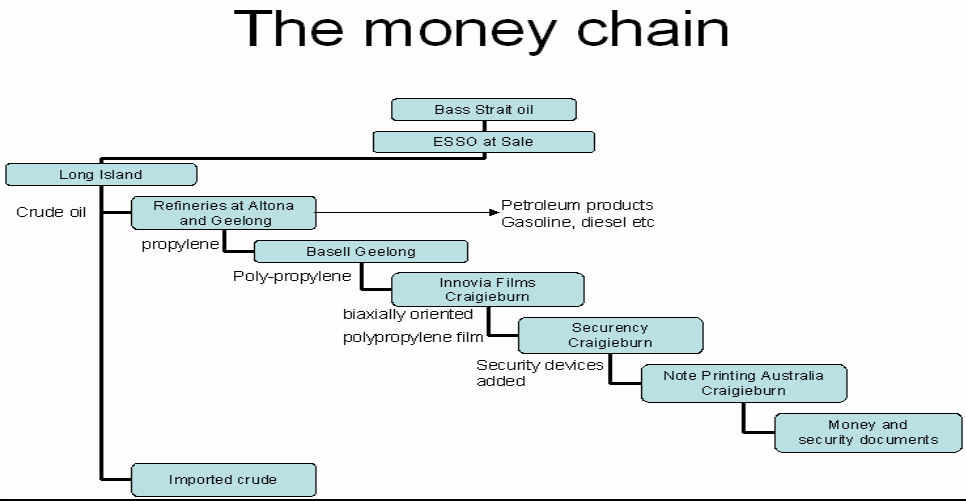
Some well known innovations created in Australia by companies within the plastics and chemicals industry are featured in the following case studies. Each of these boxes reveals the integration of the plastics and chemicals industry with other industries important to the economy. Given that manufacturing is becoming increasingly dependent on niche marketing and innovation, the local plastics and chemicals industry has a central role for the future.

Securing our currency - Plastic money

Developed in Australia and first circulated in Australia in 1988, plastic banknotes are now used in 22 countries. CSIRO expertise in polymer and synthetic chemistry in conjunction with Note Printing Australia was used to develop a non-fibrous and non-porous plastic film, which the banknotes are printed on. This substrate gives high tear initiation resistance, good fold characteristics and a longer lifetime than paper.

The substrate and the specially-developed protective overcoat prevent the absorption of moisture, sweat and grime so that the polymer banknotes stay cleaner. Simultaneously, CSIRO developed a variety of security features for use on the plastic banknotes. The result is the world's first plastic banknote. As well as being more secure, the banknote is four times more durable than rag paper notes.

Perhaps equally important is the fact that the plastic banknotes are made from 100% Australian made poly-propylene and support a number of key upstream firms as shown in the diagram below.



Environmental Innovation - Thermoformed Trays

Plantic Technologies Limited develops and manufactures biodegradable plastic materials. These are produced using renewable resources and assist manufacturers and retailers achieve environmentally friendly solutions to their packaging and product needs.

The company, which is based in Laverton North, a suburb of Melbourne, is rapidly expanding as its unique Plantic bio-degradeable polymer material gains market acceptance. The company's emphasis on on-going research and development of other biomaterials is ensuring it remains at the forefront of bio-degradable polymer technology.

The first commercial application of the innovative Plantic technology is in packaging and display trays. Plantic trays look, feel and function the same as traditional plastic trays except that Plantic trays are made from renewable resources, are compostable and, most interestingly, dissolve in water.

Plantic products are currently supplied to more than 10 local companies in Australia and several multinational companies with sales operations in Europe and development partners globally.

Exporting Australian ideas to America - MIEX® Resin

Miex Doc resin was developed by a consortium involving Orica, CSIRO and the SA Water Corporation and represents an innovative development in the provision of potable water.

The MIEX® DOC resin is utilised in a continuous ion exchange process designed for the removal of dissolved organic carbon (DOC) from contaminated water. The process employs a patented magnetised ion exchange resin, the MIEX® DOC Resin.

The MIEX® DOC resin has been developed to enable adsorption of DOC to occur in a stirred vessel, much like a flash mixer in a conventional water treatment plant.

When in contact with water, negatively charged DOC is removed by exchanging with a chloride ion on active sites on the resin surface. This results in a reduction in the DOC level and a small increase in the treated water chloride level (2 to 4 mg/L).

The resin is rapidly gaining acceptance in a traditionally conservative industry and last year the first USA installation was approved in California.

Increasing Australia's competitiveness in the Automotive Industry - Light weight gear shifts

Marplex helped develop a totally plastic auto shift assembly for the Ford BA. The shift assembly achieved a 30% weight saving as well as meeting cost targets. The assembly involves eight different thermoplastics and the technology is now being used overseas.

Improving Safety through Innovation - 'Ceramifiable' Polymer Technology

Olex and the CRC for Polymers have developed a polymer material that is converted into a ceramic material when exposed to fire.

The material has multiple applications, but has been particularly utilised for cable insulation, where fire protection is critical. The ceramifiable insulation is a major advance in fire performance cable technology. It enables power cables to function longer in fire situations, thus maintaining services such as lighting, communications and ventilation and assisting in saving lives and property as well as supporting emergency crews.

The material has been readily accepted and is being specified in many major commercial developments.

Development of Automatic Dishwashing Tablets

After previously establishing a position in the market for automatic dishwashing tablets, PZ Cussons undertook a major project to develop a product with a unique point of difference. This technology was launched to the market as Morning Fresh Tec Tabs in March 2005 with immediate success, as demonstrated by sustained growth in sales and market share.

The technology incorporates a layer of enzymes and a layer of gel into a cavity in a bilayer tablet base – as well as an aesthetic point of difference, the consumer is also given benefits in increased performance and solubility. The innovation has been developed locally in Victoria by the PZ Cussons technical team in collaboration with a number of materials supplier and engineering firms. The challenge of technology development was as much about developing a unique manufacturing process as it was about developing the formulation and hence the need to coordinate internal and external expertise across a number of departments and firms.

The demands of speed-to-market and in-market agility were major factors in the decision to develop and commission the manufacturing solution to take place locally. However, this was only made possible by the fact that PZ Cussons has a local R&D team, suppliers were able to support formulation development and local engineering firms had relevant expertise to assist in developing the manufacturing capability at the factory in Dandenong.

The case studies illustrate the important role the sector plays in the broader economy and in furthering the development of new technology and niche products

6. Australia and Victoria, along with other high income countries and regions, now face considerable threats to the chemicals sector. At worst, these threats will result in substantial contraction in the sector in many high income countries over the decade to 2015. The European Cefic study makes the following findings.

The Cefic study '*Horizon 2015: Perspectives for the European Chemical Industry*' has documented the threats to the chemicals sector in high income countries in general, and in Europe in particular. The four key threats identified by the industry in Europe and detailed in the Cefic report are:

1. development of Asia, particularly China, as the global manufacturing centre and subsequent supply chain impacts in Europe;

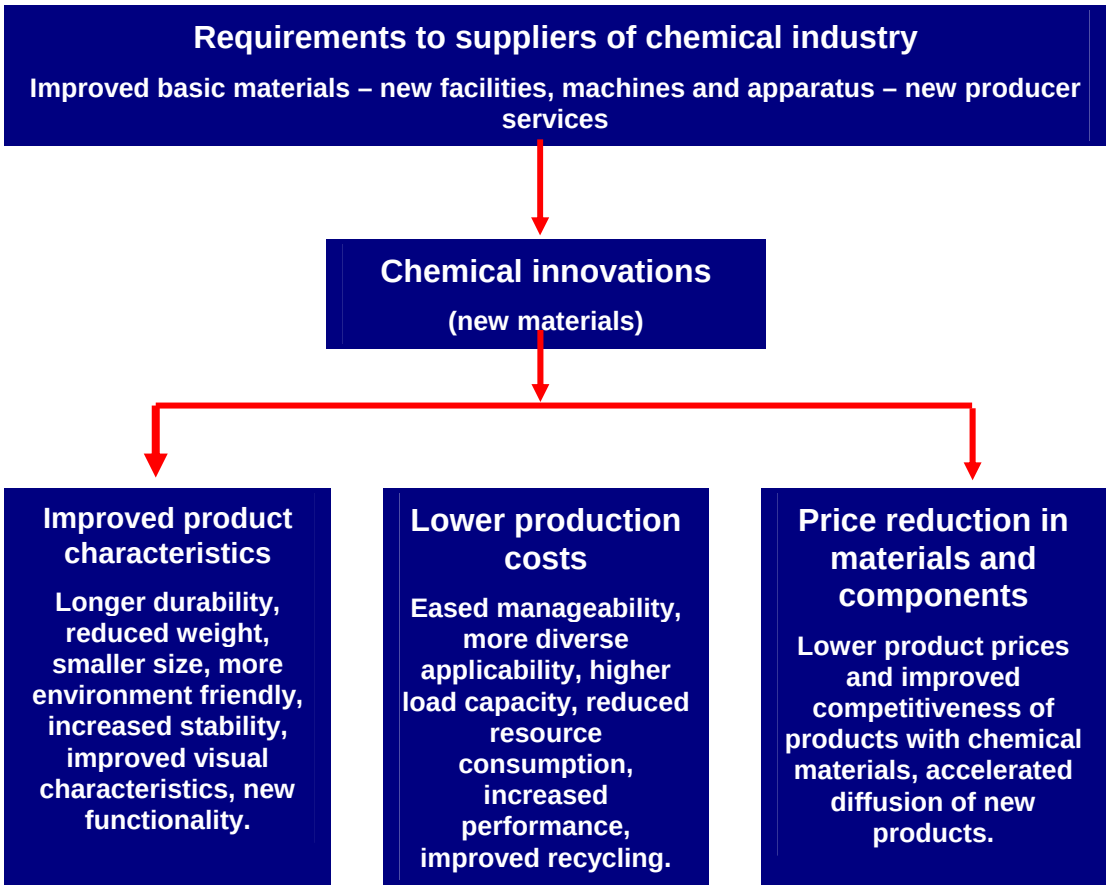
2. basic petrochemical industry expansion in the Middle East, with an estimated 50 per cent of all new ethylene production builds and expansions planned for the region;

3. saturation and commoditisation, over-regulation and lack of effective industry policy; and

4. exchange rate between the US dollar and the Euro, particularly as many of the Asian currencies are tied closely to the US dollar.

The European Chemical Industry is confronted by European and global trends which contribute to the cycle of loss of competitive advantage, loss of investment, loss of skills and innovation and loss of research and development capacity.

Figure 2: Impact of chemical innovations on innovation activities in other industries



Source: *The vision for 2025 and beyond*; A European technology platform for sustainable chemistry.

These broader trends include:

- the hollowing out of the industry's customer base, which is reducing demand; customers themselves may be moving to Asia to take advantage of more competitive manufacturing costs. Customer industry sectors relocating or establishing operations in Asia include automotive components, textiles, plastic processing and electronics firms;

- slow industry growth and hence slow demand growth in Europe;

- increasing level of competition from imports;

- high production cost in terms of feedstocks, plant and labour costs;

- the reduction in research and development, largely due to lower profitability in the European Plastics and Chemicals Industry when compared to other regions;

- continuing reduction in the number of students graduating in disciplines related to the sector;

- higher energy costs than many competing regions; and

- compliance costs – the cost of meeting EU requirements for both corporate and environmental regulations is seen as uncompetitive with the costs in Asia. Time and cost of introducing new chemicals and production to Europe are proving to be a major barrier, with the Cefic report stating that, given the regulatory environment in Europe, it takes three times longer and is 10 times more expensive to introduce a new chemical to Europe than to the US.

The Cefic report identifies the key competitiveness factors as innovation, regulation, market access, energy, logistics and reputation.

7. Despite the threats, many high income countries still regard the chemicals sector as a strategic vehicle for wealth creation.

High income countries in North America and Western Europe explicitly acknowledge the importance of the chemicals sector to their national economies, because it is a sector that is the catalyst for much new technology and innovation. That is, they acknowledge it as a strategic sector and strategic sectors transform raw materials and knowledge into wealth creation.

The chemicals sector is regarded as strategic because it:

(i) has strong upstream and downstream linkages with other industries in the economy;

(ii) is the conduit for the transfer of leading edge technologies to the local economy (such as nanotechnology); and

(iii) possesses strong skills and industry knowledge, complex work organisation arrangements and strategic management techniques which spill over to the rest of the economy, thus transferring both technology and knowledge to the broader industrial base.

Thus, the chemicals sector has one of the highest local output and employment multipliers in the economy, especially if a broad based manufacturing sector exists.

To protect the strategic importance of the chemicals sector, other high income countries are developing explicit and aggressive strategies to develop the sector. The main elements of these strategies for development of the chemicals sector are given in the Box 1.

BOX 1
Summary of key growth strategies: an international perspective

How do competing nations seek to retain or grow their chemicals industry?

- Plan more knowledge intensive focus and high value added businesses such as the knowledge based industries in India's 'Vision 2010' which include pharmaceuticals, agrochemicals and biotech and other products such as high-performance polymers and elastomers, new fibres and advanced materials that have high value applications in other industry sectors.
- The Cefic report on the European industry identifies the key competitiveness factors as innovation, regulation, market access, energy, logistics and reputation.
- Intensify R and D and improve number of patents.
- Move basic and specialty chemicals manufactures to a more knowledge intensive culture to embrace innovation including new products and processes, services and engineering solutions.
- Try to retain as much of the supply chain manufacturing components as possible to avoid hollowing out of customer base.
- Grow exports of higher value production, associated technologies and engineering solutions that include innovation in product delivery.
- Achieve global competitiveness through scale and consolidation.
- Address regulatory and tariff issues to ensure future growth, competitiveness and profitability.
- Improve branding and marketing channels, both local and international.
- Improve public perception and knowledge of the industry.
- Harness available knowledge, skills and manpower to attract global outsourcing, particularly in areas of research and development.
- Leverage off high local demand to build world scale export industry.
- Create a culture of investment in infrastructure and plant and equipment to ensure global competitiveness and economies of scale.
- Plan for future growth and profitability by encouraging government and industry to work together to develop the strategies needed to create and sustain global competitiveness.

8. Australia has acknowledged, to some extent, the importance of the chemicals sector through the report: *Underpinning Australia's Industrial Growth: The Chemicals and Plastics Action Agenda.*

The Australian Plastics and Chemicals industry has developed an Action Agenda, which was presented to the Australian Government in March 2001. The Government responded to the report in October 2002. The industry action agenda is intended to create a broader based industry approach to strategic planning to provide industry with an opportunity to identify actions, which will place the industry on a sustainable growth path.

To quote from the Government's response:

> The steering group (established in March 2000) identified key issues affecting the future development of the industry and established working parties on:
>
> **Scenario planning** – high level industry stakeholders identified the critical factors affecting both the industry today and in the future. These factors were used to map possible future paths for the industry.
>
> **Regulatory reform** – the impact of regulatory reform requirements on the industry covering issues such as registering chemicals, environmental requirements, dangerous goods and the implications of greenhouse requirements.
>
> **Education and training** – examine tertiary and vocational education requirements for the industry both today and in the future.
>
> **Innovation and emerging technologies –** investigating the changing technologies and opportunities for innovation changes to the industry and the roles and relationships between stakeholders.

While the issues identified in the industry's action agenda are strategic in trying to assist the industry in Australia to maintain competitiveness, this study goes on to identify the imperative for urgent industry and government action to ensure positive outcomes for the industry.

9. The threat to the Australian and Victorian chemicals sector will be greater than that to the chemical sectors of other high income countries, because of its relatively poorer exporting and R&D performance.

Tables 9 to 11 benchmark the Australian chemical sector's performance against that of other OECD (that is, high income) countries. Aside from the pharmaceutical sector, which has received above-average government assistance over the last two decades, the performance of the Australian chemicals sector, in terms of export share of production, research and development expenditures and growth rates, over recent years is relatively poor.

However, compared to its past, Australia has improved somewhat over recent years. Australia has still not closed the gap with other OECD economies as they have been improving the performance indicators at a similar rate. This means that Australia has never been able to significantly offset the economies of scale disadvantage of a small domestic market through increased export effort.

The evidence from the tables below shows the cost of Australia being unable to close the performance gap with other OECD economies, in terms of exporting and R&D effort. Although the Australian chemicals sub-sector output growth rates were comparable to the OECD average to the mid-1990s, since then they have been significantly inferior, despite a relatively strong domestic economy.

Table 10 OECD versus Australia: exports as per cent of production

	Chemicals		Pharmaceuticals		Plastic and rubber	
	Australia	OECD average	Australia	OECD average	Australia	OECD average
1980	6	20	7	18	1.6	18
1985	5	22	6	21	1.0	20
1990	8	24	12	21	2.9	19
1995	14	33	18	29	5.4	28
2000	17	42	27	40	5.4	31
2002 or 2001	17	35	17	35	5.1	30

Table 11 OECD versus Australia: chemicals sector average annual production growth rates

	Chemicals		Pharmaceuticals		Plastic and rubber	
	Australia	OECD average	Australia	OECD average	Australia	OECD average
1985-1990	5.1	3.2	6.9	8.7	5.8	6.3
1990-1995	4.0	3.9	13.5	7.8	4.7	4.8
1995-2000	1.3	4.0	9.2	8.5	1.2	4.9
1985-2000	3.5	3.7	9.8	8.3	3.9	5.3

Table 12 Research and development expenditure as a per cent of production

	Australia	OECD
Chemicals (excluding pharmaceuticals)		
1990	1.2	3.4
2000	0.7	2.6
Pharmaceuticals		
1990	5.1	10.7
2000	5.5	10.8
Rubber and plastics products		
1990	0.5	0.9
2000	0.6	0.9

A major problem for Australia and Victoria is that there are few strong chemicals sector export prospects.

NIEIR undertook detailed analysis to identify emerging export prospects. An emerging export prospect was defined as being one where a product had a relatively higher export-to-production ratio (that is, greater than 30 per cent) and recent sustained growth in exports. Unfortunately, only a handful of such commodities were identified.

The commodities that have a relatively high export share of production and sustained reasonable growth rates are:

- phenol-alcohols and derivatives;
- other inorganic chemicals (large);
- synthetic inorganic colouring agents; and
- filler, putty compounds (small).

Commodities where the export share of production is growing rapidly and exports are also growing on a sustained basis are:

- mixed fertilizers; and
- other cleaning products.

Overall, however, these products constitute a relatively small share of domestic production. This is not surprising, given Australia's relatively poor research and development effort, as potential exporting profitability is a major driver of R&D efforts.

The above analysis has been in terms of Australia overall. This study found, however, that overall the rest of Australia has a higher export propensity than Victoria. The rest of Australia has a significantly better export performance in inorganic chemicals, pharmaceuticals, cosmetics, 'other basic chemical' products and plastic injected moulded products. Victoria does have a significantly better export performance in organic industrial products and plastic extruded products.

The sector is also being adversely affected by the rise in the exchange rate over the past year and a half. Analysis shows that, for many commodities, there has been a decline in import prices relative to Australian production prices in 2004 of between 5 and 20 per cent, compared to the average 2002-03 outcome. This of course will make expanding export markets more difficult.

10. Pharmaceuticals aside, Australia is constrained on the export front by its reliance on the New Zealand economy.

Table 14 profiles imports from the top 10 countries in 2004 and their ranking in 1996. The key change over the period has been the fall in the United States share of total Australian imports, from 22.5 per cent in 1996 to 18.9 per cent in 2004, and the rise of China. China's share of imports has risen from 2.9 per cent in 1996 to 5.6 per cent in 2004. Ireland, also, has had an equally dramatic increase in import share.

Table 13 shows the significance of the New Zealand market for Australian chemical sector exports. Whether this is due to institutional constraints from the ownership structure of Australian industry, or genuine lack of competitiveness, is an issue that needs to be addressed. Its resolution will probably be a political matter. This is also shown by sub-sector

in Table 15. Table 15 also shows China's presence in most chemical industries is growing strongly, though from a low base. The strongest presence is in the plastic injected moulded product industry. From Table 15, the Chinese market is the only significant export market that has been growing strongly in recent years.

Australia's trade deficit in chemicals trade with Ireland in 2004, at $0.7 billion, was the same as the trade deficit with China. The biggest trade deficits are, however, with the United States, United Kingdom and Germany of between $1.4 and $3.0 billion.

Table 13 Exports from Australia by top 10 countries – total chemical and associated product manufacturing

	1995-96 ($m FOB)	2003-04 ($m FOB)	1995-96 (rank)	2003-04 (rank)	1995-96 (% of total)	2003-04 (% of total)	1995-96 (trade balance)	2003-04 (trade balance)
New Zealand	793.6	1133.2	1	1	22.9	19.7	335.9	557.3
United States of America	145.1	517.6	6	2	4.2	9.0	-2336.0	-2957.9
China	84.4	308.6	14	3	2.4	5.4	-238.1	-713.6
United Kingdom	156.7	281.5	5	4	4.5	4.9	-940.8	-1486.3
Korea, Republic of	110.1	270.5	11	5	3.2	4.7	-167.4	-126.6
Hong Kong (Sar of China)	292.2	255.2	2	6	8.4	4.4	237.0	190.5
Taiwan	131.2	251.1	8	7	3.8	4.4	-126.5	-47.1
Thailand	110.1	250.9	10	8	3.2	4.4	14.4	-39.7
Japan	187.2	226.7	3	9	5.4	3.9	-696.9	-823.1
Malaysia	127.5	207.3	9	10	3.7	3.6	-72.9	-160.8
All countries	**3461.9**	**5755.0**	**–**	**–**	**100.0**	**100.0**	**-7568.3**	**-12640.7**

Table 14 Imports into Australia by top 10 countries – total chemical and associated product manufacturing

	1995-96 ($m FOB)	2003-04 ($m FOB)	1995-96 (rank)	2003-04 (rank)	1995-96 (% of total)	2003-04 (% of total)	1995-96 (trade balance)	2003-04 (trade balance)
United States of America	2481.0	3475.5	1	1	22.5	18.9	-2336.0	-2957.9
United Kingdom	1097.5	1767.8	2	2	9.9	9.6	-940.8	-1486.3
Germany	831.3	1478.1	4	3	7.5	8.0	-810.7	-1420.5
Japan	884.1	1049.9	3	4	8.0	5.7	-696.9	-823.1
China	322.5	1022.2	8	5	2.9	5.6	-238.1	-713.6
France	509.0	934.2	5	6	4.6	5.1	-493.7	-877.1
Italy	245.9	835.4	11	7	2.2	4.5	-220.8	-796.1
Ireland	214.1	743.6	14	8	1.9	4.0	-210.8	-706.6
New Zealand	457.6	575.8	6	9	4.1	3.1	335.9	557.3
Switzerland	380.9	461.2	7	10	3.5	2.5	-375.9	-438.2
All countries	**11030.**	**18395.**	**-**	**-**	**100.0**	**100.0**	**-7568.3**	**-12640.7**


2
8

Table 15 Share of exports in total ranked by top 30 countries' share of non-pharmaceutical chemical exports in 2004

		Synthetic resin manufacturing		Other basic chemicals		Medicinal and pharmaceutical products		Soaps, cosmetics and pesticides (other knowledge industries)		Plastic products		Other specialty products		Total (excluding pharmaceuticals)		Total average annual growth
Rank	Country	1996	2004	1996	2004	1996	2004	1996	2004	1996	2004	1996	2004	1996	2004	1996-2004
1	New Zealand	22.9	26.6	9.6	6.9	28.4	16.2	41.3	49.1	31.9	31.3	25.6	32.8	20.9	22.4	4.2
2	China	2.8	11.7	3.1	10.4	2.7	1.4	0.9	1.3	2.2	9.8	0.9	5.4	2.3	8.4	21.1
3	United States of America	0.7	2.2	3.8	7.1	4.0	10.9	9.4	9.7	3.9	9.2	5.7	7.9	4.3	7.5	10.9
4	Japan	1.0	4.8	9.4	6.4	3.0	2.7	3.3	2.2	4.8	4.5	6.1	3.2	6.3	4.9	0.0
5	Indonesia	8.1	7.2	4.4	5.1	1.0	0.8	1.5	0.9	2.5	1.7	8.3	6.3	5.0	4.3	1.3
6	Hong Kong (Sar of China)	23.8	12.3	3.8	2.9	8.3	5.0	5.1	3.2	12.7	2.8	6.1	4.7	8.5	4.0	-6.0
7	Korea, Republic of	1.4	1.8	7.6	5.1	0.6	6.2	2.1	1.5	1.5	2.9	1.4	2.5	4.1	3.6	1.4
8	Thailand	3.6	3.7	3.2	5.1	3.5	5.5	2.1	2.2	2.3	1.6	3.5	1.9	3.1	3.5	4.8
9	Finland	0.0	0.0	8.7	6.0	0.1	0.3	0.1	0.1	0.0	0.0	0.1	0.0	3.8	2.7	-0.9
10	United Kingdom	0.2	0.3	0.6	1.3	11.2	8.1	2.2	5.3	4.6	4.7	4.9	2.2	2.0	2.5	5.7
11	Malaysia	4.7	5.1	2.3	2.4	4.9	5.2	3.6	2.0	2.4	1.5	4.7	2.4	3.2	2.4	-0.5
12	Singapore	5.8	4.3	3.6	1.1	3.7	2.4	4.1	3.2	6.4	2.9	6.9	3.6	5.0	2.3	-6.0
13	Taiwan	6.0	2.3	3.4	2.5	4.5	7.3	3.8	1.9	2.2	0.9	2.6	2.6	3.5	2.1	-3.0
14	Papua New Guinea	1.1	1.6	1.9	1.4	0.8	0.2	2.9	1.3	5.8	2.2	4.8	5.0	3.0	2.1	-0.9
15	Pakistan	0.3	1.0	0.4	3.2	0.1	0.2	0.6	1.8	0.1	0.0	0.1	0.1	0.3	1.8	28.0
16	Viet Nam	1.0	2.1	0.2	1.2	0.9	0.5	0.1	0.2	0.4	5.2	0.5	0.8	0.4	1.8	24.5
17	Philippines	3.4	1.6	3.5	1.5	4.0	3.7	0.4	1.3	2.4	1.8	1.9	1.1	2.7	1.5	-4.3
18	South Africa	0.8	0.8	0.8	1.4	1.1	0.8	0.5	0.7	1.3	2.0	0.9	1.3	0.9	1.3	9.2
19	India	8.5	2.9	1.1	1.3	0.1	0.3	0.0	0.1	0.4	1.2	0.3	1.6	1.8	1.3	-0.8
20	International Waters	0.0	1.2	0.0	1.6	0.0	0.0	0.0	0.2	0.0	0.0	0.0	1.3	0.0	1.1	0.0
21	Fiji	0.4	0.9	0.3	0.2	0.6	0.2	1.3	1.7	1.8	1.7	1.6	1.9	0.9	1.0	5.0
22	Bangladesh	0.5	1.0	0.3	1.7	0.1	0.1	0.0	0.2	0.1	0.0	0.1	0.2	0.2	0.9	22.8
23	United Arab Emirates	0.0	0.4	0.0	1.0	0.1	0.3	0.3	0.5	0.7	1.4	0.9	0.6	0.3	0.9	18.1
24	Canada	0.0	0.0	0.4	0.4	2.4	3.1	2.8	0.5	0.3	1.0	0.2	1.5	0.6	0.7	5.8
25	Ghana	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.0	0.6	45.6
26	Netherlands	0.2	0.0	1.4	0.7	3.3	5.3	0.3	0.5	0.9	0.5	4.1	0.5	1.5	0.6	-8.9
27	Belgium	0.0	0.0	0.0	0.7	0.0	1.4	0.0	1.2	0.0	0.1	0.0	0.3	0.0	0.5	0.0
28	France	0.0	0.0	0.1	0.2	0.4	1.6	2.7	0.6	0.4	1.1	0.4	0.9	0.5	0.5	4.1
29	Germany	0.2	0.9	0.3	0.3	0.7	1.7	0.5	0.6	0.6	0.4	1.6	0.7	0.6	0.5	0.3
30	Italy	0.1	0.1	1.8	0.5	0.2	1.1	0.2	0.2	0.3	0.4	0.3	0.4	0.9	0.4	-7.9

11. There are other costs to Australia being unable to close the performance gap with OECD economies. The chemicals industry in Australia will be constrained in its efforts to improve performance because current profitability and balance sheet structures are at best average, and at worst poor.

Figures 4 to 8 clearly show an industry that has been under-investing in recent years. In part, from Table 16, this is due to poor profitability, especially in the synthetic resin industry, pharmaceuticals and other specialty products industry.

Table 16 also indicates that there are insubstantial resources in balance sheets to drive significant improvement in future investment and research and development expenditures.

This bodes ill for the future. The performance of the chemicals industry has been, at best, modest. To improve performance there has to be significant increases in:

- the level of investment and transfer of production technology;
- R and D expenditure;
- market development expenditures to increase exports; and
- training expenditures to lift productivity.

The question then becomes, whether or not there is capacity for the chemicals industry to lift their performance by “bootstrap” strategies? That is, by one’s own efforts using existing resources.

The evidence is that the chemicals industry does not have the internal financial resources to significantly lift investment, R&D effort, or export expansion expenditures above current levels.

Like Europe, the prospects for the Australian chemicals industry very much depend on how all stakeholders respond to the objective of improving its performance.

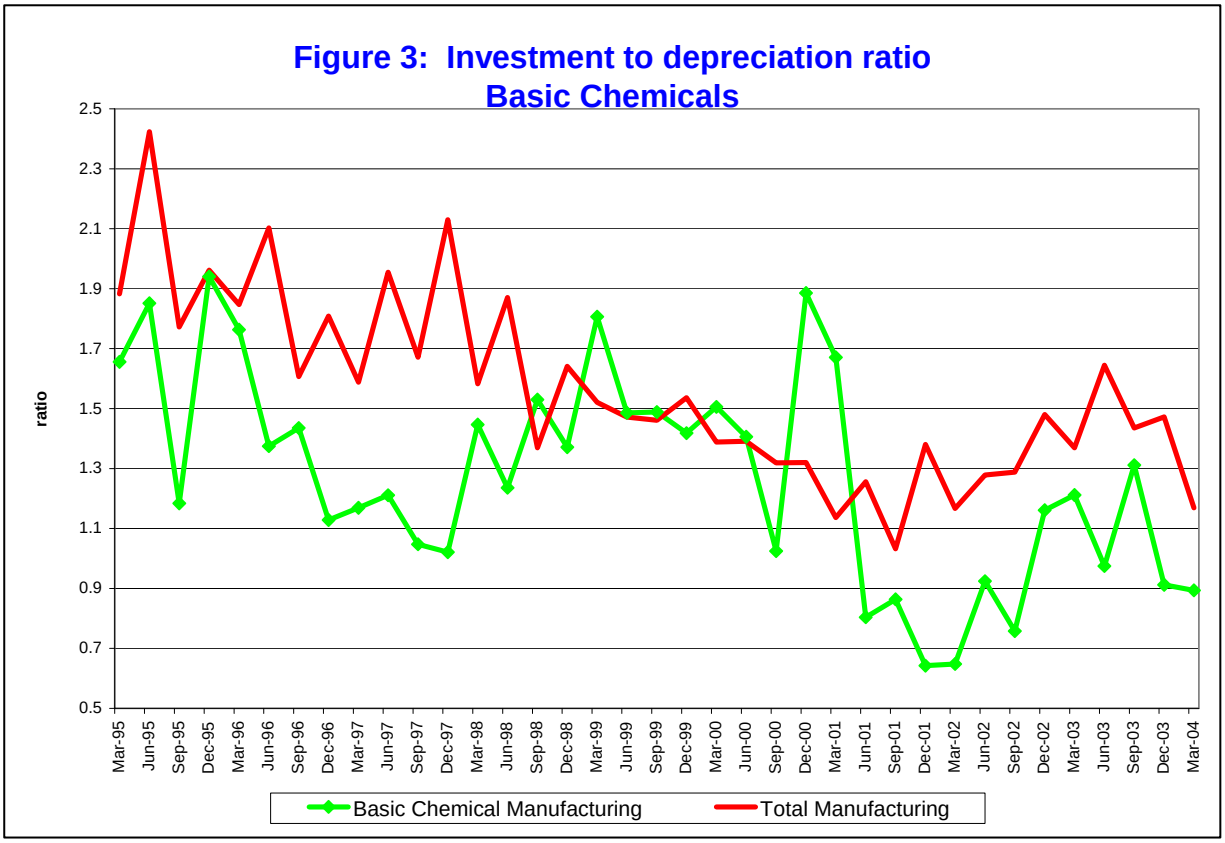


Figure 3: Investment to depreciation ratio
Basic Chemicals
ratio
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
Mar-95 Jun-95 Sep-95 Dec-95 Mar-96 Jun-96 Sep-96 Dec-96 Mar-97 Jun-97 Sep-97 Dec-97 Mar-98 Jun-98 Sep-98 Dec-98 Mar-99 Jun-99 Sep-99 Dec-99 Mar-00 Jun-00 Sep-00 Dec-00 Mar-01 Jun-01 Sep-01 Dec-01 Mar-02 Jun-02 Sep-02 Dec-02 Mar-03 Jun-03 Sep-03 Dec-03 Mar-04
Basic Chemical Manufacturing
Total Manufacturing

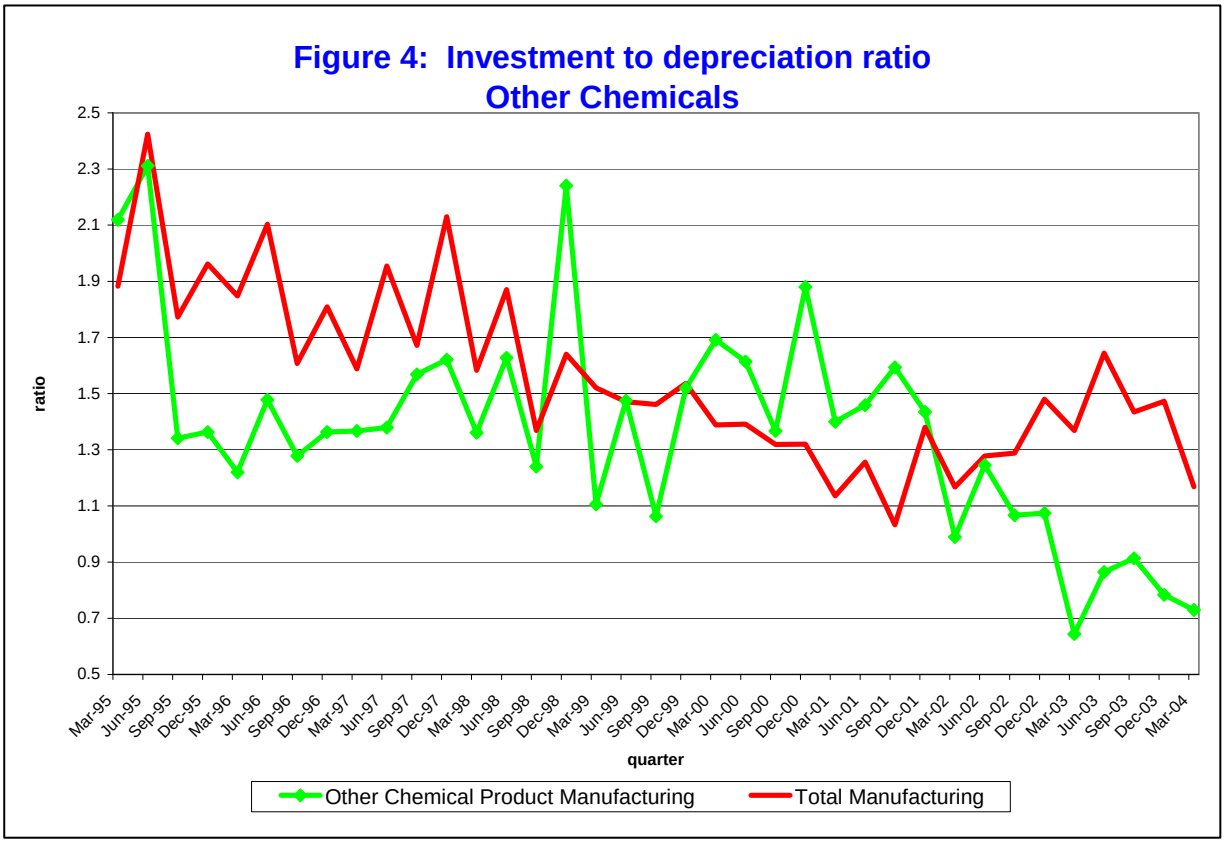


Figure 4: Investment to depreciation ratio
Other Chemicals
ratio
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
Mar-95 Jun-95 Sep-95 Dec-95 Mar-96 Jun-96 Sep-96 Dec-96 Mar-97 Jun-97 Sep-97 Dec-97 Mar-98 Jun-98 Sep-98 Dec-98 Mar-99 Jun-99 Sep-99 Dec-99 Mar-00 Jun-00 Sep-00 Dec-00 Mar-01 Jun-01 Sep-01 Dec-01 Mar-02 Jun-02 Sep-02 Dec-02 Mar-03 Jun-03 Sep-03 Dec-03 Mar-04
quarter
Other Chemical Product Manufacturing
Total Manufacturing

Figure 5: Investment to depreciation ratio
Rubber Products

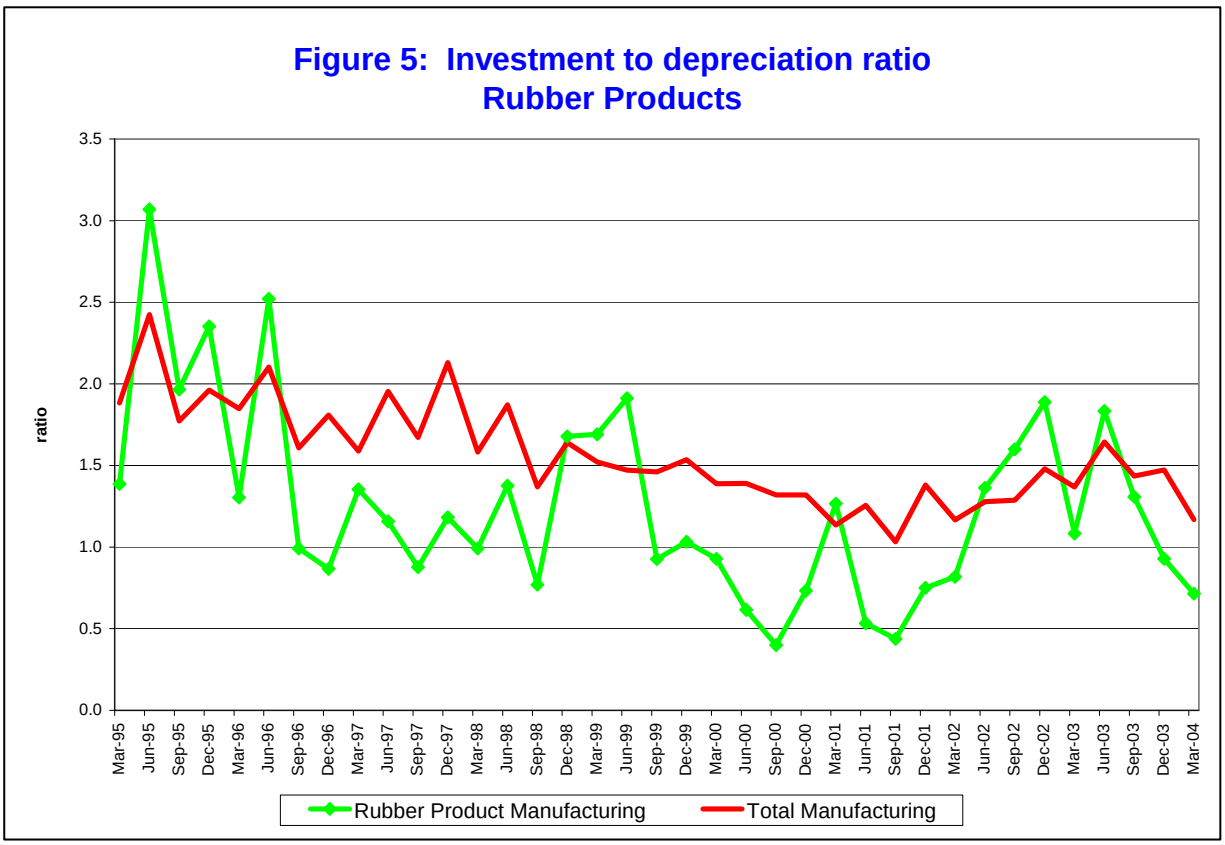
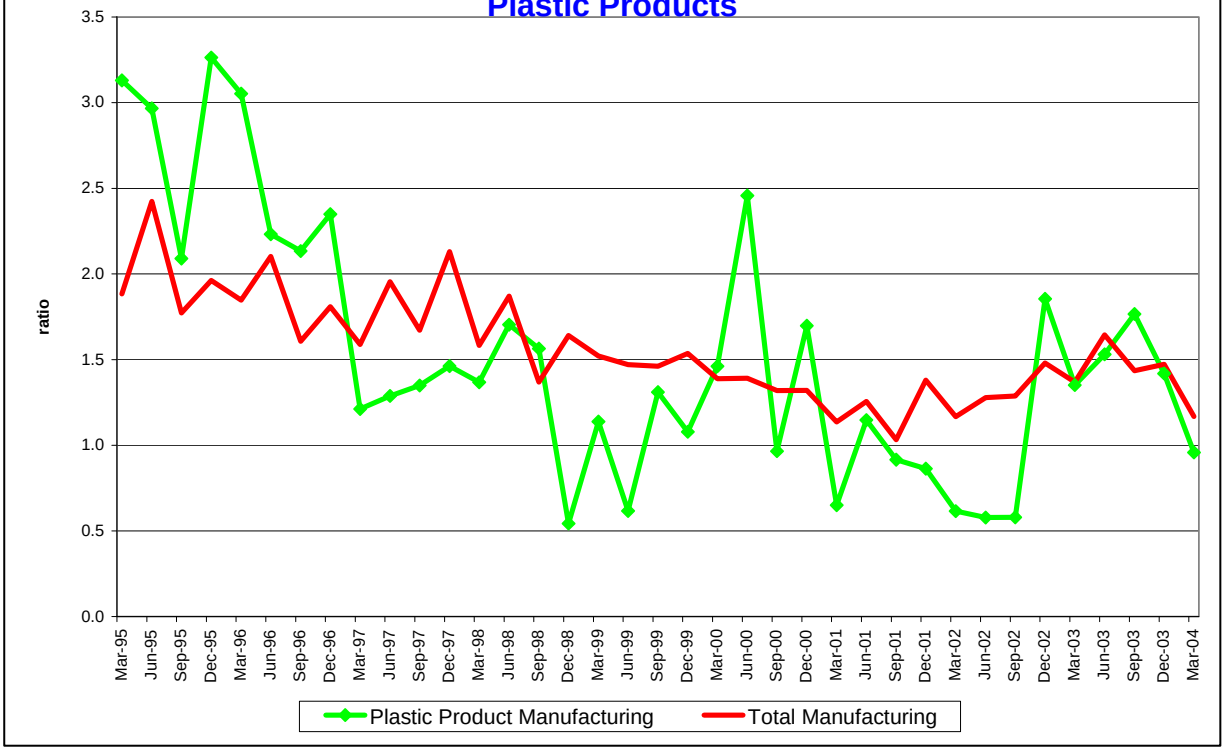


Figure 6: Investment to depreciation ratio
Plastic Products



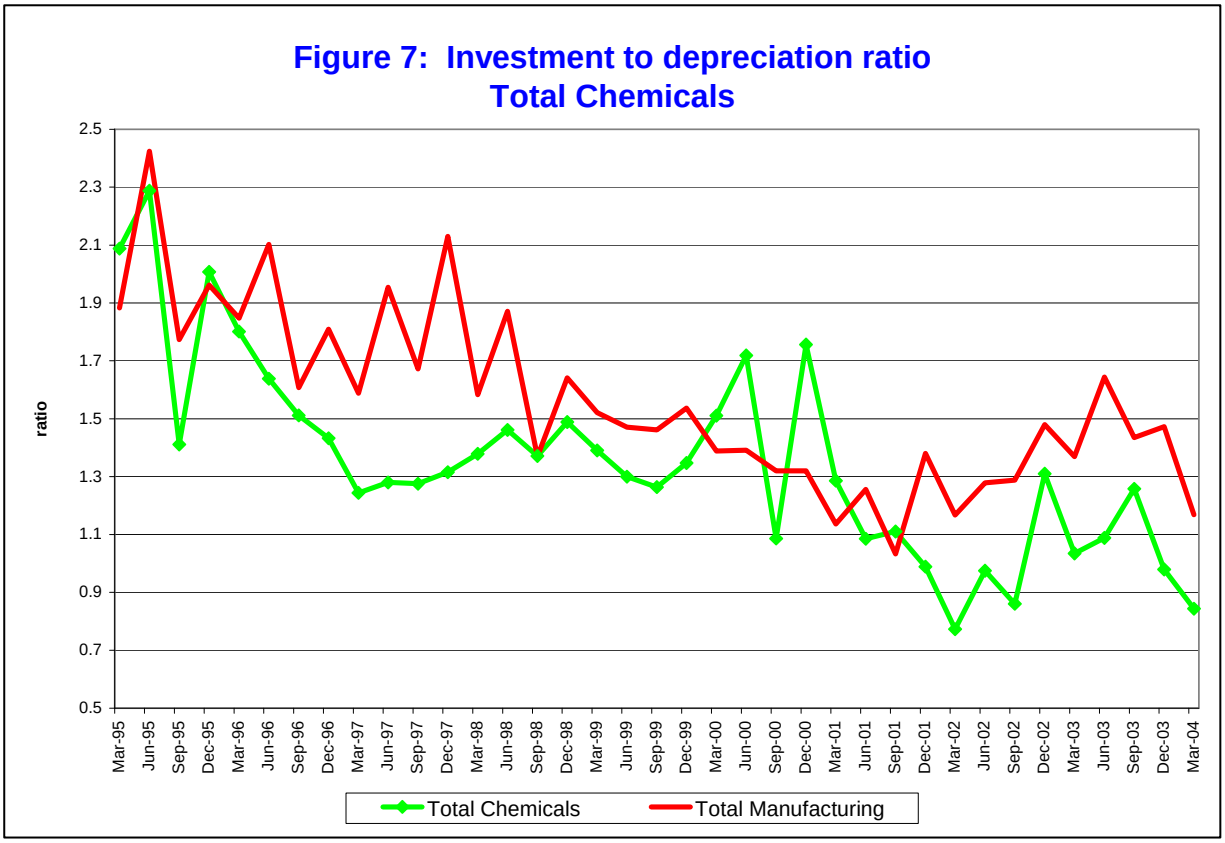


Table 16 Financial indicators for Australian manufacturing sub-sectors (2002-03)

	Earnings before tax and interest to sales	Earnings to asset ratio	Ratio of total liabilities to total assets	Ratio of fixed investment to depreciation
Food	5.9	9.4	56.3	162.4
Beverages	13.1	5.5	53.1	51.5
Textiles	5.2	7.3	60.6	112.1
Clothing, footwear, leather	7.0	13.7	60.2	141.3
Wood	10.0	13.6	50.2	128.6
Paper	13.4	12.0	58.8	82.3
Printing, publishing	13.5	10.3	48.3	93.7
Petroleum	4.3	10.7	41.5	73.1
Synthetic resin mfg	1.7	2.0	60.2	49.1
Other basic chemicals	11.6	10.3	77.3	130.9
Medicinal & pharmaceutical products	9.9	7.3	59.0	93.6
Soaps, cosmetics and pesticides (other knowledge industries)	9.3	10.1	67.0	102.4
Plastic products	8.7	11.6	70.5	182.2
Other specialty products	7.4	8.9	56.3	100.3
Non-metallic minerals	12.7	10.6	55.0	130.8
Basic metals	11.5	10.4	61.6	89.4
Fabricated metals	8.3	12.4	55.0	112.9
Motor vehicles	3.3	5.8	67.4	163.9
Other transport	5.5	5.5	70.8	155.1
Electrical electronic	5.9	8.3	62.5	104.9
Industrial machinery	8.4	12.2	65.4	132.5
Other manufacturing	7.0	14.1	62.6	134.8
Manufacturing average	**8.9**	**10.4**	**59.6**	**120.5**

12. A current trend scenario for the Victorian chemicals sector for the next decade indicates that the sector is likely to make negligible contributions to Victorian economic growth, and that without strategic interaction by all stakeholders, the prospects are for a significant negative contribution to economic growth.

The NIEIR report developed a base case scenario to 2015 for the Australian and Victorian chemicals sectors. The scenario is based on the assumptions that key structural drivers of chemicals sector activity (import penetration, export effort, etc.) maintain the trends of the recent past. Hence, the scenario is designated the 'current trends' scenario.

The expectation, from Table 17, for the current trends scenario (at the 50 per cent probability level) is for a 0.4 per cent average annual growth in the Victorian chemicals sector output to 2015. The other specialty products sub-sector has the highest expected growth rate of 3.7 per cent per annum. At the other end of the scale is the likelihood of plant closures in the synthetic resins sub-sector, forcing a contraction in the expected output growth of the sub-sector at just under 5 per cent per annum.

The expectation is that the 'other basic chemicals' sub-sector will contract from current levels by 2015, while pharmaceutical production is expected to remain stagnant. The soaps, cosmetics and plastics sub-sectors are expected to have a growth rate, over the next decade, of approximately half the growth rate of the national economy.

The major drivers of the outcomes are the expectation of sustained further increases in import penetration and the expectation of continued modest export performance outcomes.

Uncertainty exists around what is the precise definition of 'current trends'. Should current trends be defined in terms of the trend growth in import penetration of the last decade, or should it reflect more the acceleration of import penetration of the last few years? Further, over the next decade, plants will be older than what they were five years ago, which will alter the investment-production response even if the economic environment does not reflect any fundamental change in competitiveness.

To reflect this uncertainty, confidence limits were placed around the drivers of individual chemical sub-sector's activity. This enabled probability ratings to be assigned to a range of growth outcomes. Thus, from Table 17, for the chemicals sector as a whole, realistic uncertainty as to what will constitute a current trends scenario leads to an outcome where the Victorian chemicals sector has a 15 per cent probability that the annual rate of growth of the sector will be less than -0.8 per cent per annum. Alternatively, it has only a 25 per cent probability that the rate of growth will be above 0.9 per cent per annum. The corresponding range for the Victorian other basic chemicals sub-sector is for a growth rate outcome of -5.1 and -0.2 per cent per annum respectively. The growth rate ranges for the other sub-sectors are given in Table 17.

From Table 17, the expectation is that the worst outcome expected for the Victorian chemicals sector over the next decade on a 'current trends' basis is one of a mild contraction in output, and at best slow growth.

The mean expected growth rate for the total chemicals sector in Table 17 would be close to the average of expectations for the individual enterprises which contributed to the survey undertaken for this study.

It became clear from the case studies undertaken as part of this study that the current trends scenario could well prove optimistic. This is because of the importance of supply chains to the collective competitiveness of chemical industries.

A weakening of supply chains, which would occur if some of the local members were forced out of business by imports, would adversely affect the competitiveness of remaining members, which could well result in the eventual collapse of the supply chain. For example, it could well be, from Table 17, that if the synthetic resin industry did in fact contract by 4.8 per cent per annum, the supply chain weakening effect this would have on the chemicals sector as a whole would result in a total chemicals sector growth rate that would be significantly negative. That is, significantly below the 0.4 per cent of the 50 per cent probability case.

To test the validity of this hypothesis the study carried out two case studies: The first into a firm in the synthetic resins industry and the second looking at two firms in the soap and detergents industry.

Table 17 Current trends scenario: average annual growth rates for Victoria chemicals sector – 2004-2015

	Upper bound growth rates by probability benchmark				
	15 per cent	**25 per cent**	**50 per cent**	**75 per cent**	**95 per cent**
Synthetic resins	-17.2	-8.2	-4.8	-0.5	1.4
Other basic chemicals	-5.1	-3.1	-1.7	-0.2	0.9
Pharmaceuticals	-4.4	-1.7	0.2	2.3	4.6
Soaps, cosmetics and pesticides	-0.6	0.5	1.1	1.8	2.7
Plastics	0.2	1.0	1.6	2.1	2.9
Other specialty products	-0.5	2.0	3.7	5.6	7.3
Total chemicals sector	**-0.8**	**-0.1**	**0.4**	**0.9**	**1.6**
Total excluding pharmaceuticals	-0.7	0.0	0.4	0.8	1.5

Explanation: The -8.2 per cent growth rate for synthetic resins at the 25 per cent probability benchmark means that there is a 25 per cent probability that growth will be less than -8.2 per cent per annum.

13. The modern supply chains of the globalised economy involve collective risk sharing and coordination and strategies to maintain maximum supply chain competitiveness

In the traditional vertically-integrated company structure, captive or bonded supply relationships lead to inefficiencies, inflexibility and final product uncompetitiveness.

The arrival of e-commerce has transformed the operating environment for manufacturers. Increasing cost competitiveness, short product and product development life cycles are now commonplace. Consequently this is resulting in increased product recognition with products being distributed across world markets; best practice quality required for competitiveness; and accelerating rates of innovation.

The destruction of the vertically-integrated company by outsourcing and the greater co-ordination of the supply chain to produce the modern integrated supply chain enhance supply chain competitiveness by improved focus, quality and simplification of remaining in-house OEM operations and lower production and inventory costs. E-commerce allows for risk sharing and co-ordination to reduce product development costs, wider access to technological choices (by widening supply chain membership) and relative ease in expanding best practice manufacturing capacity by expansion of supply chain membership.

Effective modern integrated supply chain management requires the minimisation of friction, barriers and waste of resources within the supply chain and the maximisation of functional and procedural synergy between members. Companies need to respond quickly to shifts in market requirements and minimise excess capacity and inventory levels and ensure time product development cycle at minimum costs.

Current information technology, allows integration of purchasing, logistics and manufacturing across all enterprises in the supply chain; final product orders with the entire manufacturing and distribution process; just-in-time inventory co-ordination; and post sales servicing.

This enables companies to minimize the cost and time of the manufacture and distribution of a single product while at the same time maximising ability to tailor to customer requirements and monitor the product over its life for defects and durability characteristics.

In order to remain or become a member of the emerging flexible supply chains, a necessity for remaining in business, Australian enterprises will have to have:

- computer integrated manufacturing systems;
- managers with the ability to participate in the management of the entire supply chain;
- strong strategic alliances with other core members of the supply chain;
- an open risk sharing, information sharing and communication system;
- a sound financial balance sheet so that the risks of continued innovation can be covered;
- a workforce involved in life-time learning;
- full e-commerce enablement (work sites, integrated systems);
- skill acquisition on a world-wide basis (the sole use of local inferior skills not an option); and
- access to appropriate design and development skills.

14. The reinforcing dynamics of a modern integrated supply chain unleashes a range of forces which continually reinforce supply chain competitiveness

The case study of two enterprises in the soap and detergents industry clearly demonstrated the benefits of increased supply chain integration. The two firms in the case study were Albright and Wilson and PZ Cussons.

PZ Cussons, which manufactures and distributes more than 30 brands across its global networks, set up its own operation in Melbourne in 1976 when it acquired a local soap manufacturer. PZ Cussons opened its detergent manufacturing plant in Dandenong, Victoria in 1987. The company's major brands in the Australian market are: Radiant, Duo, Reflect, Morning Fresh, Imperial Leather, Pure, Pearl, Preservene and Graphite.

Albright & Wilson (Australia) Limited has two manufacturing sites in Australia; the Phosphates range of products is manufactured at Yarraville (Victoria) and the Surfactants range at Wetherill Park (NSW). Albright & Wilson has been producing phosphates since 1940 and surfactants since 1958 and is an established supplier to Australian industry.

Phosphates and surfactants are two of the most important performance ingredients in household products, which include laundry detergents, dishwashing detergents, disinfectants, floor cleaners and hard-surface cleaners. Surfactants are an essential ingredient in the manufacture of personal care products, the products we use to clean and condition our skin and hair. Products such as liquid soaps, hair shampoos, toothpaste, shower gels and bath foams are all based on surfactants.

Albright and Wilson, from its Victorian operation, manufactures sodium tripolyphosphate (STPP) and supplies the products to PZ Cussons for the manufacture of detergent powders. STPP is a global commodity and Albright and Wilson is the only Australian based manufacturer of the product. Albright and Wilson also supplies PZ Cussons with other raw materials including the cleaning agents LAS C12 and LAS C14.

Changes at PZ Cussons will, in turn, impact on the firm's suppliers such as Albright and Wilson. The two firms, recognising the need to improve supply chain management, in line with the requirements of the globalised economy, are working more closely together to resolve supply chain issues and maximise the benefit of supply chain improvements for both companies. Because of the cycle of promotional campaigns, the ordering patterns and sales volumes of key brands can change significantly, so just-in-time flexible supply chain management has become an increasingly important component of customer service.

What is most important for this study is the long list of benefits that the two firms saw as flowing from increased supply chain integration. A selection of these benefits are:

- increased research and development activities and links to research organisations and CRCs;
- high levels of R&D and associated highly skilled jobs mean flow-on opportunities at all levels of education and training;
- flow-on effects include more patents and hence more ownership of intellectual property;
- greater value adding and consequent wealth creation benefits to the broader community;
- with enhanced local manufacture providing protection against the vagaries of international markets supply and demand constraints, reduces customer requirement to carry more inventories, creates more flexibility and less risk in relation to price fluctuations and exchange movements;
- create increased export opportunity potential;
- enable downstream innovation and cost savings;
- enable point of difference in the design of retail products as product differentiation often depends on local supplier capabilities including special formulations;
- enhance entrepreneurship;
- enhance ability to innovate and create new products;
- enhance the ability to innovate in relation to technology and systems advances;
- developing and adapting processes and products that may have originally been developed overseas, to meet local market conditions and scale. The capacity for this kind of innovation has flow on effects to downstream firms;

- contribute to supply chain strength through strong local supplier relationships, which can often be very creative, generating new ideas, new ways of doing things and assisting in the development of new products and companies;

- contribute to an agile supply chain that can respond quickly to changes, assisting to keep inventory levels to a minimum and bypassing disruptions;

- provide high standards of co-ordination and communication to customer firms with integration of knowledge management systems and staff;

- create opportunities for Australian managers to learn skills and create international networks; and

- increase service opportunities for service providers such as accounting firms, printers, IT firms and a host of technical, service and cleaning firms, which enable these firms to reach world best practice in their service delivery;

15. The Victorian chemicals sector is fairly isolated from world supply chains. One reason why it has remained competitive is because the synthetic resins industry has been willing to manufacture a wide range of products to Australian standard

The strategic importance of the synthetic resins industry was highlighted by the Qenos case study.

Qenos is a strategically important business, operating in both Victoria and New South Wales. It is strategic because it adds value to the output of the Victorian petrochemical industry and sits at the beginning of a complex supply chain. By providing the raw materials for the plastics and chemicals industry in Australia, Qenos enables businesses downstream to produce a vast range of manufactured goods, as noted in Table 18.

Qenos is located in Victoria at Altona in Melbourne's west and is one of the largest employers in the region. The jobs created by the firm are highly skilled and well paid so the impact of this wealth and skill creation is valuable, not only to Melbourne's western suburbs but also to the rest of the city and beyond.

Table 18 Polyethylene: Typical applications

Process	HDPE	LDPE	LLDPE
Film	Food packaging	Cling wrap	Stretch film
	Freezer bags	Bread bags	Construction film
	Shopping bags	Milk carton lining	Diaper liners
Injection	Garbage bins	Housewares	Food containers
	Paint pails	Toys, pails, lids	
	Crates	Ice cream lids	Closures
Blow moulding	Detergent bottles	Cosmetic bottles	
	Mauser drums	Squeezable bottles	
	Dangerous goods drums		
Extrusion	Irrigation pipe	Flexible irrigation pipe	Cable sheathing
	Shade cloth	Cable jacketing	

Qenos has the capability to create products that suit harsh climatic conditions and to respond quickly to increases in demand. As well as the supply chain benefits of local manufacture already listed in this chapter, Qenos creates specific benefits for the broader economy. These include:

- the skill development of chemical and mechanical consultants;
- R&D focus on Australian market which assists customer product differentiation and competitiveness;
- technical innovation: as an example the rotational moulding industry which produces water tanks etc purchases formulated UV resistant resin from Qenos. This resin is formulated to meet harsh demands of Australian climatic conditions. Imported resins are not necessarily formulated to provide such high levels of protection and importing thus creates a risk to the customer as they may have to carry out their own formulating to create suitable resins to meet the demands of Australian climatic conditions;
- taking costs out of the supply chain because of improved inventory management that local manufacturing creates;
- enhanced value adding opportunities as they relate to the Australian resource sector, for example the use of gas and oil to produce the feedstocks of the industry; and
- a strong local feedstocks industry allows its local customers to be far more flexible and hence competitive in meeting market demands and enhances these companies' ability to manufacture and supply their products to meet tight schedules. It is important to note that many major projects, industrial or infrastructure related, rely on flexible and speedy delivery of materials to ensure that these projects are delivered on time and on budget. A strong local feedstocks industry and associated flexible supply chain reduce the risk of costly delays to major projects.

Qenos comprises a significant share of the Victorian synthetic resins industry. If Qenos closed, the contraction in Victoria's chemicals sector output would be large. The reason is straight forward. Local customers simply would not be able to secure suitable imports, either because none would be available that are suitable for local conditions, or if they were available, at a marginal cost to a small market that would be uneconomic. Local plastics production would contract, as would production in products such as automobile components that use these products.

In short, the closure of Qenos would generate a significantly greater loss to the Victorian economy than what would be indicated by the already high economic significance estimates of Qenos to the Victorian economy. This is approximately one quarter to one third of the benefits of the synthetic resins industry given in Table 7 above.

16. Supply chain integration provides large economic benefits. Supply chain fragmentation will produce large economic costs

One strong theme that nearly all industry representatives contacted during the course of this study agreed to was the importance of issues of supply chain strength. The consensus was that there was a desirability of maintaining the scale and density of a number of existing chemical industry supply chains.

The reasons for this view are best understood by examining the implications for the competitiveness of many of the chemicals sector domestic supply chains if the scale and density of the chains are allowed to contract significantly over the next decade. Essentially the commencement of a significant contraction in the scale of the local chemicals sector would probably trigger a vicious cycle of further contractions because of the initial weakening of supply chain scale and density.

17. The complexity and strategic importance of chemical sector supply chains varies. The most strategically important is that of the synthetic resins industry.

The case study clearly identified the synthetic resins industry of strategic importance to the chemicals sector as a whole. This was verified by a macro approach to ranking chemical industry based supply chains in terms of:

- the strength of their backward linkages into the general economy and the chemicals sector; and
- the strength of their forward linkages into the general economy and the chemicals sector.

A chemical industry with strong backward linkages means the industry has a high propensity to spend on goods and services purchased from other Victorian industries. A chemical industry with strong forward linkages means that there is a high propensity of other Victorian industries to spend on the products produced by the industry.

Clearly industries with relatively strong forward and backward linkages will be associated with supply chains that are likely to be of strategic importance to the Victorian economy. The converse holds for chemical industries with weak backward and forward linkages into the Victorian economy.

The clarification of Victorian chemical industries into the strengths of their supply chains as far as the Victorian economy is concerned is given in Tables 19 and 20. The stand out result is the strategic importance of the synthetic resins industry.

The soap and detergents industry has relatively weak supply chain integration within the Victorian economy. Even so, the case study makes clear that there are considerable benefits that would accrue to Victoria if the local soap and detergents industry supply chain was strengthened.

Table 19 Allocation of chemical industries by supply chain complexity – economy-wide assessment

Strong forward and backward linkages	**Strong backward linkages/weak forward linkages**
Synthetic resins	Industrial gases
Other chemical products	Pesticides
Other rubber products	Cosmetics
Plastic blow moulded products	Ink
	Plastic extruded products
Weak backward linkages/strong forward linkages	**Weak backward and forward linkages**
Organic industrial chemicals	Fertilizer
Inorganic industrial chemicals	Explosives
Paint	Pharmaceuticals
Rubber	Soap and Detergents
Plastic bags	Plastic injection moulded products
Plastic rigid fibre products	
Plastic foam products	

Notes: BM = normalised backward multiplier.
FM = normalised forward multiplier.

Table 20 Allocation of chemical industries by supply chain complexity – chemicals sector assessment	
Strong forward and backward linkages	**Strong backward linkages/weak forward linkages**
Industrial gases Synthetic resins Plastic blow moulded products Plastic rigid fibre products Plastic foam products	Explosives Paint Ink Plastic bags
Weak backward linkages/strong forward linkages	**Weak backward and forward linkages**
Organic chemicals Inorganic chemicals Other chemical products	Fertilizer Pharmaceuticals Pesticides Soap and Detergents Cosmetics Rubber tyres Other rubber products Plastic extruded products Plastic injected moulded products

Notes: BM = normalised backward multiplier.
FM = normalised forward multiplier.

18. The supply chain disintegration scenario: the implications of supply chain weakening

The study quantified the issues surrounding further disintegration of existing supply chains by making adjustments to the model which produced the current trends scenario outcome.

The scenario in Table 16 was based on the premise that the risks facing each chemical sector industry are independent of the risk profile facing any other chemical industry. The issue of supply chain strength and competitiveness is essentially an issue of the inter-relationship between risks, not only between chemical industries but also between chemical industries and other industries. These inter-related risks were accommodated in the model by making the following linkages:

- a sharp rise in the import penetration in one chemical industry is likely to be linked to the rise in import penetration in related chemical industries, as the supply chain strength linking the two domestic industries declines;

- a sharp rise in the import penetration in a chemical industry is likely to be linked to a reduction in the long run export effort of the industry as the reduction in supply chain scale drives up both short and long run production costs and drives down the capacity to innovate;

- the scale of current world-wide chemicals sector structural change is at such a level that few Victorian chemical sector firms will escape its impact; and

- most importantly, the linkage between the growth in synthetic resins imports and plastics imports to reflect the key strategic role the synthetic resins industry plays in protecting the plastics sector.

Given these linkages, a supply chain disintegration scenario was developed from the current trends scenario in the model structure, by linking the probability distribution of the risk factors facing each Victorian chemical industry. This scenario is summarised in Table 21. This scenario produces a more pessimistic, yet perhaps more realistic, outlook for the Victorian chemicals sector in the absence of a coordinated effort by stakeholders in this sector to improve the sector's growth potential.

Without this coordinated effort to strengthen and further integrate existing supply chains, there is a reasonable probability that the chemicals sector will contract by between 10 and 30 per cent over the next decade. That is, over the next decade the elements of the chemicals sector are at risk of implosion.

Table 21 Supply chain disintegration scenario: average annual growth rates for Victoria chemicals sector – 2004-2015

	Upper bound growth rates by probability benchmark				
	15 per cent	**25 per cent**	**50 per cent**	**75 per cent**	**95 per cent**
Synthetic resins	-13.4	-10.5	-7.4	-3.0	0.3
Other basic chemicals	-6.6	-5.7	-3.9	-2.1	0.4
Pharmaceuticals	-7.6	-5.8	-3.1	-0.1	3.2
Soaps, cosmetics and pesticides	-1.7	-1.2	-0.5	0.3	1.4
Plastics	-4.1	-3.3	-2.1	-0.8	0.8
Other specialty products	-0.7	-3.6	1.4	2.9	3.1
Total chemicals sector	**-4.2**	**-3.3**	**-2.3**	**-1.6**	**0.6**
Total excluding pharmaceuticals	-3.9	-3.5	-2.3	-1.1	0.3

19. Growing importance of strong supply chains

A focus of many main strategies for industry development involves increasing the efficiency of supply chains. Strengthening the efficiency of local supply chains will, in many instances, help achieve the strategic objectives of reducing the rate of growth of import penetration.

Supply chain mechanisms that afford some degree of natural protection against imports are:

- just-in-time: it can be risky to import time critical inputs because of possible delays in overseas supply and shipping and increases in inventory are a likely outcome to offset increased delivery risk; and

- bulkier items, particularly at the lower end of the value scale, are less likely to be imported.

Conversely, products that require less skilled labor and less capital intensity through the production cycle are more likely to be imported.

It can also be argued that because of advances in information communication technology (ICT) and as successful companies become more integrated through the supply chain, the barriers of natural protection are being broken down.

The car industry is an example of an industry that manages complex flexible supply chains across international borders; this industry is also a major customer of the plastics and chemicals industry in Australia and overseas. In the car industry, highly complex transactions are now managed through sophisticated, web-enabled quality management systems and supply chain collaboration networks, all driven by communications technology. This is an industry that is consolidating, but even so one of the smaller US companies still boasts more than 100 plants in 37 countries and nearly 15,000 suppliers with 13,000 sales outlets across most countries around the globe.

Sophisticated computer based tracking systems within the car industry provide detailed knowledge of real time business and manufacturing processes that allow the businesses within the supply chain to respond rapidly to the changing demands of the market place. Transactions between companies in the supply chain, company documentation, bills of lading, invoices and payments are all completed through new ICT systems so that international trade is made easier and less expensive than before. These systems also enable design and quality problems to be identified at an earlier stage and therefore assist in reducing or eliminating expensive delays.

Just-in-time systems, which reduce inventory, excess transport and eliminate the need for secondary storage, create extreme pressure, particularly in a globalised supply chain, across the entire supply chain. Co-ordination across the supply chain is therefore becoming increasingly important in managing product flows. The successful companies of the future will understand that their supply chains run downstream from the initial raw materials all the way through to the end customer.

In many industries ICT has already had a major impact on reducing supply chain costs and the emphasis now is on creating supply chain flexibility to enable the business to better meet and cope with fluctuating customer demand. Supply chain agility is enhanced by closer co-operation between firms within the supply chain, a poorly performing supplier upstream and an overstocked customer downstream can be highly disruptive to production flows and profits. If firms in the supply chain share information the situation of likely shortages and overruns can be readily identified.

20. The chemicals sector itself has a clear idea of what it requires from stakeholders in order to generate more optimistic future outcomes

As part of this study, a series of industry surveys were conducted, the first of which focused on firm supply chain structure and the second on past, current and future financial and growth outcomes and expectations. These two written surveys were followed up by face-to-face interviews. Some 50 companies and organisations participated in this part of the study. Their views on what the chemicals industry thinks stakeholders can do to generate a more optimistic future are summarised in Box 2.

BOX 2
A roadmap of the key findings of the surveys

Describing their vision of how the industry may be able to maintain and improve its global competitiveness and attract future investment, respondents stated the following issues were critical.

Investment competitiveness and growth prospects are enhanced if the following conditions exist:

- recognition of the strategic importance of a broader industry policy to create world scale operations in Australia;
- the provision of world class infrastructure and planning including ports, transport, zoning and waste management;
- a regulatory landscape which is consistent across Australia's states and which is sympathetic and contemporary to industry needs;
- an industrial relations environment which does not reduce the industry's global competitiveness;
- determination to put in place the major investments the industry must have to achieve global competitiveness and to avoid major plant closures;
- recognition of the industry's significant contribution to wealth creation in Australia;
- recognition of Australia's natural advantages of plentiful supply of raw materials and energy to leverage future growth;
- improved social and political influence of the industry;
- continually improving workforce skills to enhance innovation and competitiveness;
- growing local R and D and increasing the number of patents;
- universities which provide graduates who meet industry needs; and
- recognition of global trends, including changes in customer needs and the growing importance of global brands.

The chemical industry's view: the reasons for the current difficulties

The chemicals industry states that the main reason for the current difficulties is that chemical producers are faced, in relative terms, with a small domestic market and an industry history of relatively poor export culture and focus. This is obvious from the data.

Historically, it can be argued that the plastics and chemicals industry in Australia has not developed an export focus because:

1. international ownership of some of the bigger firms may have largely confined the activities of Australian operations – those with the capacity and scale to develop export markets – to the domestic market;
2. industry protection did not encourage the development of an export culture; and
3. there was a lack of co-ordinated industry strategy in the latter part of the 20th century.

Much of Australia's larger scale plant is small by world standards, and while often well maintained, it is ageing. In many cases this dilemma can be summarised by the understanding that firms, with largely depreciated assets across a number of ageing facilities throughout the industry, may continue operation until a decision for significant investment is required. At this crucial point the overwhelming economic reality of the competitiveness of imports from world-scale manufacturing operations may well result in the closure of local operations.

The chemical industry's view: issues for a more optimistic future

Prospects in Australia, exist for those technologically sound plants with capacity for innovation and value adding, although some degree of currency realignment is desirable to assist with competitiveness.

The industry survey, conducted as part of the study, emphasised that the future of the chemicals sector is in further value adding and knowledge and consumer based production. This future direction highlights the importance of safeguarding the building blocks of the supply chain and the maintenance of a local feedstock industry.

Furthermore, a viable feedstock industry in Australia is vital for the competitiveness of many aspects of the chemical supply chain. The reasons for this vary but the key reasons are the powerful advantages of economies of scale, logistic efficiency and cost effectiveness that a strong feedstock industry provides. In addition to this, locally based sourcing of the key inputs of the industry allows for hedging against the vagaries of the international business cycle.

These factors more than offset the availability of cheap imports whose supply and price may not be secure. The manufacture of bulk basics from domestic raw materials and feedstocks, assuming a degree of natural protection in the areas of transport costs and supply chain reliability and security, may provide opportunity for the Australian plastics and chemicals industry to build scale. This strategy would require a range of major infrastructure developments and joint industry and government planning because of the scale of infrastructure requirements and the (sometimes) remote location of raw materials.

It is likely that many firms in the plastics and chemicals industry in Australia will not be 'free trade ready' and as a result, investment in developing the industry, and specifically its major opportunities, may prove unattractive to multinational investors. Industry firms in Australia typically may not be free trade ready because of their relative size and strength, their ability to compete in the global economy and position in global supply chains.

21. The strategic roadmap: the ranking of drivers for a more optimistic future

The strategic drivers that will determine a more optimistic future can be technically derived from an analysis of the relative importance of the drivers determining the range of outcomes given in Table 19. The results of this analysis are given in Figure 8.

By far the most important factor is the exporting effort across the industries. The next most important factors, in turn, are import penetration into the pharmaceutical and synthetic resin industries. Activity levels in the motor vehicle and machinery industries are also of some importance.

Figure 8: Ranking of drivers of supply chain dis-integration scenario

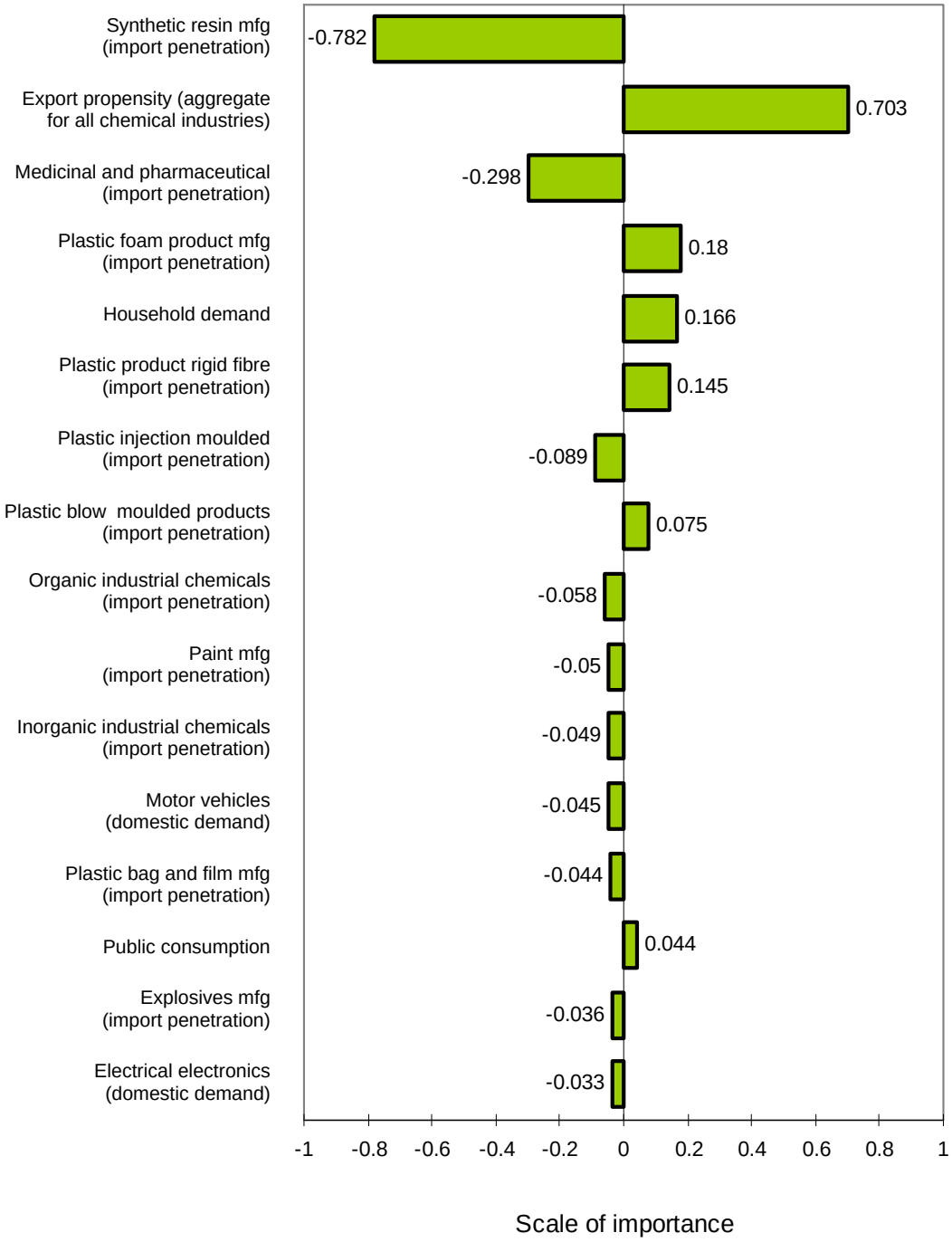
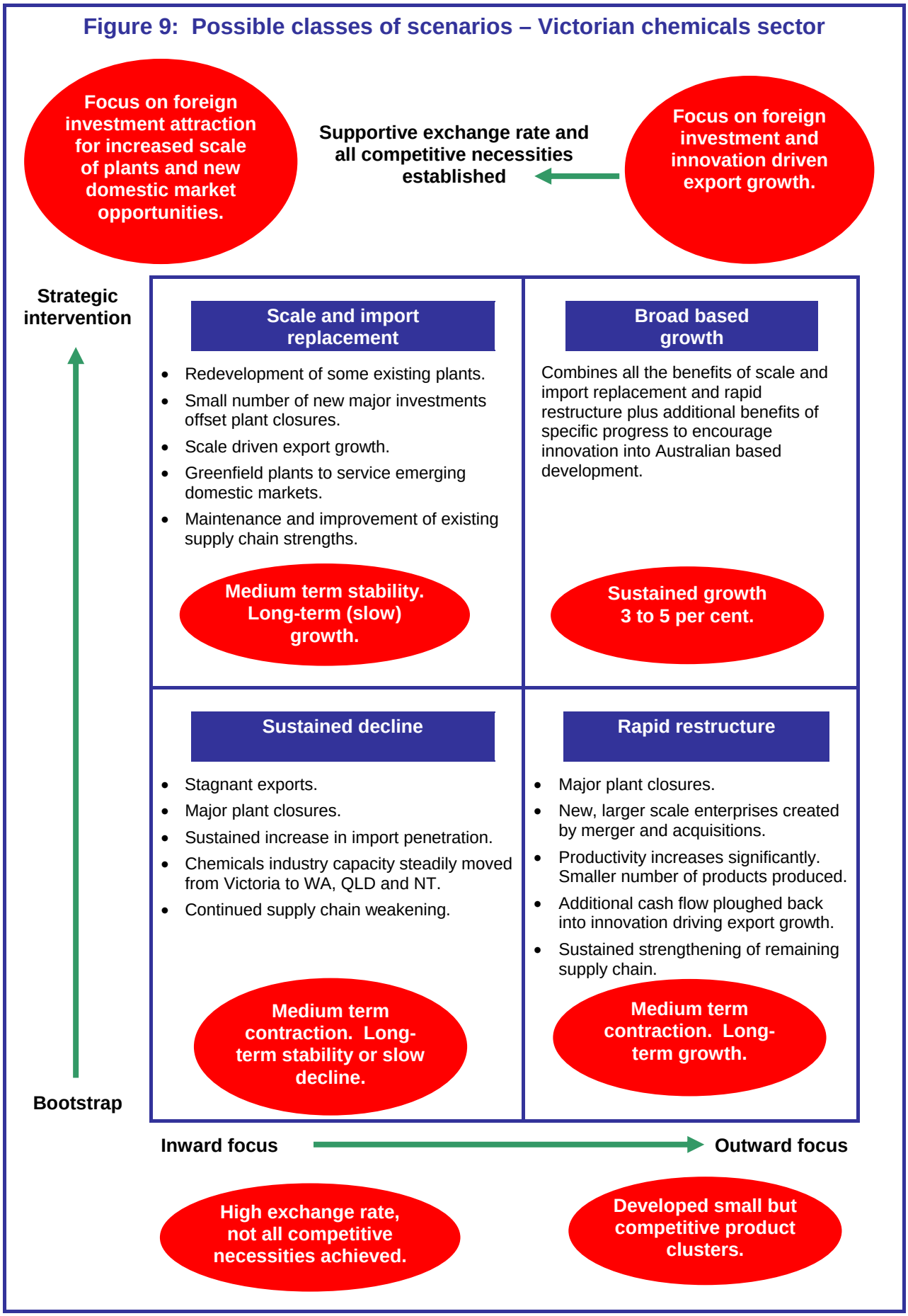


Figure 9: Possible classes of scenarios – Victorian chemicals sector



22. Challenges and future threats facing the industry

The Victorian chemicals sector is facing a number of key challenges that will require significant cultural change and support. There is little likelihood that the chemicals sector can move beyond the current trends scenario that leads to an outcome of a 15 per cent probability that the annual rate of growth of the sector will be less than -0.8 per cent per annum without addressing the following challenges:

- inward focused industry with a large dependency on domestic demand for activity;
- highly vulnerable to increases in import penetration; and
- ageing capital equipment.

As a result, over the past 10 years, the Australian chemicals sector has experienced:

- slower than average growth;
- loss of market share to international imports; and
- in the case of the Victorian chemicals sector, a decline in absolute allocation of product to interstate markets.

The report has identified four key threats to the chemical sector in achieving broad based growth in the future including:

- a lack of collaborative focus, direction and effectively targeted industry policy;
- gradual disintegration of the supply chain;
- development of competing nations with lower cost structures and bigger economies of scale; and
- continuing reduction in growth resulting in major plant closures.

23. What is needed to achieve broad based growth?

As mentioned earlier in Section 8 of the report, the Australian chemical industry developed an Action Agenda that was presented to the Commonwealth Government in March 2001. At the recommendation of the Action Agenda report, the Chemicals and Plastics Leadership Group (CPLG) was formed to progress the recommendations of the Action Agenda.

The CPLG identified four main areas for action:

- regulatory reform;
- investment;
- education and training; and
- innovation and export.

Working Groups were formed on each of these areas to address the Action Agenda recommendations. A summarised progress report is at Attachment B of this report.

The research and analysis undertaken for this study acknowledges the importance of the four areas identified by the Action Agenda and supports the work that has been undertaken to date as a result. The policy responses of the CPLG provide a comprehensive list of policy options or a toolbox of instruments. However, while the Action Agenda tackles some very important areas necessary for growth of the sector, without a firm commitment from Federal and State Governments, it is difficult for the industry to formulate a strategic industry plan for the medium to long term future. Without this strategic plan, important steps such as

increased investment and the development of supporting infrastructure will be difficult to implement.

This study aims to build on the Action Agenda by providing a strategic policy framework for the future to assist in demonstrating why Government and industry commitment to the chemicals sector is so vital.

Many of the instruments recommended by the CPLG are dependent on the existing supply chains remaining intact; therefore, the most important broad policy objective is to strengthen existing supply chains. It is clear, however, that there are substantial risks that a number of important supply chains may well disintegrate over the next decade without strategic intervention to set a plan for the industry.

To set this plan, a strategic policy process is required. To date, micro policies such as general purpose research and development support, investment incentives and export incentives, have been utilized to tweak industry performance. However, given the current structure and conduct of the Victorian chemicals sector, these are likely to prove insufficient. Taking a micro policy approach is akin to prescribing vitamin pills to treat a patient with a broken leg.

For the immediate future, resources and focus should be on the current weak links of the existing supply chains and development of a response using appropriate policy instrument combinations. The drivers of the disintegration scenario suggest how research might be prioritized into the potential weaknesses of existing supply chains.

Figure 8 lists the drivers of the disintegration scenario in terms of their importance to the overall outcome. This figure shows where government and industry can start to identify weaknesses.

It is clear from this report that it is necessary for the chemicals sector to embrace an outward focus rather than maintaining a continued reliance on domestic markets that are being whittled away by imports.

Moreover, it is evident from the report that strategic intervention is crucial to achieve broad based growth for the chemical sector. Australia, similar to other like nations, must assist industry to set out a plan for the future. Without this plan, which must embody certainty and regulatory support, the chemical sector will be significantly vulnerable to the emerging competition.

The question then becomes, whether or not there is capacity for the chemicals industry to lift its performance by “bootstrap” strategies? That is, by its own efforts using existing resources.

The evidence is that the chemicals industry does not have the internal financial resources to significantly increase investment, research and development effort or export expansion expenditures above current levels.

Like Europe, the prospects for the Australian chemicals industry very much depend on how all stakeholders, including State and Federal Governments, respond to the objective of improving its performance.

24. Case studies – future directions for the industry

These case studies are selected examples of companies that have been successful through innovation, export activity or investment.

As suggested throughout this report, the chemical sector is making a solid contribution to the Victorian and Australian economy. To attest to this a number of case studies have been collected to illustrate the current strengths and future needs of the sector.

Symex Holdings Ltd, is 100% Australian owned and is located in Port Melbourne (Victoria, Australia). It is a world-competitive manufacturer of Oleochemicals including Oleine, Stearine, Glycerine and Distilled Fatty Acids. These products are used in personal care, cosmetic, food, pharmaceutical and many other industrial applications.

Symex is capitalising on Victoria's natural advantages of low cost power, the availability of quality raw materials and favourable 'back filling' freight costs and combining with the firm's expertise, innovativeness, and its reputation for consistently high-quality products and outstanding customer service is taking on the world. The firm exports over 75 per cent of its products to over 35 countries, including the Asia-Pacific region, North America and Europe.

At a time when commodity chemicals are increasingly being supplied out of Asia or the Middle East, Australia's only manufacturers of polyolefins (Qenos, who manufacture polyethylene and Basell, who manufacture polypropylene) have both recently committed to significant investments at their respective Victorian operations, ensuring that polyolefins will continue to be manufactured in Victoria for many years to come. This is good news for the many downstream customers who will be able to source tailor-made polymer blends not available elsewhere.

Qenos is investing about $70 million at Altona to convert to a gas feed stock and Basell Australia is investing a similar amount to expand its plant at Geelong.

These investments will improve production efficiencies and make the plants comparable with world benchmarks for the production of polyolefins.

Polypropylene is used in textiles, automotive, packaging and in making Australia's leading edge plastic currency, while polyethylene is used for pipes and conduit, milk bottles, food packaging and water tanks.

25. Target for the Victorian and national chemicals sector – 2014

Given the downside risks, a seemingly modest, yet in practice may prove difficult, target to achieve would be one where the target growth rate for the Australian chemicals sector would be an average annual growth rate near the expected GDP growth rate of approximately 3 per cent per annum. This target would be exclusive of major national gas-based conversion projects, such as methanol or on the North West Shelf or in Darwin.

For the Victorian chemicals sector a reasonable complementary target would be for Victoria to maintain its share of the national chemicals sector. This would mean that the Victorian chemicals sector would maintain its significance to the national economy at 2.3 per cent, but would marginally increase its significance to the Victorian economy. This is because the Victorian economy can expect to grow at less than the national economic growth rate. As the accompanying table indicates, the significance of the Victorian chemicals sector to the Victorian economy would increase from 7.3 per cent to 7.5 per cent.

Because of higher productivity growth rates in the chemicals sector, the target would imply that the contribution of the Victorian chemicals sector to Victorian and national employment would fall slightly.

Given the expected growth in import penetration to achieve the national chemicals sector output growth rate, exports as a per cent of national output will have to climb to 29 per cent of output, or just under double. For Victoria the requirement will be that exports reach a quarter of output.

To achieve the export requirement national net chemicals sector investment over the decade to 2014 will have to double in terms of the average annual outcome over the ten years to 2004. Over the last four years, national net investment has been negligible.

	Current		Target	
	Victoria 2004	**Australia 2004**	**Victoria 2014**	**Australia 2014**
Contribution to GSP/GDP	7.3%	7.3%[(a)]	7.5%	2.3%[(a)]
Contribution to total employment	6.8%	2.1%[(a)]	6.7%	1.9%[(a)]
Exports[(c)]	$1.5 billion	$5.7 billion	$5.0 billion	$13.8 billion
National net investment per annum (2004 $ million)	n.a.	$340 million[(b)]	$300 million	$750 million
Exports as a per cent of production	10%	15%	25%	29%
Research and development	Well below OECD average	Well below OECD average	80-90 per cent of OECD average	80-90 per cent of OECD average

Notes: (a) Contribution of the Victorian chemicals sector to national activity.
(b) Average ten years to 2004.
(c) 2004 prices.
n.a. Not available.

26. Conclusion and imperatives for future growth

This study provides a comprehensive basis for industry and government to identify and build on the strengths of the Victorian and Australian chemical sector, but also articulates a call for action. This action must be responsive and strategically focussed and must build commitment by all stakeholders to the continued growth and health of the chemicals sector.

As demonstrated throughout the study, the Australian chemical industry is at the crossroads. It is evident that without significant strategic policy intervention that provides long term direction and stability to this industry, the industry is in danger of declining. While it is inevitable for some industries to decline thereby eliminating inefficiencies from the broader economy, the Australian and Victorian chemical sector does not fall within this category. Rather, due to the unique contribution the sector makes to broader manufacturing and innovation in Australia, it is integral to Australia's economic future. In other words, if the decline of the sector were allowed to occur, this decline would have a significant negative impact on the broader Australian economy.

A plan that clearly articulate where the Victorian and Australian chemicals sector will be in the future is vital and must be formulated to secure the ongoing future of the sector.

Based on the research and analysis undertaken for this report, six strategic policy imperatives underline any future strategy and policy decisions for the chemicals sector.

In order to achieve broad based industry growth, a long term strategic focus is necessary but more importantly all stakeholders will need to commit to it. As a minimum, the long-term strategic plan for the chemical industry must:

- ***Secure the recognition of State and Federal Governments of the significant strategic value and contribution to innovation the chemical sector makes to broader manufacturing and service industries within the economy***
- ***Strengthen local industry supply chains***
- ***Capitalise on opportunities for export and import replacement***
- ***Enhance the conditions for firms to increase investment in research and development***
- ***Improve access to capital and long term foreign investment in research and development projects***
- ***Embrace measures to create a stable economic and regulatory environment that encourages investment and growth in the chemicals sector***

27. Strategic Policy Imperatives

Strategic Policy Imperative 1 :

The chemicals sector is recognised by industry and Government for its significant strategic value and contribution to innovation in broader manufacturing and service industries within the economy.

The chemical sector is intertwined with the broader manufacturing and services industries. The three main sub-sectors – basic chemicals, knowledge based chemicals and specialty products chemicals – provide significant social and economic flow-on benefits to the broader economy.

The Victorian chemicals sector contributes $33 billion to Victorian gross output and $11.2 billion to gross product at factor cost. This represents 6.2 per cent of Victorian gross product at factor cost in 2004. Crucially, the Victorian chemicals sector indirectly generates 158,700 standardised employment positions, or 5.8 per cent of total Victorian employment.

Furthermore, it is estimated that the Victorian chemicals sector is responsible for 7.3 per cent of Victorian economic activity in 2004. This does not include the cumulative benefits of productivity-enhancing opportunities the chemicals sector generates for other sectors in the economy such as new technologies, research and development effort in improving the prospects of successful commercial innovation, and training employees in new technologies.

It is estimated that the cumulative benefit of the innovation efforts of the chemicals sector to Victorian non-chemical sectors over the past decade (1994 – 2004) was $2.8 billion.

Recognition by policy makers and external stakeholders of the chemical sector's economic and social contribution is crucial to future industry policy. In many ways the relationships that exist between the chemical sector and broader manufacturing exemplify the importance of ensuring a critical mass. There is little doubt that without a healthy local chemical sector, Australian manufacturing would suffer significant losses in research and development contribution and innovation capabilities and enablers: two essential ingredients to future sustainability of manufacturing.

Recognition of the chemicals sector's value and contribution may be achieved through:

<u>Federal Government</u>

- The Federal Industry Minister to respond publicly to this study and the Action Agenda recommendations and highlight importance of the industry in public forums

<u>State Government</u>

- The State Industry Minister to promote the findings of the study to Ministerial colleagues and the broader industry community and commit to responding publicly to the study
- The State Industry Minister highlight the importance of the industry in public forums

<u>Industry</u>

- Encouraging industry leaders from outside the chemicals sector to speak on the importance of the industry to their operations.
- Embarking on a public campaign to boost image and understanding of the industry

Strategic Policy Imperative 2 :

Strong and flexible supply chains are essential to increasing local capability, capacity and resilience to changing market conditions for the chemical industry and the entire manufacturing sector.

This report illustrates the importance of supply chains as key to reducing import penetration and increasing competitiveness. Strong supply chains within the chemical sector encourage better communication and inter-company and inter-industry collaboration to achieve efficient and innovative outcomes. The case studies from PZ Cussons and Albright & Wilson demonstrate these benefits.

Just in time delivery and bulk purchasing methods are utilised by some Australian manufacturers favouring locally produced commodities. The case study featuring Qenos emphasises the importance of local raw materials manufacturers and their ability to supply a demanding local market vulnerable to import penetration.

The case studies further demonstrate the dependency of broader manufacturing on the chemical sector for the flow-on benefits such as economic activity, skills development and technical innovation.

However, the increasing use of ICT in supply chains is a challenge for local suppliers as ordering from overseas becomes easier and more efficient than it has been in the past.

Strong supply chains create a collaborative culture between the participating firms, generating productivity improvements, innovation and greater efficiencies. Conversely, without them, the industry is vulnerable to inefficiencies and limited capabilities that lead to increased import penetration.

Strong and flexible supply chains may be achieved through:

<u>Federal Government</u>

- The prioritisation of supporting infrastructure for the raw materials industry by the Federal Government
- The creation of an environment conducive to, and actively encouraging of, collaboration with all levels of the supply chain
- Assistance to the industry to form clusters and to develop innovative supply chain systems

<u>State Government</u>

- Funding programs and events, seminars and training programs to demonstrate the benefits of local supply chains
- Encouraging further take up of e-commerce to improve supply chain efficiencies

<u>Industry</u>

- Increasing participation in collaborative ventures
- Continual refinement of supply chains to achieve efficient processes

Strategic Policy Imperative 3 :

A stronger focus on exports will compensate for declining domestic demand and increasing import penetration.

Current statistics reveal that if pharmaceuticals are excluded, the Australian chemical sector's current export share is only 8% of total production. Given this, the chemical sector is missing opportunities to create new revenue streams, increase profits and provide access to new skills and know-how offered by overseas markets.

While Australia's chemical export levels have improved over recent years we have not closed the gap with other OECD economies as they have been improving their performance at a similar rate. To date Australia has not been able to significantly offset the economies of scale disadvantage of a small domestic market through increased export effort.

While maintaining strong local feedstock manufacture and supply is crucial for domestic manufacturing, this report highlights the importance of capitalising on opportunities that exist where there are high barriers to entry, high levels of research and development and high degree of product differentiation in Australian chemical manufacturing, to build a stronger export culture.

Rising import penetration, resulting in a shrinking domestic market, has placed further pressure on some Australian manufacturers to seek overseas markets for their product. It is evident from the analysis that for the sector to achieve broad industry growth, it must embrace an export culture. An export culture will not only increase Australian exports, it will also replace commodities that are currently imported.

This report reveals that only a small number of sub-sectors are directly exporting. The commodities that have a relatively high export share of production and sustained reasonable growth rates are:

- phenol-alcohols and derivatives;
- other inorganic chemicals (large);
- synthetic inorganic colouring agents; and
- filler, putty compounds (small).

Commodities where the export share of production is growing rapidly and exports are also growing on a sustained basis are mixed fertilizers and other cleaning products.

While increasing demand for existing exports is beneficial, there must be exploration of the suitability of other commodities for export. A better understanding of Australia's position on the world stage is necessary to establish product niches overseas and viable opportunities for import replacement domestically.

A stronger focus on exports may be achieved through:

Federal Government

- The provision of more information and research into specific overseas markets and products with high export potential
- Promotion of the capacity and capability in the Australian manufacturing sector, and the chemicals and plastics sector, and encouragement of investment and commitment by industry

State Government

- Effective monitoring, advocacy and support on export trade barriers and arrangements that may provide importers with an unfair advantage over local industry.
- Promotion of the capacity and capability in the Australian manufacturing sector, and the chemicals and plastics sector, and encouragement of investment and commitment by industry

Industry

- Support and promote innovation link to other industries that are creating exportable products.

Strategic Policy Imperative 4 :

Strengthened commitment to research and development is essential for the chemical sector to compete successfully in a global environment increasingly characterised by high levels of research and development.

Research has shown that due to poor profitability and insufficient financial resources, the Australian chemical sector has been under-investing in research and development in recent years.

Despite a relatively strong economy (the Australian chemicals sub-sector output growth rates were comparable to the OECD average to the mid-1990s), Australia has been unable to close the performance gap with other OECD economies in terms of exporting and research and development effort.

The lack of investment has significant long term impacts for chemical companies and their ability to compete with other countries who are leading in these areas.

To improve performance there must be significant increases in:

- the level of investment and transfer of production technology;
- research and development expenditure;
- market development expenditures to increase exports; and
- training expenditures to lift productivity.

Relative to our major competitors in the region, Australia is well placed to be the leader of research and development in the chemicals sector. Boasting well respected universities, research institutions, increasing scientific infrastructure and high quality graduates, Australia has a distinct advantage on regional competitors that is not being effectively capitalised upon.

Australia's poor rates of research and development in comparison to the other OECD countries indicate that Australia does not have the right policy settings to regain our strength in this area.

Internationally, competitive research and development initiatives that include real encouragement and incentive to companies are essential for ongoing viability. Without real support for risk-taking and investment, other jurisdictions will continue to have the edge over Australia, and therefore enjoy greater employment and economic activity.

A stronger commitment to research and development may be achieved through:

<u>Federal Government</u>

- The development of more attractive general research and development incentives
- More comprehensive assistance in the commercialisation of research and development
- An emphasis on technology and the competitive advantages available to Australian manufacturers

<u>State Government</u>

- Encouragement of collaboration of research and development to share risks
- Promoting capabilities and investment by Government in enablers such as the Synchrotron and nanotechnology.

<u>Industry</u>

- Advocating and demonstrating applications of new technologies to create competitive advantage.

Strategic Policy Imperatives 5 :

Improve access to venture capital and long term foreign investment in research and development projects

Many chemical companies face major barriers in accessing venture capital and overseas investment for long term research projects. The long term projects, conducted in collaboration with Cooperative Research Centres, are core to the continued success of the chemicals industry and other sectors within the manufacturing industry.

Many of these projects require investors are high risk and can take up 20 years to return on the investment making less attractive than other investment options available. Overseas investors and the domestic capital markets are more likely to avoid the risks involved in this type of investment and prefer to limit their expectations to short term for a return. Many foreign investors are also constrained by a 'not invested here' attitude that makes attaining foreign investment difficult.

Unless better access to the levels of finance required for long term research projects and support through the commercialisation phase is enhanced, many local ideas will be exported for production.

Improvements in access to venture capital and long term foreign investment in research and development projects may be achieved through the following actions:

Federal Government

- Creation of enablers, such as special tax treatment, for fund managers to invest more readily in long term research projects
- Better cooperation between State and Federal Departments to promote foreign investment in Australian companies and innovations
- Coordinated promotion of manufacturing capabilities of the chemical sector through targeted campaigns to international decision makers

State Government

- Facilitation growth of industry clusters to nurture development of collaborative research

Industry

- Continued generation of new ideas and exploit opportunities for partnerships to develop innovative products

Strategic Policy Imperatives 6 :

Ensure a stable economic and regulatory environment that encourages investment and growth of the chemicals sector

Without new and continued investment in plant and equipment the industry will stagnate. Any strategic plan for the future must ensure that it is designed to attract long term commitment from existing and new locally owned and multinational companies

This report has found that insufficient resources have been allocated on a company level to drive significant improvement in future investment and research and development. This under-investment is a result of tighter operating margins and a lack of clear direction for the industry.

Australia has significant advantages on our competitors in areas such as legal protection for intellectual property that could be utilised to encourage growth in the sector.

A stable economic and regulatory environment may be achieved through:

Federal Government

- Implementation of the recommendations of the *Report of the Taskforce on Reducing the Regulatory Burdens on Business – Rethinking Regulation* (the Banks Report) and the intent of the COAG Ministerial communiqué (February 2006) regarding reform of chemicals and plastics regulation
- Commitment to the industry through the provision of infrastructure for the raw materials industry
- Commitment to enabling and facilitating green-fields development or extensions to existing sites and infrastructure
- Continual regulatory reform/review with a view to minimising the impact of industry regulation through such mechanisms as the government's red tape reform agenda

State Government

- Effective consultation with industry on policy development and any changes in planning and environmental regulation that may impact on future investment opportunities in the chemical sector, through such mechanisms as the National Manufacturing Summit.

Industry

- Building case studies to market Victoria and Australia as a prime location for investment.

Progress of the CPLG Working Groups –

Chemical and Plastics Sector Action Agenda

Regulatory reform

Progress is most evident in the passage through the Australian Parliament in June 2004 of the *Industrial Chemicals (Notification and Assessment) Amendment (Low Regulatory Concern Chemicals) Bill 2004*. This legislation is a very significant outcome of the Chemicals and Plastics Action Agenda and addresses many of the issues raised by industry regarding regulation of low-concern and non-hazardous polymers and chemicals.

To build on the progress to date in regulatory reform, the CPLG recommends that:

- The government direct the Productivity Commission to conduct a comprehensive review of regulation governing the chemical and plastics industry with the aim of reducing the regulatory burden and providing consistency of regulation across all jurisdictions
- future regulatory reform action focus on developing a program to systematically review regulations impacting on the plastics and chemicals industry;
- all agencies continue to investigate opportunities for introducing low regulatory concern reforms as well as enhancing the reforms currently in place; and
- NOHSC consult with industry on policy development, implementation plans and timetables for GHS for industrial chemicals and NDPSC in consultation with industry, and consider ramifications of classification and labelling of GHS for domestic and agricultural/veterinary products.

Investment

On measures to encourage investment and re-investment, the CPLG acknowledges that the Government has established the Strategic Investment Coordination process to facilitate infrastructure assistance. This is an essential component of project development for international competitiveness.

Among various measures, the CPLG recommends that the Government extend its assistance for infrastructure development to include the restoration of infrastructure at existing sites. It argues that the recycling and extension of existing “brownfields” sites is infrastructure intensive and deserves similar support from government as is proposed for infrastructure serving greenfields sites.

To assist in the identification and development of potential world-scale petrochemical projects, the CPLG recommends that the Australian Government undertake a national study in consultation with industry as an extension of the WA study into petrochemical feedstocks. The full extent and scope of the national study would embrace:

- availability of feedstocks for world-scale petrochemicals production (significant resources by location and quantity);
- competitiveness of feedstocks and any tax impediments to competitiveness;
- the alternatives of greenfields development or extensions to existing sites; and
- an examination of the petrochemical building blocks, including methane as well as ethylene-derived product chains.

Innovation and Exports

The CPLG recommends the following actions to support innovation in the sector.

1. The establishment of Mentoring Groups in all major states to provide a first point of call option for innovators where they can access advice and support. The initial Mentoring Group would be established in Victoria with selected industry representatives.

2. A grant of $200,000 to be made available over two years to provide for the Chairman, administrative support, travel and publicising of the Victorian Mentoring Group and its role. At the end of this period, the process should be reviewed, the value of the Mentoring Groups assessed and their future decided.

3. Extension of the Mentoring Group model to all industry sectors if the Plastics and Chemicals model is successful.

4. Amendment of AusIndustry guidelines to cater more for the needs of SMEs. In particular, some financial support should be provided for the development of preliminary Business and Technical plans.

The proposed amendment to AusIndustry guidelines has low budget impact and is more accountable in that only projects/inventions with a measured level of success potential are considered. This recommendation fills the gap between the SMEs and the existing AusIndustry system, without confusing the applicant by referring them to other assistance schemes that may or may not help.

Based on the work of the Innovations and Export Working Group, the CPLG believes that the R&D Tax Concession Scheme, providing tax concessions in excess of $550 million per annum, is failing in its aim of stimulating business investment in R&D because:

- there is a high cost of compliance compared with the benefits provided;

- the retrospectivity of the benefit means that it has little, or no, influence on decisions regarding the level of investment in R&D or the projects undertaken; and

- the benefit from the scheme appears on the bottom line of the balance sheet and is not factored into R&D budgets or other decisions on R&D investment.

To provide more advice and assistance to companies seeking innovation development partners, the CPLG recommends that AusIndustry in conjunction with the CSIRO, other public R&D groups and industry bodies, extend the existing guide for potential collaborators titled *"Research Collaboration between Industry and Universities"*.

Education and Training

The Government response to the Action Agenda largely focuses on industry working through the national training advisory arrangements to achieve satisfaction in having skill development needs recognized and addressed. Industry has invested significant resources over the past 10 years to support the national and state industry advisory arrangements to develop industry competency standards, Training Packages and resources.

Despite these efforts, a number of impediments still exist to industry accessing appropriate skill development to address its current and emerging needs. The CPLG Education and Training Working Group has developed a list of outstanding issues and priority initiatives that it believes are essential for the implementation of effective measures to address the industry's need for a skilled workforce.

The issues requiring concerted and immediate action focus on:

- the critical importance of attracting young people to the chemical and plastics industries;
- up-skilling existing workers to address skill gaps;
- achieving minimum standards in safety and induction training for all workers;
- addressing the knowledge and skills levels of trainers and assessors working with chemical and plastics industries;
- the availability of adequate learning resources to support skill development ensuring adequate entry level skills; and
- promotion of the industry to young people and the community, and supporting industry to access training.