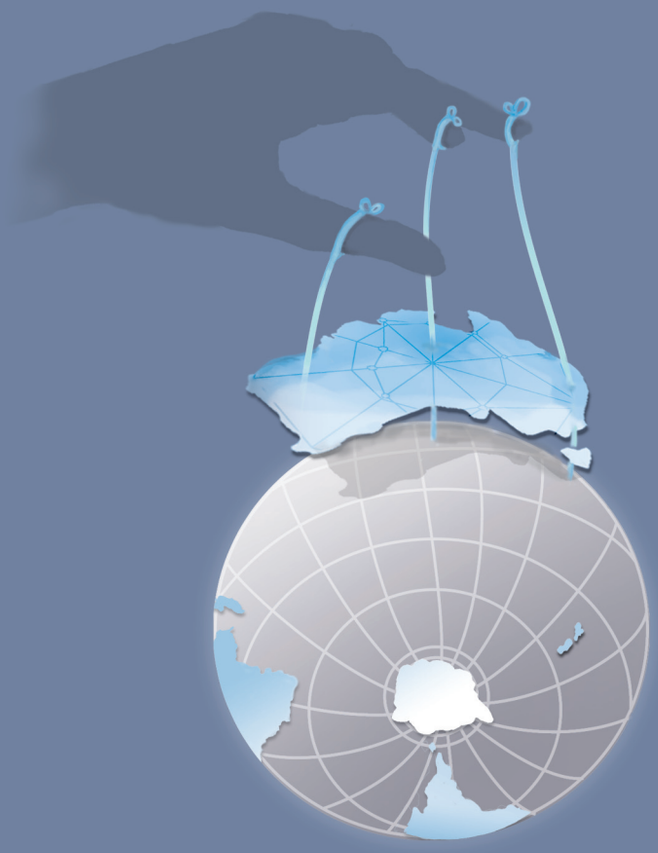

Balancing Act

A TRIPLE BOTTOM LINE ANALYSIS

OF THE AUSTRALIAN ECONOMY

VOLUME 4

The University of Sydney

CSIRO

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Barney Foran
Resource Futures Program
CSIRO Sustainable Ecosystems
GPO Box 284
CANBERRA ACT 2601

Manfred Lenzen and Christopher Dey
School of Physics A28
University of Sydney
SYDNEY NSW 2006

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Contents

Sector 3601: Electricity Supply (El)

Electricity supply, transmission and distribution

Short Summary

Electricity supply is fundamental to a modern economy. Due to its technological structure the sector's energy and greenhouse indicators perform poorly. Greenhouse emissions per dollar of final consumption are eleven times the economy wide average and water use is 65% above average while land disturbance is 90% below average. Over 80% of the emissions and water use are direct effects within the sector, rather than due to its suppliers. For financial indicators, the operating surplus is 60% above average, export propensity is 10% below average and import penetration is 70% below average. For the sector's social indicators, employment generation is 55% below average while income and government revenue are both 40% below average respectively. The linkages of the sector to its suppliers are relatively weak and increases in consumer demand do not give a broad stimulus to the supply chain. The sector shows strong linkages to downstream sectors such as aluminium, wholesale and retail trade and accommodation. Overall the electricity sector presents a mixed TBL account with a number of challenges. One issue is the long operating life of electricity generation plants, which hinders the transition to other generating forms such as wind and solar thermal. Institutional and market reforms have also advantaged low cost suppliers, which tend to have relatively higher greenhouse emission intensities.

Sector Description

Currently, Australia has around 210 major electricity plants with an installed capacity of 46 200 megawatts and an average plant age of 21 years, varying from older hydro plants (average 33 years) to the relatively new wind farms (average 2 years). Over 200 000 gigawatt hours of electricity are generated annually and 2 200 petajoules (10^{15}J) of primary fuels are consumed. The fuel origin in terms of megawatts of installed capacity is hydro (16%), coal (60%), oil (4%), gas-steam (15%), gas combined-cycle (4%) and renewables (1%). However 84% of total electricity is generated from coal due to its low production cost and the current absence of restrictive carbon constraints. With periodic upgrades, major electricity plants can last for 50 years or more and, in the absence of policy and industry innovation, the structure of future generation capacity for the next 30 years may already be in place.

Place of Industry in the Economy

Electricity generation is ranked 16th out of 135 in its contribution to value adding in the economy and contributes 1.86% of GDP in this analysis. It is a moderate generator of employment with a total of 31 000 employment years, 17 000 of which are used directly in the industry, and 14 000 which are used by the industry's suppliers. In addition, it contributes 33 000 employment years to the final demand of downstream sectors. The sector requires 16% of national primary energy use and emits 11% of national greenhouse gases. It has 1.6% of national water use and less than one tenth of one percent of national land disturbance. Any discrepancy between other national data and these data is due to the allocation of energy and greenhouse to the sectors of consumption.

Strategic Overview

The integrated overview in the spider diagram reveals large outliers for the environmental indicators of energy use, greenhouse emissions and water use, and the social indicators of employment generation, income and government revenue. The challenge of reducing these outliers is immense as cheap electricity underpins most facets of modern economic growth and consumer lifestyle.

TBL Account #1

The operating surplus is 60% above average with two thirds a direct effect and contributions from black (11%) and brown coal (1%). Employment generation is 55% below average with half a direct effect and minor contributions from a diverse set of suppliers. Greenhouse gas emissions are eleven times the economy wide average with most due to fuel combustion in the sector's generating plants, and minor contributions from black coal mining (2%) and natural gas production (1%).

TBL Accounts #2 and #3

In the second TBL account, export propensity is 10% below average, and mostly due to the embodiment of electricity production in the production of export goods and commodities. The social indicator of income is 40% below average with two thirds a direct effect. Water use is 65% above average and most of this (87%) is a direct affect from water use for steam generation and cooling, with smaller first order effects of water use for coal washing and natural gas production. The third TBL account shows an import penetration 70% below average, government revenue 40% below average, and land disturbance 90% below average.

Structural Path Analysis and Linkages

Increases in consumer demand for electricity give relatively weak backwards linkages to upstream sectors such as black coal, wholesale trade and property development. The sector shows strong downstream linkages to the aluminium, wholesale and retail trade, and accommodation sectors, which must expand in order to dissipate the increased generation capacity.

Future Trends in Sector

The base case scenario of the *Future Dilemmas* study with 25 million people by 2050, anticipates that electricity production will increase by 40% over the next 50 years. This includes a range of assumptions such as the aggressive implementation of improved efficiencies in the end use of electricity (reduced electricity requirement for the same energy service such as lighting) as well as taking the current fossil fuelled generation to the cutting edge of its potential thermodynamic efficiencies. Other analyses suggest that electricity demand could increase by 75% by the year 2020.

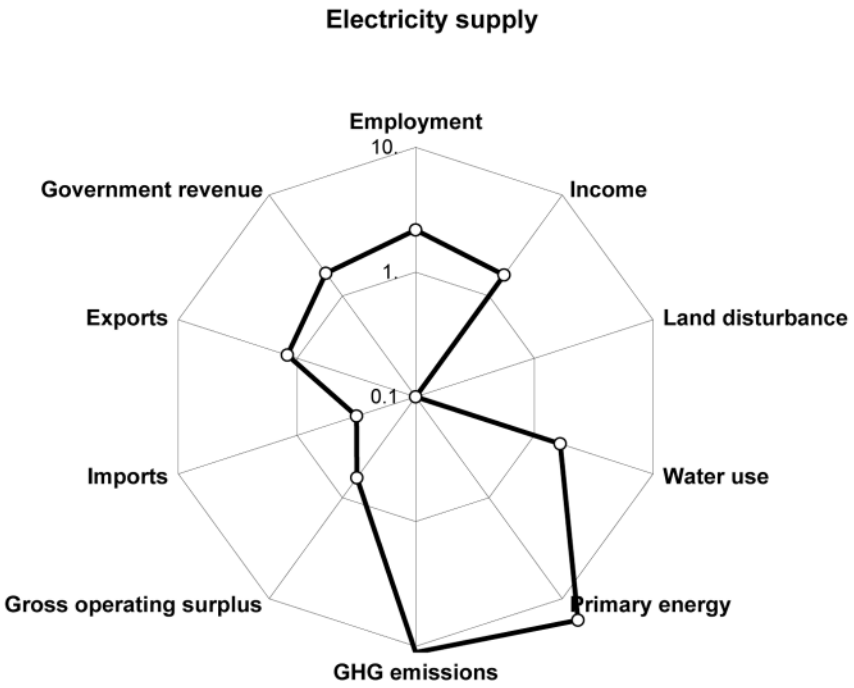
Innovation and Technical Opportunities

While advances in technology are significantly lowering the emissions intensity of new coal-based electricity plants, they remain the most emission-intensive form of electricity in widespread use. Fossil fuel based generation would be particularly affected by the introduction of carbon constraints. A wide range of technologies could significantly reduce the greenhouse signature of energy production and use. These include relatively mature technologies such as wind and bagasse, rapidly developing technologies such as solar, and others at or still to reach demonstration stage such as hot dry rocks and carbon capture. For many industrial applications, installing combined heat and power (CHP) plants is a proven way to reduce greenhouse emissions. Marginal greenhouse reductions can be obtained by co-firing in traditional coal generators with wood fuels and also industrial and municipal waste. These approaches are often based on diverting waste from landfill where it would otherwise generate methane emissions. The introduction of distributed micropower generators, usually based on fuel cells fuelled by natural gas or methanol, offers a step change in the efficiency of electricity generation and avoids loss along transmission lines. Renewable electricity such as wind, solar thermal and solar photovoltaic is now technically and economically feasible in a wide range of applications. The options for end use energy efficiencies are obvious, but largely untapped due to relatively low electricity prices.

Sector **Electricity supply** **(EI)**

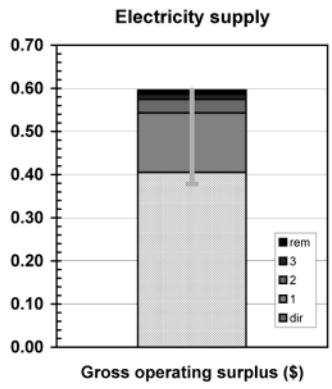
Electricity supply, transmission and distribution

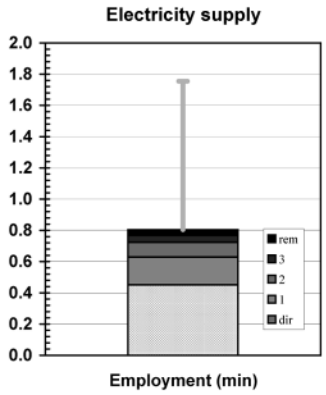
Spider diagram

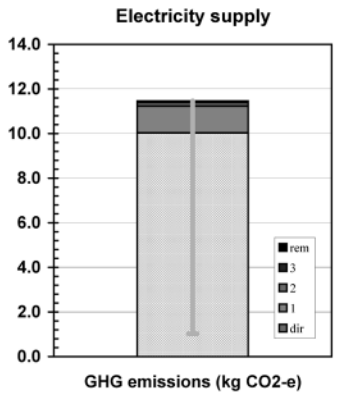


Bar graphs

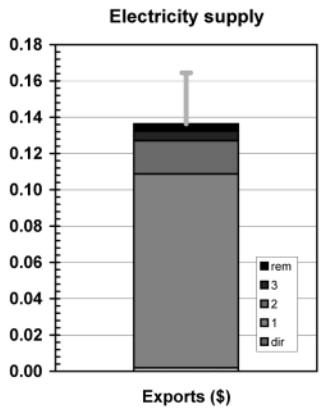
Account #1

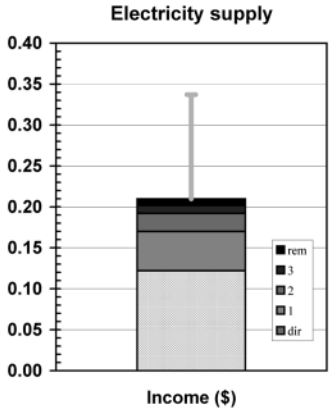


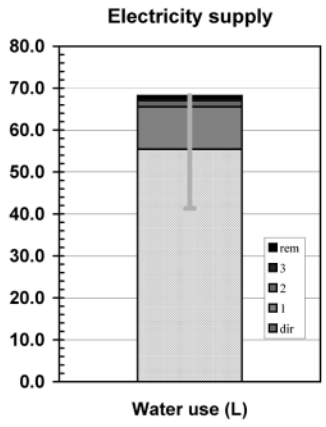




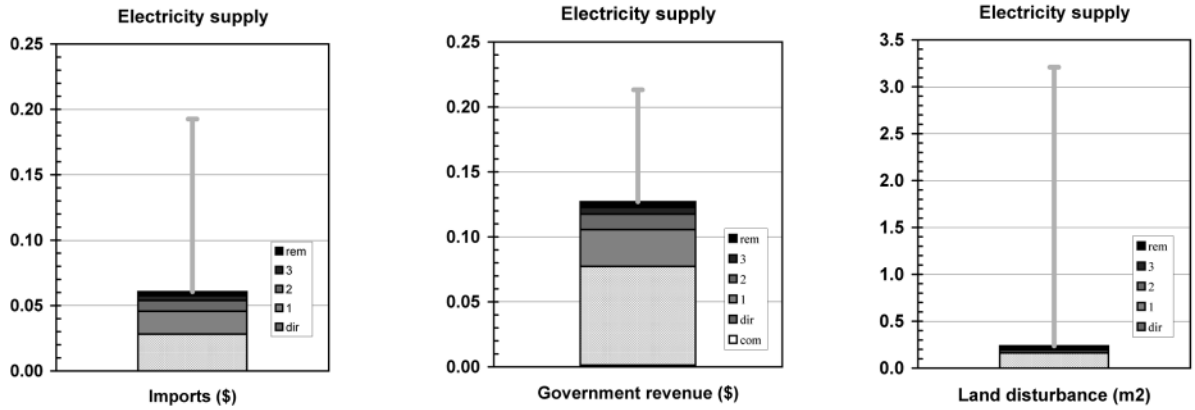
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 4,483.2	(1.70% of total)	($m 4,480.6 domestically produced)
Government final consumption	$m 158.5	(0.18% of total)	($m 158.5 domestically produced)
Gross fixed capital expenditure	$m 176.2	(0.17% of total)	($m 176.2 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 4,817.9**	**(1.05% of GNE)**	**($m 4,815.3 domestically produced)**
Exports	$m 26.8	(0.03% of total)	($m 26.8 domestically produced)
Final demand	**$m 4,844.7**	**(0.89% of GNT)**	**($m 4,842.1 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 1,689.0	(0.99% of total)	
Gross operating surplus	$m 5,611.7	(2.93% of total)	
Taxes less subsidies	$m 1,052.7	(1.23% of total)	
Sectoral GDP*	**$m 8,353.4**	**(1.86% of GDP)**	
Imports	$m 389.5	(0.40% of total)	
Primary inputs	**$m 8,742.9**	**(1.60% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 5,611.7	(2.93%)	$m 1,962.2	(1.02%)	$m 2,886.0	(1.50%)
Exports ($m)	$m 26.8	(0.03%)	$m 9.4	(0.01%)	$m 660.0	(0.79%)
Imports ($m)	$m 389.5	(0.40%)	$m 136.2	(0.14%)	$m 293.7	(0.30%)
Employment (e-y)	50,000 e-y	(0.70%)	17,483 e-y	(0.25%)	31,221 e-y	(0.44%)
Income ($m)*	$m 1,689.0	(0.99%)	$m 590.6	(0.35%)	$m 1,015.5	(0.59%)
Government revenue ($m)†	$m 1,058.5	(0.98%)	$m 373.9	(0.35%)	$m 615.4	(0.57%)
GHG emissions (kt CO_2-e)	138,852 kt	(26.77%)	48,552 kt	(9.36%)	55,507 kt	(10.70%)
Water use (ML)	767,646 ML	(3.66%)	268,420 ML	(1.28%)	330,417 ML	(1.58%)
Land disturbance (kha)	224 kha	(0.14%)	78 kha	(0.05%)	115 kha	(0.07%)
Primary energy (TJ)	1,556,258 TJ	(40.11%)	544,171 TJ	(14.02%)	605,397 TJ	(15.60%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.41	0.60	0.38
Exports ($)	0.00	0.14	0.16
Imports ($)	0.03	0.06	0.19
Employment (min)	0.45	0.80	1.75
Income ($)	0.12	0.21	0.34
Government revenue ($)	0.08	0.13	0.21
GHG emissions (kg CO_2-e)	10.03	11.46	1.02
Water use (L)	55.44	68.24	41.32
Land disturbance (m^2)	0.16	0.24	3.21
Primary energy (MJ)	112.38	125.03	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
EI	0.405	(0; 68.%)	EI	0.451	(0; 56.%)	EI	10.0	(0; 87.%)
BI EI	0.0646	(1; 11.%)	BI EI	0.0249	(1; 3.1%)	BI EI	0.253	(1; 2.2%)
Br EI	0.00674	(1; 1.1%)	Wt EI	0.0149	(1; 1.9%)	Ga EI	0.0226	(1; 0.2%)
Wa EI	0.00437	(1; 0.73%)	Rf BI EI	0.00767	(2; 0.95%)	Ng EI	0.0178	(1; 0.16%)
Ng EI	0.00392	(1; 0.66%)	Ee EI	0.00738	(1; 0.92%)	EI BI EI	0.0156	(2; 0.14%)
Ga EI	0.0033	(1; 0.55%)	Rf EI	0.00587	(1; 0.73%)	Ce EI	0.00395	(1; 0.034%)
Wt EI	0.00207	(1; 0.35%)	Wa EI	0.00556	(1; 0.69%)	EI Rf BI EI	0.0028	(3; 0.024%)
Pd EI	0.00207	(1; 0.35%)	Ts EI	0.00529	(1; 0.66%)	Rf BI EI	0.00278	(2; 0.024%)
Rv EI	0.00157	(1; 0.26%)	Pi EI	0.00523	(1; 0.65%)	EI Rf EI	0.00214	(2; 0.019%)
Cm EI	0.0015	(1; 0.25%)	Pd EI	0.00497	(1; 0.62%)	Rf EI	0.00213	(1; 0.019%)
Ee EI	0.00119	(1; 0.2%)	Ga EI	0.00485	(1; 0.6%)	Br EI	0.00208	(1; 0.018%)
Ts EI	0.00117	(1; 0.2%)	Eq EI	0.00451	(1; 0.56%)	Wt EI	0.00207	(1; 0.018%)
Cp EI	0.00105	(1; 0.18%)	Ed EI	0.00443	(1; 0.55%)	EI Pi EI	0.00191	(2; 0.017%)
Rf BI EI	0.00096	(2; 0.16%)	Ms EI	0.0043	(1; 0.53%)	Ke EI	0.00174	(1; 0.015%)
Ms EI	0.000959	(1; 0.16%)	Rv EI	0.00419	(1; 0.52%)	Ce Cp EI	0.00163	(2; 0.014%)
Bk EI	0.000878	(1; 0.15%)	Cm EI	0.00414	(1; 0.51%)	EI Br EI	0.00162	(2; 0.014%)
Mn BI EI	0.000749	(2; 0.13%)	Ho EI	0.00361	(1; 0.45%)	EI Wa EI	0.00142	(2; 0.012%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
BI EI	0.098	(1; 72.%)	EI	0.122	(0; 58.%)	EI	55.4	(0; 81.%)
EI	0.00193	(0; 1.4%)	BI EI	0.0108	(1; 5.2%)	Wa EI	3.21	(1; 4.7%)
Wt EI	0.00169	(1; 1.2%)	Wt EI	0.0032	(1; 1.5%)	BI EI	1.31	(1; 1.9%)
Rf BI EI	0.00157	(2; 1.2%)	Rf BI EI	0.00215	(2; 1.%)	Br EI	0.541	(1; 0.79%)
Rf EI	0.0012	(1; 0.88%)	Pd EI	0.00187	(1; 0.89%)	EI BI EI	0.0861	(2; 0.13%)
Ee EI	0.00119	(1; 0.87%)	Rf EI	0.00165	(1; 0.79%)	Wa Pd EI	0.0566	(2; 0.083%)
Eq EI	0.000804	(1; 0.59%)	Pi EI	0.00147	(1; 0.7%)	Mn BI EI	0.0499	(2; 0.073%)
Ke EI	0.000547	(1; 0.4%)	Ee EI	0.00142	(1; 0.68%)	Ng EI	0.0349	(1; 0.051%)
At EI	0.000438	(1; 0.32%)	Ga EI	0.00128	(1; 0.61%)	Ws Ho EI	0.0263	(2; 0.039%)
Wt BI EI	0.000308	(2; 0.23%)	Wa EI	0.00125	(1; 0.6%)	Wa Ms EI	0.0247	(2; 0.036%)
Oi Ke EI	0.000293	(2; 0.22%)	Ts EI	0.00124	(1; 0.59%)	Bc Mp Ho EI	0.0189	(3; 0.028%)
Nf Ee EI	0.00028	(2; 0.21%)	Br EI	0.00113	(1; 0.54%)	Dc Dp EI	0.0171	(2; 0.025%)
Pc EI	0.000256	(1; 0.19%)	Ed EI	0.0011	(1; 0.52%)	Wa BI EI	0.0165	(2; 0.024%)
Ho EI	0.000201	(1; 0.15%)	Ms EI	0.001	(1; 0.48%)	Wa Ts EI	0.0158	(2; 0.023%)
Cm EI	0.0002	(1; 0.15%)	Cm EI	0.000939	(1; 0.45%)	Dc Dp Ho EI	0.0157	(3; 0.023%)
Ts EI	0.000186	(1; 0.14%)	Bk EI	0.00086	(1; 0.41%)	Ee EI	0.0156	(1; 0.023%)
Rf Br EI	0.000164	(2; 0.12%)	Eq EI	0.000796	(1; 0.38%)	EI Rf BI EI	0.0155	(3; 0.023%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
EI	0.0281	(0; 46.%)	EI	0.076	(0; 60.%)	EI	0.162	(0; 68.%)
BI EI	0.00477	(1; 7.9%)	BI EI	0.00784	(1; 6.2%)	BI EI	0.00822	(1; 3.5%)
Ee EI	0.00116	(1; 1.9%)	Wt EI	0.0015	(1; 1.2%)	Bc Mp Ho EI	0.00521	(3; 2.2%)
Ke EI	0.000988	(1; 1.6%)	Pd EI	0.00122	(1; 0.97%)	Wa EI	0.00159	(1; 0.67%)
Wa EI	0.000663	(1; 1.1%)	Rf BI EI	0.00099	(2; 0.79%)	Rf BI EI	0.00108	(2; 0.46%)
Pc EI	0.000544	(1; 0.9%)	Wa EI	0.000942	(1; 0.75%)	Rf EI	0.000826	(1; 0.35%)
Eq EI	0.000532	(1; 0.88%)	Br EI	0.000818	(1; 0.65%)	Wo Tx Ru EI	0.000635	(3; 0.27%)
Br EI	0.000497	(1; 0.82%)	Rf EI	0.000757	(1; 0.6%)	Wo Mp Ho EI	0.000588	(3; 0.25%)
Wt EI	0.000482	(1; 0.79%)	Pi EI	0.000675	(1; 0.54%)	Wo Tx Wt EI	0.000531	(3; 0.22%)
Ru EI	0.000451	(1; 0.74%)	Ga EI	0.00065	(1; 0.52%)	Ba Bm Ho EI	0.000426	(3; 0.18%)
Fo EI	0.000415	(1; 0.68%)	Ee EI	0.000619	(1; 0.49%)	Fr EI	0.000407	(1; 0.17%)
Fo BI EI	0.000403	(2; 0.67%)	Ts EI	0.00061	(1; 0.48%)	Bc Mp Ho BI E	0.000394	(4; 0.17%)
Mn BI EI	0.000343	(2; 0.57%)	Ng EI	0.000476	(1; 0.38%)	Bc Mp Ch EI	0.000359	(3; 0.15%)
Ts EI	0.000337	(1; 0.56%)	Bk EI	0.000475	(1; 0.38%)	Bc Mp Ho Pd	0.000353	(4; 0.15%)
Pd EI	0.000298	(1; 0.49%)	Ms EI	0.000475	(1; 0.38%)	Ga EI	0.00032	(1; 0.13%)
Ng EI	0.000289	(1; 0.48%)	Cm EI	0.000449	(1; 0.36%)	Bc Mp Ho Wt	0.000307	(4; 0.13%)
Ap EI	0.000288	(1; 0.47%)	Rv EI	0.000416	(1; 0.33%)	Wo Cs BI EI	0.000296	(3; 0.12%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.693 ±0.016	(±2.3%)
Downstream	1.252 ±0.014	(±1.1%)

Sector 3602: Gas Production and Distribution (Ga)

Gas production and distribution

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of land disturbance and water use are well below average while greenhouse emissions are nearly three times the economy wide average. For the social indicators, government revenue is twice average, income is 20% below average and employment generation is 35% below average. For the financial indicators, operating surplus is 40% above average while both export propensity and import penetration are both well below average. Natural gas is a critical feedstock for Australian industry, as well as facilitating our standard of living through its domestic applications. Proven reserves of natural gas are large in relation to current domestic requirements but these stocks are distant from major domestic markets. This may require investment in new pipelines and storage facilities as domestic requirements increase particularly for personal mobility and freight transport. Tensions between gas for domestic markets and contracted exports of liquefied natural gas (LNG) may emerge after 2030.

Sector Description

This sector produces and distributes natural gas for 3.4 million households and 105 000 industrial customers. Liquefied natural gas (Lg) for exports is a separate sector, as is the gas exploration and mining (Ng) sector. Domestic gas reserves will soon produce 1 600 PJ (10^{15}J) with 1 000 PJ used locally (this sector) and 400 PJ exported as LNG. There are currently 20 000 km of high pressure gas pipelines, with another 7 000 km under development evaluation. There are 75 000 km of low pressure gas pipeline for distribution to consumers. Proven stocks of natural gas are large, but by 2030 there could be tensions between domestic and export requirements particularly as its lower carbon status is exploited for industry, and as a transport fuel when domestic oil stocks become constrained. In 2002 the sector had turnover of about $6 billion per year.

Place of Industry in the Economy

The gas production and distribution sector ranks 69th out of 135 sectors in terms of value adding in the economy, and contributes 0.23% of GDP in this analysis. It is similar in value adding to timber and woodchips and rail passenger transport, but is expected to expand considerably in the next decade. It is a relatively small employer with direct and indirect requirements of 2 000 employment years respectively giving a total of 4 000 employment years. It also contributes 6 000 employment years to downstream industries. The gas production and delivery process are responsible for less than one third of one percent of national energy use and greenhouse emissions, although the gas product delivered supplies nearly 20% of national energy. Water and land use are minor.

Strategic Overview

The integrated overview shown in the spider diagram reveals a better than average performance for the sector in five indicators and a below average performance in the other five. Because LNG is exported from its own sector, the outlier for export propensity is not relevant in these data apart from the natural gas embodied in refined metals and manufactured goods. Two downstream issues relate in the medium term to the centrality of gas as a lower carbon fuel for many other sectors as well as for domestic consumers, and in intergenerational timeframes to what energy source replaces gas if stocks become constrained. The next 25 years for the sector should continue to be optimistic.

TBL Account #1

The financial indicator of operating surplus is 40% above the economy wide average and most of this is a within sector effect. The social indicator of employment generation is 35% below average and reflects the capital-intensive nature of the industry, as well as efficiency and competition initiatives applied to most utilities over the last decade. The environmental indicator of greenhouse emissions is nearly three times the economy wide average and is discussed in more detail below.

TBL Accounts #2 and #3

The second TBL account shows an export propensity 80% below average, an income indicator 20% below average and a water use indicator 85% below average. The third TBL account shows an import penetration indicator that is 70% below average, a government revenue indicator that is over twice the average and a small land disturbance indicator that does not include possible marine impact. The three TBL accounts suggest a number of issues for more investigation which are relevant for the whole energy sector rather than just for natural gas.

Structural Path Analysis and Linkages

Improvement might be sought for the greenhouse emissions indicator, which is three times the economy wide average. The structural chain analysis reveals that 92% of the effect is direct, due to gas flaring, and the gas combusted to fuel the gas processing phase and to power the in-pipeline compressors (which move the gas from gas fields to city markets). Other effects are minor.

The gas production and distribution sector provides a less than average stimulus to its upstream suppliers such as property development and real estate, legal and accounting services and office management services. The sector reveals greater than average downstream linkages to sectors such as alumina production, electricity supply, residential building construction, wholesale and retail trade and accommodation cafes and restaurants. These sectors will have to increase their activity substantially if any expansion of the gas sector for the domestic market is contemplated.

Future Trends in Sector

The base case scenario in the *Future Dilemmas* study anticipates domestic natural gas demand could double by the year 2050, and ABARE's projections suggest almost a doubling by 2030. Three issues seem critical to the rate of growth in domestic gas requirements over the next two to five decades. The development of major industrial processes such as the manufacture of nitrogenous fertiliser or methanol plants could cause step changes in gas requirements. Secondly, a switch to compressed natural gas for private cars and heavy transport in the face of declining domestic oil or a carbon constraint, could substantially increase gas demand. Thirdly, although it is currently a higher priced option compared to thermal coal plants, gas for electricity production particularly in gas turbines and ultimately fuel cells may increase if demand for lower carbon sources of electricity increase.

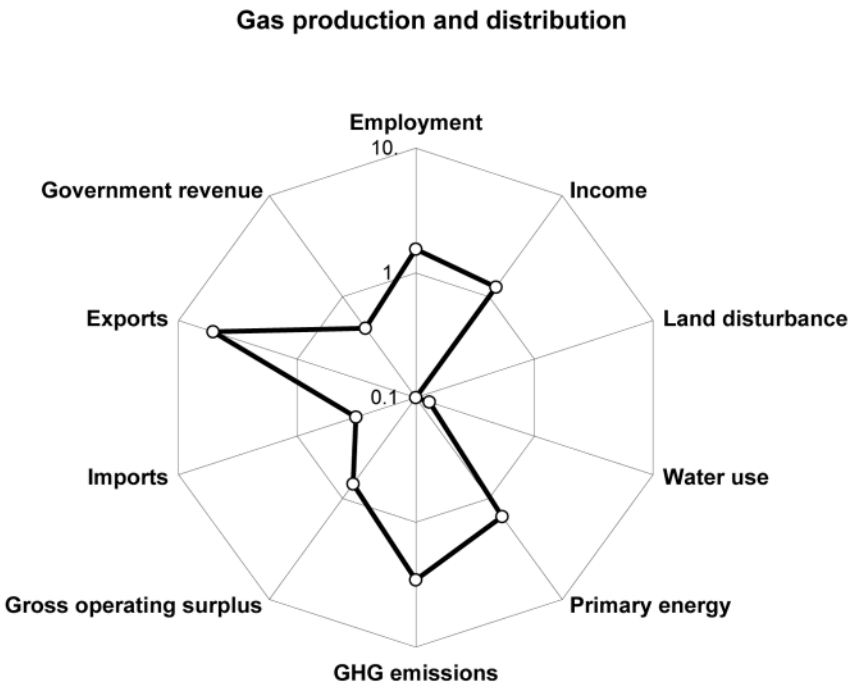
Innovation and Technical Opportunities

Past the year 2020, the natural gas sector will be integrally linked to the wide use of fuel cells particularly for the distributed generation of electricity and heat where a doubling of conversion efficiency is possible compared to today's systems. In common with a number of other utility sectors, it is possible that natural gas firms will manage the services provided by natural gas (heating, cooking infrastructure, cooling, electricity, vehicle transportation) rather than just providing the energy alone. Tri-cycle technologies may be installed at domestic and commercial scales to produce heating cooling and electricity, all gas powered. It is also possible that natural gas becomes more strategically valued as a feedstock for nitrogenous fertilizer (urea, ammonia), methanol (for mobile fuel cells) and other materials, rather than as a raw fuel source alone.

Sector **Gas production and distribution** **(Ga)**

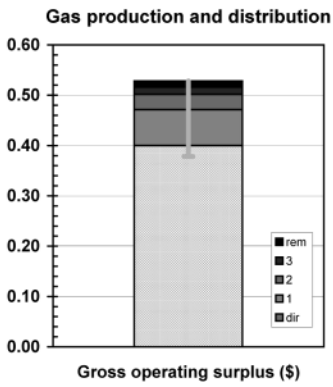
Gas production and distribution

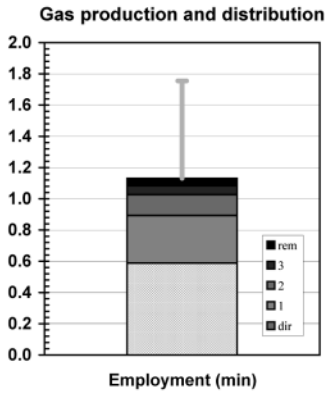
Spider diagram

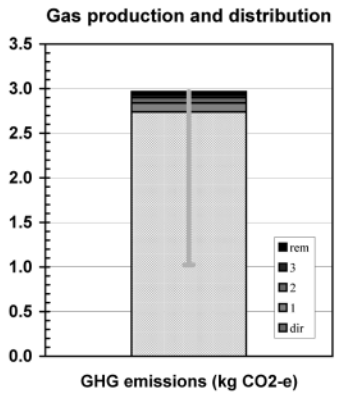


Bar graphs

Account #1







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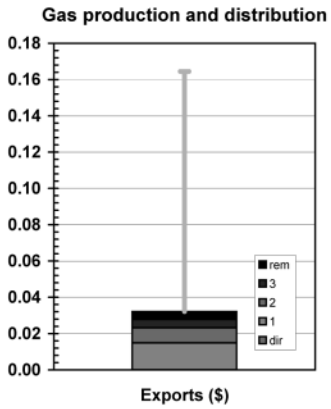

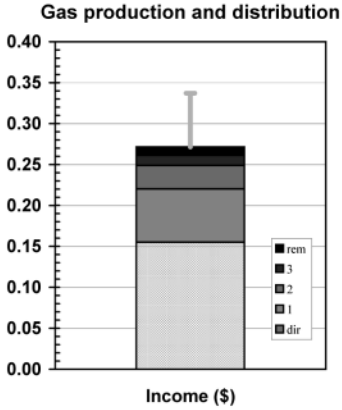

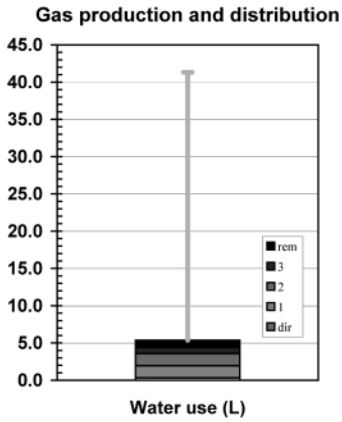

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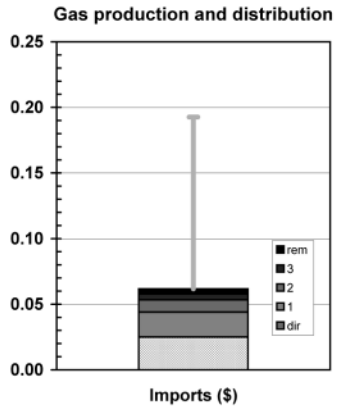
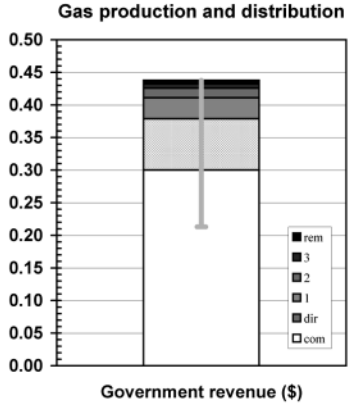
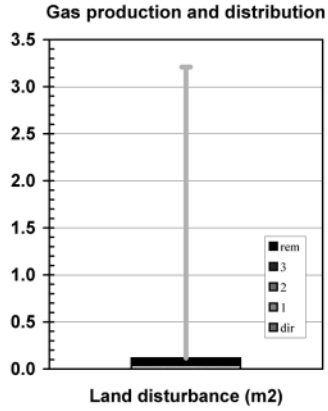






National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 390.5	(0.15% of total)	($m 390.0 domestically produced)
Government final consumption	$m 0.0	(0.00% of total)	($m 0.0 domestically produced)
Gross fixed capital expenditure	$m 26.9	(0.03% of total)	($m 26.9 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 417.4**	**(0.09% of GNE)**	**($m 416.9 domestically produced)**
Exports	$m 0.0	(0.00% of total)	($m 0.0 domestically produced)
Final demand	**$m 417.4**	**(0.08% of GNT)**	**($m 416.9 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 247.8	(0.15% of total)	
Gross operating surplus	$m 639.1	(0.33% of total)	
Taxes less subsidies	$m 125.9	(0.15% of total)	
Sectoral GDP*	**$m 1,012.8**	**(0.23% of GDP)**	
Imports	$m 40.0	(0.04% of total)	
Primary inputs	**$m 1,052.8**	**(0.19% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 639.1	(0.33%)	$m 166.7	(0.09%)	$m 220.2	(0.11%)
Exports ($m)	$m 0.0	(0.00%)	$m 0.0	(0.00%)	$m 13.4	(0.02%)
Imports ($m)	$m 40.0	(0.04%)	$m 10.4	(0.01%)	$m 25.7	(0.03%)
Employment (e-y)	7,538 e-y	(0.11%)	1,965 e-y	(0.03%)	3,779 e-y	(0.05%)
Income ($m)*	$m 247.8	(0.15%)	$m 64.6	(0.04%)	$m 113.1	(0.07%)
Government revenue ($m)†	$m 250.9	(0.23%)	$m 157.9	(0.15%)	$m 182.5	(0.17%)
GHG emissions (kt CO_2-e)	4,379 kt	(0.84%)	1,142 kt	(0.22%)	1,236 kt	(0.24%)
Water use (ML)	523 ML	(0.00%)	136 ML	(0.00%)	2,241 ML	(0.01%)
Land disturbance (kha)	6 kha	(0.00%)	2 kha	(0.00%)	5 kha	(0.00%)
Primary energy (TJ)	15,209 TJ	(0.39%)	3,966 TJ	(0.10%)	4,817 TJ	(0.12%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.40	0.53	0.38
Exports ($)	0.00	0.03	0.16
Imports ($)	0.03	0.06	0.19
Employment (min)	0.59	1.13	1.75
Income ($)	0.15	0.27	0.34
Government revenue ($)	0.38	0.44	0.21
GHG emissions (kg CO_2-e)	2.74	2.97	1.02
Water use (L)	0.33	5.38	41.32
Land disturbance (m^2)	0.04	0.12	3.21
Primary energy (MJ)	9.51	11.55	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Ga	0.4	(0; 76.%)	Ga	0.588	(0; 52.%)	Ga	2.74	(0; 92.%)
Ms Ga	0.0257	(1; 4.9%)	Ms Ga	0.115	(1; 10.%)	El Ga	0.0395	(1; 1.3%)
Pd Ga	0.0083	(1; 1.6%)	Rh Ga	0.0358	(1; 3.2%)	Ng Ga	0.016	(1; 0.54%)
Rh Ga	0.00586	(1; 1.1%)	Bs Ga	0.0355	(1; 3.1%)	El Ms Ga	0.0107	(2; 0.36%)
Bs Ga	0.0036	(1; 0.68%)	Pd Ga	0.02	(1; 1.8%)	Lg Ga	0.00553	(1; 0.19%)
Ng Ga	0.00353	(1; 0.67%)	Bs Ms Ga	0.0111	(2; 0.98%)	Ch Ga	0.0044	(1; 0.15%)
Cm Ga	0.00236	(1; 0.45%)	Ts Ga	0.01	(1; 0.88%)	El Pd Ga	0.00396	(2; 0.13%)
Lg Ga	0.00233	(1; 0.44%)	Wt Ga	0.00849	(1; 0.75%)	El Rh Ga	0.00382	(2; 0.13%)
Ts Ga	0.00222	(1; 0.42%)	Fm Ga	0.00677	(1; 0.6%)	At Ga	0.00273	(1; 0.092%)
Cm Ms Ga	0.00194	(2; 0.37%)	Os Ga	0.00674	(1; 0.6%)	Bl Ga	0.00236	(1; 0.08%)
El Ga	0.0016	(1; 0.3%)	Cm Ga	0.00651	(1; 0.58%)	El Bs Ga	0.00219	(2; 0.074%)
Wa Ga	0.00158	(1; 0.3%)	Ed Ga	0.00632	(1; 0.56%)	Ch Pl Ga	0.00212	(2; 0.072%)
St Ga	0.00123	(1; 0.23%)	Cm Ms Ga	0.00537	(2; 0.47%)	El Pi Ga	0.00171	(2; 0.058%)
Wt Ga	0.00118	(1; 0.22%)	Pl Ga	0.00508	(1; 0.45%)	Ms Ga	0.00154	(1; 0.052%)
Bs Ms Ga	0.00112	(2; 0.21%)	Pi Ga	0.00468	(1; 0.41%)	At Ms Ga	0.00144	(2; 0.049%)
Bk Ga	0.000996	(1; 0.19%)	Ho Ms Ga	0.00431	(2; 0.38%)	Gd Ga	0.00142	(1; 0.048%)
Rv Ga	0.000982	(1; 0.19%)	Ts Ms Ga	0.0041	(2; 0.36%)	Wt Ga	0.00118	(1; 0.04%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Ms Ga	0.00397	(1; 12.%)	Ga	0.155	(0; 57.%)	Wa Ga	1.16	(1; 22.%)
Lg Ga	0.00272	(1; 8.5%)	Ms Ga	0.0268	(1; 9.9%)	Wa Ms Ga	0.66	(2; 12.%)
Wt Ga	0.000965	(1; 3.%)	Pd Ga	0.00749	(1; 2.8%)	Ga	0.327	(0; 6.1%)
Bl Ga	0.000916	(1; 2.8%)	Bs Ga	0.00436	(1; 1.6%)	Wa Pd Ga	0.227	(2; 4.2%)
At Ga	0.000868	(1; 2.7%)	Rh Ga	0.00392	(1; 1.4%)	El Ga	0.219	(1; 4.1%)
Bs Ga	0.000667	(1; 2.1%)	Ts Ga	0.00234	(1; 0.86%)	Wa Bs Ga	0.109	(2; 2.%)
Ch Ga	0.000511	(1; 1.6%)	Os Ga	0.00189	(1; 0.7%)	Vf Ms Ga	0.0732	(2; 1.4%)
At Ms Ga	0.000459	(2; 1.4%)	Wt Ga	0.00182	(1; 0.67%)	Ms Ga	0.0643	(1; 1.2%)
Pd Ga	0.000395	(1; 1.2%)	Ed Ga	0.00157	(1; 0.58%)	El Ms Ga	0.0594	(2; 1.1%)
Bl El Ga	0.000387	(2; 1.2%)	Cm Ga	0.00148	(1; 0.54%)	Wa Bs Ms Ga	0.0339	(3; 0.63%)
Rf Ga	0.000377	(1; 1.2%)	Bs Ms Ga	0.00136	(2; 0.5%)	Ng Ga	0.0314	(1; 0.58%)
Ts Ga	0.000352	(1; 1.1%)	Pi Ga	0.00131	(1; 0.48%)	Ws Ho Ms Ga	0.0314	(3; 0.58%)
Fm Ga	0.000349	(1; 1.1%)	Cm Ms Ga	0.00122	(2; 0.45%)	Wa Ts Ga	0.0299	(2; 0.56%)
Cm Ga	0.000314	(1; 0.98%)	Fm Ga	0.00106	(1; 0.39%)	Vf Pd Ga	0.0266	(2; 0.5%)
St Ga	0.000306	(1; 0.95%)	Pl Ga	0.00103	(1; 0.38%)	Bc Mp Ho Ms	0.0225	(4; 0.42%)
Pl Ga	0.000276	(1; 0.86%)	Bk Ga	0.000976	(1; 0.36%)	Pd Ga	0.0225	(1; 0.42%)
Cm Ms Ga	0.000259	(2; 0.81%)	Ts Ms Ga	0.00096	(2; 0.35%)	El Pd Ga	0.0219	(2; 0.41%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Ga	0.025	(0; 41.%)	Ga	0.0787	(0; 57.%)	Ga	0.0388	(0; 33.%)
Ms Ga	0.00584	(1; 9.5%)	Ms Ga	0.0127	(1; 9.2%)	Bc Mp Ho Ms	0.00622	(4; 5.3%)
Rh Ga	0.00302	(1; 4.9%)	Pd Ga	0.00491	(1; 3.6%)	Bc Mp Ho Ga	0.00326	(3; 2.8%)
Pd Ga	0.0012	(1; 1.9%)	Rh Ga	0.0018	(1; 1.3%)	Bc Mp Ms Ga	0.00236	(3; 2.%)
Pl Ga	0.000977	(1; 1.6%)	Bs Ga	0.00129	(1; 0.94%)	Bc Mp Ch Ga	0.00175	(3; 1.5%)
Bs Ga	0.000715	(1; 1.2%)	Ts Ga	0.00115	(1; 0.84%)	Bc Mp Ho Pd	0.00142	(4; 1.2%)
Ts Ga	0.000637	(1; 1.%)	Os Ga	0.000875	(1; 0.63%)	Wo Tx Pl Ga	0.00098	(3; 0.84%)
Ch Ga	0.000512	(1; 0.83%)	Wt Ga	0.000852	(1; 0.62%)	Bc Mp Pd Ga	0.000967	(3; 0.83%)
Fm Ga	0.000458	(1; 0.74%)	Cm Ga	0.000706	(1; 0.51%)	Bc Mp Ga	0.000892	(2; 0.76%)
Ap Ga	0.000446	(1; 0.72%)	Pi Ga	0.000605	(1; 0.44%)	Bc Ch Ga	0.000879	(2; 0.75%)
Pr Ga	0.000415	(1; 0.67%)	Cm Ms Ga	0.000583	(2; 0.42%)	Bc Mp Ch Pl (	0.000844	(4; 0.72%)
Cm Ga	0.000403	(1; 0.65%)	Ed Ga	0.000574	(1; 0.42%)	Ms Ga	0.0008	(1; 0.69%)
Ru Ga	0.000353	(1; 0.57%)	Bk Ga	0.000539	(1; 0.39%)	Bc Mp Ho Bs (	0.000763	(4; 0.65%)
Cm Ms Ga	0.000333	(2; 0.54%)	Ts Ms Ga	0.000473	(2; 0.34%)	Wo Mp Ho Ms	0.000702	(4; 0.6%)
Et Ms Ga	0.000284	(2; 0.46%)	In Pd Ga	0.000449	(2; 0.33%)	Wo Bs Ga	0.00068	(2; 0.58%)
Pr Ms Ga	0.000276	(2; 0.45%)	Pl Ga	0.000448	(1; 0.33%)	El Ga	0.000639	(1; 0.55%)
Wt Ga	0.000274	(1; 0.44%)	Ng Ga	0.000428	(1; 0.31%)	Bc Mp Bs Ga	0.00062	(3; 0.53%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.716 ±0.017	(±2.4%)
Downstream	1.440 ±0.017	(±1.2%)

Sector 3701: Water Supply, Sewerage and Drainage (Wa)

Water supply, sewerage and drainage services

Short Summary

This sector accounts for the water (and other resources) used in the delivery and treatment of water. The environmental indicators of greenhouse emissions and land disturbance are 40% and 95% below average respectively, while the water indicator is eight times the economy wide average. The social indicators of employment, income and government revenue are 45%, 40% and 35% below average respectively, suggesting society may subsidise water delivery. The financial indicators reveal operating surplus is 45% above average, while import penetration and export propensity are 75% and 50% below average respectively. Currently consumer sentiment is against the building of new dams. However, when faced with continued economic and population growth and declining water quantity and quality, this situation may change. As well as augmenting supplies, Australian governments will need to increase demand management efforts through support for whole water cycle management, with increasing desalination, capture of urban stormwater, recycling, resource extraction caps, and market interventions based on full cost pricing.

Sector Description

The water supply, sewerage and drainage sector is responsible for domestic and industrial water supply covering dam operation, filtration and reticulation, as well as sewerage operation and treatment, storm water services and the eventual disposal or reuse of supplied water. Increasingly the sector is becoming responsible for the whole water cycle. Some ‘mains’ irrigation water is included in this sector. Water supply and sewerage infrastructure together have a replacement value of nearly $70 billion. Water supply requires nearly 900 dams and weirs, over 1 000 water bores, 175 000 km of water mains, 3 200 pumping stations and over 700 water treatment plants across Australia. Sewage services require 125 000 km of sewage mains, 9 000 pumping stations and 800 sewage treatment plants. In dollar terms, the industry turnover of the sector is nearly $10 billion per year. Household consumption averages 300-400 litres per person per day, but on a whole economy basis (direct plus indirect effects) water consumption is currently 3 300 litres per person per day.

Place of Industry in the Economy

For value adding in the economy, the sector ranks 28th in size out of 135 sectors and contributes 0.92% of GDP in this analysis. It is similar in value adding to vehicle manufacturing, and the basic iron and steel industries. It is a moderate employer with a direct requirement of 15 000 employment years and another 10 000 years in its upstream suppliers giving a total of 25 000 employment years. It also contributes 13 000 employment years to downstream industries. The sector’s supply services consume a large quantity of water internally with 1 100 GL (10^9L) used both directly and indirectly, and a further 1 000 GL supplied to downstream industries. It has less than four tenths of one percent of energy use and greenhouse emissions, and one twentieth of one percent of land disturbance.

Strategic Overview

The spider diagram shows mixed outcomes with major outliers for water use, and the three social indicators of employment generation, income and government revenue. Upstream issues for the sector focus on water catchments and their environmental integrity, and the assurance of a continuous, safe, high quality water supply, particularly under long term scenarios of climate change in some regions. Downstream issues relate to disposing of used water safely into the environment.

TBL Account #1

This account reveals that the financial indicator of operating surplus is 45% greater than average and most of this is a direct effect. The social indicator of employment generation is 45% below average and more than half of this is a direct effect. The environmental indicator of greenhouse emissions is 40% below average. These data suggest a tension between operating surplus and employment generation. This is a reflection of the sector's capital intensity, as well as the wide scale water reform driven partly by new technology as well as the quest for economic efficiency.

TBL Accounts #2 and #3

The second TBL account shows an export propensity that is 75% below average, income 40% below average and a water indicator that is eight times the economy wide average. This represents the water 'embodied' in the delivery of water to final end users and represents water used in filtration and treatment as well as wastage and leaks. The third TBL account shows import penetration that is 50% below the average, government revenue that is 35% below average and land disturbance that is 95% below average. In part, this analysis supports the thesis that Australians do not pay enough for their water services. A steady progression towards the payment of prices based on the full cost of water provision and its ecological effects will eventually improve the outcomes shown in this type of TBL analysis.

Structural Path Analysis and Linkages

The water indicator (i.e. the water embodied in the provision and treatment of water) could be improved. Since 99% of the indicator is a direct effect, the sector itself must improve technology and management. The social indicators of employment and income could be improved and the direct within sector effect accounts for around 60% of the total. Over 80% of the above average operating surplus is also a direct effect, suggesting that management improvements have so far advantaged financial indicators over social ones. Looming challenges of infrastructure renewal and new development may alter the position shown in this analysis.

The sector's stimulus to upstream supplying sectors is well below the economy wide average as its operations are essentially self contained and there is little expansion of major infrastructure currently. The downstream linkages are average and expansion of the sector must be accompanied by expansion of wholesale and retail trade, property development and legal and accounting services.

Future Trends in Sector

The base case scenario in the *Future Dilemmas* study anticipates total water requirements will increase by 60% from 24 000 GL/year to around 40 000 GL/year in 2050, with most of this due to expansion of export-orientated northern agriculture. Water quality linked to human health will become an increasingly important issue. Demand for domestic water use under a 25 million population scenario could be met through a combination of demand-reducing price increases, transfers from agriculture, desalination, improved water use efficiency in agricultural sectors, and industrial reuse and recycling. Advanced membrane purification and desalination technologies are rapidly closing the price gap with traditional supply systems.

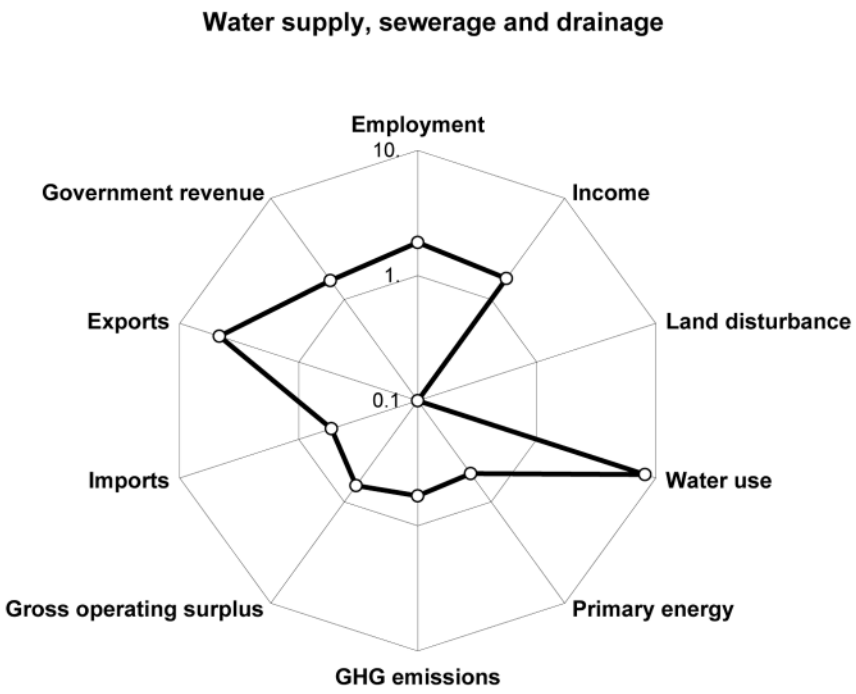
Innovation and Technical Opportunities

Future urban designs, feasible with today's technology could see houses disconnected from centralised water and sewage systems. Alternatively, water services (personal care, households, green gardens) could be provided by water authorities and charged by the metered unit, much like mobile phones. Closed-loop sewage systems, now operational in Germany, produce liquid fertiliser (urine), compost (faeces) and energy (biogas). Efficiency gains of around 50% are feasible for many irrigation sectors if available technologies are used. Labelling of water content in food is feasible.

Sector **Water supply, sewerage and drainage** **(Wa)**

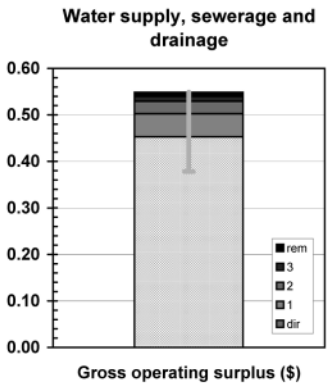
Water supply, sewerage and drainage services

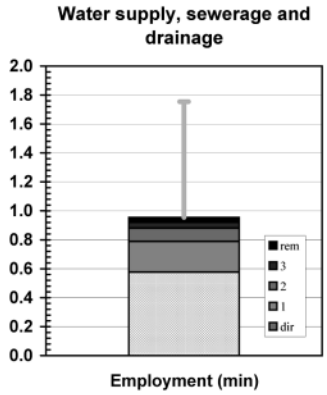
Spider diagram

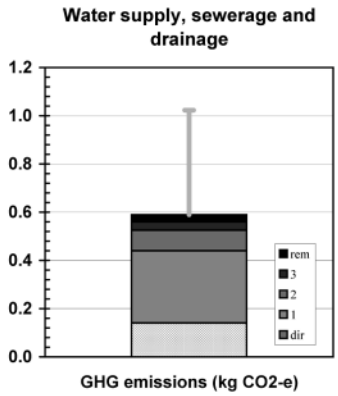


Bar graphs

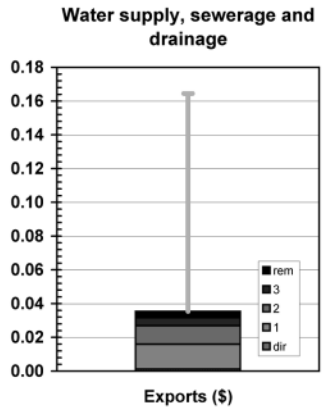
Account #1

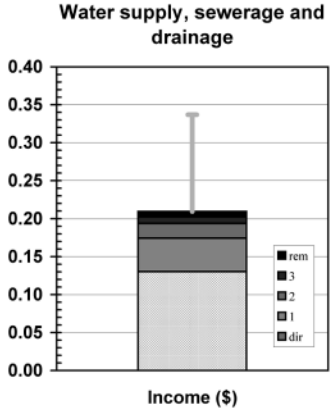


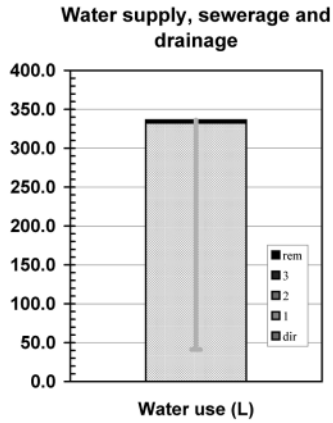




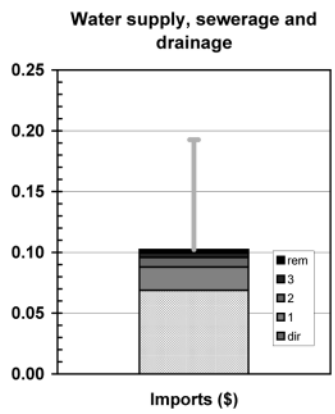
Account #2

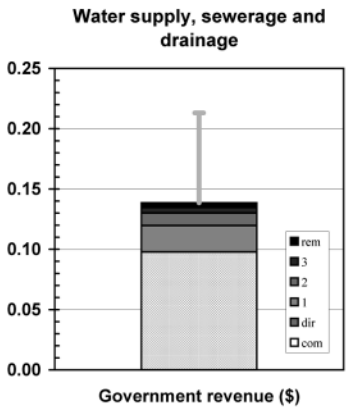


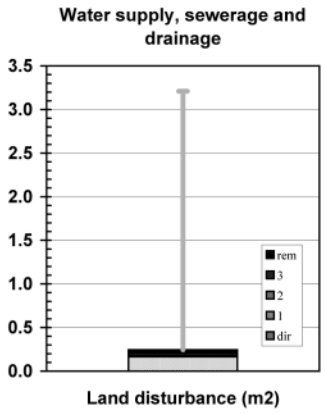




Account #3







National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 3,214.8	(1.22% of total)	($m 3,209.4 domestically produced)
Government final consumption	$m 78.8	(0.09% of total)	($m 78.8 domestically produced)
Gross fixed capital expenditure	$m 7.2	(0.01% of total)	($m 7.2 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 3,300.7**	**(0.72% of GNE)**	**($m 3,295.4 domestically produced)**
Exports	$m 6.7	(0.01% of total)	($m 6.7 domestically produced)
Final demand	**$m 3,307.4**	**(0.61% of GNT)**	**($m 3,302.1 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 791.3	(0.46% of total)	
Gross operating surplus	$m 2,753.6	(1.44% of total)	
Taxes less subsidies	$m 594.4	(0.70% of total)	
Sectoral GDP*	**$m 4,139.2**	**(0.92% of GDP)**	
Imports	$m 418.4	(0.43% of total)	
Primary inputs	**$m 4,557.6**	**(0.84% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 2,753.6	(1.44%)	$m 1,495.2	(0.78%)	$m 1,811.6	(0.94%)
Exports ($m)	$m 6.7	(0.01%)	$m 3.6	(0.00%)	$m 116.8	(0.14%)
Imports ($m)	$m 418.4	(0.43%)	$m 227.2	(0.23%)	$m 337.9	(0.35%)
Employment (e-y)	28,088 e-y	(0.39%)	15,251 e-y	(0.21%)	25,255 e-y	(0.35%)
Income ($m)*	$m 791.3	(0.46%)	$m 429.7	(0.25%)	$m 691.8	(0.40%)
Government revenue ($m)†	$m 594.4	(0.55%)	$m 322.7	(0.30%)	$m 457.5	(0.42%)
GHG emissions (kt CO_2-e)	852 kt	(0.16%)	463 kt	(0.09%)	1,946 kt	(0.38%)
Water use (ML)	2,022,589 ML	(9.65%)	1,098,240 ML	(5.24%)	1,110,329 ML	(5.30%)
Land disturbance (kha)	100 kha	(0.06%)	54 kha	(0.03%)	81 kha	(0.05%)
Primary energy (TJ)	1,184 TJ	(0.03%)	643 TJ	(0.02%)	13,278 TJ	(0.34%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.45	0.55	0.38
Exports ($)	0.00	0.04	0.16
Imports ($)	0.07	0.10	0.19
Employment (min)	0.58	0.95	1.75
Income ($)	0.13	0.21	0.34
Government revenue ($)	0.10	0.14	0.21
GHG emissions (kg CO_2-e)	0.14	0.59	1.02
Water use (L)	332.59	336.25	41.32
Land disturbance (m^2)	0.16	0.24	3.21
Primary energy (MJ)	0.19	4.02	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Wa	0.453	(0; 83.%)	Wa	0.576	(0; 60.%)	El Wa	0.147	(1; 25.%)
El Wa	0.00596	(1; 1.1%)	Fm Wa	0.0275	(1; 2.9%)	Wa	0.14	(0; 24.%)
Ms Wa	0.00592	(1; 1.1%)	Ms Wa	0.0266	(1; 2.8%)	Lm Wa	0.0661	(1; 11.%)
Bk Wa	0.00561	(1; 1.%)	Wt Wa	0.0239	(1; 2.5%)	Ce Wa	0.0393	(1; 6.7%)
Sf Wa	0.00482	(1; 0.88%)	Bk Wa	0.0222	(1; 2.3%)	Ch Wa	0.0177	(1; 3.%)
Wt Wa	0.00332	(1; 0.61%)	Gv Wa	0.0102	(1; 1.1%)	Fo Wa	0.0111	(1; 1.9%)
Fm Wa	0.00248	(1; 0.45%)	Fn Wa	0.0093	(1; 0.97%)	Is Fm Wa	0.004	(2; 0.68%)
Fn Wa	0.00233	(1; 0.42%)	Bs Wa	0.00698	(1; 0.73%)	Bl El Wa	0.00372	(2; 0.63%)
Sg Wa	0.00228	(1; 0.41%)	El Wa	0.00663	(1; 0.69%)	Oi Fo Wa	0.00336	(2; 0.57%)
Cm Wa	0.00215	(1; 0.39%)	Sf Wa	0.00626	(1; 0.66%)	Wt Wa	0.00331	(1; 0.56%)
Sf Bk Wa	0.00196	(2; 0.36%)	Cm Wa	0.00595	(1; 0.62%)	At Wa	0.00329	(1; 0.56%)
Oi Fo Wa	0.00159	(2; 0.29%)	Sm Wa	0.00582	(1; 0.61%)	Is Wa	0.00277	(1; 0.47%)
Ce Wa	0.00153	(1; 0.28%)	Rd Wa	0.00535	(1; 0.56%)	El Ch Wa	0.00267	(2; 0.45%)
Pt Wa	0.00149	(1; 0.27%)	Ch Wa	0.00432	(1; 0.45%)	El Ms Wa	0.00248	(2; 0.42%)
Ch Wa	0.00148	(1; 0.27%)	Ho Wa	0.00392	(1; 0.41%)	El Fm Wa	0.0021	(2; 0.36%)
Bl El Wa	0.00095	(2; 0.17%)	Pl Wa	0.00368	(1; 0.39%)	Ce Lm Wa	0.002	(2; 0.34%)
Sf Fn Wa	0.000928	(2; 0.17%)	Eq Wa	0.00341	(1; 0.36%)	Lm Ce Wa	0.00199	(2; 0.34%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Wt Wa	0.00272	(1; 7.7%)	Wa	0.13	(0; 62.%)	Wa	332.6	(0; 99.%)
Ch Wa	0.00206	(1; 5.8%)	Ms Wa	0.00618	(1; 2.9%)	El Wa	0.815	(1; 0.24%)
Bl El Wa	0.00144	(2; 4.1%)	Bk Wa	0.00549	(1; 2.6%)	Dc Dp Wa	0.192	(2; 0.057%)
Fm Wa	0.00142	(1; 4.%)	Wt Wa	0.00513	(1; 2.5%)	Wa Ms Wa	0.152	(2; 0.045%)
Sg Wa	0.00113	(1; 3.2%)	Fm Wa	0.00432	(1; 2.1%)	Vf Wa	0.0618	(1; 0.018%)
Wa	0.0011	(0; 3.1%)	Gv Wa	0.00256	(1; 1.2%)	Sg Wa	0.0577	(1; 0.017%)
Oi Fo Wa	0.00108	(2; 3.1%)	El Wa	0.00179	(1; 0.86%)	Ch Wa	0.0541	(1; 0.016%)
At Wa	0.00105	(1; 3.%)	Fn Wa	0.00174	(1; 0.83%)	Wa El Wa	0.0471	(2; 0.014%)
Ms Wa	0.000917	(1; 2.6%)	Sf Wa	0.00155	(1; 0.74%)	Fm Wa	0.0381	(1; 0.011%)
Eq Wa	0.000609	(1; 1.7%)	Cm Wa	0.00135	(1; 0.64%)	Sm Wa	0.0369	(1; 0.011%)
Fo Wa	0.000452	(1; 1.3%)	Sm Wa	0.001	(1; 0.48%)	Ws Ho Wa	0.0286	(2; 0.0085%)
Bk Wa	0.000436	(1; 1.2%)	Rd Wa	0.00092	(1; 0.44%)	Ws Wa	0.0259	(1; 0.0077%)
Nf Fm Wa	0.000363	(2; 1.%)	Ch Wa	0.000916	(1; 0.44%)	Bc Mp Ch Wa	0.0256	(3; 0.0076%)
Is Fm Wa	0.000354	(2; 1.%)	Bs Wa	0.000857	(1; 0.41%)	Su Bv Wa	0.0248	(2; 0.0074%)
Rd Wa	0.000317	(1; 0.89%)	Ed Wa	0.000745	(1; 0.36%)	Wa Bs Wa	0.0214	(2; 0.0064%)
Sg Ce Wa	0.000307	(2; 0.87%)	Ce Wa	0.000745	(1; 0.36%)	Bc Mp Ho Wa	0.0205	(3; 0.0061%)
Cm Wa	0.000287	(1; 0.81%)	Pl Wa	0.000744	(1; 0.36%)	Bl El Wa	0.0193	(2; 0.0057%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Wa	0.0688	(0; 67.%)	Wa	0.0977	(0; 71.%)	Wa	0.165	(0; 67.%)
Fo Wa	0.00365	(1; 3.6%)	Bk Wa	0.00303	(1; 2.2%)	Bc Mp Ch Wa	0.00705	(3; 2.9%)
Ch Wa	0.00207	(1; 2.%)	Ms Wa	0.00293	(1; 2.1%)	Bc Mp Ho Wa	0.00565	(3; 2.3%)
Fm Wa	0.00186	(1; 1.8%)	Wt Wa	0.0024	(1; 1.7%)	Bc Ch Wa	0.00355	(2; 1.5%)
Pt Wa	0.00163	(1; 1.6%)	Fm Wa	0.00151	(1; 1.1%)	Bc Mp Wa	0.00292	(2; 1.2%)
Ms Wa	0.00135	(1; 1.3%)	Sf Wa	0.00135	(1; 0.97%)	El Wa	0.00238	(1; 0.97%)
Wt Wa	0.000772	(1; 0.75%)	El Wa	0.00112	(1; 0.81%)	Bc Mp Ho Ms	0.00144	(4; 0.59%)
Sg Wa	0.000712	(1; 0.7%)	Gv Wa	0.000892	(1; 0.64%)	Wo Tx Tp Wa	0.00137	(3; 0.56%)
Pl Wa	0.000707	(1; 0.69%)	Fn Wa	0.000851	(1; 0.61%)	Dc Dp Wa	0.000995	(2; 0.41%)
Bk Wa	0.000542	(1; 0.53%)	Rd Wa	0.000653	(1; 0.47%)	Wo Tx Wt Wa	0.000851	(3; 0.35%)
Sm Wa	0.000476	(1; 0.47%)	Cm Wa	0.000645	(1; 0.47%)	Bc Mp Ho Bk '	0.000812	(4; 0.33%)
El Wa	0.000414	(1; 0.4%)	Sf Bk Wa	0.000549	(2; 0.4%)	Wo Mp Ch Wa	0.000796	(3; 0.33%)
Eq Wa	0.000402	(1; 0.39%)	At Wa	0.000469	(1; 0.34%)	Wo Tx Cl Wa	0.000795	(3; 0.33%)
Cm Wa	0.000368	(1; 0.36%)	Ch Wa	0.000457	(1; 0.33%)	Bc Mp Bp Wa	0.00071	(3; 0.29%)
At Wa	0.000312	(1; 0.31%)	Ce Wa	0.000442	(1; 0.32%)	Wo Tx Pl Wa	0.000709	(3; 0.29%)
Gv Wa	0.000265	(1; 0.26%)	Pt Wa	0.000386	(1; 0.28%)	Wo Mp Ho Wa	0.000638	(3; 0.26%)
Rd Wa	0.000231	(1; 0.23%)	Sm Wa	0.000385	(1; 0.28%)	Bc Mp Ch Pl V	0.000611	(4; 0.25%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.527 ±0.007	(±1.3%)
Downstream	1.004 ±0.017	(±1.7%)

Sector 4101: Residential Building (Rb)

Residential building, construction, repair and maintenance

Short Summary

Against the metric of one dollar of final demand, the environmental indicator of greenhouse emissions is 35% below average while water use and land disturbance are 85% and 95% below average respectively. The majority of these effects are indirect and due to basic material inputs such as wood, concrete and bricks used in the sector. For social indicators, employment generation is 10% below average, income is 20% below average and government revenue is 30% below average. About half of the effect is direct emphasising that population dynamics (growth, declining household size, moves to the coast etc.) which stimulate home building, drive immediate social returns. For the financial indicators, the operating surplus is 20% above average, while export propensity and import penetration are 50% and 35% below average respectively. In absolute terms, export performance is poor as this is primarily a local activity, although some builders are now expanding overseas. Consumer demand that drives this sector provides a reasonable stimulation in the upstream sectors such as property development, wholesale trade, steel mesh, concrete and bricks. There are weak downstream linkages as most of the effect is dissipated by home ownership.

Sector Description

The domestic dwelling stock in Australia currently has approximately 7.6 million dwelling units covering 900 million square metres of floor space. Three quarters of the building stock is detached single houses and the remainder are flats and apartments. About 120 000 new dwellings covering 25 million square metres of floor space are currently added each year.

Place of Industry in the Economy

Residential building ranks 13th out of 135 in terms of value adding in the economy and represents 2.54% of GDP in this analysis. It is a good generator of employment which may account for its policy priority with Federal and State governments. A total of 329 000 employment years are generated by the sector, with 140 000 directly engaged in the sector and 189 000 years employed by the sector's suppliers. The sector also contributes 150 000 employment years to downstream sectors such as the ownership of dwellings. The sector has a moderate effect on land disturbance and water use, both being less than 1% of national totals. Energy use and greenhouse gas emissions are larger, both being 3-4% of national totals. Imports outweigh exports by a factor of 50:1 in absolute financial terms.

Strategic Overview

The integrated overview in the spider diagram shows a relatively well balanced TBL account with outliers for export propensity and government revenue. Upstream issues for the sector include workforce occupational health and safety and age and skill imbalance in many regions, due to the boom and bust nature of the business cycle over long periods leading to uneven recruitment and training. An important issue outside the control of the sector is the urban structure, environmental performance and connectivity, into which each built house is placed. Downstream issues relate to suitability for an ageing population, the environmental performance (energy, greenhouse, water etc.) and habitability of houses. A number of health issues are particularly important such as sick building syndrome caused by a combination of poor design and materials used. The interaction and management of these upstream and downstream issues in a free market economy presents dilemmas for both business and policy although innovative planning controls are re-emerging in some states.

TBL Account #1

The financial indicator of operating surplus is 20% above average and about half is a direct effect, with another fifth contributed by first order effects such as the plaster, property development, wholesale trade and brick sectors. The social indicator of employment generation is 10% below average with about half a direct effect, and one third due to first order effects composed of building components. The greenhouse emissions indicator is 35% below average with one tenth a direct effect and one third of contributions from second order supply chains such as 'softwood plantations-wood frames-residential building' and 'electricity production-brick making-residential building'.

TBL Accounts #2 and #3

In the second TBL account, the export propensity indicator is 50% below average with most of the effect due to the sector's suppliers. The income indicator is 20% below average while water use is 80% below average. In the third TBL account, import penetration is 35% below average, government revenue is 30% below average while land disturbance is 95% below average.

Structural Path Analysis and Linkages

While the export indicator is below average only 1% of the indicator is direct highlighting the essentially local and small business nature of the sector. Key upstream sectors including building components such as timber products (8%), wholesale trade (7%), weldmesh (2%), and bricks (2%) provide a domestic base through which export activities could be enhanced.

Increased consumer demand provides reasonably strong upstream linkages to sectors such as plywood and frames, plaster board, weldmesh, wholesale trade, road freight, property development and legal services. The sector shows weak downstream linkages with the ownership of buildings being the most notable sector. The ownership of dwellings sector provides a final sink for all building activity (in the broadest sense) in which all upstream activity is dissipated.

Future Trends in Sector

The base case scenario for the *Future Dilemmas* study with 25 million people by 2050 anticipates an average requirement of 70 000 new domestic dwellings each year for the next 50 years and total new floor space rising from 25 million to 35 million square metres per year in 2050. Many of the assumptions in this quite complex analysis may change, particularly the current trend to larger floor area of homes and the absolute level of net overseas migration.

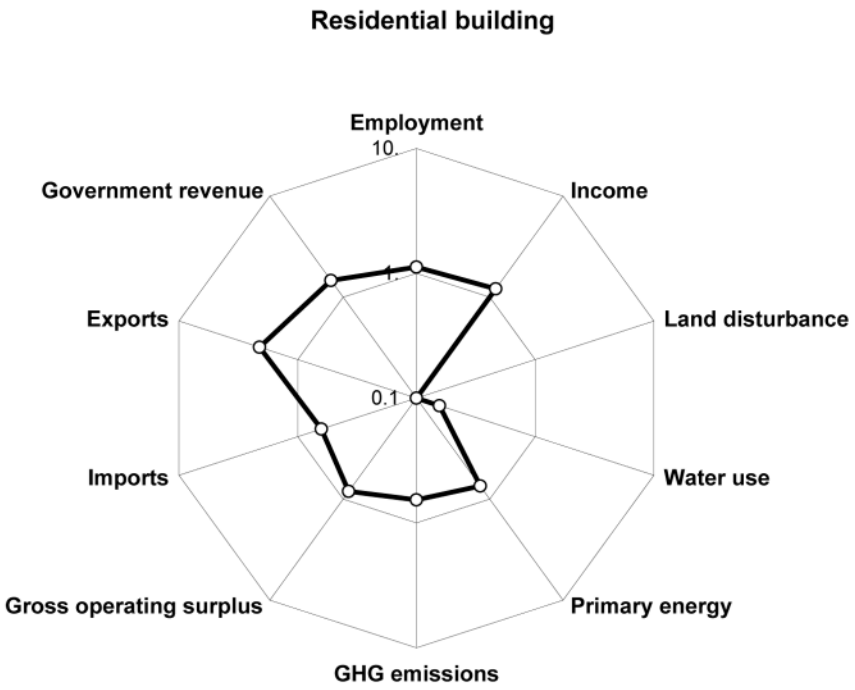
Innovation and Technical Opportunities

The biggest challenge to the sector is that markets, institutions and behaviour lag well behind what is technically possible in reducing water use, energy use and greenhouse gas emissions of the domestic housing stock. Direct energy use in the average Australian house produces 15 tonnes of greenhouse gas yearly and collectively generate 20% of Australia's total greenhouse emissions. The relatively low voluntary uptake of advanced energy design standards to date will lead to increasing incentives, regulation and cross compliance measures. Schemes such as the recent 'first home owners grant' (where new houses were subsidized for $7 000-$14 000 each to balance the negative impact of the GST on this sector, under which over $1 billion in public subsidies for 150 000 new houses were applied in the first year) could be tied to state of the art designs that passively save energy and water. While some energy efficient designs may involve higher initial energy use in an embodied sense (larger thermal mass, more insulation, double glazing etc.), this allows a much reduced yearly operational energy use over the 50-100 year life of each house. It is possible to foresee future suburban developments of 5 000 to 10 000 people that are essentially decoupled from the grid supplying over half of their own water and energy from inside their suburban boundary.

Sector **Residential building** **(Rb)**

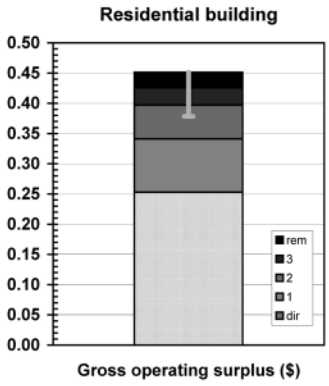
Residential building, construction, repair and maintenance

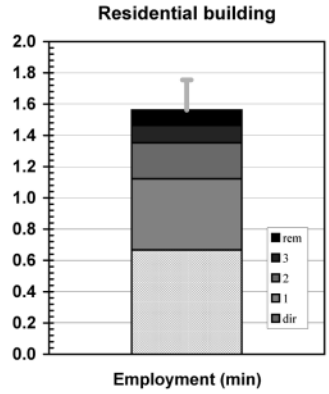
Spider diagram

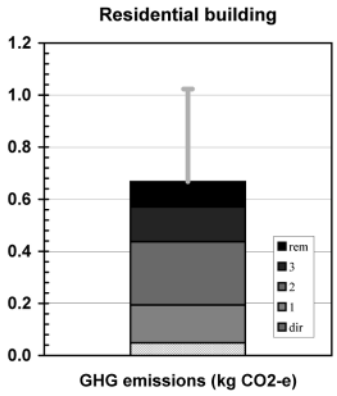


Bar graphs

Account #1







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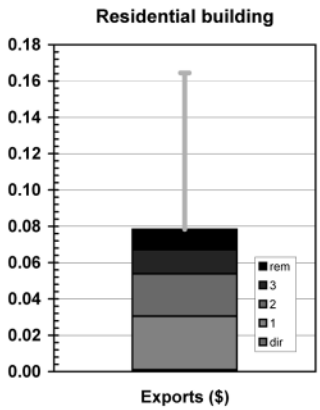
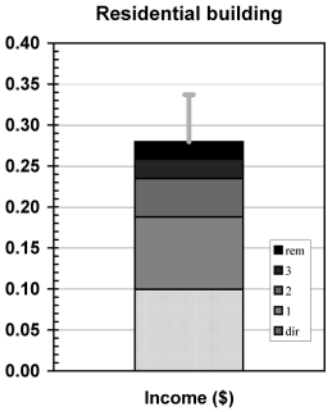
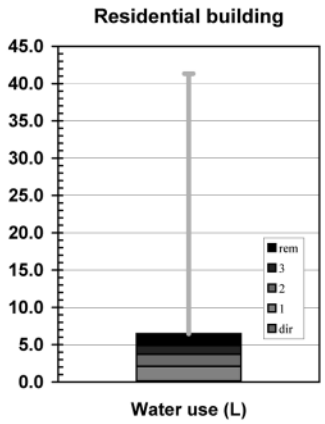
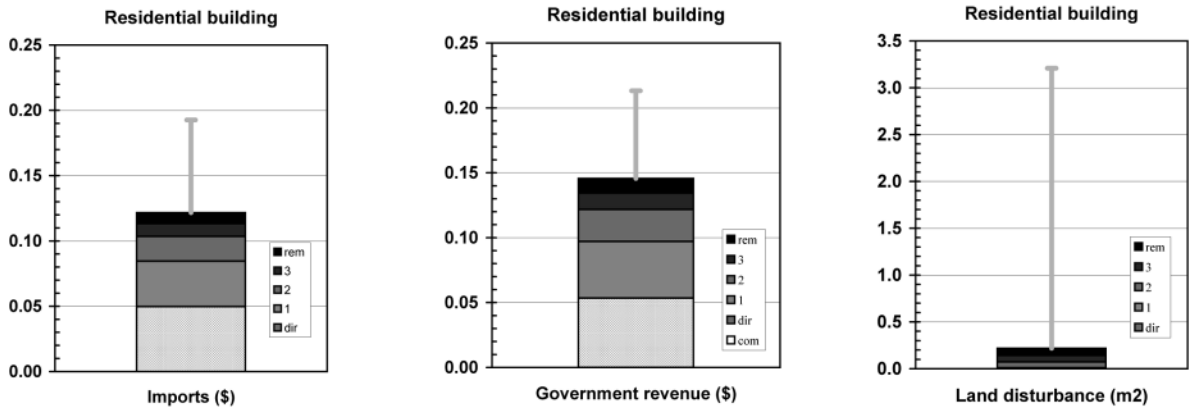






Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 0.3	(0.00% of total)	($m 0.3 domestically produced)
Government final consumption	$m 0.0	(0.00% of total)	($m 0.0 domestically produced)
Gross fixed capital expenditure	$m 26,247.2	(25.06% of total)	($m 26,238.7 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 26,247.6**	**(5.71% of GNE)**	**($m 26,239.1 domestically produced)**
Exports	$m 27.9	(0.03% of total)	($m 27.9 domestically produced)
Final demand	**$m 26,275.5**	**(4.84% of GNT)**	**($m 26,267.0 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 2,784.2	(1.63% of total)	
Gross operating surplus	$m 7,078.6	(3.69% of total)	
Taxes less subsidies	$m 1,497.2	(1.75% of total)	
Sectoral GDP*	**$m 11,359.9**	**(2.54% of GDP)**	
Imports	$m 1,392.8	(1.43% of total)	
Primary inputs	**$m 12,752.8**	**(2.34% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 7,078.6	(3.69%)	$m 6,638.8	(3.46%)	$m 11,859.8	(6.18%)
Exports ($m)	$m 27.9	(0.03%)	$m 26.1	(0.03%)	$m 2,057.8	(2.47%)
Imports ($m)	$m 1,392.8	(1.43%)	$m 1,306.3	(1.34%)	$m 3,196.6	(3.27%)
Employment (e-y)	149,612 e-y	(2.10%)	140,317 e-y	(1.97%)	328,854 e-y	(4.61%)
Income ($m)*	$m 2,784.2	(1.63%)	$m 2,611.2	(1.53%)	$m 7,341.7	(4.30%)
Government revenue ($m)†	$m 1,497.2	(1.39%)	$m 1,404.2	(1.30%)	$m 3,826.2	(3.54%)
GHG emissions (kt CO_2-e)	1,358 kt	(0.26%)	1,274 kt	(0.25%)	17,528 kt	(3.38%)
Water use (ML)	3,269 ML	(0.02%)	3,066 ML	(0.01%)	169,694 ML	(0.81%)
Land disturbance (kha)	9 kha	(0.01%)	8 kha	(0.00%)	576 kha	(0.35%)
Primary energy (TJ)	19,537 TJ	(0.50%)	18,323 TJ	(0.47%)	149,082 TJ	(3.84%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.25	0.45	0.38
Exports ($)	0.00	0.08	0.16
Imports ($)	0.05	0.12	0.19
Employment (min)	0.67	1.56	1.75
Income ($)	0.10	0.28	0.34
Government revenue ($)	0.05	0.15	0.21
GHG emissions (kg CO_2-e)	0.05	0.67	1.02
Water use (L)	0.12	6.46	41.32
Land disturbance (m^2)	0.00	0.22	3.21
Primary energy (MJ)	0.70	5.68	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Rb	0.253	(0; 56.%)	Rb	0.667	(0; 43.%)	Rb	0.0485	(0; 7.3%)
Cp Rb	0.0115	(1; 2.5%)	Sm Rb	0.0526	(1; 3.4%)	Sw Ti Rb	0.0372	(2; 5.6%)
Pd Rb	0.00699	(1; 1.5%)	Wp Rb	0.0517	(1; 3.3%)	Cr Rb	0.0306	(1; 4.6%)
Wt Rb	0.00651	(1; 1.4%)	Wt Rb	0.0469	(1; 3.%)	Cc Rb	0.0263	(1; 3.9%)
Cr Rb	0.00617	(1; 1.4%)	Cr Rb	0.0461	(1; 3.%)	Ce Cp Rb	0.0178	(2; 2.7%)
Sm Rb	0.00599	(1; 1.3%)	Cp Rb	0.03	(1; 1.9%)	Is Sm Rb	0.0171	(2; 2.6%)
Wp Rb	0.00575	(1; 1.3%)	Ti Rb	0.0294	(1; 1.9%)	Fr Sw Ti Rb	0.0161	(3; 2.4%)
Rv Rb	0.0055	(1; 1.2%)	Rd Rb	0.0208	(1; 1.3%)	Is Rb	0.015	(1; 2.3%)
Cc Rb	0.00491	(1; 1.1%)	Pd Rb	0.0168	(1; 1.1%)	Ce Cc Rb	0.0132	(2; 2.%)
Ti Rb	0.00451	(1; 1.%)	Fm Rb	0.0158	(1; 1.%)	Ce Rb	0.0106	(1; 1.6%)
Rd Rb	0.00354	(1; 0.78%)	Rv Rb	0.0147	(1; 0.94%)	Ti Rb	0.00988	(1; 1.5%)
Sg Rb	0.00307	(1; 0.68%)	Ms Rb	0.0118	(1; 0.75%)	Sw Wp Rb	0.00947	(2; 1.4%)
Ms Rb	0.00263	(1; 0.58%)	Cc Rb	0.0109	(1; 0.7%)	Sw Ti Wp Rb	0.00844	(3; 1.3%)
Sg Cc Rb	0.00199	(2; 0.44%)	Fm Sm Rb	0.00802	(2; 0.51%)	El Cr Rb	0.00791	(2; 1.2%)
Is Sm Rb	0.00198	(2; 0.44%)	Eq Rb	0.00736	(1; 0.47%)	El Wp Rb	0.00778	(2; 1.2%)
Is Rb	0.00174	(1; 0.39%)	Ti Wp Rb	0.00668	(2; 0.43%)	El Rb	0.00665	(1; 1.%)
Pt Rb	0.00174	(1; 0.38%)	Rd Cc Rb	0.00612	(2; 0.39%)	Wt Rb	0.0065	(1; 0.97%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Ti Rb	0.00587	(1; 7.5%)	Rb	0.0994	(0; 36.%)	Wp Rb	0.426	(1; 6.6%)
Wt Rb	0.00532	(1; 6.8%)	Wt Rb	0.0101	(1; 3.6%)	Wa Rb	0.391	(1; 6.1%)
Sm Rb	0.00185	(1; 2.4%)	Wp Rb	0.01	(1; 3.6%)	Sm Rb	0.333	(1; 5.2%)
Sg Rb	0.00152	(1; 1.9%)	Sm Rb	0.00905	(1; 3.2%)	Vf Rb	0.202	(1; 3.1%)
Is Sm Rb	0.00151	(2; 1.9%)	Cr Rb	0.00674	(1; 2.4%)	Wa Pd Rb	0.191	(2; 3.%)
Cr Rb	0.00145	(1; 1.8%)	Cp Rb	0.00667	(1; 2.4%)	Rb	0.117	(0; 1.8%)
Wp Rb	0.00133	(1; 1.7%)	Pd Rb	0.00631	(1; 2.3%)	Mi Rb	0.106	(1; 1.6%)
Ti Wp Rb	0.00133	(2; 1.7%)	Ti Rb	0.00477	(1; 1.7%)	Sg Rb	0.0777	(1; 1.2%)
Is Rb	0.00133	(1; 1.7%)	Rd Rb	0.00357	(1; 1.3%)	Wa Ms Rb	0.0676	(2; 1.%)
Eq Rb	0.00131	(1; 1.7%)	Ms Rb	0.00274	(1; 0.98%)	Cp Rb	0.0528	(1; 0.82%)
Nf Sm Rb	0.00125	(2; 1.6%)	Fm Rb	0.00248	(1; 0.89%)	Ti Rb	0.0508	(1; 0.79%)
Rd Rb	0.00123	(1; 1.6%)	Cc Rb	0.0024	(1; 0.86%)	Sg Cc Rb	0.0504	(2; 0.78%)
Rb	0.000995	(0; 1.3%)	Rv Rb	0.00237	(1; 0.85%)	Is Sm Rb	0.0453	(2; 0.7%)
Sg Cc Rb	0.000989	(2; 1.3%)	In Rb	0.00146	(1; 0.52%)	El Cr Rb	0.0437	(2; 0.68%)
Ee Rb	0.000858	(1; 1.1%)	Bk Rb	0.00146	(1; 0.52%)	El Wp Rb	0.043	(2; 0.67%)
Fm Rb	0.000816	(1; 1.%)	Eq Rb	0.0013	(1; 0.46%)	Is Rb	0.0399	(1; 0.62%)
Mi Rb	0.000654	(1; 0.83%)	Fm Sm Rb	0.00126	(2; 0.45%)	Mi Cr Rb	0.0385	(2; 0.6%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Rb	0.0497	(0; 41.%)	Rb	0.0535	(0; 37.%)	Sw Ti Rb	0.0293	(2; 13.%)
Wp Rb	0.00509	(1; 4.2%)	Wp Rb	0.00487	(1; 3.3%)	Wo Tx Tp Rb	0.0164	(3; 7.5%)
Sm Rb	0.0043	(1; 3.5%)	Wt Rb	0.0047	(1; 3.2%)	Wo Tx Rb	0.0134	(2; 6.1%)
Ti Rb	0.0023	(1; 1.9%)	Pd Rb	0.00413	(1; 2.8%)	Sw Wp Rb	0.00745	(2; 3.4%)
Cr Rb	0.0022	(1; 1.8%)	Sm Rb	0.00347	(1; 2.4%)	Bc Mp Ho Rb	0.00724	(3; 3.3%)
Cp Rb	0.00194	(1; 1.6%)	Cp Rb	0.0031	(1; 2.1%)	Sw Ti Wp Rb	0.00664	(3; 3.%)
Pt Rb	0.0019	(1; 1.6%)	Cr Rb	0.00273	(1; 1.9%)	Fr Sw Ti Rb	0.00516	(3; 2.4%)
Wt Rb	0.00151	(1; 1.2%)	Rd Rb	0.00254	(1; 1.7%)	Bc Mp Rt Rb	0.00311	(3; 1.4%)
Hh Rb	0.00111	(1; 0.91%)	Ti Rb	0.00209	(1; 1.4%)	Rb	0.00304	(0; 1.4%)
Fm Rb	0.00107	(1; 0.88%)	In Rb	0.00157	(1; 1.1%)	Hw Ti Rb	0.00258	(2; 1.2%)
Pd Rb	0.00101	(1; 0.83%)	Rv Rb	0.00146	(1; 1.%)	Bc Mp Rb	0.00232	(2; 1.1%)
Sg Rb	0.00096	(1; 0.79%)	Cc Rb	0.00142	(1; 0.98%)	Wo Tx Wt Rb	0.00167	(3; 0.76%)
Rd Rb	0.000896	(1; 0.74%)	Ms Rb	0.0013	(1; 0.89%)	Fr Hw Ti Rb	0.00157	(3; 0.72%)
Eq Rb	0.000867	(1; 0.71%)	Fm Rb	0.000866	(1; 0.59%)	Sm Rb	0.00133	(1; 0.6%)
Ee Rb	0.000837	(1; 0.69%)	Bk Rb	0.000805	(1; 0.55%)	Fr Sw Wp Rb	0.00131	(3; 0.6%)
Pl Rb	0.000816	(1; 0.67%)	Rd Cc Rb	0.000747	(2; 0.51%)	Bc Mp Ho Pd	0.00119	(4; 0.54%)
Pc Rb	0.000721	(1; 0.59%)	Eq Rb	0.000643	(1; 0.44%)	Wo Tx Sm Rb	0.00118	(3; 0.54%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.264 ±0.017	(±1.4%)
Downstream	0.069 ±0.005	(±7.0%)

Sector 4102: Non-Residential Construction (Nb)

Non-residential buildings, roads, bridges and other construction, repairs and maintenance

Short Summary

Against the metric of one dollar of final demand, the environmental indicator of greenhouse emissions is 50% below average while water use and land disturbance are 85% and 95% below average respectively. The sector is a significant part of the economy and so containing absolute emissions still deserves attention. The social indicators for employment generation and income are 30% and 10% above average, while the contribution to government revenue is 15% below average. The financial indicators show an operating surplus 15% below average with export propensity and import penetration 50% and 35% below average respectively. Increased consumer demand in the sector generates only moderate activity for upstream suppliers. The downstream linkages from increased construction activity are weak. The financial indicator of exports and the social indicator of government revenue are the most obvious targets for policy and industry innovation.

Sector Description

The non-residential building sector is made up of construction activities focused on commercial and institutional buildings (40%), roads and bridges (20%) and other facilities such as stadiums, dams, pipelines etc. (40%). In terms of floor area the building stock serviced in this sector covers approximately 25 million square metres of which offices, retail and education facilities cover 30%, 40% and 15% respectively. Roads of 806 000 km in length, of which 38% are sealed, service the nation's road transport requirements. In 2002, financial turnover was $25 billion and involved over 7 000 enterprises.

Place of Industry in the Economy

The industry ranks 7th out of 135 in its contribution to value adding in the economy and represents 3.43% of GDP in this analysis. It is a good generator of employment with a total of 517 000 employment years of which 366 000 years are generated directly in the sector, and 151 000 years generated by the sector's suppliers. In addition it contributes 31 000 employment years to downstream sectors such as wholesale trade, property development and defence. It has moderate requirements for water and land with less than 1% each of the national total, but requires 4% of national energy use and produces 3% of national greenhouse emissions. In financial terms, imports outweigh exports by a ratio of 16 to 1.

Strategic Overview

The spider diagram shows a reasonably balanced TBL outcome with an outlier for export performance, and below average performance for government revenue and operating surplus. These issues vary with the business cycle and spikes of activity such as the Sydney Olympic Games and may improve in subsequent analyses. Upstream issues for the sector focus on the mature age structure of the construction workforce and the challenge of maintaining a continuity of skills for highly skilled specialist areas such as hard rock tunnelling. Downstream issues relate to the environmental and societal performance of the eventual product of the construction activity. It is possible for example, that a new freeway or toll road may meet the very highest construction standards and add beauty to bland suburbs, but stimulate large increases in transport activity, the emissions from which increase population health impacts such as asthma and respiratory disease.

TBL Account #1

The financial indicator of surplus is 15% below the economy wide average with a direct effect of one half, and contributions from property development, engineering, repairs to vehicles and sand and gravel, each of which contribute 2%. The employment indicator is 30% above the average and two thirds is a direct effect. The greenhouse emissions indicator is 50% below the average with only one fifth of the emissions being direct, and similar amounts from first order (steel, concrete, electricity production and wholesale trade) and second order (cement for concrete, electricity for electronics manufacturing, steel for weldmesh, cement for plaster products) suppliers.

TBL Accounts #2 and #3

The second TBL account shows export propensity is 50% below average with most of the contribution from first and second order effects. The income indicator is 10% above average with two thirds a direct effect. The water use indicator is 85% below average with only a small direct effect. The third TBL reveals an import penetration 35% below average, government revenue 15% below average and land disturbance 95% below average.

Structural Path Analysis and Linkages

The structural path analysis for export propensity shows that the direct effect is 4% of the total. First order effects due to business equipment (12%), wholesale trade (5%), electrical fittings (5%) and air conditioning (4%) are more important and may be suitable targets for export enhancement.

Increases in consumer demand for non residential building and construction show an average upstream linkage to sectors such as wholesale trade and property development with smaller effects on component suppliers such as iron and steel beams, weldmesh, electric wiring, road freight and consulting engineering. The sector shows weak downstream linkages and the sector activity effectively dissipates once construction is completed.

Future Trends in Sector

The base case scenario in the *Future Dilemmas* study anticipates a doubling of office space and a trebling of retail space by 2050 as a guide to the future requirement for construction activity. In road construction, possibly 20 000 km of new urban road will be required by 2050 in addition to the maintenance and remaking of existing roads. Dams, water and sewage pipes will expand in line with suburban expansion but may be more limited in extent due to new spatial and technological designs. Possible future shortages of cheap transport fuels and health problems caused by urban emissions may require a large increase in light and heavy rail within cities and fast rail between cities. This would stimulate a large increase in construction activity. Similarly, higher rates of population growth would cause a step change in construction activity.

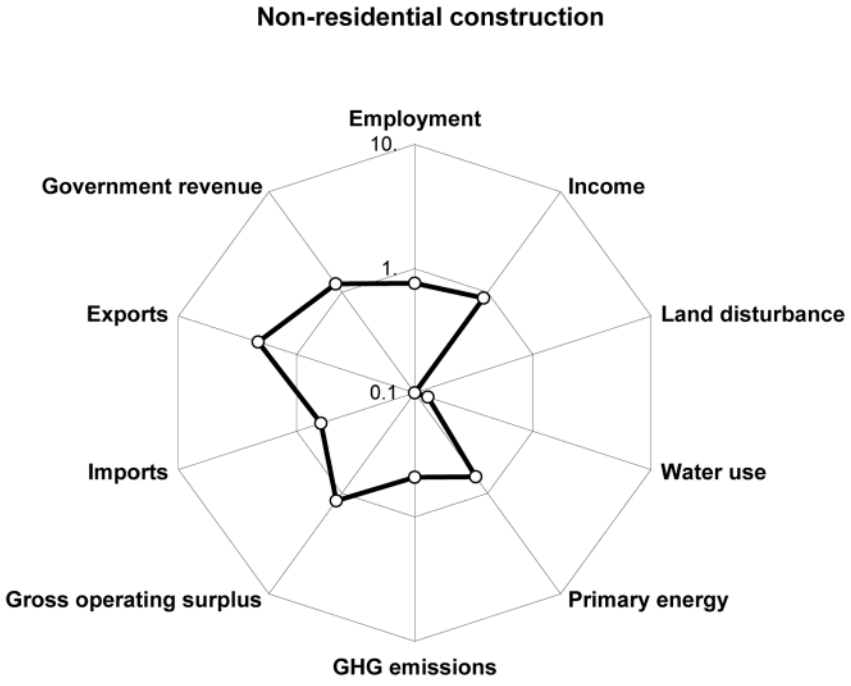
Innovation and Technical Opportunities

Innovation in construction appears to be developing along at least three lines. While the basic form of the construction machinery will not change, multiuse construction units known as ‘mobile counterweights’ will evolve which can undertake most activities. The physical construction process will see the integration of design and regulation processes, which will be seamlessly down-linked by satellite positioning systems to enable precise location, almost to individual bolt hole level. New materials will be developed, many of them mimicking the design strength and utility of human bone and collagen, to enable radical construction designs to be implemented. Much of this development, particularly in the case of office and institutional buildings, will focus on the human habitability of the building stock, avoiding sick building syndrome, producing low greenhouse emissions on a whole of life basis, and facilitating the recycling and reuse of building materials and components once the building has finished its economic or social life.

Sector **Non-residential construction** **(Nb)**

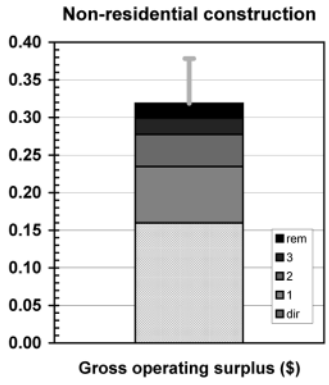
Non-residential buildings, roads, bridges and other construction, repair and maintenance

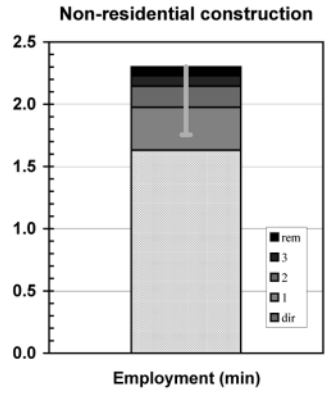
Spider diagram

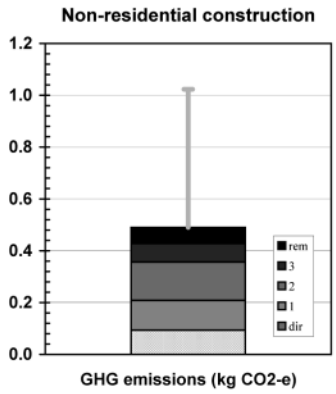


Bar graphs

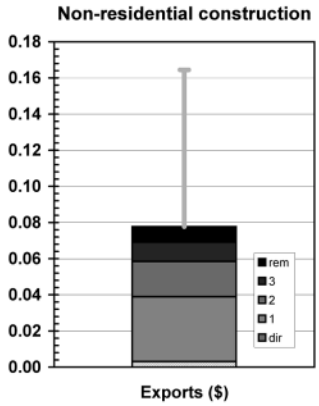
Account #1

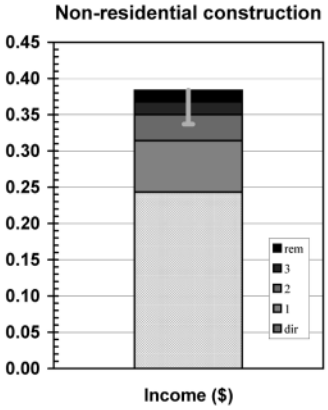


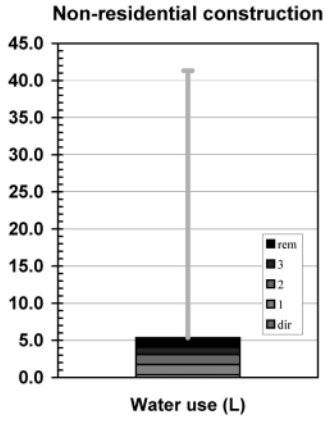




Account #2







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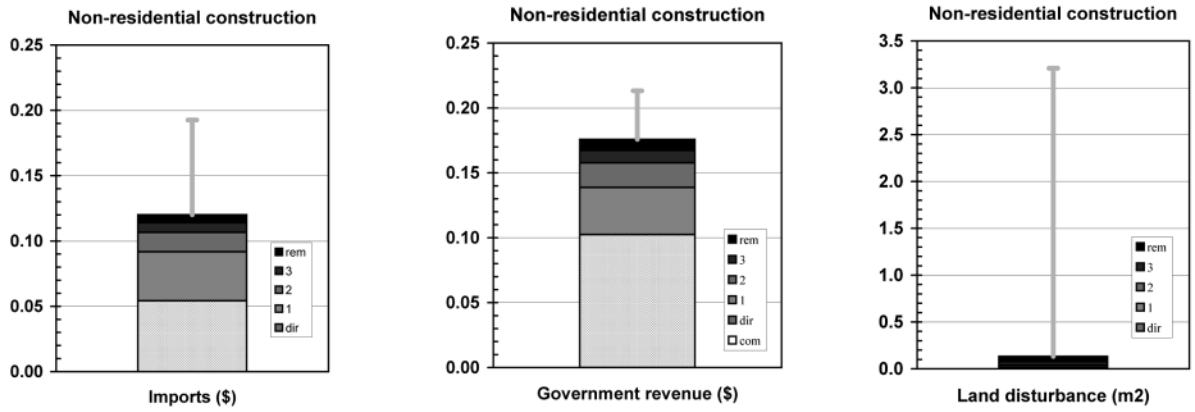


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 0.6	(0.00% of total)	($m 0.6 domestically produced)
Government final consumption	$m 2,243.7	(2.54% of total)	($m 2,243.7 domestically produced)
Gross fixed capital expenditure	$m 25,697.7	(24.54% of total)	($m 25,672.2 domestically produced)
Net changes in stocks	$m 1.9	(0.11% of total)	($m 1.9 domestically produced)
Sectoral GNE	**$m 27,943.9**	**(6.08% of GNE)**	**($m 27,918.4 domestically produced)**
Exports	$m 92.8	(0.11% of total)	($m 92.8 domestically produced)
Final demand	**$m 28,036.8**	**(5.17% of GNT)**	**($m 28,011.3 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 7,395.1	(4.33% of total)	
Gross operating surplus	$m 4,856.5	(2.53% of total)	
Taxes less subsidies	$m 3,114.6	(3.65% of total)	
Sectoral GDP*	**$m 15,366.3**	**(3.43% of GDP)**	
Imports	$m 1,647.9	(1.69% of total)	
Primary inputs	**$m 17,014.1**	**(3.12% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 4,856.5	(2.53%)	$m 4,472.6	(2.33%)	$m 8,929.6	(4.66%)
Exports ($m)	$m 92.8	(0.11%)	$m 85.5	(0.10%)	$m 2,176.1	(2.61%)
Imports ($m)	$m 1,647.9	(1.69%)	$m 1,517.6	(1.55%)	$m 3,366.0	(3.45%)
Employment (e-y)	397,388 e-y	(5.58%)	365,971 e-y	(5.13%)	516,510 e-y	(7.25%)
Income ($m)*	$m 7,395.1	(4.33%)	$m 6,810.5	(3.99%)	$m 10,747.0	(6.29%)
Government revenue ($m)†	$m 3,114.6	(2.88%)	$m 2,868.4	(2.65%)	$m 4,923.9	(4.55%)
GHG emissions (kt CO_2-e)	2,843 kt	(0.55%)	2,618 kt	(0.50%)	13,724 kt	(2.65%)
Water use (ML)	10,178 ML	(0.05%)	9,374 ML	(0.04%)	149,527 ML	(0.71%)
Land disturbance (kha)	29 kha	(0.02%)	27 kha	(0.02%)	371 kha	(0.23%)
Primary energy (TJ)	40,614 TJ	(1.05%)	37,403 TJ	(0.96%)	146,702 TJ	(3.78%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.16	0.32	0.38
Exports ($)	0.00	0.08	0.16
Imports ($)	0.05	0.12	0.19
Employment (min)	1.63	2.30	1.75
Income ($)	0.24	0.38	0.34
Government revenue ($)	0.10	0.18	0.21
GHG emissions (kg CO_2-e)	0.09	0.49	1.02
Water use (L)	0.33	5.34	41.32
Land disturbance (m^2)	0.01	0.13	3.21
Primary energy (MJ)	1.34	5.24	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Nb	0.16	(0; 50.%)	Nb	1.63	(0; 71.%)	Nb	0.0935	(0; 19.%)
Pd Nb	0.00656	(1; 2.1%)	Wt Nb	0.0348	(1; 1.5%)	Is Nb	0.0283	(1; 5.8%)
Rv Nb	0.00597	(1; 1.9%)	Sm Nb	0.0292	(1; 1.3%)	Cc Nb	0.023	(1; 4.7%)
Ts Nb	0.00522	(1; 1.6%)	Ts Nb	0.0235	(1; 1.%)	El Nb	0.0219	(1; 4.5%)
Sg Nb	0.00514	(1; 1.6%)	Ee Nb	0.0224	(1; 0.97%)	Ce Cc Nb	0.0116	(2; 2.4%)
Wt Nb	0.00484	(1; 1.5%)	Fm Nb	0.02	(1; 0.87%)	El En Nb	0.00955	(2; 1.9%)
Cc Nb	0.0043	(1; 1.3%)	Eq Nb	0.0186	(1; 0.81%)	Is Sm Nb	0.0095	(2; 1.9%)
Cp Nb	0.00389	(1; 1.2%)	En Nb	0.0169	(1; 0.73%)	Ce Cp Nb	0.00603	(2; 1.2%)
Ee Nb	0.00362	(1; 1.1%)	Rv Nb	0.016	(1; 0.69%)	Lm Cc Nb	0.00562	(2; 1.1%)
Sm Nb	0.00333	(1; 1.%)	Pd Nb	0.0158	(1; 0.69%)	El Cc Nb	0.00544	(2; 1.1%)
Is Nb	0.00327	(1; 1.%)	Rd Nb	0.0147	(1; 0.64%)	Wt Nb	0.00483	(1; 0.99%)
En Nb	0.00298	(1; 0.94%)	Ms Nb	0.0122	(1; 0.53%)	Sg Nb	0.00405	(1; 0.83%)
Ms Nb	0.00272	(1; 0.85%)	Cp Nb	0.0102	(1; 0.44%)	Rd Nb	0.00398	(1; 0.81%)
St Nb	0.00269	(1; 0.85%)	Cc Nb	0.00951	(1; 0.41%)	El Is Nb	0.00371	(2; 0.76%)
Rd Nb	0.0025	(1; 0.79%)	Is Nb	0.00781	(1; 0.34%)	El Pd Nb	0.00313	(2; 0.64%)
Eq Nb	0.00189	(1; 0.59%)	Sg Nb	0.00649	(1; 0.28%)	Sw Ti Nb	0.00309	(2; 0.63%)
Fm Nb	0.0018	(1; 0.56%)	Bk Nb	0.00573	(1; 0.25%)	Mi Nb	0.00304	(1; 0.62%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
En Nb	0.00897	(1; 12.%)	Nb	0.243	(0; 63.%)	Vf Nb	0.372	(1; 7.%)
Wt Nb	0.00396	(1; 5.1%)	Wt Nb	0.00748	(1; 1.9%)	Nb	0.335	(0; 6.3%)
Ee Nb	0.00361	(1; 4.6%)	Pd Nb	0.00592	(1; 1.5%)	Sm Nb	0.185	(1; 3.5%)
Eq Nb	0.00332	(1; 4.3%)	Ts Nb	0.0055	(1; 1.4%)	Wa Pd Nb	0.179	(2; 3.4%)
Nb	0.00305	(0; 3.9%)	Sm Nb	0.00504	(1; 1.3%)	Sg Nb	0.13	(1; 2.4%)
Sg Nb	0.00256	(1; 3.3%)	Ee Nb	0.0043	(1; 1.1%)	El Nb	0.121	(1; 2.3%)
Is Nb	0.0025	(1; 3.2%)	En Nb	0.00425	(1; 1.1%)	Wa Nb	0.107	(1; 2.%)
Sm Nb	0.00103	(1; 1.3%)	Eq Nb	0.00329	(1; 0.86%)	Is Nb	0.0749	(1; 1.4%)
Fm Nb	0.00103	(1; 1.3%)	Fm Nb	0.00313	(1; 0.82%)	Wa Ts Nb	0.0703	(2; 1.3%)
Rd Nb	0.000871	(1; 1.1%)	Ms Nb	0.00283	(1; 0.74%)	Wa Ms Nb	0.0699	(2; 1.3%)
Sg Cc Nb	0.000866	(2; 1.1%)	Rv Nb	0.00257	(1; 0.67%)	El En Nb	0.0528	(2; 0.99%)
Nf Ee Nb	0.000849	(2; 1.1%)	Rd Nb	0.00253	(1; 0.66%)	Mi Nb	0.0512	(1; 0.96%)
Is Sm Nb	0.000841	(2; 1.1%)	Cp Nb	0.00226	(1; 0.59%)	Ee Nb	0.0472	(1; 0.88%)
Ts Nb	0.000828	(1; 1.1%)	Cc Nb	0.0021	(1; 0.55%)	Wp Nb	0.0444	(1; 0.83%)
Ma Nb	0.000706	(1; 0.91%)	Is Nb	0.00186	(1; 0.49%)	Sg Cc Nb	0.0442	(2; 0.83%)
Nf Sm Nb	0.000695	(2; 0.89%)	Bk Nb	0.00142	(1; 0.37%)	Sc Cg Vf Nb	0.0386	(3; 0.72%)
Io Is Nb	0.00068	(2; 0.87%)	St Nb	0.00112	(1; 0.29%)	Cc Nb	0.0318	(1; 0.6%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Nb	0.0542	(0; 45.%)	Nb	0.102	(0; 58.%)	Wo Tx Tp Nb	0.011	(3; 8.3%)
En Nb	0.0104	(1; 8.7%)	Pd Nb	0.00388	(1; 2.2%)	Nb	0.00967	(0; 7.3%)
Ee Nb	0.00353	(1; 2.9%)	Wt Nb	0.0035	(1; 2.%)	Bc Mp Nb	0.0059	(2; 4.5%)
Sm Nb	0.00239	(1; 2.%)	Ts Nb	0.00271	(1; 1.5%)	Wo Tx Nb	0.00512	(2; 3.9%)
Eq Nb	0.0022	(1; 1.8%)	En Nb	0.00259	(1; 1.5%)	Bc Mp Ho Nb	0.00432	(3; 3.3%)
Sg Nb	0.00161	(1; 1.3%)	Sm Nb	0.00193	(1; 1.1%)	Bc Mp Rt Nb	0.00256	(3; 1.9%)
Ts Nb	0.0015	(1; 1.2%)	Ee Nb	0.00188	(1; 1.1%)	Sw Ti Nb	0.00243	(2; 1.8%)
Fm Nb	0.00135	(1; 1.1%)	Rd Nb	0.0018	(1; 1.%)	Wo Tx Wt Nb	0.00124	(3; 0.94%)
Is Nb	0.00118	(1; 0.98%)	Eq Nb	0.00163	(1; 0.93%)	Bc Mp Ho Pd	0.00112	(4; 0.85%)
Wt Nb	0.00112	(1; 0.94%)	Rv Nb	0.00159	(1; 0.9%)	Hw Nb	0.000935	(1; 0.71%)
Pt Nb	0.00104	(1; 0.87%)	Ms Nb	0.00135	(1; 0.77%)	Wo Ts Nb	0.000902	(2; 0.68%)
Pd Nb	0.000945	(1; 0.79%)	Cc Nb	0.00124	(1; 0.71%)	Sw Wp Nb	0.000777	(2; 0.59%)
Ma Nb	0.000834	(1; 0.69%)	In Nb	0.00115	(1; 0.65%)	Bc Mp Pd Nb	0.000764	(3; 0.58%)
Rv Nb	0.000773	(1; 0.64%)	Fm Nb	0.00109	(1; 0.62%)	Bc Mp Ts Nb	0.000738	(3; 0.56%)
Cp Nb	0.000659	(1; 0.55%)	Cp Nb	0.00105	(1; 0.6%)	Sm Nb	0.000737	(1; 0.56%)
Pc Nb	0.000644	(1; 0.54%)	Is Nb	0.000855	(1; 0.49%)	Bc Mp Ho Wt	0.000716	(4; 0.54%)
Rd Nb	0.000635	(1; 0.53%)	Bk Nb	0.000782	(1; 0.44%)	Sw Ti Wp Nb	0.000693	(3; 0.52%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.989 ±0.013	(±1.4%)
Downstream	0.139 ±0.002	(±1.8%)

Sector 4501: Wholesale Trade (Wt)

Wholesale trade (excluding repairing and servicing)

Short Summary

Against the metric of one dollar of final demand, the environmental indicator of greenhouse emissions is 55% below the economy wide average, water use is 85% below and land disturbance is 95% below average. The social indicators reveal that employment generation is equal to average, income is 10% above average and government revenue is 10% below average. The financial indicators reveal that the operating surplus is 15% below average, export propensity is equal to average while import penetration is 55% below average. The upstream linkage to the sector's suppliers such as property development, accounting and marketing, forwarding and storage, communications and road transport is slightly above average. The downstream linkages from an investment or expansion point of view are slightly below average. While this TBL assessment reveals positive outcomes, the size of the sector ranking second in its contribution to GDP suggests that energy use and greenhouse emissions may still require some attention.

Sector Description

The wholesale trade sector provides an intermediate clearing house between manufacturers, primary producers and importers, and the retail stores and institutions such as governments and private firms where final consumption takes place. While there are 40 or more sub-sectors in wholesale trade it is convenient to classify them into three classes: basic materials (farm produce, minerals and building supplies); machinery and motors (cars and equipment); and personal and household goods (food, textiles, appliances). There are approximately 75 000 wholesale enterprises in Australia with machinery and equipment suppliers (31%), building supplies (14%) and food and drink (13%) being the dominant activities in number terms. In 2002, gross turnover was about $260 billion.

Place of Industry in the Economy

The wholesale trade sector ranks second out of 135 sectors in terms of value adding in the economy and contributes 5.46% of GDP in this analysis. It is similar in size of value adding to the health and education sectors. It is a large employer with a direct requirement of 208 000 employment years and a further 184 000 in its upstream suppliers giving a total of 392 000 employment years or 5.5% of the national total. In addition it contributes another 224 000 employment years to the final demand of downstream industries, such as non-residential and residential construction, accommodation cafes and restaurants, retail trade, and road transport. It is responsible for less than one percent of national water use and land disturbance but two to four percent of energy use and greenhouse emissions. In financial flow terms, exports are three times the size of imports.

Strategic Overview

The integrated overview provided in the spider diagram reveals an advantaged TBL outcome for the wholesale trade sector. The environmental indicators of water use and land disturbance are well below average, while energy use and greenhouse emissions are also below average. The social indicators of employment generation and income are above average, while the government revenue indicator is below average. The financial indicators of export propensity and import penetration are well above average, while operating surplus is close to average. The wholesaling sector faces a wide range of complex logistical challenges in regard to e-commerce and other retailing innovations as sustainability issues gain traction in consumption choices. Using production chain analyses, wholesalers could select products for retailers and thereby reduce upstream environmental impacts.

TBL Account #1

The financial indicator of operating surplus is 15% below average, the social indicator of employment generation is equal to average, and the environmental indicator of greenhouse emissions is 55% below average. This account presents a positive outcome for the sector.

TBL Accounts #2 and #3

The second TBL account shows an export propensity that is equal to average, an income indicator 10% above average, and a water use indicator 85% below average. The third TBL account shows an import penetration indicator that is 55% below average, a government revenue indicator that is 10% below average and a land disturbance indicator that is 95% below average.

Structural Path Analysis and Linkages

While the indicator of greenhouse intensity is well below average, the absolute size of the sector and its responsibility in full chain terms for 2.4% of national greenhouse emissions suggest that this may warrant attention. About one third of the indicator is a direct within sector effect, indicating scope for direct management. Others are electricity generation (9%), airlines (4%), a second order effect of ‘electricity production to storage to wholesale trade’ (2%), and road transport (2%).

The sector reveals higher than average linkages to its upstream suppliers such as property development, accounting and marketing, forwarding and storage, communications and road transport. The linkages to downstream industries are a little below average but strong links to residential and non-residential construction, accommodation cafes and restaurants, retail trade, communications and road transport are indicated. Thus, investment into wholesale trade should also be accompanied by expansion in these sectors if the investment is to be effectively dispersed.

Future Trends in Sector

The base case scenario for the *Future Dilemmas* study with 25 million domestic population by 2050, anticipates an increase in wholesale space from 15 million m^2 in 2001 to 22 million m^2 or a 50% increase over the next 50 years. Importantly, these requirements will be spread by population drivers that see space for Perth and Brisbane grow by 75%, Sydney and Melbourne by 50%, and regional areas by 30%. The location of eventual population growth is highly uncertain, as are energy futures and transport logistics, the effect of e-commerce in cutting out the wholesale ‘middleman’, and the degree to which retail and wholesale space merge, as evidenced today by large furniture and appliance megastores where storage, display and sale take place on the same floor space. While the congestion experienced on European roads will not impact on Australia to the same extent, there may be a move to increase inventories and decrease reliance on just-in-time supply.

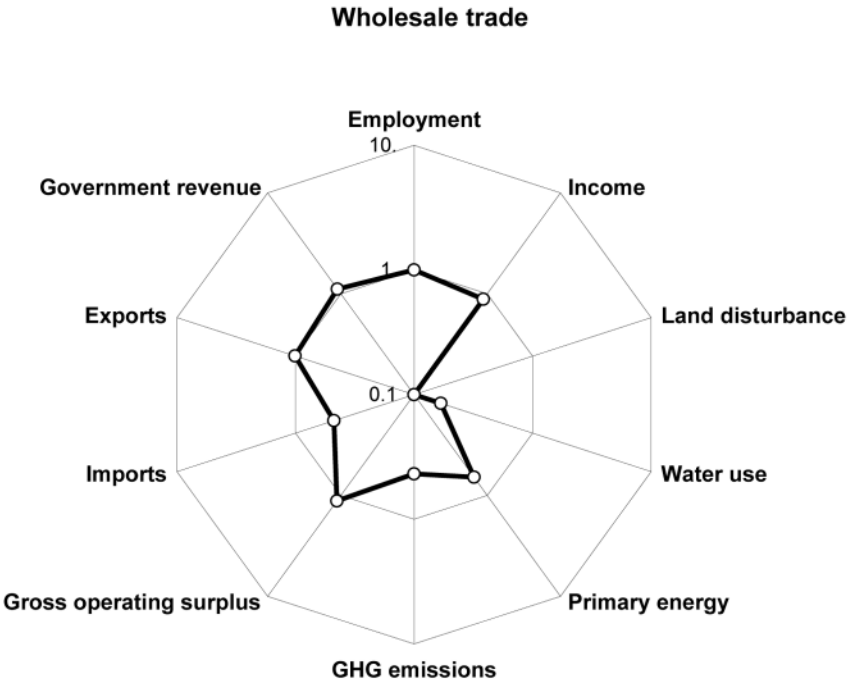
Innovation and Technical Opportunities

The wholesale trade sector, the second largest in value adding in the Australian economy (or the largest if the accounting assumptions behind the ‘ownership of domestic dwellings’ were adjusted) faces challenges from direct producer to consumer e-commerce, the integration of retail and wholesale, and removal of activity to globally centralised facilities offshore, with local delivery logistics. Countering this prognosis is an emerging institutional logic that views products as sources of environmental and social risks, and views wholesale-retail trade as responsible for helping manage and direct the full production chain from primary production to final consumption eg ‘from ocean to plate’ in the case of fisheries or ‘from paddock to plate’ for beef and sheep meats. If the leaders of the wholesale trade sector accept this logic, they could help drive the sustainability agenda through the full supply chain and strengthen its relevance and standing with consumers and suppliers. Environmentally certified supply chains could become a source of competitive advantage.

Sector **Wholesale trade** **(Wt)**

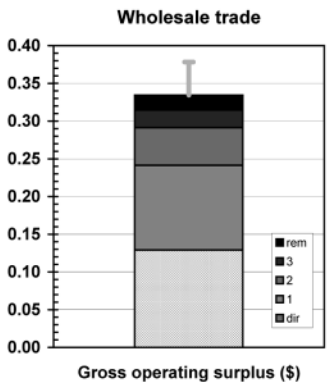
Wholesale trade (excl repairing and servicing)

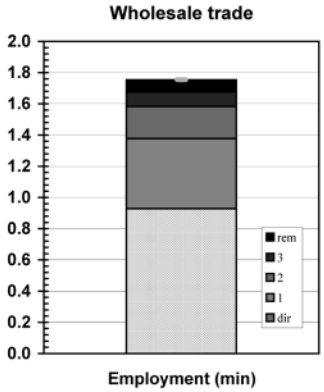
Spider diagram

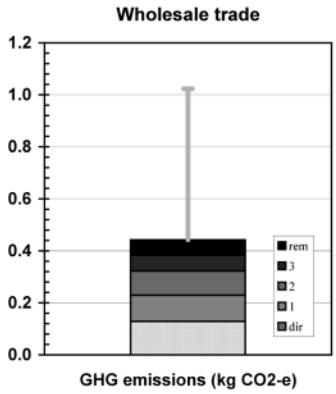


Bar graphs

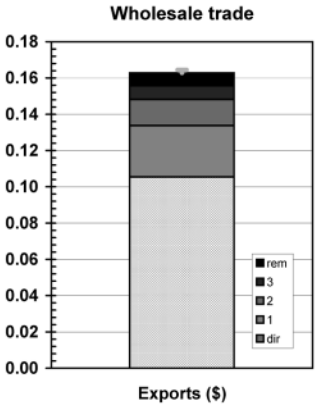
Account #1

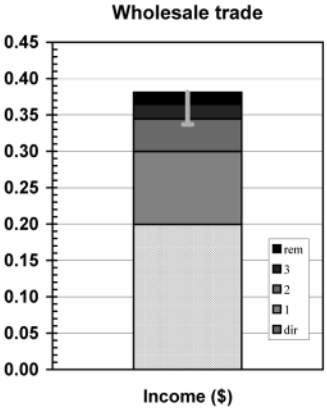


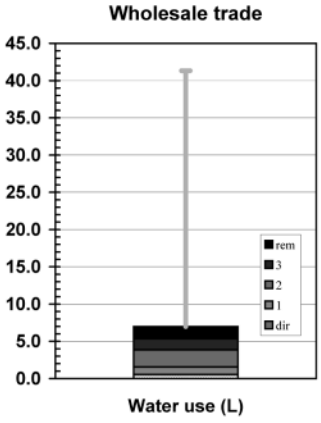




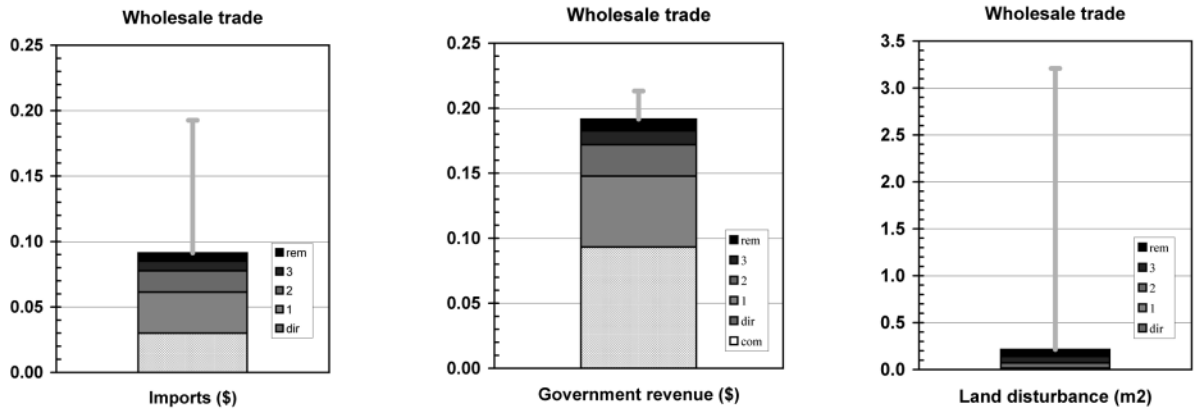
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 11,222.9	(4.25% of total)	($m 11,222.9 domestically produced)
Government final consumption	$m 14.9	(0.02% of total)	($m 14.9 domestically produced)
Gross fixed capital expenditure	$m 10,249.0	(9.79% of total)	($m 10,249.0 domestically produced)
Net changes in stocks	$m 312.6	(17.69% of total)	($m 312.6 domestically produced)
Sectoral GNE	**$m 21,799.5**	**(4.75% of GNE)**	**($m 21,799.5 domestically produced)**
Exports	$m 6,123.1	(7.34% of total)	($m 6,123.1 domestically produced)
Final demand	**$m 27,922.5**	**(5.15% of GNT)**	**($m 27,922.5 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 11,573.7	(6.77% of total)	
Gross operating surplus	$m 7,488.9	(3.90% of total)	
Taxes less subsidies	$m 5,409.5	(6.33% of total)	
Sectoral GDP*	**$m 24,472.0**	**(5.46% of GDP)**	
Imports	$m 1,740.0	(1.78% of total)	
Primary inputs	**$m 26,212.0**	**(4.80% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 7,488.9	(3.90%)	$m 3,600.6	(1.88%)	$m 9,336.2	(4.87%)
Exports ($m)	$m 6,123.1	(7.34%)	$m 2,943.9	(3.53%)	$m 4,548.9	(5.46%)
Imports ($m)	$m 1,740.0	(1.78%)	$m 836.6	(0.86%)	$m 2,546.7	(2.61%)
Employment (e-y)	432,065 e-y	(6.06%)	207,732 e-y	(2.91%)	392,285 e-y	(5.50%)
Income ($m)*	$m 11,573.7	(6.77%)	$m 5,564.5	(3.26%)	$m 10,645.2	(6.23%)
Government revenue ($m)†	$m 5,409.5	(5.01%)	$m 2,600.8	(2.41%)	$m 5,350.6	(4.95%)
GHG emissions (kt CO_2-e)	7,472 kt	(1.44%)	3,593 kt	(0.69%)	12,354 kt	(2.38%)
Water use (ML)	30,169 ML	(0.14%)	14,505 ML	(0.07%)	194,494 ML	(0.93%)
Land disturbance (kha)	46 kha	(0.03%)	22 kha	(0.01%)	599 kha	(0.37%)
Primary energy (TJ)	111,603 TJ	(2.88%)	53,658 TJ	(1.38%)	140,591 TJ	(3.62%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.13	0.33	0.38
Exports ($)	0.11	0.16	0.16
Imports ($)	0.03	0.09	0.19
Employment (min)	0.93	1.75	1.75
Income ($)	0.20	0.38	0.34
Government revenue ($)	0.09	0.19	0.21
GHG emissions (kg CO_2-e)	0.13	0.44	1.02
Water use (L)	0.52	6.97	41.32
Land disturbance (m^2)	0.01	0.21	3.21
Primary energy (MJ)	1.92	5.04	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Wt	0.129	(0; 39.%)	Wt	0.928	(0; 53.%)	Wt	0.129	(0; 29.%)
St Wt	0.0246	(1; 7.4%)	Ms Wt	0.0838	(1; 4.8%)	El Wt	0.0387	(1; 8.7%)
Ms Wt	0.0187	(1; 5.6%)	St Wt	0.0401	(1; 2.3%)	At Wt	0.0157	(1; 3.5%)
Pd Wt	0.0148	(1; 4.4%)	Pd Wt	0.0356	(1; 2.%)	El St Wt	0.0102	(2; 2.3%)
Cm Wt	0.00868	(1; 2.6%)	Rd Wt	0.0305	(1; 1.7%)	Rd Wt	0.00825	(1; 1.9%)
Rd Wt	0.0052	(1; 1.6%)	Cm Wt	0.024	(1; 1.4%)	El Ms Wt	0.00782	(2; 1.8%)
Ts Wt	0.00413	(1; 1.2%)	Pr Wt	0.0227	(1; 1.3%)	El Pd Wt	0.00705	(2; 1.6%)
Rv Wt	0.00334	(1; 1.%)	Bs Wt	0.0223	(1; 1.3%)	Ga Wt	0.00502	(1; 1.1%)
Bk Wt	0.00297	(1; 0.89%)	Ts Wt	0.0186	(1; 1.1%)	Ng Wt	0.00399	(1; 0.9%)
Pr Wt	0.00272	(1; 0.81%)	Rt Wt	0.0182	(1; 1.%)	St Wt	0.0028	(1; 0.63%)
Bs Wt	0.00226	(1; 0.68%)	Ho Wt	0.0132	(1; 0.75%)	Bc Mp Ho Wt	0.00262	(3; 0.59%)
Ne Wt	0.00209	(1; 0.63%)	Bk Wt	0.0118	(1; 0.67%)	Sw Pp Pr Wt	0.00233	(3; 0.53%)
Sf Wt	0.00163	(1; 0.49%)	Rh Wt	0.00899	(1; 0.51%)	Pp Pr Wt	0.00228	(2; 0.51%)
El Wt	0.00156	(1; 0.47%)	Rv Wt	0.00893	(1; 0.51%)	Ap Wt	0.00226	(1; 0.51%)
Rh Wt	0.00147	(1; 0.44%)	Bs Ms Wt	0.00806	(2; 0.46%)	Gd Wt	0.00217	(1; 0.49%)
At Wt	0.00144	(1; 0.43%)	At Wt	0.00787	(1; 0.45%)	Ch Pl Wt	0.002	(2; 0.45%)
Cm Ms Wt	0.00142	(2; 0.42%)	In Wt	0.00729	(1; 0.42%)	Is Wt	0.00193	(1; 0.44%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Wt	0.105	(0; 65.%)	Wt	0.199	(0; 52.%)	Wt	0.519	(0; 7.5%)
St Wt	0.00609	(1; 3.7%)	Ms Wt	0.0195	(1; 5.1%)	Wa Ms Wt	0.481	(2; 6.9%)
At Wt	0.00499	(1; 3.1%)	Pd Wt	0.0133	(1; 3.5%)	Wa Pd Wt	0.405	(2; 5.8%)
Ms Wt	0.00289	(1; 1.8%)	St Wt	0.0102	(1; 2.7%)	Wa Wt	0.28	(1; 4.%)
Rd Wt	0.00181	(1; 1.1%)	Cm Wt	0.00544	(1; 1.4%)	El Wt	0.214	(1; 3.1%)
Cm Wt	0.00116	(1; 0.71%)	Rd Wt	0.00525	(1; 1.4%)	Dc Dp Wt	0.155	(2; 2.2%)
Rf Wt	0.000866	(1; 0.53%)	Pr Wt	0.00456	(1; 1.2%)	St Wt	0.106	(1; 1.5%)
Ho Wt	0.000736	(1; 0.45%)	Ts Wt	0.00436	(1; 1.1%)	Ws Ho Wt	0.0964	(2; 1.4%)
Pd Wt	0.000705	(1; 0.43%)	In Wt	0.00316	(1; 0.83%)	Bc Mp Ho Wt	0.0692	(3; 0.99%)
Ts Wt	0.000655	(1; 0.4%)	Bk Wt	0.00291	(1; 0.76%)	Wa Bs Wt	0.0683	(2; 0.98%)
In Wt	0.000612	(1; 0.38%)	At Wt	0.00278	(1; 0.73%)	Dc Dp Ho Wt	0.0574	(3; 0.82%)
Mv Wt	0.000442	(1; 0.27%)	Bs Wt	0.00274	(1; 0.72%)	Pp Pr Wt	0.057	(2; 0.82%)
Bs Wt	0.000419	(1; 0.26%)	Rt Wt	0.00216	(1; 0.57%)	El St Wt	0.0566	(2; 0.81%)
Bl El Wt	0.000378	(2; 0.23%)	Ho Wt	0.00193	(1; 0.51%)	Wa Ts Wt	0.0557	(2; 0.8%)
Oi Ap Wt	0.000378	(2; 0.23%)	Ne Wt	0.00162	(1; 0.43%)	Vf Ms Wt	0.0533	(2; 0.77%)
Ai At Wt	0.000339	(2; 0.21%)	Rv Wt	0.00144	(1; 0.38%)	Vf Pd Wt	0.0474	(2; 0.68%)
Om Wt	0.000338	(1; 0.21%)	Rf Wt	0.00119	(1; 0.31%)	Ms Wt	0.0468	(1; 0.67%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Wt	0.03	(0; 33.%)	Wt	0.0931	(0; 49.%)	Wo Tx Wt	0.0331	(2; 15.%)
Ms Wt	0.00425	(1; 4.7%)	Ms Wt	0.00926	(1; 4.8%)	Bc Mp Ho Wt	0.0191	(3; 8.9%)
Pr Wt	0.00407	(1; 4.5%)	Pd Wt	0.00875	(1; 4.6%)	Bc Mp Wt	0.0126	(2; 5.9%)
St Wt	0.00223	(1; 2.4%)	St Wt	0.00547	(1; 2.9%)	Bc Mp Rt Wt	0.00976	(3; 4.5%)
Pd Wt	0.00213	(1; 2.3%)	Rd Wt	0.00373	(1; 1.9%)	Wt	0.00788	(0; 3.7%)
At Wt	0.00149	(1; 1.6%)	In Wt	0.0034	(1; 1.8%)	Bc Mp Ho Ms	0.00453	(4; 2.1%)
Cm Wt	0.00148	(1; 1.6%)	Cm Wt	0.0026	(1; 1.4%)	Wo Tx Tp Wt	0.00255	(3; 1.2%)
Rd Wt	0.00132	(1; 1.4%)	At Wt	0.00223	(1; 1.2%)	Bc Mp Ho Pd '	0.00253	(4; 1.2%)
Ap Wt	0.00127	(1; 1.4%)	Pr Wt	0.0022	(1; 1.1%)	Wo Mp Ho Wt	0.00215	(3; 1.%)
Ts Wt	0.00118	(1; 1.3%)	Ts Wt	0.00215	(1; 1.1%)	Sw Pp Pr Wt	0.00184	(3; 0.86%)
Mv Wt	0.00111	(1; 1.2%)	Bk Wt	0.00161	(1; 0.84%)	Bc Mp Pd Wt	0.00172	(3; 0.8%)
Ne Wt	0.00101	(1; 1.1%)	Ho Wt	0.00102	(1; 0.53%)	Bc Mp Ms Wt	0.00172	(3; 0.8%)
Pl Wt	0.000919	(1; 1.%)	Rv Wt	0.000887	(1; 0.46%)	At Wt	0.0017	(1; 0.79%)
Rh Wt	0.000759	(1; 0.83%)	Ne Wt	0.000814	(1; 0.42%)	Wo Tx Cl Wt	0.0016	(3; 0.75%)
Pa Wt	0.000702	(1; 0.77%)	Bs Wt	0.000812	(1; 0.42%)	Ba Bm Ho Wt	0.00156	(3; 0.73%)
Et Wt	0.000565	(1; 0.62%)	In Pd Wt	0.000801	(2; 0.42%)	Wo Mp Wt	0.00142	(2; 0.66%)
Ap At Wt	0.000561	(2; 0.62%)	Rt Wt	0.000704	(1; 0.37%)	Wo Mp Rt Wt	0.0011	(3; 0.51%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.157 ±0.022	(±1.9%)
Downstream	0.939 ±0.009	(±0.9%)

Sector 5101: Retail Trade (Rt)

Retail trade (excluding repairing and servicing)

Short Summary

Against a metric of one dollar of final demand, the environmental indicator of greenhouse gas emissions is 35% below average while both water use and land disturbance are 50% below average. The social indicators show that employment generation is nearly twice the national average, income is 30% above average and government revenue is 15% below average. The financial indicators show that the operating surplus is 30% below average, the export propensity is 45% below average and import penetration is 55% below average. The sector reveals average linkages to its upstream suppliers while downstream linkages are extremely weak as the majority of the effect is dissipated by private consumption. While this analysis reveals a positive outcome in its TBL indicators, the size of the sector means that it is responsible for 4% of national water use and land disturbance, and 5% of energy use and greenhouse emissions. Retail enterprises could examine their supply chains to access goods certified with low environmental impacts to develop a green marketing edge.

Sector Description

The retail sector forms the conduit where much of the activity of the 100 or so physical production sectors is finally made available to the consumer. While it can be broken down into 20 or more sub-sectors, there are three main groupings: grocery retailing (supermarkets and grocery stores); personal and household goods (clothing, furniture, recreational equipment etc.); and motor vehicles (cars, fuel, tyres, motor cycles etc.). There are approximately 176 000 retail outlets of all sizes with a strong population effect eg New South Wales (33%), Victoria (24%) and Queensland (19%). In 2002, the yearly financial turnover was about $200 billion.

Place of Industry in the Economy

The retail sector ranks fifth out of 135 sectors in terms of value adding in the Australian economy and contributes 4.26% of GDP in this analysis. By way of comparison, it is flanked by the education sector with 4.6% of GDP and the legal accounting and marketing sector with 3.4% of GDP. It is a major employer with 777 000 employment years directly embodied in final demand, and another 270 000 in upstream suppliers giving a total of 1 047 000 employment years or 15% of the national total. In addition, it contributes 18 000 employment years to the final demand of downstream industries. Because of its size, importance and supply chain (including land based products such as groceries), it is responsible for 4% of national water use and land disturbance, and 5% of national energy use and greenhouse emissions. Imports are approximately equal to exports.

Strategic Overview

The integrated overview in the spider diagram shows the environmental indicators of water use, land disturbance, energy use and greenhouse emissions are below the economy wide average. The social indicators of employment generation and income are substantially higher than average while government revenue is well below average. In the financial indicators, the gross operating surplus is below average as is the export propensity, while the import penetration is well below average. In an overall sense the TBL report is very positive. The below average operating surplus may be a product of the particular point in the business cycle represented by this data analysis and large fluctuations can therefore be expected. The export indicator parallels a sparseness of export performance in the Australian services sector more generally. Expansion of domestic retailing into major overseas markets is fraught with financial risks due primarily to the global scale of business competitors.

TBL Account #1

The financial indicator of operating surplus is 30% below the economy wide average and this could reflect normal fluctuations in the business cycle. The social indicator of employment generation is nearly twice the average and three quarters of this is direct within sector effect emphasising the importance of the sector in social terms. The greenhouse gas emissions indicator is 35% below the economy wide average and only one fifth of this is a direct effect, with most of the influence found in the product supply chain, particularly animal products.

TBL Accounts #2 and #3

The second TBL account shows an export propensity that is 45% below average, an income indicator that is 30% above average and a water use indicator that is 50% below average. The third TBL account shows an import penetration that is 55% below average, government revenue that is 15% below average, and land disturbance that is 45% below average.

Structural Path Analysis and Linkages

While these indicators of greenhouse emissions and land disturbance are well below average, the absolute size of the effect, when multiplied by final consumption, means they warrant further attention. The greenhouse chain is dominated by the second order effect of ‘beef cattle to meat products to retail’ (27%) while the direct sector effect accounts for 17% and electricity production is 12%. Smaller contributors include ‘electricity to accounting and marketing to retail’ (1%) and ‘dairy cows to dairy products to retail’ (1%). The chain for land disturbance is dominated by ‘beef cattle to meat products to retail’ (75%) (area grazed and land clearance), ‘sheep to meat products to retail’ (8%), ‘dairy cows to dairy products to retail’ (1%) with a direct sector effect of less than 1%.

The retail sector shows only average linkages to its upstream suppliers such as accounting and marketing, property development and real estate, wholesale trade, communications, and printing and stationery. The downstream linkages are weak and are mostly dissipated by private consumption.

Future Trends in Sector

The base case scenario of the *Future Dilemmas* report anticipates a 72% increase in built space for retail activities with an increase of 25% in raw population numbers by the year 2050. Future trends in retail are highly uncertain. E-commerce may capture a significant share of retailing which would then require increased wholesale space and improved logistics for delivery. If retail trends continue to be driven by age and gender, the sector faces significant change as Australia ages over the next 50 years. To date, the consumption habits of older consumers have not been well studied. By 2050, the over 65 years olds will represent 28% of the population, while the 20-40 year olds will be 25%.

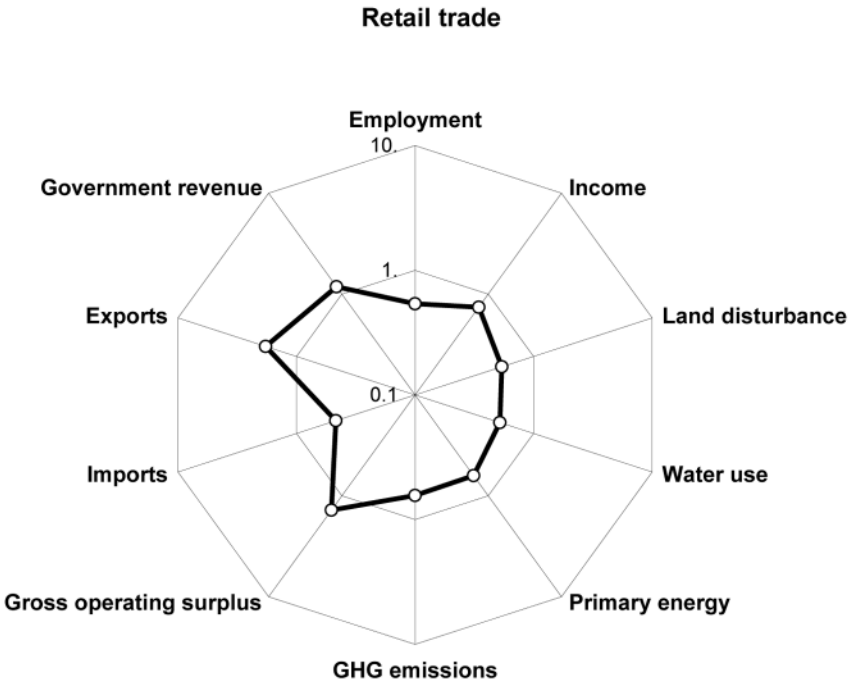
Innovation and Technical Opportunities

The retail literature identifies a number of interesting uncertainties. First there are many contradictory modes of behaviour which make it difficult to define and target groups and their retail preferences. Second is the well established move towards shopping as entertainment rather than fulfilling more practical objectives. The sceptic might suggest that nothing has changed in centuries, but now the opportunity is more widely spread. Third is the concept of retail space as the central focus of city structure. As sustainability emerges there may be planning regimes to more actively integrate low-energy transport modes and shopping activities. Fourth is the search for authenticity and originality, which may challenge the current dominance of megastores and world wide brands. Fifth is the possibility that relatively unprocessed foods will re-emerge at the pinnacle of the value chain challenging the dominance of global food companies with local product.

Sector **Retail trade** **(Rt)**

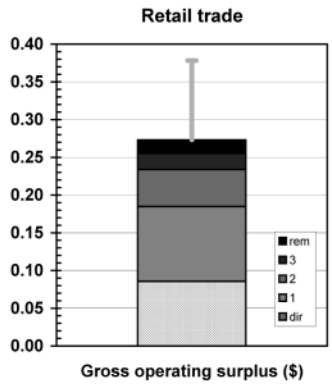
Retail trade (excl repairing and servicing)

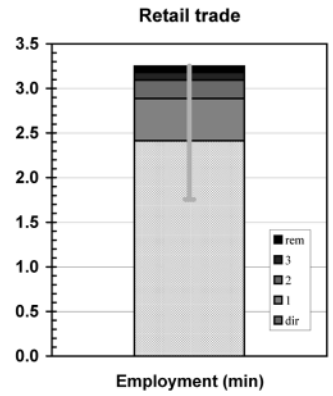
Spider diagram

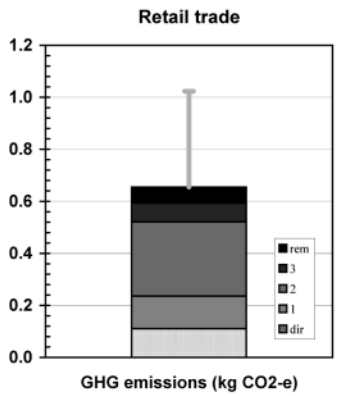


Bar graphs

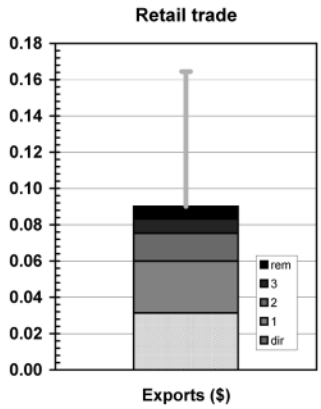
Account #1

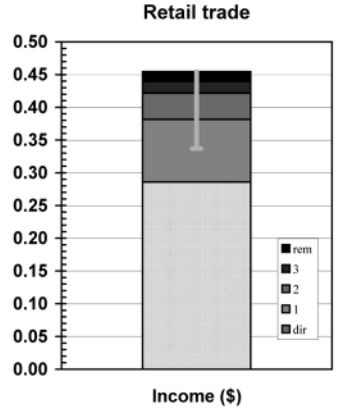


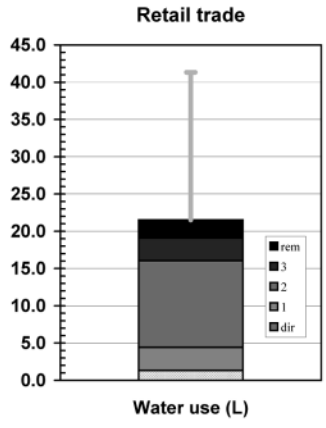




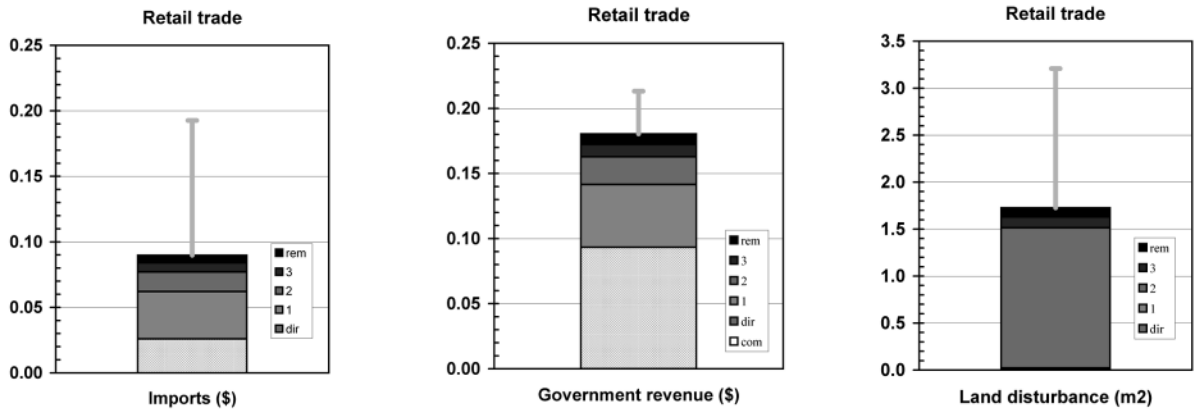
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 38,445.3	(14.54% of total)	($m 38,157.5 domestically produced)
Government final consumption	$m 0.0		
Gross fixed capital expenditure	$m 736.2	(0.70% of total)	($m 736.2 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 39,181.5**	**(8.53% of GNE)**	**($m 38,893.6 domestically produced)**
Exports	$m 1,287.1	(1.54% of total)	($m 1,287.1 domestically produced)
Final demand	**$m 40,468.7**	**(7.46% of GNT)**	**($m 40,180.8 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 11,741.3	(6.87% of total)	
Gross operating surplus	$m 3,522.1	(1.84% of total)	
Taxes less subsidies	$m 3,835.9	(4.49% of total)	
Sectoral GDP*	**$m 19,099.4**	**(4.26% of GDP)**	
Imports	$m 1,064.8	(1.09% of total)	
Primary inputs	**$m 20,164.1**	**(3.69% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 3,522.1	(1.84%)	$m 3,443.3	(1.80%)	$m 10,973.9	(5.72%)
Exports ($m)	$m 1,287.1	(1.54%)	$m 1,258.3	(1.51%)	$m 3,621.1	(4.34%)
Imports ($m)	$m 1,064.8	(1.09%)	$m 1,040.9	(1.07%)	$m 3,609.2	(3.70%)
Employment (e-y)	794,813 e-y	(11.15%)	777,018 e-y	(10.90%)	1,046,847 e-y	(14.69%)
Income ($m)*	$m 11,741.3	(6.87%)	$m 11,478.5	(6.72%)	$m 18,268.1	(10.69%)
Government revenue ($m)†	$m 3,835.9	(3.55%)	$m 3,750.0	(3.47%)	$m 7,246.4	(6.70%)
GHG emissions (kt CO_2-e)	4,527 kt	(0.87%)	4,425 kt	(0.85%)	26,322 kt	(5.08%)
Water use (ML)	53,886 ML	(0.26%)	52,680 ML	(0.25%)	864,391 ML	(4.13%)
Land disturbance (kha)	55 kha	(0.03%)	54 kha	(0.03%)	6,943 kha	(4.27%)
Primary energy (TJ)	67,266 TJ	(1.73%)	65,760 TJ	(1.69%)	194,089 TJ	(5.00%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.09	0.27	0.38
Exports ($)	0.03	0.09	0.16
Imports ($)	0.03	0.09	0.19
Employment (min)	2.41	3.25	1.75
Income ($)	0.29	0.45	0.34
Government revenue ($)	0.09	0.18	0.21
GHG emissions (kg CO_2-e)	0.11	0.66	1.02
Water use (L)	1.31	21.51	41.32
Land disturbance (m^2)	0.01	1.73	3.21
Primary energy (MJ)	1.64	4.83	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Rt	0.0857	(0; 31.%)	Rt	2.41	(0; 74.%)	Bc Mp Rt	0.178	(2; 27.%)
Ms Rt	0.0212	(1; 7.8%)	Ms Rt	0.095	(1; 2.9%)	Rt	0.11	(0; 17.%)
Cm Rt	0.0109	(1; 4.%)	Rh Rt	0.0461	(1; 1.4%)	El Rt	0.0813	(1; 12.%)
Rh Rt	0.00754	(1; 2.8%)	Pr Rt	0.0371	(1; 1.1%)	El Ms Rt	0.00887	(2; 1.4%)
Pd Rt	0.00635	(1; 2.3%)	Bs Rt	0.0327	(1; 1.%)	Dc Dp Rt	0.00709	(2; 1.1%)
Bk Rt	0.00509	(1; 1.9%)	Cm Rt	0.0301	(1; 0.92%)	Wo Mp Rt	0.00608	(2; 0.93%)
Ne Rt	0.00482	(1; 1.8%)	Bk Rt	0.0202	(1; 0.62%)	El Rh Rt	0.00491	(2; 0.75%)
Pr Rt	0.00444	(1; 1.6%)	Ne Rt	0.0163	(1; 0.5%)	Gd Rt	0.0049	(1; 0.75%)
Bs Rt	0.00331	(1; 1.2%)	Wt Rt	0.0157	(1; 0.48%)	At Rt	0.00387	(1; 0.59%)
El Rt	0.00329	(1; 1.2%)	Pd Rt	0.0152	(1; 0.47%)	Sw Pp Pr Rt	0.00381	(3; 0.58%)
Ts Rt	0.00315	(1; 1.2%)	Ts Rt	0.0142	(1; 0.44%)	Pp Pr Rt	0.00372	(2; 0.57%)
Bc Mp Rt	0.00297	(2; 1.1%)	Bc Mp Rt	0.0131	(2; 0.4%)	Ga Rt	0.00337	(1; 0.51%)
Rv Rt	0.00274	(1; 1.%)	Et Rt	0.0125	(1; 0.38%)	Fr Bc Mp Rt	0.00328	(3; 0.5%)
Et Rt	0.00263	(1; 0.96%)	Mp Rt	0.0108	(1; 0.33%)	Fd Rt	0.00311	(1; 0.47%)
St Rt	0.00254	(1; 0.93%)	Gv Rt	0.00931	(1; 0.29%)	El Pd Rt	0.00303	(2; 0.46%)
Wt Rt	0.00218	(1; 0.8%)	Bs Ms Rt	0.00914	(2; 0.28%)	Vf Rt	0.00259	(1; 0.4%)
Sf Bk Rt	0.00178	(2; 0.65%)	Ho Rt	0.00866	(1; 0.27%)	El Pr Rt	0.00233	(2; 0.36%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Rt	0.0313	(0; 35.%)	Rt	0.286	(0; 63.%)	Bc Mp Rt	4.69	(2; 22.%)
Mp Rt	0.00692	(1; 7.7%)	Ms Rt	0.0221	(1; 4.9%)	Dc Dp Rt	2.85	(2; 13.%)
Ms Rt	0.00328	(1; 3.6%)	Pr Rt	0.00744	(1; 1.6%)	Vf Rt	1.39	(1; 6.4%)
Wt Rt	0.00178	(1; 2.%)	Cm Rt	0.00683	(1; 1.5%)	Rt	1.31	(0; 6.1%)
Cm Rt	0.00145	(1; 1.6%)	Pd Rt	0.00572	(1; 1.3%)	Ri Fc Rt	1.26	(2; 5.8%)
Dp Rt	0.00131	(1; 1.4%)	Rh Rt	0.00504	(1; 1.1%)	Wa Rt	0.843	(1; 3.9%)
At Rt	0.00123	(1; 1.4%)	Bk Rt	0.00498	(1; 1.1%)	Wa Ms Rt	0.545	(2; 2.5%)
Fi Rt	0.000882	(1; 0.98%)	Bs Rt	0.00401	(1; 0.88%)	El Rt	0.449	(1; 2.1%)
Fd Rt	0.000854	(1; 0.95%)	Ne Rt	0.00375	(1; 0.82%)	Su Fd Rt	0.376	(2; 1.7%)
Bl El Rt	0.000795	(2; 0.88%)	Wt Rt	0.00336	(1; 0.74%)	Wo Mp Rt	0.197	(2; 0.92%)
Ne Rt	0.000704	(1; 0.78%)	Ts Rt	0.00332	(1; 0.73%)	Wa Pd Rt	0.174	(2; 0.81%)
St Rt	0.000629	(1; 0.7%)	Gv Rt	0.00234	(1; 0.51%)	Sc Cg Mp Rt	0.148	(3; 0.69%)
Bs Rt	0.000614	(1; 0.68%)	Et Rt	0.0022	(1; 0.48%)	Sc Cg Bc Mp I	0.147	(4; 0.68%)
Wo Mp Rt	0.000539	(2; 0.6%)	In Rt	0.00216	(1; 0.47%)	Sc Cg Vf Rt	0.144	(3; 0.67%)
Mv Rt	0.000536	(1; 0.59%)	Mp Rt	0.00186	(1; 0.41%)	Vf Bc Mp Rt	0.109	(3; 0.5%)
Om Rt	0.000529	(1; 0.59%)	Ho Rt	0.00126	(1; 0.28%)	Wa Bs Rt	0.1	(2; 0.47%)
Ts Rt	0.000499	(1; 0.55%)	Rv Rt	0.00118	(1; 0.26%)	Pp Pr Rt	0.0931	(2; 0.43%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Rt	0.0259	(0; 29.%)	Rt	0.0933	(0; 52.%)	Bc Mp Rt	1.29	(2; 75.%)
Pr Rt	0.00665	(1; 7.4%)	Ms Rt	0.0105	(1; 5.8%)	Wo Mp Rt	0.146	(2; 8.5%)
Ms Rt	0.00482	(1; 5.4%)	Pd Rt	0.00375	(1; 2.1%)	Dc Dp Rt	0.0148	(2; 0.86%)
Rh Rt	0.00389	(1; 4.3%)	Pr Rt	0.0036	(1; 2.%)	Rt	0.0134	(0; 0.78%)
Ne Rt	0.00232	(1; 2.6%)	Cm Rt	0.00326	(1; 1.8%)	Bc Mp Ho Rt	0.0125	(3; 0.72%)
Cm Rt	0.00186	(1; 2.1%)	Bk Rt	0.00275	(1; 1.5%)	Wo Tx Rt	0.0116	(2; 0.67%)
Et Rt	0.00185	(1; 2.1%)	In Rt	0.00232	(1; 1.3%)	Bc Mp Pe Mp	0.011	(4; 0.64%)
Mv Rt	0.00134	(1; 1.5%)	Rh Rt	0.00231	(1; 1.3%)	Wh Fc Rt	0.0109	(2; 0.63%)
Ap Rt	0.00104	(1; 1.2%)	Ne Rt	0.00188	(1; 1.%)	Bc Mp Bp Rt	0.00713	(3; 0.41%)
Pd Rt	0.000914	(1; 1.%)	Ts Rt	0.00163	(1; 0.91%)	Bc Mp Fd Rt	0.00675	(3; 0.39%)
Ts Rt	0.000902	(1; 1.%)	Wt Rt	0.00157	(1; 0.87%)	Bc Mp Ho Ms	0.00514	(4; 0.3%)
Pa Rt	0.00079	(1; 0.88%)	Bs Rt	0.00119	(1; 0.66%)	Bc Mp Of Rt	0.00397	(3; 0.23%)
Fi Rt	0.000708	(1; 0.79%)	Et Rt	0.000919	(1; 0.51%)	Sw Pp Pr Rt	0.003	(3; 0.17%)
Bs Rt	0.000659	(1; 0.73%)	Mp Rt	0.000882	(1; 0.49%)	Wh Fd Rt	0.00295	(2; 0.17%)
Pp Pr Rt	0.000572	(2; 0.64%)	Gv Rt	0.000815	(1; 0.45%)	Bc Mp Ms Rt	0.00195	(3; 0.11%)
Wt Rt	0.000506	(1; 0.56%)	Rv Rt	0.000729	(1; 0.4%)	Wh Bc Mp Rt	0.00173	(3; 0.1%)
Bk Rt	0.000492	(1; 0.55%)	Ho Rt	0.000665	(1; 0.37%)	Wo Mp Ho Rt	0.00141	(3; 0.082%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.067 ±0.017	(±1.6%)
Downstream	0.038 ±0.001	(±2.8%)

Sector 5401: Mechanical Repairs (Rv)

Repairs of motor vehicles, outboard motors, lawn mowers, tractors, agricultural and construction machinery

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of greenhouse emissions, water use and land disturbance are respectively 85%, 85% and 95% below the average. The social indicator of employment generation is 15% below average, and income and government revenue are 25% and 30% below average respectively. The financial indicator of operating surplus is 30% above average, export propensity is 75% below average and import penetration is 55% below average. Overall, the TBL account provides a positive outcome for the sector. The sector is expected to expand by at least 40% by 2020 based on anticipated increases in the size of the vehicle fleet, and a slightly higher average vehicle age. Increasing sophistication of design, tied to environmental and consumer standards, may require significant skills upgrading, changing the balance between the social and financial TBL indicators. Alternatively, a modular throw-away approach to repairs could worsen environmental outcomes over the full equipment life cycle.

Sector Description

The sector is a typical small business sector distributed throughout suburban and regional Australia. Businesses undertake mechanical repairs to private motor vehicles and a wide range of motors and machinery. Vehicle parts are sourced from the Australian vehicle components sector, as well as from imports. Mechanical repairs can be a source of local pollution and land contamination due to activities such as respraying (solvents) and coating of body parts with metals such as chromium.

Place of Industry in the Economy

The mechanical repairs sector ranks 19th out of 135 sectors in terms of value adding, and contributes 1.74% of GDP in this analysis. In comparison, the residential building industry generates 2.4% of GDP (about 45% larger), but is the focus of significant policy intervention and itinerant subsidies. Part of the difference in policy focus is due to the linkage mechanisms within the economy. Increased consumer demand for the mechanical repairs sector gives only a weak stimulus to upstream supplying sectors such as wholesale trade and the manufacture of motor vehicle parts. Much of the economic activity is captured within the sector by labour intensive repair activity and emerges in the better than average operating surplus. By comparison, the residential building sector provides strong stimulus to upstream suppliers such as property development, wholesale trade, concrete, bricks and metal products. The mechanical repairs sector has a direct employment requirement for 62 000 employment years and an additional 20 000 years in the sector's suppliers giving a total of 82 000 employment years. In addition the sector contributes 37 000 employment years to downstream sectors such as non-residential construction and road freight transport.

Strategic Overview

The strategic overview shown in the spider diagram shows a reasonably balanced TBL outcome except for the outlier of export propensity and below average government revenue. The export indicator is less meaningful for this sector since repairs (versus manufacturing) are essentially a within-country activity. The government revenue indicator should improve in subsequent analyses as the full implications of the GST are embodied in the indicators. Downstream issues in a full life cycle context include the cost, the physical ease of repairs, and the long term availability of parts, relative to purchases of new equipment. Many consumer items are designed to be thrown away.

TBL Account #1

The financial indicator of operating surplus is 30% above average with most a direct effect (85%) and minor contributions from wholesale trade (3%) and motor vehicle and parts manufacturing (2%). The social indicator of employment generation is 15% below average with two thirds a direct effect and smaller contributions from wholesale trade and motor manufacture. The environmental indicator of greenhouse emissions is 85% below the economy wide average with electricity generation contributing one quarter and further minor contributions from wholesale trade (delivery of parts) and iron and steel.

TBL Accounts #2 and #3

In the second TBL account, export propensity is 75% below average, while the social indicator of income is 25% below average and water use is 85% below average. For the third TBL account, import penetration is 55% below average, government revenue is 30% below average and land disturbance is 95% below average.

Structural Path Analysis and Linkages

A structural path analysis of the income indicator shows that 70% of the income effect is within the mechanical repairs sector with 8% located in wholesale trade and 6% in basic iron and steel. Given the above average operating surplus and the below average income indicators there may be opportunity to increase income as requirements for higher skill levels develop.

The mechanical repairs sector shows relatively weak downstream linkages to the sectors of road freight (delivery of parts), wholesale trade (motor parts) and non-residential construction (industrial premises). Increased consumer demand gives a weak upstream stimulus to suppliers such as wholesale trade and motor vehicles and parts.

Future Trends in Sector

The base case scenario (25 million people by 2050) in the CSIRO *Future Dilemmas* study indicates this sector may expand with a 40% increase in personal vehicles, and a slight increase in average age of the vehicle fleet. The truck fleet sees a gradual increase in larger trucks and an 80% increase in delivery vehicles in cities in response to just-in-time delivery requirements. It is possible that vehicle fleet size will be constrained from 2020 onwards by improved logistics, efficient fleet management and city air pollution standards. Improved vehicle design may also reduce repair requirements. However the introduction of new vehicle types with less mature technologies, such as hybrid cars and hypercars, may offset this decline by requiring more frequent repairs. Whatever the technological future, the currently established size and age structure of the car and truck fleet should ensure expansion of the sector to at least 2020.

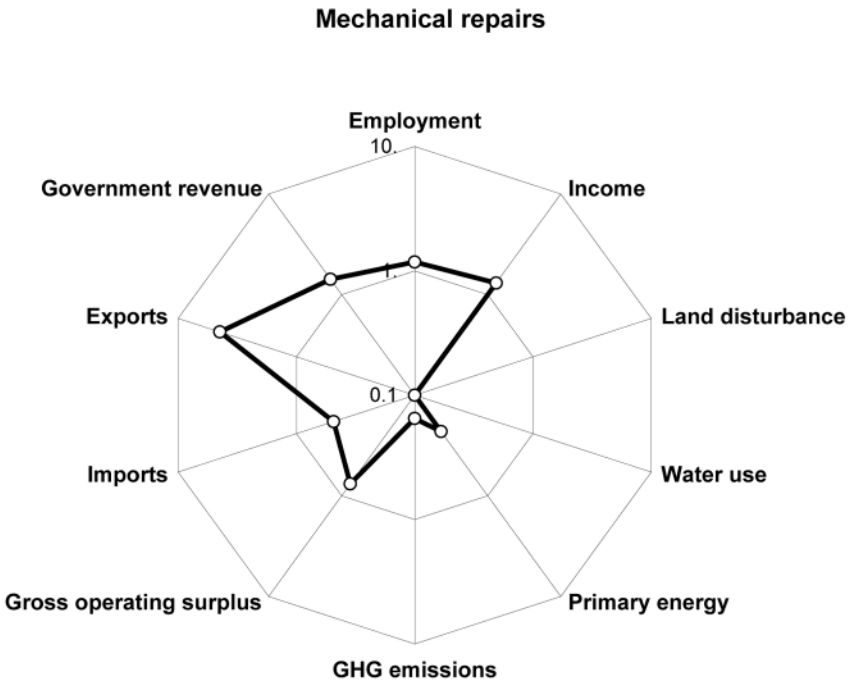
Innovation and Technical Opportunities

As motor vehicle industries respond to issues of new drive trains such as fuel cells, clean air in city airsheds and greenhouse gas mitigation requirements, the technological sophistication of the mechanical repairs sector will rise. If technology and skills are imported rather than developed domestically, then the TBL indicators relating to imports (sophisticated machinery), energy use (throw away components) and employment (machines replace people) may deteriorate. Cradle-to-grave responsibility chains could expand business opportunities in this sector. Technology development and training could anticipate, rather than react to, these possible developments. A relatively rapid transition to the hypercar design may advantage smaller scale local manufacturing and the repairs and maintenance skills that underpin it. The design breakthrough rests on lightweight composite materials which can be easily fabricated and repaired, avoiding large capital investment.

Sector **Mechanical repairs** **(Rv)**

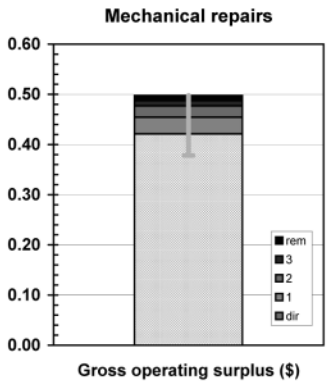
Repairs of motor vehicles, outboard motor, lawn mowers, tractors, agricultural and construction machinery

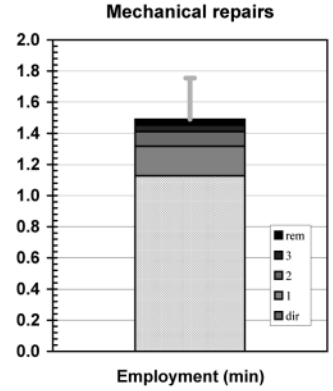
Spider diagram

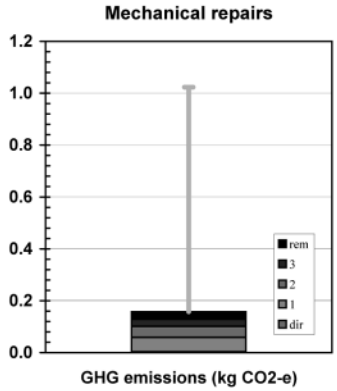


Bar graphs

Account #1







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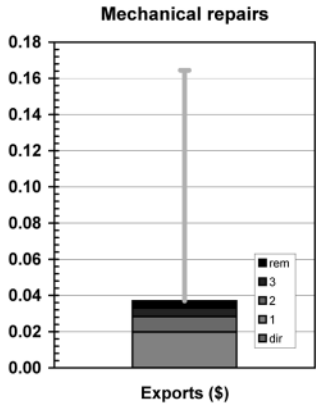
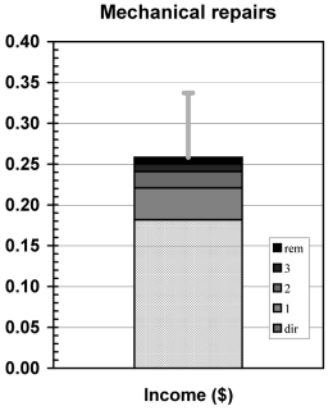
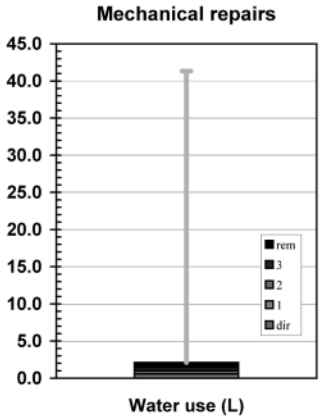
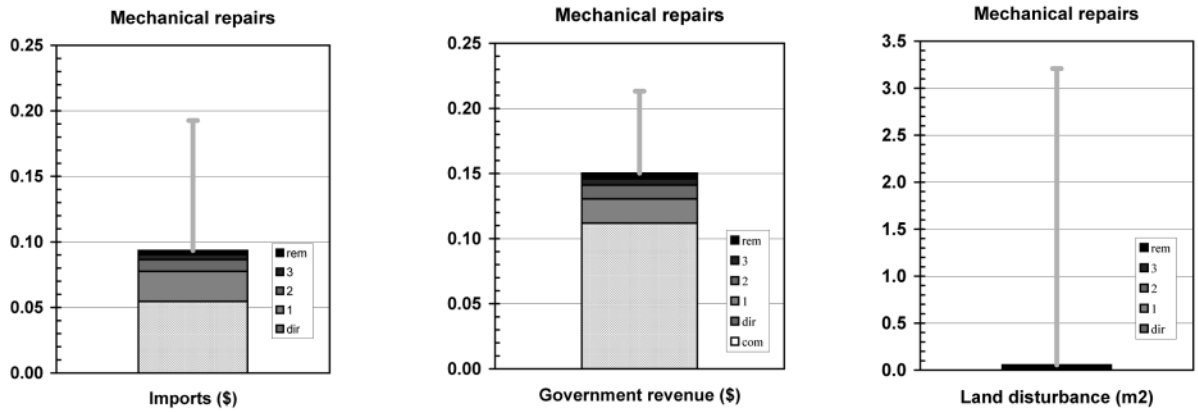






Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 6,824.7	(2.58% of total)	($m 6,824.7 domestically produced)
Government final consumption	$m 0.0		
Gross fixed capital expenditure	$m 0.0		
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 6,824.7**	**(1.49% of GNE)**	**($m 6,824.7 domestically produced)**
Exports	$m 0.0		
Final demand	**$m 6,824.7**	**(1.26% of GNT)**	**($m 6,824.7 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 1,985.9	(1.16% of total)	
Gross operating surplus	$m 4,605.9	(2.40% of total)	
Taxes less subsidies	$m 1,223.5	(1.43% of total)	
Sectoral GDP*	**$m 7,815.2**	**(1.74% of GDP)**	
Imports	$m 596.5	(0.61% of total)	
Primary inputs	**$m 8,411.7**	**(1.54% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 4,605.9	(2.40%)	$m 2,875.4	(1.50%)	$m 3,395.3	(1.77%)
Exports ($m)	$m 0.0				$m 252.6	(0.30%)
Imports ($m)	$m 596.5	(0.61%)	$m 372.4	(0.38%)	$m 637.9	(0.65%)
Employment (e-y)	98,715 e-y	(1.39%)	61,627 e-y	(0.86%)	81,511 e-y	(1.14%)
Income ($m)*	$m 1,985.9	(1.16%)	$m 1,239.8	(0.73%)	$m 1,762.0	(1.03%)
Government revenue ($m)†	$m 1,223.5	(1.13%)	$m 763.8	(0.71%)	$m 1,025.7	(0.95%)
GHG emissions (kt CO_2-e)	34 kt	(0.01%)	21 kt	(0.00%)	1,075 kt	(0.21%)
Water use (ML)	6 ML	(0.00%)	4 ML	(0.00%)	14,404 ML	(0.07%)
Land disturbance (kha)	11 kha	(0.01%)	7 kha	(0.00%)	38 kha	(0.02%)
Primary energy (TJ)	531 TJ	(0.01%)	332 TJ	(0.01%)	11,969 TJ	(0.31%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.42	0.50	0.38
Exports ($)	0.00	0.04	0.16
Imports ($)	0.05	0.09	0.19
Employment (min)	1.13	1.49	1.75
Income ($)	0.18	0.26	0.34
Government revenue ($)	0.11	0.15	0.21
GHG emissions (kg CO_2-e)	0.00	0.16	1.02
Water use (L)	0.00	2.11	41.32
Land disturbance (m^2)	0.01	0.06	3.21
Primary energy (MJ)	0.05	1.75	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Rv	0.421	(0; 85.%)	Rv	1.13	(0; 76.%)	El Rv	0.0374	(1; 24.%)
Wt Rv	0.0131	(1; 2.6%)	Wt Rv	0.0946	(1; 6.3%)	Wt Rv	0.0131	(1; 8.3%)
Mv Rv	0.00992	(1; 2.%)	Mv Rv	0.0538	(1; 3.6%)	Is Mv Rv	0.00977	(2; 6.2%)
St Wt Rv	0.00251	(2; 0.5%)	Ms Wt Rv	0.00854	(2; 0.57%)	El Mv Rv	0.00481	(2; 3.1%)
Ms Wt Rv	0.0019	(2; 0.38%)	Wt Mv Rv	0.00685	(2; 0.46%)	El Wt Rv	0.00394	(2; 2.5%)
El Rv	0.00151	(1; 0.3%)	Ms Rv	0.00645	(1; 0.43%)	Rv	0.00315	(0; 2.%)
Pd Wt Rv	0.00151	(2; 0.3%)	Ma Rv	0.00538	(1; 0.36%)	Mv Rv	0.00175	(1; 1.1%)
Ms Rv	0.00144	(1; 0.29%)	Bk Rv	0.00461	(1; 0.31%)	At Wt Rv	0.0016	(2; 1.%)
Bk Rv	0.00116	(1; 0.23%)	St Wt Rv	0.00409	(2; 0.27%)	Is Ma Rv	0.00148	(2; 0.94%)
Is Mv Rv	0.00113	(2; 0.23%)	Pd Wt Rv	0.00362	(2; 0.24%)	El Is Mv Rv	0.00128	(3; 0.81%)
Wt Mv Rv	0.000952	(2; 0.19%)	Rd Wt Rv	0.00311	(2; 0.21%)	El St Wt Rv	0.00104	(3; 0.66%)
Cm Rv	0.000947	(1; 0.19%)	Bs Rv	0.00302	(1; 0.2%)	Wt Mv Rv	0.00095	(2; 0.6%)
Cm Wt Rv	0.000884	(2; 0.18%)	Gv Rv	0.00297	(1; 0.2%)	Bl El Rv	0.000943	(2; 0.6%)
Rd Wt Rv	0.000529	(2; 0.11%)	Is Mv Rv	0.0027	(2; 0.18%)	Rd Wt Rv	0.00084	(2; 0.53%)
St Rv	0.000449	(1; 0.09%)	Cm Rv	0.00262	(1; 0.18%)	El Ms Wt Rv	0.000797	(3; 0.51%)
Ts Wt Rv	0.000421	(2; 0.085%)	Cm Wt Rv	0.00244	(2; 0.16%)	El Pd Wt Rv	0.000719	(3; 0.46%)
Ma Rv	0.000407	(1; 0.082%)	Pr Wt Rv	0.00232	(2; 0.16%)	Nf Mv Rv	0.000715	(2; 0.45%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Wt Rv	0.0107	(1; 29.%)	Rv	0.182	(0; 70.%)	El Rv	0.207	(1; 9.8%)
Mv Rv	0.00651	(1; 18.%)	Wt Rv	0.0203	(1; 7.9%)	Wa Rv	0.191	(1; 9.1%)
Is Mv Rv	0.000865	(2; 2.3%)	Mv Rv	0.00932	(1; 3.6%)	Dc Dp Rv	0.0567	(2; 2.7%)
Ma Rv	0.00079	(1; 2.1%)	Ms Wt Rv	0.00199	(2; 0.77%)	Wt Rv	0.0529	(1; 2.5%)
Wt Mv Rv	0.000778	(2; 2.1%)	Ms Rv	0.0015	(1; 0.58%)	Wa Ms Wt Rv	0.049	(3; 2.3%)
St Wt Rv	0.000621	(2; 1.7%)	Wt Mv Rv	0.00147	(2; 0.57%)	Wa Pd Wt Rv	0.0412	(3; 2.%)
Nf Mv Rv	0.000523	(2; 1.4%)	Pd Wt Rv	0.00136	(2; 0.53%)	Mv Rv	0.04	(1; 1.9%)
At Wt Rv	0.000508	(2; 1.4%)	Bk Rv	0.00114	(1; 0.44%)	Wa Ms Rv	0.037	(2; 1.8%)
Bl El Rv	0.000366	(2; 0.99%)	St Wt Rv	0.00104	(2; 0.4%)	Wa Mv Rv	0.0334	(2; 1.6%)
Ms Wt Rv	0.000295	(2; 0.8%)	Ma Rv	0.00101	(1; 0.39%)	Wa Wt Rv	0.0285	(2; 1.4%)
Io Is Mv Rv	0.000235	(3; 0.63%)	In Rv	0.000835	(1; 0.32%)	El Mv Rv	0.0266	(2; 1.3%)
Ms Rv	0.000223	(1; 0.6%)	Gv Rv	0.000746	(1; 0.29%)	Is Mv Rv	0.0259	(2; 1.2%)
Rd Wt Rv	0.000184	(2; 0.5%)	Is Mv Rv	0.000644	(2; 0.25%)	El Wt Rv	0.0218	(2; 1.%)
Ee Rv	0.000171	(1; 0.46%)	Cm Rv	0.000594	(1; 0.23%)	Dc Dp Wt Rv	0.0158	(3; 0.75%)
In Rv	0.000162	(1; 0.44%)	Cm Wt Rv	0.000555	(2; 0.21%)	Vf Rv	0.0129	(1; 0.61%)
Pc Rv	0.000135	(1; 0.36%)	Rd Wt Rv	0.000535	(2; 0.21%)	Wa El Rv	0.012	(2; 0.57%)
Is Ma Rv	0.000131	(2; 0.35%)	Pr Wt Rv	0.000464	(2; 0.18%)	St Wt Rv	0.0108	(2; 0.51%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Rv	0.0546	(0; 58.%)	Rv	0.112	(0; 74.%)	Rv	0.0103	(0; 18.%)
Mv Rv	0.0163	(1; 17.%)	Wt Rv	0.00949	(1; 6.3%)	Wo Tx Wt Rv	0.00337	(3; 6.%)
Wt Rv	0.00305	(1; 3.3%)	Mv Rv	0.004	(1; 2.7%)	Bc Mp Ho Wt	0.00194	(4; 3.5%)
Ma Rv	0.000933	(1; 1.%)	Ms Wt Rv	0.000943	(2; 0.63%)	Bc Mp Rv	0.00166	(2; 3.%)
Ms Wt Rv	0.000433	(2; 0.46%)	In Rv	0.000898	(1; 0.6%)	Bc Mp Wt Rv	0.00128	(3; 2.3%)
Pr Wt Rv	0.000415	(2; 0.44%)	Pd Wt Rv	0.000891	(2; 0.59%)	Bc Mp Rt Wt F	0.000994	(4; 1.8%)
Pt Rv	0.000413	(1; 0.44%)	Ms Rv	0.000712	(1; 0.47%)	Wt Rv	0.000803	(1; 1.4%)
Is Mv Rv	0.000408	(2; 0.44%)	Wt Mv Rv	0.000688	(2; 0.46%)	Mv Rv	0.000764	(1; 1.4%)
Ms Rv	0.000327	(1; 0.35%)	Bk Rv	0.000629	(1; 0.42%)	Wo Tx Mv Rv	0.000762	(3; 1.4%)
Pc Rv	0.000287	(1; 0.31%)	St Wt Rv	0.000557	(2; 0.37%)	El Rv	0.000604	(1; 1.1%)
St Wt Rv	0.000227	(2; 0.24%)	Ma Rv	0.000487	(1; 0.32%)	Wo Tx Tp Rv	0.000552	(3; 0.99%)
Wt Mv Rv	0.000221	(2; 0.24%)	Rd Wt Rv	0.00038	(2; 0.25%)	Bc Mp Ho Rv	0.000478	(3; 0.86%)
Pd Wt Rv	0.000217	(2; 0.23%)	In Wt Rv	0.000346	(2; 0.23%)	Bc Mp Ho Ms	0.000461	(5; 0.83%)
Pt Mv Rv	0.000211	(2; 0.23%)	Is Mv Rv	0.000295	(2; 0.2%)	Bc Mp Ho Mv	0.000441	(4; 0.79%)
Ee Rv	0.000167	(1; 0.18%)	Cm Rv	0.000284	(1; 0.19%)	Bc Mp Ho Ms	0.000348	(4; 0.62%)
Cm Rv	0.000162	(1; 0.17%)	El Rv	0.000284	(1; 0.19%)	Dc Dp Rv	0.000294	(2; 0.53%)
At Wt Rv	0.000152	(2; 0.16%)	Cm Wt Rv	0.000265	(2; 0.18%)	Bc Mp Ho Pd	0.000257	(5; 0.46%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.516 ±0.014	(±2.6%)
Downstream	0.721 ±0.011	(±1.6%)

Sector 5402: Other Repairs (Rh)

Repairs of household and business equipment and other wholesale and retail repairing

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of water use and land disturbance are more than 90% below the economy wide average, while greenhouse gas emissions are 65% below average. The social indicators of employment generation is 25% above average while income and government revenue are 20% and 35% below average respectively. The financial indicators of operating surplus and import penetration are equal to average. The export propensity indicator is not particularly relevant because the sector is mostly focused on local activities, but still requires imported replacement parts. The sector shows weak linkages to upstream suppliers but stronger than average linkages to downstream industries. For our domestic and commercial machine stock, there is a considerable tension between long lived durable machines that can be repaired, and shorter lived items that are frequently difficult to repair and easier to throw away and replace.

Sector Description

This sector repairs a wide range of machines and appliances used both in domestic homes and in commercial enterprises. For household situations this includes repairs to washing machines, refrigerators, televisions, heating furnaces and air conditioners as well as repairs to watches, shoes and clothes. In commercial situations this includes repairs and servicing to telecommunications equipment as well as electronic business equipment such as computers and printers, office equipment, air conditioners and specialised equipment. In financial flow terms, business repairs make up 30% of activity, households 10%, wholesale repairs 30% and retail repairs 30%.

Place of Industry in the Economy

The other repairs sector is moderately sized in terms of value adding in the economy, ranking 31st out of 135 sectors and contributing 0.71% of GDP in this analysis. By way of comparison it is similar in value adding to the crude oil production sector and the publication of newspapers, books and periodicals. It is a relatively small employer with direct requirements of around 12 000 employment years and another 2 000 years in the sector's upstream suppliers, giving a total of 14 000 employment years. However it contributes 67 000 employment years to the final demand of downstream industries. It has minor requirements for water use and land disturbance and uses less than one tenth of one percent of national primary energy and subsequent greenhouse gas emissions. Because it is by definition a local industry exports are negligible.

Strategic Overview

The integrated overview shown in the spider diagram reveals a mixed outcome for the sector. The environmental indicators of water use, land disturbance, primary energy use and greenhouse emissions are all well below average. For the social indicators, employment generation is higher than average while income and government revenue are below average. For the financial indicators, the operating surplus and import penetration are equal to average. This sector is particularly affected by equipment manufacturers who must balance uneasily in a marketplace which tends to affirm cheaper less durable goods, which are often difficult to repair and easier to throw away and replace. Many life cycle analyses favour repair and refurbishment in contrast to the buy and throw away option. Repair and refurbishment can also generate local employment and economic activity.

TBL Account #1

The financial indicator of operating surplus is equal to average and four fifths of this is a direct sector effect. The social indicator of employment generation is 25% higher than average while the environmental indicator of greenhouse gas emissions is 65% below average. One half of the greenhouse outcome is due to a first order effect of electricity production and sourcing low carbon forms of electricity production could further improve this indicator.

TBL Accounts #2 and #3

The second TBL account shows an export indicator that is less relevant because of the local nature of the sector, an income indicator that is 20% below average and a water use indicator that is 90% below average. The third TBL account shows import penetration equal to average, government revenue 35% below average while land disturbance is 95% below average.

Structural Path Analysis and Linkages

The export and government revenue indicators are significant outliers on the spider diagram. The structural path analysis reveals that the direct sector effect is about 70% of the total in both cases. There are a number of first order effects such as wholesale trade (6%), equipment manufacture (2%), and then accounting and marketing, insurance, and banking, with 1% each. Although unlikely, it may be possible to improve the export indicator by re-manufacturing used home and business equipment to exacting environmental standards, and then exporting it to niche markets.

The sector shows weaker than average linkages to its upstream suppliers such as wholesale trade, pumps and bearings and other manufacturing. The linkages to downstream industries are well above average suggesting that expansion of the sector must be led by sectors such as wholesale and retail trade, accommodation and cafes, communications, and banking to dissipate the investment effect.

Future Trends in Sector

Under the base case scenario of the *Future Dilemmas* study with 25 million people by the year 2050, the requirement for appliances, office machines and space conditioning increases by 30% to 40% under assumptions of turnover rates that are similar to today, and without paradigm changes that vastly increase or decrease the use of machines in our domestic and work lives. Increases are easy to imagine with continued mechanisation of daily tasks. However some uncertainty due to the possibility of combining many capabilities into one machine, or the growth in nano-technology enabled services, should not be ignored. Although it is hard to imagine, a transition to a simpler community focused lifestyle with more durable goods could increase activity within the sector.

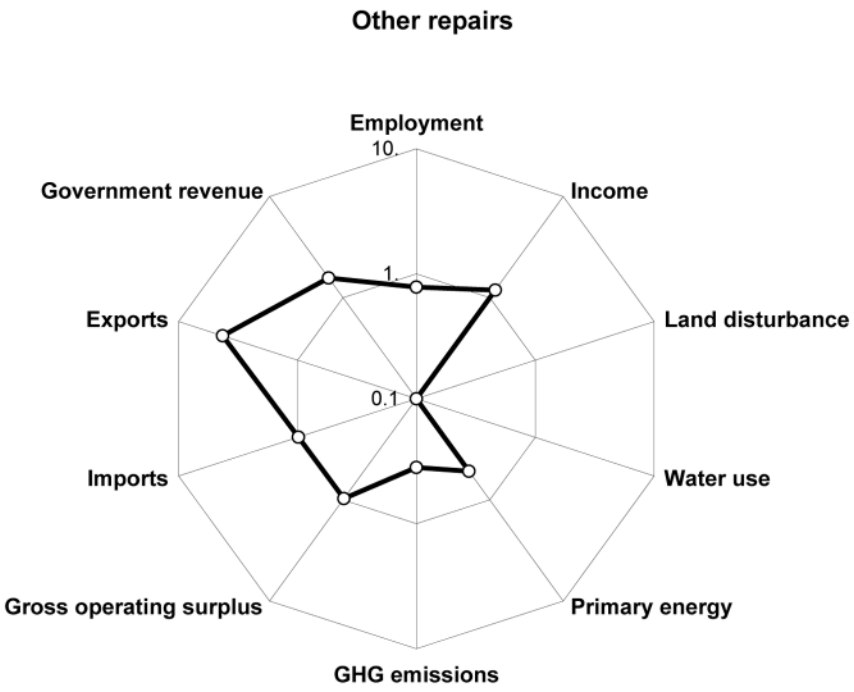
Innovation and Technical Opportunities

Uncertain production approaches promise to constrain the future of the equipment repairs sector. The first is a tendency towards planned obsolescence of equipment, much of it due to less durable design that caters for immediate consumer tastes. This tends to increase financial returns to the producer since repair often presents a relatively costly option compared to a new purchase. The second issue is that well manufactured and long lived equipment with slow turnover rates can give technological lock-in, should real innovation occur. The third is that equipment remanufacture (replacing outmoded components and presenting a new machine in an old casing) offers an attractive way forward but is difficult to implement effectively because of the complex dynamics of the consumption cycle and the diversity of components in many product and brand lines. The European move towards extended producer responsibility will possibly become apparent locally within the next decade. This could enhance local hubs of remanufacturing that could thereby increase regional employment while reducing the sector’s import penetration indicator.

Sector **Other repairs** **(Rh)**

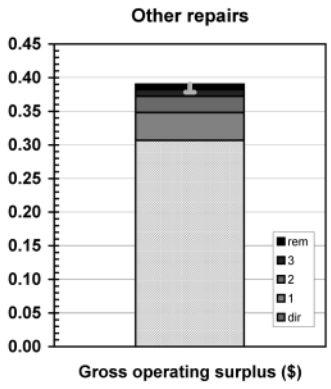
Repairs of household and business equipment and other wholesale and retail repairing

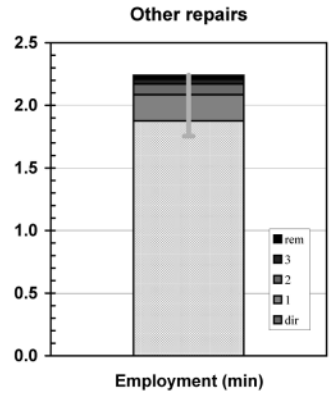
Spider diagram

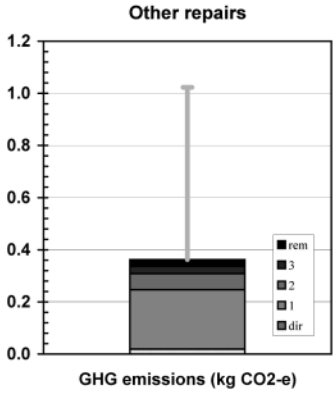


Bar graphs

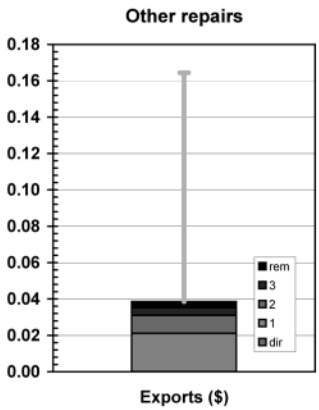
Account #1

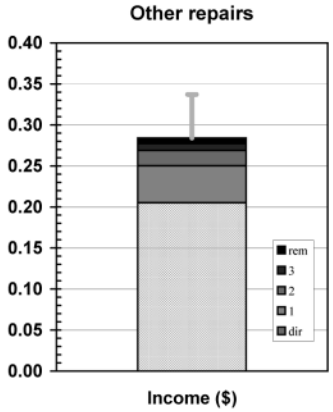


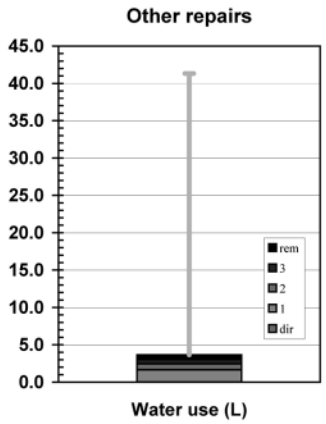




Account #2







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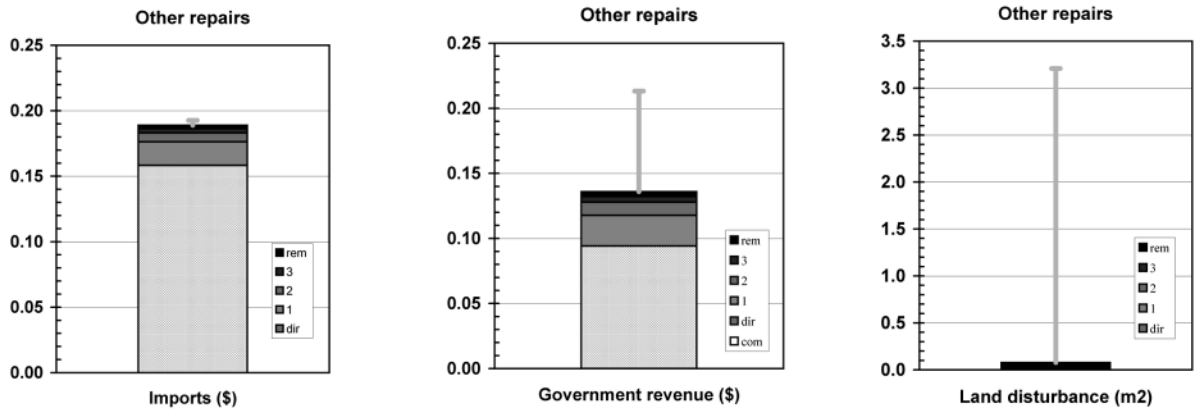


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 791.9	(0.30% of total)	($m 791.9 domestically produced)
Government final consumption	$m 0.0		
Gross fixed capital expenditure	$m 0.0		
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 791.9**	**(0.17% of GNE)**	**($m 791.9 domestically produced)**
Exports	$m 0.0		
Final demand	**$m 791.9**	**(0.15% of GNT)**	**($m 791.9 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 1,081.5	(0.63% of total)	
Gross operating surplus	$m 1,617.6	(0.84% of total)	
Taxes less subsidies	$m 496.6	(0.58% of total)	
Sectoral GDP*	**$m 3,195.8**	**(0.71% of GDP)**	
Imports	$m 834.3	(0.85% of total)	
Primary inputs	**$m 4,030.0**	**(0.74% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 1,617.6	(0.84%)	$m 242.9	(0.13%)	$m 309.2	(0.16%)
Exports ($m)	$m 0.0				$m 30.5	(0.04%)
Imports ($m)	$m 834.3	(0.85%)	$m 125.3	(0.13%)	$m 149.6	(0.15%)
Employment (e-y)	79,233 e-y	(1.11%)	11,900 e-y	(0.17%)	14,215 e-y	(0.20%)
Income ($m)*	$m 1,081.5	(0.63%)	$m 162.4	(0.10%)	$m 224.8	(0.13%)
Government revenue ($m)†	$m 496.6	(0.46%)	$m 74.6	(0.07%)	$m 107.6	(0.10%)
GHG emissions (kt CO_2-e)	98 kt	(0.02%)	15 kt	(0.00%)	287 kt	(0.06%)
Water use (ML)	5 ML	(0.00%)	1 ML	(0.00%)	2,890 ML	(0.01%)
Land disturbance (kha)	6 kha	(0.00%)	1 kha	(0.00%)	6 kha	(0.00%)
Primary energy (TJ)	1,509 TJ	(0.04%)	227 TJ	(0.01%)	3,151 TJ	(0.08%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.31	0.39	0.38
Exports ($)	0.00	0.04	0.16
Imports ($)	0.16	0.19	0.19
Employment (min)	1.88	2.24	1.75
Income ($)	0.21	0.28	0.34
Government revenue ($)	0.09	0.14	0.21
GHG emissions (kg CO_2-e)	0.02	0.36	1.02
Water use (L)	0.00	3.65	41.32
Land disturbance (m^2)	0.01	0.08	3.21
Primary energy (MJ)	0.29	3.98	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Rh	0.307	(0; 79.%)	Rh	1.88	(0; 84.%)	El Rh	0.2	(1; 55.%)
Wt Rh	0.00995	(1; 2.5%)	Wt Rh	0.0716	(1; 3.2%)	Rh	0.0186	(0; 5.1%)
El Rh	0.00809	(1; 2.1%)	Eq Rh	0.0322	(1; 1.4%)	Wt Rh	0.00993	(1; 2.7%)
Eq Rh	0.00326	(1; 0.84%)	Ms Rh	0.0133	(1; 0.59%)	Fo Rh	0.00586	(1; 1.6%)
Bk Rh	0.00303	(1; 0.78%)	Bk Rh	0.012	(1; 0.54%)	Bl El Rh	0.00504	(2; 1.4%)
Ms Rh	0.00297	(1; 0.76%)	El Rh	0.00899	(1; 0.4%)	Is Eq Rh	0.00478	(2; 1.3%)
Cm Rh	0.00248	(1; 0.64%)	Cm Rh	0.00686	(1; 0.31%)	El Wt Rh	0.00299	(2; 0.82%)
St Wt Rh	0.0019	(2; 0.49%)	Ms Wt Rh	0.00647	(2; 0.29%)	Oi Fo Rh	0.00177	(2; 0.49%)
Ms Wt Rh	0.00144	(2; 0.37%)	Gv Rh	0.00542	(1; 0.24%)	El Eq Rh	0.00171	(2; 0.47%)
Bl El Rh	0.00129	(2; 0.33%)	In Rh	0.00516	(1; 0.23%)	Gd Rh	0.00162	(1; 0.45%)
Pd Wt Rh	0.00114	(2; 0.29%)	Bs Rh	0.00507	(1; 0.23%)	El En Rh	0.00158	(2; 0.44%)
Sf Bk Rh	0.00106	(2; 0.27%)	Fm Rh	0.00459	(1; 0.21%)	El Ms Rh	0.00124	(2; 0.34%)
St Rh	0.000966	(1; 0.25%)	Rd Rh	0.00457	(1; 0.2%)	Rd Rh	0.00124	(1; 0.34%)
Pt Rh	0.000965	(1; 0.25%)	Ee Rh	0.00401	(1; 0.18%)	At Wt Rh	0.00121	(2; 0.33%)
Sf In Rh	0.000917	(2; 0.23%)	Ho Rh	0.0034	(1; 0.15%)	Ga Rh	0.00106	(1; 0.29%)
Oi Fo Rh	0.000834	(2; 0.21%)	St Wt Rh	0.0031	(2; 0.14%)	At Rh	0.00102	(1; 0.28%)
In Rh	0.000791	(1; 0.2%)	En Rh	0.00279	(1; 0.12%)	Ch Pt Rh	0.000939	(2; 0.26%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Wt Rh	0.00813	(1; 21.%)	Rh	0.205	(0; 72.%)	El Rh	1.11	(1; 30.%)
Eq Rh	0.00575	(1; 15.%)	Wt Rh	0.0154	(1; 5.4%)	Wa Rh	0.317	(1; 8.7%)
Bl El Rh	0.00196	(2; 5.1%)	Eq Rh	0.00569	(1; 2.%)	Dc Dp Rh	0.109	(2; 3.%)
En Rh	0.00148	(1; 3.8%)	Ms Rh	0.0031	(1; 1.1%)	Wa Ms Rh	0.0764	(2; 2.1%)
Ee Rh	0.000646	(1; 1.7%)	Bk Rh	0.00297	(1; 1.%)	Wa El Rh	0.064	(2; 1.8%)
Oi Fo Rh	0.00057	(2; 1.5%)	El Rh	0.00243	(1; 0.86%)	Vf Rh	0.0442	(1; 1.2%)
St Wt Rh	0.00047	(2; 1.2%)	In Rh	0.00223	(1; 0.79%)	Wt Rh	0.0401	(1; 1.1%)
Ms Rh	0.00046	(1; 1.2%)	Cm Rh	0.00156	(1; 0.55%)	Wa Ms Wt Rh	0.0371	(3; 1.%)
In Rh	0.000433	(1; 1.1%)	Ms Wt Rh	0.0015	(2; 0.53%)	Wa Pd Wt Rh	0.0312	(3; 0.86%)
Is Eq Rh	0.000423	(2; 1.1%)	Gv Rh	0.00136	(1; 0.48%)	Bl El Rh	0.0262	(2; 0.72%)
At Wt Rh	0.000385	(2; 1.%)	Pd Wt Rh	0.00103	(2; 0.36%)	Ws Ho Rh	0.0248	(2; 0.68%)
Ma Rh	0.000361	(1; 0.93%)	St Wt Rh	0.00079	(2; 0.28%)	Ws Rh	0.0231	(1; 0.63%)
Cm Rh	0.000331	(1; 0.86%)	Rd Rh	0.000786	(1; 0.28%)	Wa Wt Rh	0.0216	(2; 0.59%)
At Rh	0.000326	(1; 0.85%)	Ee Rh	0.000769	(1; 0.27%)	Bc Mp Ho Rh	0.0178	(3; 0.49%)
Rd Rh	0.000271	(1; 0.7%)	Fm Rh	0.00072	(1; 0.25%)	Bc Mp Rh	0.0177	(2; 0.49%)
St Rh	0.000239	(1; 0.62%)	En Rh	0.000702	(1; 0.25%)	El Wt Rh	0.0165	(2; 0.45%)
Fo Rh	0.000238	(1; 0.62%)	Bs Rh	0.000622	(1; 0.22%)	Wa Bs Rh	0.0155	(2; 0.43%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Rh	0.158	(0; 84.%)	Rh	0.0942	(0; 69.%)	Rh	0.0109	(0; 14.%)
Eq Rh	0.0038	(1; 2.%)	Wt Rh	0.00719	(1; 5.3%)	Bc Mp Ho Rh	0.0049	(3; 6.3%)
Wt Rh	0.00231	(1; 1.2%)	Eq Rh	0.00282	(1; 2.1%)	Bc Mp Rh	0.00489	(2; 6.3%)
Fo Rh	0.00192	(1; 1.%)	In Rh	0.0024	(1; 1.8%)	El Rh	0.00323	(1; 4.1%)
En Rh	0.00172	(1; 0.91%)	Bk Rh	0.00164	(1; 1.2%)	Wo Tx Wt Rh	0.00255	(3; 3.3%)
Pt Rh	0.00105	(1; 0.56%)	El Rh	0.00152	(1; 1.1%)	Bc Mp Lp Fw I	0.00223	(4; 2.8%)
Ms Rh	0.000676	(1; 0.36%)	Ms Rh	0.00147	(1; 1.1%)	Bc Mp Ho Wt I	0.00147	(4; 1.9%)
Ee Rh	0.000631	(1; 0.33%)	Cm Rh	0.000744	(1; 0.55%)	Wo Tx Fw Rh	0.00131	(3; 1.7%)
El Rh	0.000561	(1; 0.3%)	Ms Wt Rh	0.000714	(2; 0.53%)	Wo Lp Fw Rh	0.00116	(3; 1.5%)
Ap Rh	0.000503	(1; 0.27%)	Pd Wt Rh	0.000675	(2; 0.5%)	Bc Mp Wt Rh	0.000972	(3; 1.2%)
Hh Rh	0.000475	(1; 0.25%)	Rd Rh	0.000558	(1; 0.41%)	Wo Tx Tp Rh	0.000923	(3; 1.2%)
Ma Rh	0.000426	(1; 0.23%)	Gv Rh	0.000474	(1; 0.35%)	Bc Mp Rt Wt F	0.000753	(4; 0.96%)
Cm Rh	0.000425	(1; 0.22%)	En Rh	0.000428	(1; 0.31%)	Bc Mp Ho Ms	0.00072	(4; 0.92%)
Ms Wt Rh	0.000328	(2; 0.17%)	St Wt Rh	0.000422	(2; 0.31%)	Wo Tx Cl Rh	0.000715	(3; 0.91%)
Pa Rh	0.000315	(1; 0.17%)	Ee Rh	0.000336	(1; 0.25%)	Wt Rh	0.000608	(1; 0.78%)
Pr Wt Rh	0.000314	(2; 0.17%)	Sf Bk Rh	0.000296	(2; 0.22%)	Dc Dp Rh	0.000565	(2; 0.72%)
Fm Rh	0.000311	(1; 0.16%)	Rd Wt Rh	0.000287	(2; 0.21%)	Wo Mp Ho Rh	0.000554	(3; 0.71%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.495 ±0.009	(±1.9%)
Downstream	1.518 ±0.027	(±1.8%)

Sector 5701: Accommodation, Cafes and Restaurants (Ho)

Hotels, accommodation services, cafes, restaurants, licensed and non-licensed clubs, meal preparation and presentation

Short Summary

Against the metric of one dollar of final demand, the environmental indicator of greenhouse emissions was 10% below average, water use was 60% above average and land disturbance was 5% below average. The social indicators of employment generation, income and government revenue are respectively 30% higher, 10% higher and 20% lower than the average. The financial indicator of operating surplus is 15% below average, export propensity is 5% above average and import penetration is 40% below the average. The sector reveals higher than average upstream linkages to its suppliers but the downstream linkages are relatively weak as most of the effect is dissipated by private consumption. In TBL terms, the sector's signature is a notable one with approximately average results for all of the indicators and without the marked outliers that characterise some agricultural and service sectors. However because of the sector's size and importance, this average performance means that the sector is responsible for 5% of the nation's water use and 3.5% of its greenhouse gas emissions in full production chain terms.

Sector Description

There are over 50 000 enterprises of various sizes that make up this sector and their location is driven by population size and tourism activity with New South Wales (38%), Victoria (24%) and Queensland (20%) being the most important numerically. In financial terms, meal and drinks preparation is the most important activity (70%), followed by accommodation (18%), and clubs (12%). In 2002, the financial turnover in the sector was about $33 billion.

Place of Industry in the Economy

The sector is a large one in terms of value adding in the economy ranking 13th out of 135 sectors and contributing 2.44% of GDP in this analysis. By way of comparison, it is similar in value adding to residential construction and banking. It is a large employer with a direct requirement of 220 000 employment years and an indirect requirement in the sector's suppliers of a further 136 000 years, giving a total of 356 000 employment years or 5% of the national total. It also contributes a further 70 000 employment years to the final demand of downstream industries and is a significant employer in regional areas. It is responsible for over 5% of national water use (1 140 GL) and 3.6% of national land disturbance through its supply chain. It uses 3% of primary energy, and contributes 3.5% of national greenhouse emissions. Exports are twice the size of imports.

Strategic Overview

The accommodation, cafes and restaurant sector is one of the few in this analysis that reveals near average outcomes for all of the indicators. The environmental indicators show land disturbance, energy use and greenhouse emissions at or near average, while water use is above average. The social indicator of employment generation is above average while income is near average and government revenue is below average. The financial indicators show that operating surplus is near average, export propensity is above average and import penetration is below average. There may be potential to improve the water indicator by management of the supply chain, since most of the effect arises from the food items which are transformed into drinks and meals.

TBL Account #1

The financial indicator of operating surplus is 15% below average and about one third of the effect is direct sector based, with the rest coming from a long chain of suppliers such as beer and malt (5%), electricity production (2%), real estate (2%), equipment repairs (2%) and wholesale trade (2%). The social indicator of employment generation is 30% above average and about two thirds of this is a direct effect. The environmental indicator of greenhouse emissions is 10% below average with most of the effect located in the supply chain and this is discussed below.

TBL Accounts #2 and #3

The second TBL account shows that export propensity is 5% above average, income is 10% above average, and water use is 40% above average (discussed below). The third TBL account shows that import penetration is 40% below average, government revenue is 20% above average and land disturbance is 5% above average. The water use and land disturbance of what is generally regarded as a service sector is located in first and second order effects of the supply chain for food and drink production.

Structural Path Analysis and Linkages

Structural path analysis of the water chain reveals that direct water use within the sector represents 3% of total. Food and drink production chains are responsible for the main contributions with wine and spirits (18%), 'beef cattle to meat products' (13%), 'dairy cows to dairy products' (11%), 'rice growing to cereal foods' (8%) and vegetable and fruit growing (7%). The greenhouse emissions chain is dominated by the 'beef cattle to meat products' second order effect with 30% of total, due to the embodiment in the meat chain of emissions from land clearing. Other greenhouse factors include electricity production (20%), direct energy use (5%), dairy cows to dairy products (2%), barley growing to beer and malt (1%) and gas production and distribution (1%). The analysis suggests the greatest potential improvements would be through purchasing policies.

The accommodation sector shows stronger than average linkages to its upstream suppliers such as beer and malt, wholesale trade, property development and legal and accounting services. The linkages to downstream industries are weak, as the effect is dissipated by personal consumption.

Future Trends in Sector

The base case scenario in the *Future Dilemmas* study anticipates that the stock of restaurant space (as a general indicator of activity in this sector) will grow by 60% out to the year 2050. This is driven partly by population growth and domestic tourism activities, but also by a large increase in international inbound tourism. The exact location of international tourism growth is reasonably uncertain as many international issues outside our grasp will determine Australia's position as a tourism destination. The domestic drivers of this sector's activity will be economic activity, personal affluence, the future shape of the family, and the ability of established tourism areas to reinvent themselves, as they evolve through their destination life cycles.

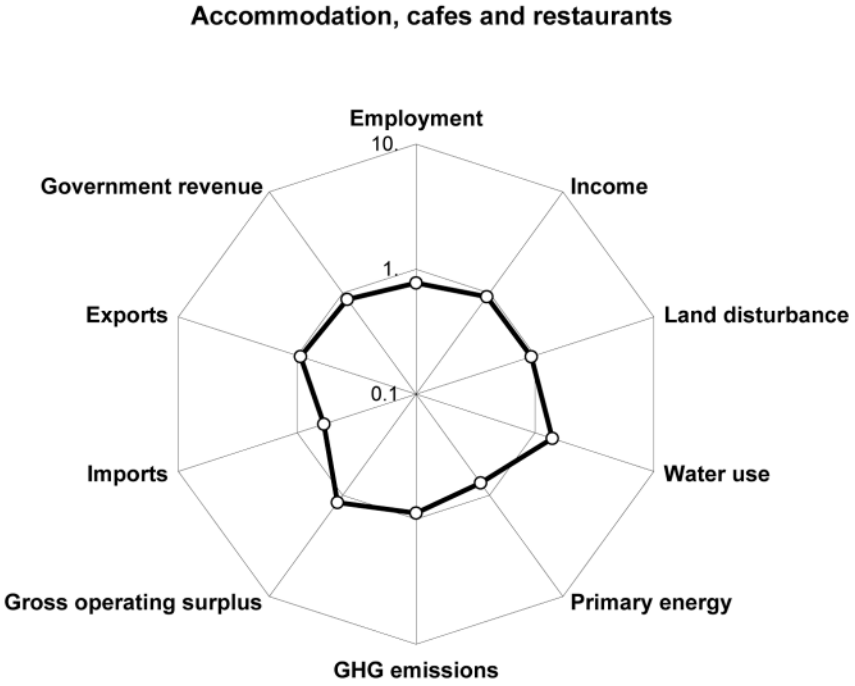
Innovation and Technical Opportunities

This sector could become a sustainability leader since it is the destination of so many production chains, and in venues where the final consumer is usually in a happy and positive frame of mind, while the absolute price of the service is often subservient to its appeal and positioning in quality terms. However leadership would be required in the sector to move beyond direct sector issues (energy saving in the kitchen, reusing towels in the hotel), to improving the environmental performance standards of its infrastructure and most importantly, choosing its raw inputs in light of the full supply chain that includes both the direct and indirect effects of water and energy.

Sector **Accommodation, cafes and restaurants** **(Ho)**

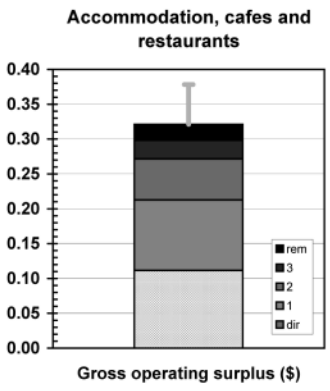
Hotels, accommodation services, cafes, restaurants, licensed and non-licensed clubs, meal preparation and presentation

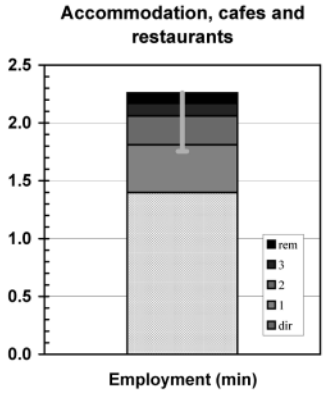
Spider diagram

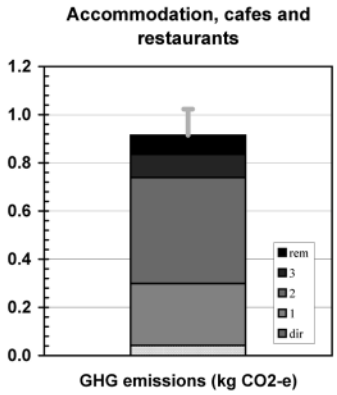


Bar graphs

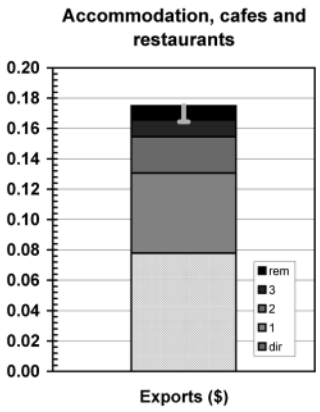
Account #1

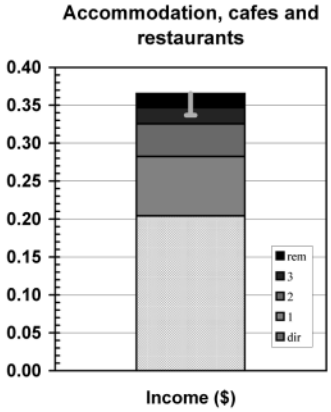


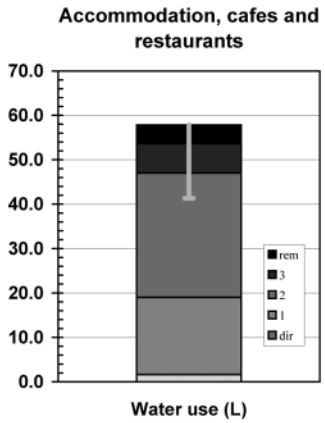




Account #2







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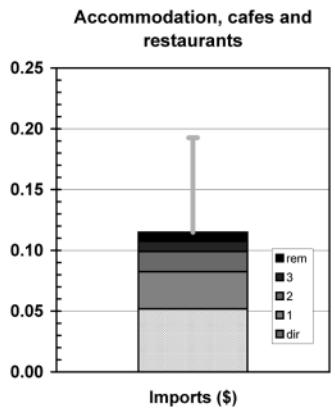
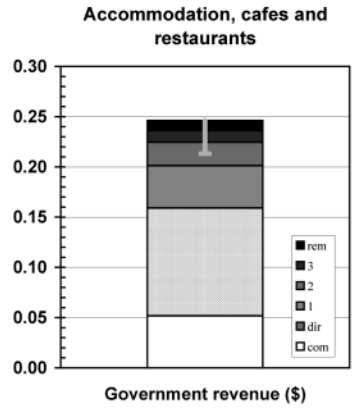
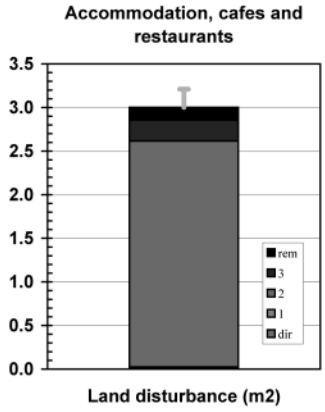






National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 18,394.3	(6.96% of total)	($m 17,630.5 domestically produced)
Government final consumption	$m 2.3	(0.00% of total)	($m 2.3 domestically produced)
Gross fixed capital expenditure	$m 0.0		
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 18,396.5**	**(4.01% of GNE)**	**($m 17,632.7 domestically produced)**
Exports	$m 2,008.7	(2.41% of total)	($m 2,008.7 domestically produced)
Final demand	**$m 20,405.3**	**(3.76% of GNT)**	**($m 19,641.5 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 5,267.7	(3.08% of total)	
Gross operating surplus	$m 2,877.1	(1.50% of total)	
Taxes less subsidies	$m 2,773.1	(3.25% of total)	
Sectoral GDP*	**$m 10,917.9**	**(2.44% of GDP)**	
Imports	$m 1,339.0	(1.37% of total)	
Primary inputs	**$m 12,256.9**	**(2.25% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 2,877.1	(1.50%)	$m 2,188.4	(1.14%)	$m 6,308.3	(3.29%)
Exports ($m)	$m 2,008.7	(2.41%)	$m 1,527.9	(1.83%)	$m 3,434.8	(4.12%)
Imports ($m)	$m 1,339.0	(1.37%)	$m 1,018.5	(1.04%)	$m 2,257.9	(2.31%)
Employment (e-y)	289,363 e-y	(4.06%)	220,103 e-y	(3.09%)	355,671 e-y	(4.99%)
Income ($m)*	$m 5,267.7	(3.08%)	$m 4,006.9	(2.35%)	$m 7,183.5	(4.20%)
Government revenue ($m)†	$m 3,788.4	(3.51%)	$m 3,124.6	(2.89%)	$m 4,834.9	(4.47%)
GHG emissions (kt CO_2-e)	1,080 kt	(0.21%)	822 kt	(0.16%)	17,961 kt	(3.46%)
Water use (ML)	41,130 ML	(0.20%)	31,286 ML	(0.15%)	1,136,320 ML	(5.42%)
Land disturbance (kha)	16 kha	(0.01%)	12 kha	(0.01%)	5,895 kha	(3.62%)
Primary energy (TJ)	17,000 TJ	(0.44%)	12,931 TJ	(0.33%)	113,371 TJ	(2.92%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.11	0.32	0.38
Exports ($)	0.08	0.17	0.16
Imports ($)	0.05	0.11	0.19
Employment (min)	1.40	2.26	1.75
Income ($)	0.20	0.37	0.34
Government revenue ($)	0.16	0.25	0.21
GHG emissions (kg CO_2-e)	0.04	0.91	1.02
Water use (L)	1.59	57.85	41.32
Land disturbance (m^2)	0.01	3.00	3.21
Primary energy (MJ)	0.66	5.77	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Ho	0.111	(0; 35.%)	Ho	1.4	(0; 62.%)	Bc Mp Ho	0.277	(2; 30.%)
Bm Ho	0.0147	(1; 4.6%)	Rh Ho	0.0418	(1; 1.8%)	El Ho	0.183	(1; 20.%)
El Ho	0.0074	(1; 2.3%)	Wt Ho	0.0407	(1; 1.8%)	Ho	0.0418	(0; 4.6%)
Pd Ho	0.00706	(1; 2.2%)	Bs Ho	0.033	(1; 1.5%)	Dc Dp Ho	0.0151	(2; 1.6%)
Rh Ho	0.00684	(1; 2.1%)	Ms Ho	0.024	(1; 1.1%)	Ba Bm Ho	0.0116	(2; 1.3%)
Wt Ho	0.00565	(1; 1.8%)	Bc Mp Ho	0.0204	(2; 0.9%)	Ga Ho	0.0111	(1; 1.2%)
Ms Ho	0.00536	(1; 1.7%)	Nb Ho	0.0204	(1; 0.9%)	Wo Mp Ho	0.00949	(2; 1.%)
Ws Ho	0.00474	(1; 1.5%)	Vf Ho	0.0185	(1; 0.82%)	Vf Ho	0.00723	(1; 0.79%)
Bc Mp Ho	0.00463	(2; 1.4%)	Pd Ho	0.017	(1; 0.75%)	El Bm Ho	0.00629	(2; 0.69%)
Cm Ho	0.00446	(1; 1.4%)	Mp Ho	0.0168	(1; 0.75%)	Fi Ho	0.00605	(1; 0.66%)
Vf Ho	0.00374	(1; 1.2%)	Fi Ho	0.015	(1; 0.66%)	Ng Ho	0.006	(1; 0.66%)
Fi Ho	0.00358	(1; 1.1%)	Ws Ho	0.0137	(1; 0.61%)	Wt Ho	0.00564	(1; 0.62%)
Bs Ho	0.00334	(1; 1.%)	Cm Ho	0.0123	(1; 0.55%)	Fd Ho	0.00524	(1; 0.57%)
St Ho	0.00252	(1; 0.78%)	Cu Ho	0.0111	(1; 0.49%)	Fr Bc Mp Ho	0.00512	(3; 0.56%)
Ba Bm Ho	0.00218	(2; 0.68%)	Ba Bm Ho	0.0108	(2; 0.48%)	Bl El Ho	0.00461	(2; 0.5%)
Vf Ws Ho	0.002	(2; 0.62%)	Bp Ho	0.0107	(1; 0.47%)	El Rh Ho	0.00446	(2; 0.49%)
Nb Ho	0.00199	(1; 0.62%)	Vf Ws Ho	0.00991	(2; 0.44%)	Bm Ho	0.0044	(1; 0.48%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Ho	0.0778	(0; 44.%)	Ho	0.204	(0; 56.%)	Ws Ho	10.2	(1; 18.%)
Mp Ho	0.0108	(1; 6.2%)	Wt Ho	0.00874	(1; 2.4%)	Bc Mp Ho	7.31	(2; 13.%)
Ws Ho	0.00881	(1; 5.%)	Pd Ho	0.00637	(1; 1.7%)	Dc Dp Ho	6.06	(2; 10.%)
Bm Ho	0.00653	(1; 3.7%)	Ms Ho	0.00559	(1; 1.5%)	Ri Fc Ho	4.71	(2; 8.1%)
Wt Ho	0.00462	(1; 2.6%)	Rh Ho	0.00457	(1; 1.2%)	Vf Ho	3.86	(1; 6.7%)
Fi Ho	0.00416	(1; 2.4%)	Bs Ho	0.00405	(1; 1.1%)	Ri Ws Ho	2.28	(2; 3.9%)
Dp Ho	0.00277	(1; 1.6%)	Bm Ho	0.00328	(1; 0.9%)	Vf Ws Ho	2.07	(2; 3.6%)
Ba Bm Ho	0.00223	(2; 1.3%)	Nb Ho	0.00304	(1; 0.83%)	Ho	1.59	(0; 2.8%)
Bl El Ho	0.00179	(2; 1.%)	Mp Ho	0.0029	(1; 0.79%)	Ba Bm Ho	1.4	(2; 2.4%)
Fc Ho	0.00167	(1; 0.96%)	Ws Ho	0.00288	(1; 0.79%)	Wa Ho	1.33	(1; 2.3%)
Fd Ho	0.00144	(1; 0.82%)	Cm Ho	0.0028	(1; 0.76%)	El Ho	1.01	(1; 1.7%)
Vf Ho	0.00113	(1; 0.65%)	El Ho	0.00223	(1; 0.61%)	Su Fd Ho	0.634	(2; 1.1%)
Wo Mp Ho	0.000841	(2; 0.48%)	Cu Ho	0.00205	(1; 0.56%)	Sc Cg Vf Ho	0.401	(3; 0.69%)
Ms Ho	0.00083	(1; 0.47%)	Bk Ho	0.00192	(1; 0.53%)	Wo Mp Ho	0.307	(2; 0.53%)
Wh Fc Ho	0.000704	(2; 0.4%)	In Ho	0.00192	(1; 0.52%)	Wh Fc Ho	0.279	(2; 0.48%)
St Ho	0.000625	(1; 0.36%)	Fi Ho	0.00174	(1; 0.47%)	Sc Cg Mp Ho	0.231	(3; 0.4%)
Bs Ho	0.000619	(1; 0.35%)	Ts Ho	0.00158	(1; 0.43%)	Sc Cg Bc Mp I	0.229	(4; 0.4%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Ho	0.0519	(0; 45.%)	Ho	0.107	(0; 55.%)	Bc Mp Ho	2.02	(2; 67.%)
Rh Ho	0.00353	(1; 3.1%)	Pd Ho	0.00417	(1; 2.1%)	Wo Mp Ho	0.228	(2; 7.6%)
Fi Ho	0.00334	(1; 2.9%)	Wt Ho	0.00408	(1; 2.1%)	Ba Bm Ho	0.165	(2; 5.5%)
Pr Ho	0.00139	(1; 1.2%)	Ms Ho	0.00266	(1; 1.4%)	Wo Tx Ho	0.0571	(2; 1.9%)
Ws Ho	0.00139	(1; 1.2%)	Bm Ho	0.00257	(1; 1.3%)	Wh Fc Ho	0.0407	(2; 1.4%)
Wt Ho	0.00131	(1; 1.1%)	Rh Ho	0.0021	(1; 1.1%)	Dc Dp Ho	0.0314	(2; 1.%)
Ms Ho	0.00122	(1; 1.1%)	In Ho	0.00206	(1; 1.1%)	Wo Tx Tp Ho	0.0267	(3; 0.89%)
Ap Ho	0.0012	(1; 1.%)	Fi Ho	0.00186	(1; 0.96%)	Bc Mp Bp Ho	0.0201	(3; 0.67%)
Pd Ho	0.00102	(1; 0.88%)	Ws Ho	0.00185	(1; 0.95%)	Bc Mp Pe Mp	0.0172	(4; 0.57%)
Bm Ho	0.00101	(1; 0.88%)	El Ho	0.00139	(1; 0.71%)	Wh Bm Ho	0.0146	(2; 0.49%)
Vf Ho	0.00092	(1; 0.8%)	Mp Ho	0.00138	(1; 0.71%)	Bc Mp Fd Ho	0.0114	(3; 0.38%)
Tp Ho	0.000858	(1; 0.75%)	Cm Ho	0.00134	(1; 0.69%)	Wh Ws Ho	0.0112	(2; 0.37%)
Cm Ho	0.000762	(1; 0.66%)	Nb Ho	0.00128	(1; 0.66%)	Bc Mp Of Ho	0.00771	(3; 0.26%)
Pl Ho	0.000736	(1; 0.64%)	Bs Ho	0.0012	(1; 0.62%)	Ws Ho	0.00639	(1; 0.21%)
Ne Ho	0.000734	(1; 0.64%)	Bk Ho	0.00106	(1; 0.55%)	Ho	0.00634	(0; 0.21%)
Nb Ho	0.000677	(1; 0.59%)	Rd Ho	0.000983	(1; 0.51%)	Wh Fd Ho	0.00497	(2; 0.17%)
Bs Ho	0.000664	(1; 0.58%)	Vf Ho	0.000935	(1; 0.48%)	Bc Mp Ho Bm	0.00428	(4; 0.14%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.190 ±0.015	(±1.3%)
Downstream	0.490 ±0.007	(±1.4%)

Sector 61200010: Bus and Tramway Transport (Bt)

Bus and tramway transport services

Short Summary

Against the metric of one dollar of final demand the environmental indicators of greenhouse emissions, water use and land disturbance are all below average. The social indicators of employment generation and income are both equal to average, while government revenue is negative (ie the sector receives net subsidies from government in these data). The financial indicator of operating surplus is 10% below average, export propensity is 50% above average and import penetration is 40% below average. The primary energy indicator is 50% above average and may require attention. There are average linkages to upstream suppliers but very weak downstream linkages as most of the effect dissipates to private consumption.

Sector Description

There are approximately 68 000 buses in Australia with an average age of 10 years and an average fuel consumption of 30 litres per 100 kilometres travelled. Buses account for 9% of non urban travel with 11.7 billion passenger kilometres (pkm) and a total of 2 billion bus kilometres travelled each year. For urban travel, buses account for around 20 billion passenger kilometres annually, 92% of non-car transport or 14 % of total urban transport. There are 565 trams or light rail cars on 270 km of city track which travel 24 million tram kilometres each year, most of which are in Victoria (93%) with minor amounts in New South Wales (3%), South Australia (3%) and Western Australia (1%). Light rail and urban bus services have energy operating efficiencies of 2.1 and 2.8 MJ (10^6J) respectively per passenger kilometre compared to private cars with 5 MJ per pkm. Intercity buses operate for 1.3 MJ per pkm compared to intercity planes at 5.7 MJ and rail at 1.9 MJ per pkm.

Place of Industry in the Economy

The bus and tram transport sector is a moderate sized one in terms of value adding in the economy ranking 76th out of 135 sectors and contributing 0.2% of GDP in this analysis. By way of comparison it is similar in value adding to the natural gas production and beer and malt sectors. It is a relatively small employer with a direct requirement for 15 000 employment years for the provision of bus and train transport to final demand, and a further 13 000 in the sector's upstream suppliers giving a total of 28 000 employment years. It has relatively small requirements for water use and land disturbance, both being less than one tenth of one percent of national totals. It requires one half of one percent of national energy use and emits one third of one percent of national greenhouse gas emissions. In financial flow terms, exports are four times the size of imports. In these data, the sector received direct government subsidies of $340 million.

Strategic Overview

The strategic overview portrayed in the spider diagram shows a relatively good TBL account apart from the subsidy driven outlier for government revenue and a higher than average energy indicator. The tension between the better energy efficiency of buses versus better service provided by private cars defies easy resolution in current urban policy settings. Beyond the indicators shown in this account, there are health issues with diesel engine emissions from buses in inner city areas with high population densities and particularly micro-particles which enter lung alveoli easily. Natural gas powered buses avoid this to some extent and hydrogen powered buses are now under test in Perth.

TBL Account #1

The financial indicator of operating surplus is 10% below the economy wide average with about half being a direct sector effect and smaller contributions from road transport (6%), machinery repairs (5%), communications (3%) and accounting and marketing (2%). The social indicator of employment generation is equal to average with a similar makeup to the operating surplus. The environmental indicator of greenhouse emissions is 15% below average with about two thirds from direct fuel combustion within the sector and a smaller amount due to road transport (4%), electricity production (4%), diesel refining (3%) and oil production for diesel refining (1%).

TBL Accounts #2 and #3

In the second TBL account, export propensity is 50% higher than average, income is equal to average and water use is 90% below average. In the third TBL account, import penetration is 40% below average, the government revenue indicator is negative due to direct subsidies and land disturbance is 90% below average. Rethinking transport options, both within and between cities, given the global greenhouse challenge, oil depletion, urban air pollution and human health issues, will require large structural changes rather than marginal price alterations and improved engine design. These changes will need a broad consensus between city managers, planners and citizens.

Structural Path Analysis and Linkages

The primary energy indicator is the main technical outlier on the spider diagram and is 50% above average. The structural path analysis reveals that direct fuel combustion, mainly in the sector's buses accounts for 70% of the total. Other factors include road transport (4%), electricity production (3%), diesel fuel production (3%), wholesale trade (1%) and petrol production (1%). While prices could theoretically be increased to reflect the higher energy content of bus travel per dollar spent, the niche market of bus travel is already challenged by cheap air travel on the main intercity routes. A range of new drive trains such as diesel-electric hybrids, fuel cells and micro-turbines all offer at least 50% increase in fuel efficiency from present levels which can be as low as 60 litres per 100 km in a stop-start city bus cycle.

The bus and tramways sector shows average upstream linkages to the sector's suppliers particularly road freight, wholesale trade, accounting and marketing and property development. The downstream linkages are very small as most of the effect is dissipated by private consumption.

Future Trends in Sector

Under the base case scenario in the *Future Dilemmas* study, by 2050 passenger kilometres will increase by 40% in urban areas and almost double for intercity buses in the absence of either major technological breakthroughs or significant investment in light or heavy rail options. Intercity passenger kilometres for air travel could triple over that same time period. Air emissions from diesel engines will probably come under increasing and sustained regulation due to the macro air pollution issues as well as health effects of micro particles from tailpipe emissions.

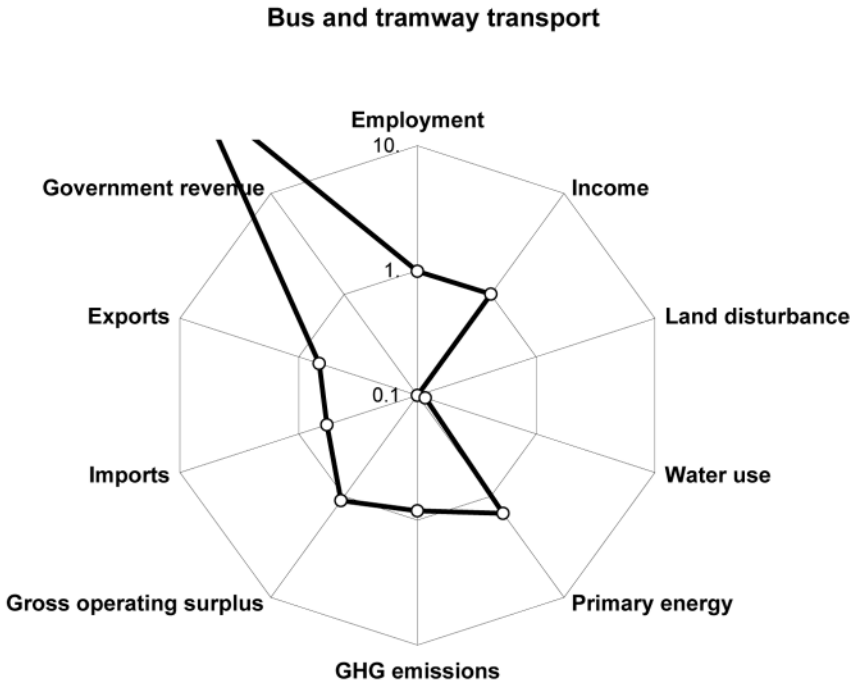
Innovation and Technical Opportunities

While individual technical solutions abound for better buses or trams, the greatest gains come from systematic structural approaches. For example the city of Curitiba in Brazil has implemented a successful bus system fully integrated with its urban plan. It functions as an above ground metro with dedicated bus lanes and a one fare price structure irrespective of the trip length. It operates 1 900 buses making 14 000 journeys daily, travelling 316 000 km every 24 hours with 1.9 million passengers daily and a 90% user satisfaction rate. No technical solution is perfect however and per capita bus use is now constant, while car use is increasing as personal affluence grows.

Sector **Bus and tramway transport** **(Bt)**

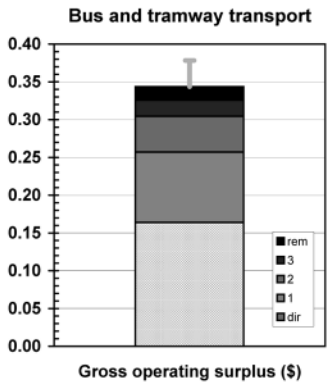
Bus and tramway transport services

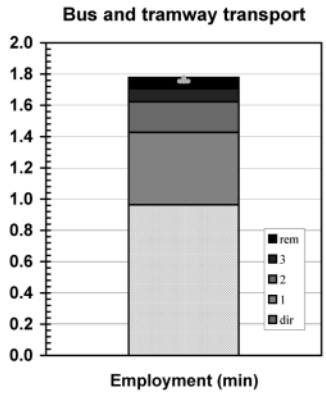
Spider diagram

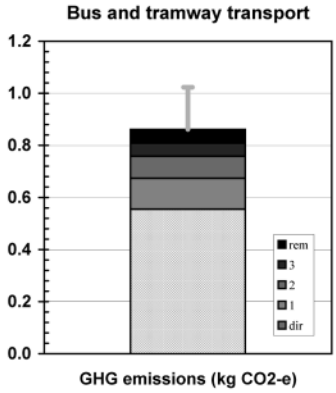


Bar graphs

Account #1







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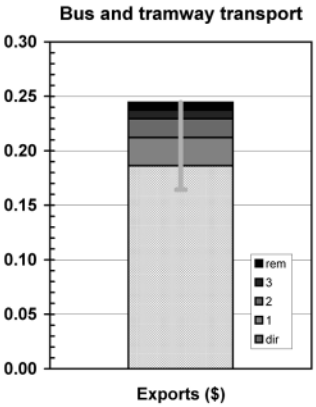

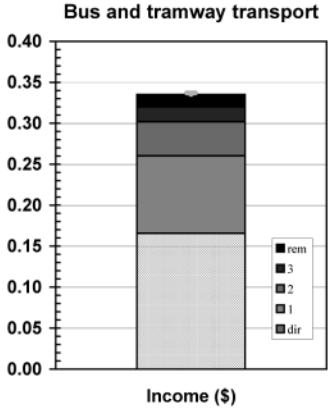

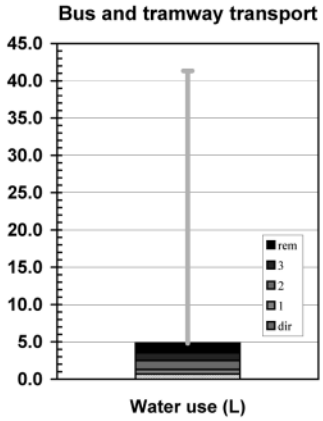

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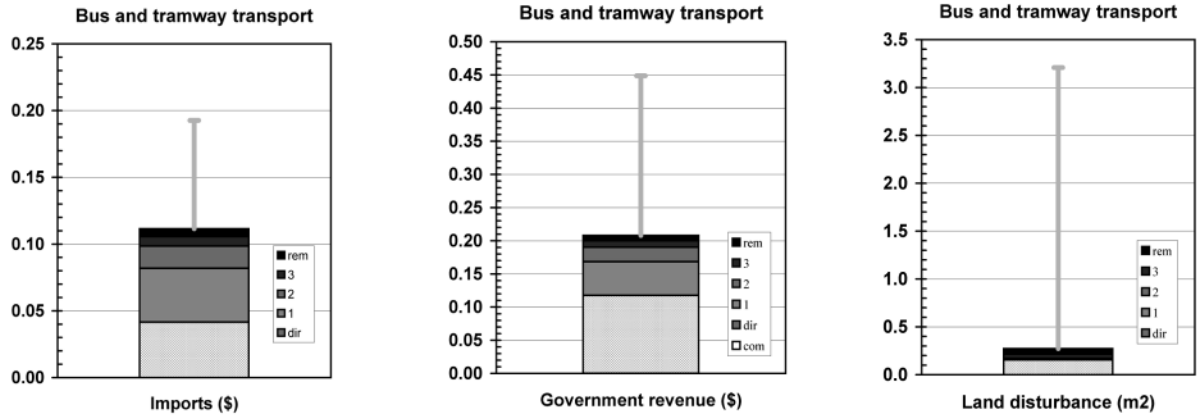


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 1,143.7	(0.43% of total)	($m 928.5 domestically produced)
Government final consumption	$m 679.8	(0.77% of total)	($m 679.8 domestically produced)
Gross fixed capital expenditure	$m 0.0		
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 1,823.5**	**(0.40% of GNE)**	**($m 1,608.3 domestically produced)**
Exports	$m 373.2	(0.45% of total)	($m 373.2 domestically produced)
Final demand	**$m 2,196.7**	**(0.40% of GNT)**	**($m 1,981.5 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 332.0	(0.19% of total)	
Gross operating surplus	$m 328.6	(0.17% of total)	
Taxes less subsidies	$m 235.6	(0.28% of total)	
Sectoral GDP*	**$m 896.3**	**(0.20% of GDP)**	
Imports	$m 83.3	(0.09% of total)	
Primary inputs	**$m 979.5**	**(0.18% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 328.6	(0.17%)	$m 324.9	(0.17%)	$m 680.7	(0.35%)
Exports ($m)	$m 373.2	(0.45%)	$m 369.0	(0.44%)	$m 484.4	(0.58%)
Imports ($m)	$m 83.3	(0.09%)	$m 82.3	(0.08%)	$m 220.9	(0.23%)
Employment (e-y)	15,472 e-y	(0.22%)	15,297 e-y	(0.21%)	28,222 e-y	(0.40%)
Income ($m)*	$m 332.0	(0.19%)	$m 328.3	(0.19%)	$m 664.1	(0.39%)
Government revenue ($m)†	-$m 231.1	- (0.21%)	-$m 233.8	- (0.22%)	-$m 54.5	- (0.05%)
GHG emissions (kt CO_2-e)	1,113 kt	(0.21%)	1,100 kt	(0.21%)	1,706 kt	(0.33%)
Water use (ML)	1,371 ML	(0.01%)	1,355 ML	(0.01%)	9,543 ML	(0.05%)
Land disturbance (kha)	31 kha	(0.02%)	31 kha	(0.02%)	54 kha	(0.03%)
Primary energy (TJ)	15,909 TJ	(0.41%)	15,728 TJ	(0.41%)	22,269 TJ	(0.57%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.16	0.34	0.38
Exports ($)	0.19	0.24	0.16
Imports ($)	0.04	0.11	0.19
Employment (min)	0.96	1.78	1.75
Income ($)	0.17	0.34	0.34
Government revenue ($)	-0.12	-0.03	0.21
GHG emissions (kg CO_2-e)	0.56	0.86	1.02
Water use (L)	0.68	4.82	41.32
Land disturbance (m^2)	0.16	0.27	3.21
Primary energy (MJ)	7.94	11.24	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Bt	0.164	(0; 48.%)	Bt	0.963	(0; 54.%)	Bt	0.555	(0; 64.%)
Rd Bt	0.0212	(1; 6.2%)	Rd Bt	0.124	(1; 7.%)	Rd Bt	0.0336	(1; 3.9%)
Rv Bt	0.0154	(1; 4.5%)	Wt Bt	0.048	(1; 2.7%)	El Bt	0.0333	(1; 3.9%)
Cm Bt	0.0111	(1; 3.2%)	Gv Bt	0.046	(1; 2.6%)	Fo Bt	0.0237	(1; 2.8%)
Ms Bt	0.00794	(1; 2.3%)	Rv Bt	0.0411	(1; 2.3%)	Oi Fo Bt	0.00714	(2; 0.83%)
Wt Bt	0.00666	(1; 1.9%)	Ms Bt	0.0356	(1; 2.%)	Wt Bt	0.00665	(1; 0.77%)
Ts Bt	0.00455	(1; 1.3%)	Cm Bt	0.0308	(1; 1.7%)	Ap Bt	0.00604	(1; 0.7%)
Mv Bt	0.00368	(1; 1.1%)	Ts Bt	0.0205	(1; 1.2%)	Fr Bt	0.00546	(1; 0.63%)
Pd Bt	0.00348	(1; 1.%)	Mv Bt	0.02	(1; 1.1%)	El Rd Bt	0.0043	(2; 0.5%)
Oi Fo Bt	0.00337	(2; 0.98%)	Ho Bt	0.0096	(1; 0.54%)	Is Mv Bt	0.00362	(2; 0.42%)
St Bt	0.0025	(1; 0.73%)	Pd Bt	0.00836	(1; 0.47%)	El Ms Bt	0.00332	(2; 0.39%)
Rv Rd Bt	0.00199	(2; 0.58%)	Fm Bt	0.00748	(1; 0.42%)	Oi Ap Bt	0.00313	(2; 0.36%)
Gv Bt	0.00196	(1; 0.57%)	Rh Bt	0.00654	(1; 0.37%)	El Gv Bt	0.00309	(2; 0.36%)
Bk Bt	0.00158	(1; 0.46%)	Bk Bt	0.00627	(1; 0.35%)	Fo Rd Bt	0.00306	(2; 0.36%)
Oi Ap Bt	0.00148	(2; 0.43%)	Wt Rd Bt	0.0062	(2; 0.35%)	El Wt Bt	0.002	(2; 0.23%)
Cm Rd Bt	0.00144	(2; 0.42%)	Gv Rd Bt	0.00594	(2; 0.33%)	Bc Mp Ho Bt	0.0019	(3; 0.22%)
El Bt	0.00134	(1; 0.39%)	Os Bt	0.00592	(1; 0.33%)	El Cm Bt	0.00181	(2; 0.21%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Bt	0.186	(0; 76.%)	Bt	0.166	(0; 49.%)	Bt	0.684	(0; 14.%)
Rd Bt	0.00737	(1; 3.%)	Rd Bt	0.0214	(1; 6.4%)	Wa Ms Bt	0.204	(2; 4.2%)
Wt Bt	0.00545	(1; 2.2%)	Gv Bt	0.0116	(1; 3.4%)	El Bt	0.184	(1; 3.8%)
Mv Bt	0.00241	(1; 0.99%)	Wt Bt	0.0103	(1; 3.1%)	Wa Pd Bt	0.0952	(2; 2.%)
Oi Fo Bt	0.0023	(2; 0.94%)	Ms Bt	0.00828	(1; 2.5%)	Rd Bt	0.0884	(1; 1.8%)
Cm Bt	0.00149	(1; 0.61%)	Cm Bt	0.00699	(1; 2.1%)	Ws Ho Bt	0.0699	(2; 1.5%)
Ms Bt	0.00123	(1; 0.5%)	Rv Bt	0.00663	(1; 2.%)	Wa Ts Bt	0.0613	(2; 1.3%)
Oi Ap Bt	0.00101	(2; 0.41%)	Ts Bt	0.00479	(1; 1.4%)	Bc Mp Ho Bt	0.0502	(3; 1.%)
Fo Bt	0.000963	(1; 0.39%)	Mv Bt	0.00346	(1; 1.%)	Gv Bt	0.0442	(1; 0.92%)
Ts Bt	0.000721	(1; 0.3%)	Pd Bt	0.00314	(1; 0.94%)	Dc Dp Ho Bt	0.0416	(3; 0.86%)
Wt Rd Bt	0.000704	(2; 0.29%)	Os Bt	0.00166	(1; 0.49%)	Dc Dp Bt	0.0408	(2; 0.85%)
Ee Bt	0.000654	(1; 0.27%)	Bk Bt	0.00155	(1; 0.46%)	Wa Gv Bt	0.0346	(2; 0.72%)
St Bt	0.00062	(1; 0.25%)	Gv Rd Bt	0.00149	(2; 0.45%)	Ri Fc Ho Bt	0.0323	(3; 0.67%)
Lg Bt	0.000565	(1; 0.23%)	Ru Bt	0.00144	(1; 0.43%)	Fo Bt	0.0283	(1; 0.59%)
Ru Bt	0.000551	(1; 0.23%)	Ho Bt	0.0014	(1; 0.42%)	Wt Bt	0.0268	(1; 0.56%)
Ho Bt	0.000534	(1; 0.22%)	In Bt	0.0014	(1; 0.42%)	Vf Ho Bt	0.0265	(2; 0.55%)
Eq Bt	0.00044	(1; 0.18%)	Wt Rd Bt	0.00133	(2; 0.4%)	Wa Ms Rd Bt	0.0264	(3; 0.55%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Bt	0.0415	(0; 37.%)	Bt	0.118	(0; 57.%)	Bt	0.155	(0; 57.%)
Fo Bt	0.00777	(1; 7.%)	Rd Bt	0.0152	(1; 7.3%)	Bc Mp Ho Bt	0.0138	(3; 5.1%)
Mv Bt	0.00605	(1; 5.4%)	Wt Bt	0.00481	(1; 2.3%)	Wo Tx Tp Bt	0.00293	(3; 1.1%)
Rd Bt	0.00537	(1; 4.8%)	Rv Bt	0.00409	(1; 2.%)	Wo Tx Ru Bt	0.00267	(3; 0.98%)
Ap Bt	0.0034	(1; 3.1%)	Gv Bt	0.00403	(1; 1.9%)	Rd Bt	0.00261	(1; 0.96%)
Rv Bt	0.00199	(1; 1.8%)	Ms Bt	0.00393	(1; 1.9%)	Bc Mp Ho Ms	0.00192	(4; 0.71%)
Cm Bt	0.00191	(1; 1.7%)	Cm Bt	0.00334	(1; 1.6%)	Bc Mp Ho Rd	0.00179	(4; 0.66%)
Ru Bt	0.0019	(1; 1.7%)	Ts Bt	0.00236	(1; 1.1%)	Fr Bt	0.00175	(1; 0.64%)
Ms Bt	0.00181	(1; 1.6%)	Pd Bt	0.00206	(1; 0.99%)	Wo Tx Wt Bt	0.00171	(3; 0.63%)
Wt Bt	0.00155	(1; 1.4%)	In Bt	0.0015	(1; 0.72%)	Wo Mp Ho Bt	0.00156	(3; 0.57%)
Ts Bt	0.0013	(1; 1.2%)	Mv Bt	0.00148	(1; 0.71%)	Bc Mp Bt	0.00133	(2; 0.49%)
Gv Bt	0.0012	(1; 1.1%)	Bk Bt	0.000855	(1; 0.41%)	Ba Bm Ho Bt	0.00113	(3; 0.41%)
Fo Rd Bt	0.001	(2; 0.9%)	Os Bt	0.000769	(1; 0.37%)	Bc Mp Ho Wt	0.000986	(4; 0.36%)
Mv Rd Bt	0.000782	(2; 0.7%)	Ru Bt	0.000759	(1; 0.36%)	Wo Tx Fu Bt	0.000948	(3; 0.35%)
Ee Bt	0.000638	(1; 0.57%)	Ho Bt	0.000737	(1; 0.35%)	Gv Bt	0.00089	(1; 0.33%)
Mv Rv Bt	0.000596	(2; 0.53%)	Wt Rd Bt	0.000622	(2; 0.3%)	Bc Mp Ho Gv	0.00087	(4; 0.32%)
Rh Bt	0.000552	(1; 0.49%)	St Bt	0.000557	(1; 0.27%)	Wo Ts Bt	0.000786	(2; 0.29%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.073 ±0.019	(±1.8%)
Downstream	0.020 ±0.001	(±3.2%)

Sector 61230010: Taxi and Hired Car with Driver (Ta)

Taxi and hired car with driver

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of water use and land disturbance are 90% below economy wide averages while greenhouse emissions are equal to average and energy use is 65% above average. The social indicators reveal that employment generation, income and government revenue are all equal to average. The financial indicators show that operating surplus is 10% below average, export propensity is 20% above average, and import penetration is 40% below average. The sector shows average upstream linkages to its suppliers such as road transport, accounting and marketing and wholesale trade. The linkages to downstream industries are relatively weak. The sector provides an ideal test bed and marketing opportunity for the next generation of energy and greenhouse efficient vehicles.

Sector Description

The taxi and hired car sector has a national fleet of approximately 15 200 taxis, 2 000 hire cars (with driver) and 6 300 special purpose vehicles. National data are difficult to locate but extrapolating from the Victorian fleet data suggests there are approximately 130 million taxi trips made each year, and with an average trip length of 10 km giving a total distance travelled of 1.3 billion km or 1 700 return trips to the moon. The capital cost of a licence to operate a taxi (the taxi plate) varies from $200 000 to $300 000 in most Australian cities. The taxi industry is heavily regulated in all states to maintain barriers to entry, maintain the capital value of the licence, and to ensure the quality of service and passenger safety standards.

Place of Industry in the Economy

The taxi and hired car sector ranks 105th out of 135 sectors in terms of value adding in the economy and contributes 0.10% of GDP in this analysis. It is a relatively small employer with a direct requirement of 5 000 employment years, and another 4 300 in the sector's upstream suppliers, giving a total of 9 300 employment years. These data seem at odds with the more than 17 000 vehicles in the fleet and may be explained by the sector's use of part time drivers who have another occupation. It requires one fifth of one percent of national primary energy use, and contributes one tenth of one percent of national greenhouse emissions. It has relatively minor requirements for water use and land disturbance. In financial flow terms, exports are three times the size of imports.

Strategic Overview

The integrated overview provided by the spider diagram shows a positive overall outcome with nine indicators better than the economy wide average. The one indicator that may require attention is primary energy use, especially if oil supplies become constrained in the future. Increasing the load factors of taxis (the time operating with a paying passenger) is one way to improve the indicator although logistical management of most taxi fleets is already reasonably efficient. New drive trains for taxis such as hybrid engines, and then fuel cells, provide an obvious technological route to lower energy use provided that service, comfort, and reliability can be maintained. Advanced communications and logistics systems may stimulate innovation in urban transport through just-in-time taxis that substantially replace the service provided by private cars. This requires a large fleet increase but provides returns in employment and energy use indicators.

TBL Account #1

The first TBL account shows the financial indicator of operating surplus 10% below the economy wide average with about half of this a direct sector effect with small contributions from first order suppliers such as road transport (6%), repairs (5%), communications (3%) and wholesale trade (2%). The social indicator of employment generation is equal to average with a makeup similar to the operating surplus. The environmental indicator of greenhouse emissions is equal to average and two thirds of this is due to fuel directly combusted within the sector. Improvements in the scheduling and driving behaviour of taxis may reap immediate rewards in managing the greenhouse indicator, but new drive trains such as hybrid engines and fuel cells present an obvious way forward.

TBL Accounts #2 and #3

The second TBL account reveals that the export propensity indicator is 20% above average, the income indicator is equal to average and the water use indicator is 90% below average. The third TBL account reveals that the import penetration indicator is 40% below average, government revenue is equal to average and land disturbance is 95% below average.

Structural Path Analysis and Linkages

The indicator for primary energy use may require attention although the greenhouse emissions derived from it are less an issue due to lower carbon fuels such as LPG predominantly used in the sector. The energy structural path analysis (not shown in the data sheets) reveals that direct fuel combustion accounts for 75% of total energy use. Smaller components are road transport (4%), electricity generation (3%), refining of petrol, LPG and diesel (3%) and wholesale trade (1%).

The taxi sector shows slightly above average linkages to its upstream suppliers such as road transport, wholesale trade, accounting and marketing, communications, property development, motor vehicle manufacturing and government administration. The downstream linkages to sectors that are impacted by investment decisions are relatively weak as most of the effect is dissipated to private consumption.

Future Trends in Sector

Under the base case scenario of the *Future Dilemmas* study, fleet vehicle mileage which includes taxis increases by 25% out to 2050 and this increase is roughly in line with population growth. As suggested in the next section, sustainable transport policies could see a large increase in taxi based transport in an effort to combat congestion and inner city vehicle emissions.

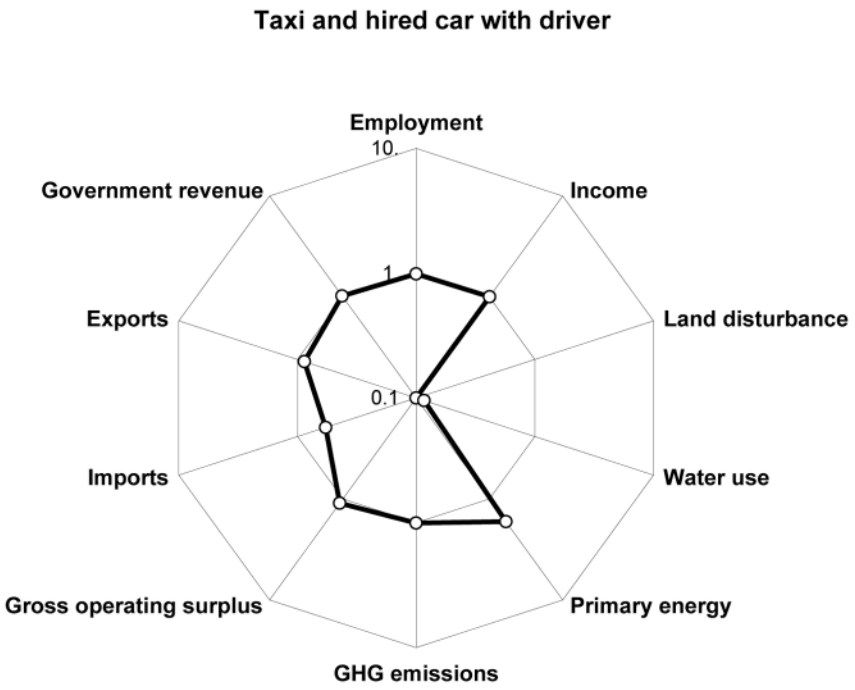
Innovation and Technical Opportunities

Three avenues of innovation seem possible for the taxi sector. The first could see a significant increase in the size of the taxi fleet if demand-responsive taxis and minibuses are used to markedly reduce personal car use in cities. Many of the technological requirements are already in place with global positioning systems in most city taxis, and well developed advanced scheduling software. Simulation studies have been completed on the Gold Coast in Queensland and full scale tests undertaken in five European countries. The second innovation is using taxi fleets as the test beds for low emission and quiet city transportation. Cities such as London with 20 000 ‘London cabs’ and 40 000 mini cabs, and New York City with 12 000 yellow taxis, are prime examples of the potential starting points for introducing fuel cell drive trains for taxis. The third innovation, the ‘TAXI 2000’ system being developed in the United States, is a system of three person driverless cabs built of composite materials which track on simple one rail guidance systems. This may belong to the tramway sector but emphasises that environmental solutions may arise across, rather than within existing sectors and may eventually spawn an entirely new sector.

Sector **Taxi and hired car with driver** **(Ta)**

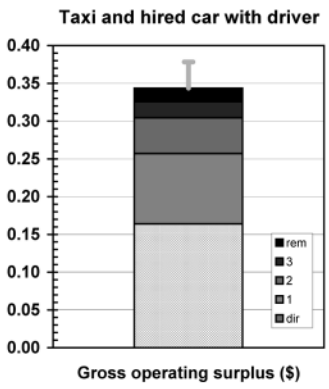
Taxi and hired car with driver

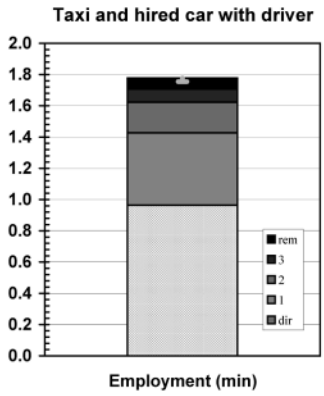
Spider diagram

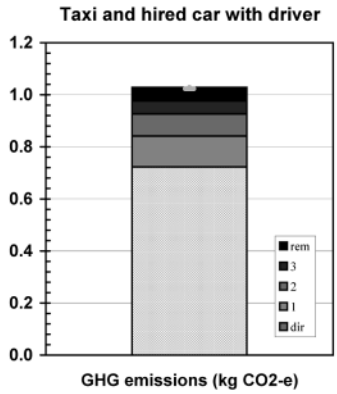


Bar graphs

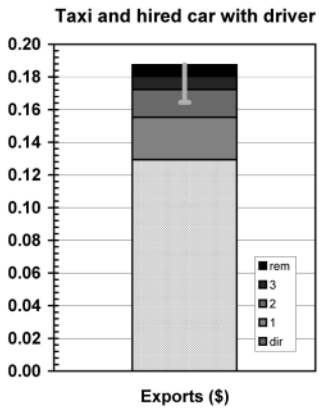
Account #1

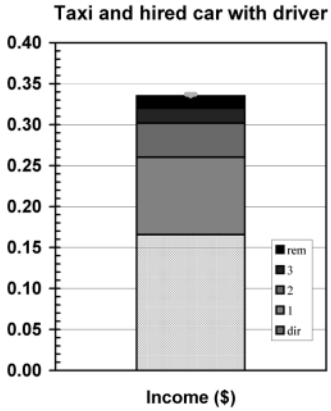


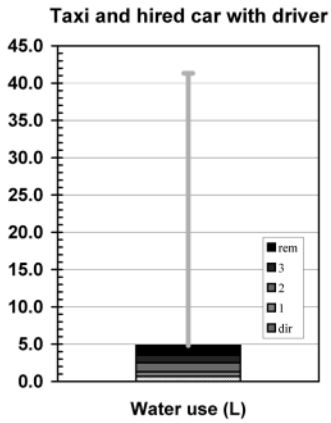




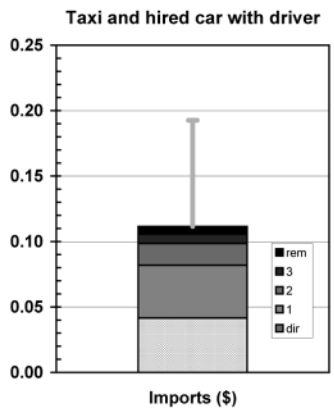
Account #2

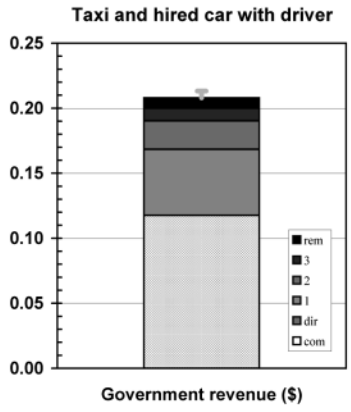


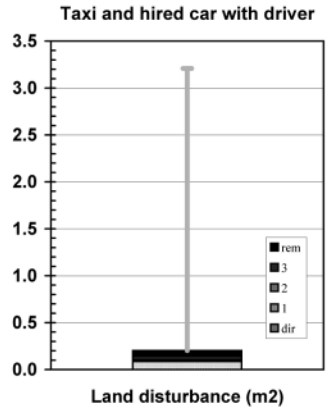




Account #3







National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 570.1	(0.22% of total)	($m 517.4 domestically produced)
Government final consumption	$m 6.1	(0.01% of total)	($m 6.1 domestically produced)
Gross fixed capital expenditure	$m 0.0		
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 576.2**	**(0.13% of GNE)**	**($m 523.5 domestically produced)**
Exports	$m 125.3	(0.15% of total)	($m 125.3 domestically produced)
Final demand	**$m 701.5**	**(0.13% of GNT)**	**($m 648.8 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 160.6	(0.09% of total)	
Gross operating surplus	$m 158.9	(0.08% of total)	
Taxes less subsidies	$m 114.0	(0.13% of total)	
Sectoral GDP*	**$m 433.5**	**(0.10% of GDP)**	
Imports	$m 40.3	(0.04% of total)	
Primary inputs	**$m 473.8**	**(0.09% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 158.9	(0.08%)	$m 106.4	(0.06%)	$m 222.9	(0.12%)
Exports ($m)	$m 125.3	(0.15%)	$m 83.9	(0.10%)	$m 121.6	(0.15%)
Imports ($m)	$m 40.3	(0.04%)	$m 27.0	(0.03%)	$m 72.3	(0.07%)
Employment (e-y)	7,483 e-y	(0.10%)	5,009 e-y	(0.07%)	9,241 e-y	(0.13%)
Income ($m)*	$m 160.6	(0.09%)	$m 107.5	(0.06%)	$m 217.4	(0.13%)
Government revenue ($m)†	$m 114.0	(0.11%)	$m 76.3	(0.07%)	$m 135.0	(0.12%)
GHG emissions (kt CO_2-e)	701 kt	(0.14%)	469 kt	(0.09%)	668 kt	(0.13%)
Water use (ML)	663 ML	(0.00%)	444 ML	(0.00%)	3,125 ML	(0.01%)
Land disturbance (kha)	8 kha	(0.01%)	6 kha	(0.00%)	13 kha	(0.01%)
Primary energy (TJ)	9,227 TJ	(0.24%)	6,176 TJ	(0.16%)	8,318 TJ	(0.21%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.16	0.34	0.38
Exports ($)	0.13	0.19	0.16
Imports ($)	0.04	0.11	0.19
Employment (min)	0.96	1.78	1.75
Income ($)	0.17	0.34	0.34
Government revenue ($)	0.12	0.21	0.21
GHG emissions (kg CO_2-e)	0.72	1.03	1.02
Water use (L)	0.68	4.82	41.32
Land disturbance (m^2)	0.09	0.20	3.21
Primary energy (MJ)	9.52	12.82	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Ta	0.164	(0; 48.%)	Ta	0.963	(0; 54.%)	Ta	0.723	(0; 70.%)
Rd Ta	0.0212	(1; 6.2%)	Rd Ta	0.124	(1; 7.%)	Rd Ta	0.0336	(1; 3.3%)
Rv Ta	0.0154	(1; 4.5%)	Wt Ta	0.048	(1; 2.7%)	El Ta	0.0333	(1; 3.2%)
Cm Ta	0.0111	(1; 3.2%)	Gv Ta	0.046	(1; 2.6%)	Fo Ta	0.0237	(1; 2.3%)
Ms Ta	0.00794	(1; 2.3%)	Rv Ta	0.0411	(1; 2.3%)	Oi Fo Ta	0.00714	(2; 0.69%)
Wt Ta	0.00666	(1; 1.9%)	Ms Ta	0.0356	(1; 2.%)	Wt Ta	0.00665	(1; 0.65%)
Ts Ta	0.00455	(1; 1.3%)	Cm Ta	0.0308	(1; 1.7%)	Ap Ta	0.00604	(1; 0.59%)
Mv Ta	0.00368	(1; 1.1%)	Ts Ta	0.0205	(1; 1.2%)	Fr Ta	0.00546	(1; 0.53%)
Pd Ta	0.00348	(1; 1.%)	Mv Ta	0.02	(1; 1.1%)	El Rd Ta	0.0043	(2; 0.42%)
Oi Fo Ta	0.00337	(2; 0.98%)	Ho Ta	0.0096	(1; 0.54%)	Is Mv Ta	0.00362	(2; 0.35%)
St Ta	0.0025	(1; 0.73%)	Pd Ta	0.00836	(1; 0.47%)	El Ms Ta	0.00332	(2; 0.32%)
Rv Rd Ta	0.00199	(2; 0.58%)	Fm Ta	0.00748	(1; 0.42%)	Oi Ap Ta	0.00313	(2; 0.3%)
Gv Ta	0.00196	(1; 0.57%)	Rh Ta	0.00654	(1; 0.37%)	El Gv Ta	0.00309	(2; 0.3%)
Bk Ta	0.00158	(1; 0.46%)	Bk Ta	0.00627	(1; 0.35%)	Fo Rd Ta	0.00306	(2; 0.3%)
Oi Ap Ta	0.00148	(2; 0.43%)	Wt Rd Ta	0.0062	(2; 0.35%)	El Wt Ta	0.002	(2; 0.19%)
Cm Rd Ta	0.00144	(2; 0.42%)	Gv Rd Ta	0.00594	(2; 0.33%)	Bc Mp Ho Ta	0.0019	(3; 0.19%)
El Ta	0.00134	(1; 0.39%)	Os Ta	0.00592	(1; 0.33%)	El Cm Ta	0.00181	(2; 0.18%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Ta	0.129	(0; 69.%)	Ta	0.166	(0; 49.%)	Ta	0.684	(0; 14.%)
Rd Ta	0.00737	(1; 3.9%)	Rd Ta	0.0214	(1; 6.4%)	Wa Ms Ta	0.204	(2; 4.2%)
Wt Ta	0.00545	(1; 2.9%)	Gv Ta	0.0116	(1; 3.4%)	El Ta	0.184	(1; 3.8%)
Mv Ta	0.00241	(1; 1.3%)	Wt Ta	0.0103	(1; 3.1%)	Wa Pd Ta	0.0952	(2; 2.%)
Oi Fo Ta	0.0023	(2; 1.2%)	Ms Ta	0.00828	(1; 2.5%)	Rd Ta	0.0884	(1; 1.8%)
Cm Ta	0.00149	(1; 0.79%)	Cm Ta	0.00699	(1; 2.1%)	Ws Ho Ta	0.0699	(2; 1.5%)
Ms Ta	0.00123	(1; 0.66%)	Rv Ta	0.00663	(1; 2.%)	Wa Ts Ta	0.0613	(2; 1.3%)
Oi Ap Ta	0.00101	(2; 0.54%)	Ts Ta	0.00479	(1; 1.4%)	Bc Mp Ho Ta	0.0502	(3; 1.%)
Fo Ta	0.000963	(1; 0.51%)	Mv Ta	0.00346	(1; 1.%)	Gv Ta	0.0442	(1; 0.92%)
Ts Ta	0.000721	(1; 0.38%)	Pd Ta	0.00314	(1; 0.94%)	Dc Dp Ho Ta	0.0416	(3; 0.86%)
Wt Rd Ta	0.000704	(2; 0.38%)	Os Ta	0.00166	(1; 0.49%)	Dc Dp Ta	0.0408	(2; 0.85%)
Ee Ta	0.000654	(1; 0.35%)	Bk Ta	0.00155	(1; 0.46%)	Wa Gv Ta	0.0346	(2; 0.72%)
St Ta	0.00062	(1; 0.33%)	Gv Rd Ta	0.00149	(2; 0.45%)	Ri Fc Ho Ta	0.0323	(3; 0.67%)
Lg Ta	0.000565	(1; 0.3%)	Ru Ta	0.00144	(1; 0.43%)	Fo Ta	0.0283	(1; 0.59%)
Ru Ta	0.000551	(1; 0.29%)	Ho Ta	0.0014	(1; 0.42%)	Wt Ta	0.0268	(1; 0.56%)
Ho Ta	0.000534	(1; 0.28%)	In Ta	0.0014	(1; 0.42%)	Vf Ho Ta	0.0265	(2; 0.55%)
Eq Ta	0.00044	(1; 0.23%)	Wt Rd Ta	0.00133	(2; 0.4%)	Wa Ms Rd Ta	0.0264	(3; 0.55%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Ta	0.0415	(0; 37.%)	Ta	0.118	(0; 57.%)	Ta	0.0852	(0; 42.%)
Fo Ta	0.00777	(1; 7.%)	Rd Ta	0.0152	(1; 7.3%)	Bc Mp Ho Ta	0.0138	(3; 6.8%)
Mv Ta	0.00605	(1; 5.4%)	Wt Ta	0.00481	(1; 2.3%)	Wo Tx Tp Ta	0.00293	(3; 1.4%)
Rd Ta	0.00537	(1; 4.8%)	Rv Ta	0.00409	(1; 2.%)	Wo Tx Ru Ta	0.00267	(3; 1.3%)
Ap Ta	0.0034	(1; 3.1%)	Gv Ta	0.00403	(1; 1.9%)	Rd Ta	0.00261	(1; 1.3%)
Rv Ta	0.00199	(1; 1.8%)	Ms Ta	0.00393	(1; 1.9%)	Bc Mp Ho Ms	0.00192	(4; 0.95%)
Cm Ta	0.00191	(1; 1.7%)	Cm Ta	0.00334	(1; 1.6%)	Bc Mp Ho Rd	0.00179	(4; 0.88%)
Ru Ta	0.0019	(1; 1.7%)	Ts Ta	0.00236	(1; 1.1%)	Fr Ta	0.00175	(1; 0.87%)
Ms Ta	0.00181	(1; 1.6%)	Pd Ta	0.00206	(1; 0.99%)	Wo Tx Wt Ta	0.00171	(3; 0.84%)
Wt Ta	0.00155	(1; 1.4%)	In Ta	0.0015	(1; 0.72%)	Wo Mp Ho Ta	0.00156	(3; 0.77%)
Ts Ta	0.0013	(1; 1.2%)	Mv Ta	0.00148	(1; 0.71%)	Bc Mp Ta	0.00133	(2; 0.66%)
Gv Ta	0.0012	(1; 1.1%)	Bk Ta	0.000855	(1; 0.41%)	Ba Bm Ho Ta	0.00113	(3; 0.56%)
Fo Rd Ta	0.001	(2; 0.9%)	Os Ta	0.000769	(1; 0.37%)	Bc Mp Ho Wt	0.000986	(4; 0.49%)
Mv Rd Ta	0.000782	(2; 0.7%)	Ru Ta	0.000759	(1; 0.36%)	Wo Tx Fu Ta	0.000948	(3; 0.47%)
Ee Ta	0.000638	(1; 0.57%)	Ho Ta	0.000737	(1; 0.35%)	Gv Ta	0.00089	(1; 0.44%)
Mv Rv Ta	0.000596	(2; 0.53%)	Wt Rd Ta	0.000622	(2; 0.3%)	Bc Mp Ho Gv	0.00087	(4; 0.43%)
Rh Ta	0.000552	(1; 0.49%)	St Ta	0.000557	(1; 0.27%)	Wo Ts Ta	0.000786	(2; 0.39%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.073 ±0.019	(±1.8%)
Downstream	0.592 ±0.013	(±2.2%)

Sector 6101: Road Freight (Rd)

Road freight transport services

Short Summary

The road freight sector shows good environmental outcomes with water, land and greenhouse indicators 90%, 95% and 40% below the economy wide average respectively. Lower greenhouse emissions are presumably due to strong competition within the sector forcing good energy and logistics management as well as efficient motors and drive trains. For the social indicators, employment generation, income and government revenue are all equal to average. The financial indicators show that operating surplus is 10% below average while export propensity and import penetration are 25% and 40% below average respectively. The sector has a reasonably balanced TBL account. However the absolute volume of road transport is projected to grow in line with economic growth, so greenhouse emissions will grow in absolute terms even if the indicator of kilograms per dollar remains low. In addition the sector requires substantial capital investment into roads in order to operate but does not contribute much to government revenue in absolute terms.

Sector Description

This sector includes only road freight with bus, tram and road transport services dealt with in separate sectors. The current road freight transport task is around 135 billion tonne kilometres per year with 77% carried by articulated trucks, 19% carried by rigid trucks and 4% by light commercial vehicles. Crude materials (33%) and live animals and food (17%) are the largest categories carried by weight. The truck fleet has 350 000 rigid trucks and 65 000 articulated trucks with an average age of 12-15 years each travelling 18 000 to 20 000 laden kilometres per year.

Place of Industry in the Economy

The road transport industry ranks 17th out of 135 in terms of value adding within the economy and contributes 1.83% of GDP in this analysis. The sector is a moderate employment generator with a direct requirement for 24 000 employment years and another 20 000 years in the sector's suppliers giving a total of 44 000 employment years. In addition, the sector contributes 118 000 employment years to the final demand of downstream sectors such as wholesale trade, construction and meat products. The industry has low requirements for water and land, generally less than one tenth of one percent of the national totals. Energy use and greenhouse emissions are larger, but still below six tenths of one percent of the national totals as the additional energy and emissions are allocated to the final demand of the product delivered by the road transport sector.

Strategic Overview

The strategic overview in the spider diagram shows a reasonably balanced TBL account with below average outcomes for export propensity and operating surplus. The greenhouse indicator of 0.6 kg/$ is surprising good and significantly less than rail freight (1.03 kg/$) and air transport (1.32 kg/$). The rail freight figure is inflated by coal fired electricity used in electric trains, mainly due to coal freight in Queensland and because rail is generally used for bulk freight of moderate to small value. By comparison the flexible and timely services offered by road transport stimulate relatively higher value adding. Upstream issues for the sector relate to the strong competition within the sector placing pressure on the financial viability of transport firms, on the safety and health of their drivers, and on other road users. Downstream issues relate to the increasing volumes of heavy road transport within urban areas and the effect this causes on traffic congestion. Specific air pollution issues relate to human health problems from micro-particles produced by diesel engines.

TBL Account #1

The financial indicator of operating surplus is 10% below average with half a direct effect and contributions from repairs (5%), communications (3%), business management (2%) and wholesale trade (3%). The social indicator of employment generation is equal to average and has a similar composition to the financial surplus. The greenhouse emissions indicator is 40% below average with about half of the effect a direct one from fuel use by trucking rigs. Other greenhouse emissions come from electricity generation (6%) and diesel refining (4%) while oil production, petrol refining, wholesale trade and forestry each contribute 1%.

TBL Accounts #2 and #3

In the second TBL account, export propensity is 25% below average, income is equal to average and water use is 90% below average. For the third TBL account, import penetration and land disturbance are respectively 40% and 95% below average, while government revenue is equal to average.

Structural Path Analysis and Linkages

There may be scope to further improve the government revenue indicator through road pricing. The federal government spends at least two billion dollars yearly on major road projects, while five billion dollars is spent by state and local governments. Some advocacy groups argue that the road transport sector does not pay directly for its access to public roads and that in addition, it has a lower fuel excise set at 24c per litre, compared to the general rate of 38c per litre. The path analysis shows that two thirds of the government revenue indicator is generated directly within the sector, with minor contributions from sectors such as repairs, wholesale trade, communications and insurance.

Increases in consumer demand stimulate average upstream linkages to sectors such as wholesale trade, communications, equipment hire, motor vehicle repairs and accounting. The sector shows strong downstream linkages where sectors such as meat products, residential and non-residential building and accommodation must also expand to dissipate the effect of any additional investment.

Future Trends in Sector

The base case scenario in the *Future Dilemmas* study anticipates slow growth in the road transport sector out to 2050 with most of the expansion in freight task, particularly bulk freight, allocated to rail. The north-south railway link from Darwin to Adelaide and other rail development proposals are current examples of this trend, but must be judged against the perception of long term underinvestment in rail compared to road on the Melbourne-Sydney-Brisbane axis. Social attitudes to increasing volumes of heavy freight through urban areas as imports and exports travel through major city seaports will be an important determinant of growth in the road freight sector. How just-in-time supply logistics may play out is uncertain. However some sectors in Europe are experiencing a partial return to increased stockholding for as traffic jams, accidents, freak weather and labour action play havoc with manufacturing and delivery schedules.

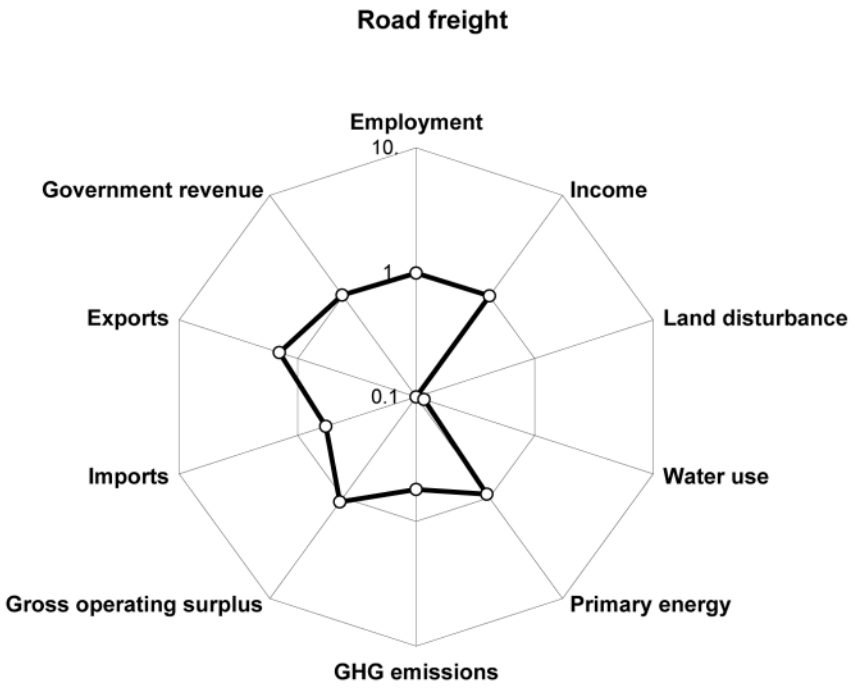
Innovation and Technical Opportunities

The logistical base of the road transport sector is highly advanced and trucks themselves are at the leading edge of engine efficiency, although fuel cells may allow a step change in energy efficiency over the next two decades. The main driver of expansion is the increasing length and complexity of the supply chain especially in food and high value manufacturing. If energy and social issues require the containment of tonne-kilometres, the location and structure of manufacturing (in the broadest sense) will need to be re-organised. A post-industrial society, while many decades away, will probably require the localisation of food manufacturing and shorter supply chains.

Sector **Road freight** **(Rd)**

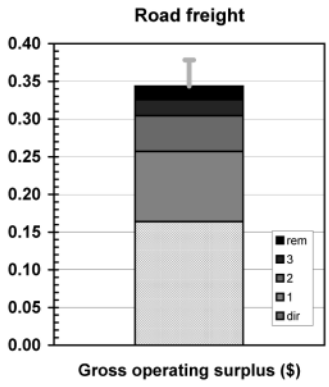
Road freight transport services

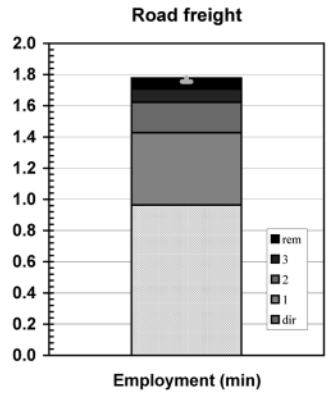
Spider diagram

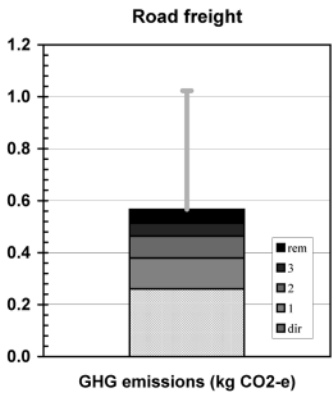


Bar graphs

Account #1







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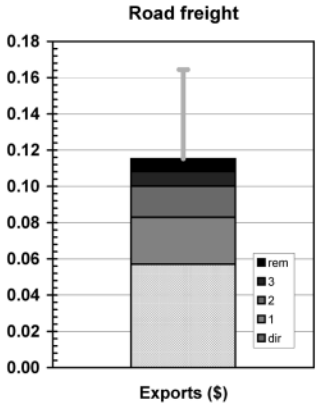

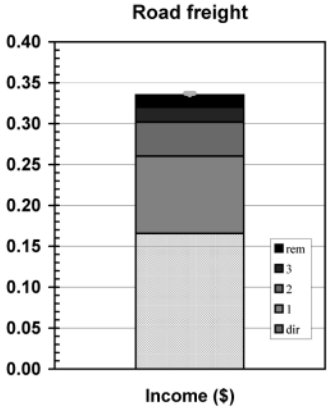

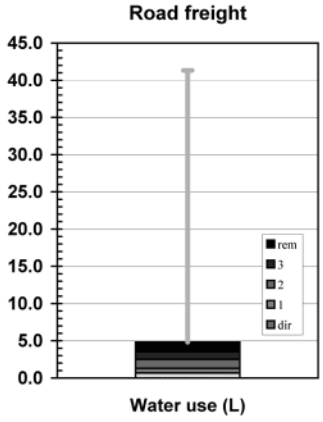

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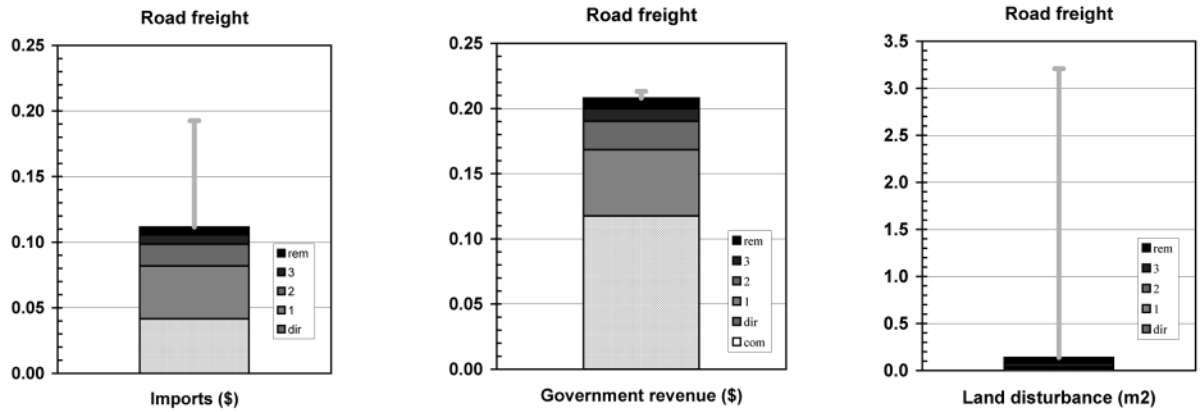


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 1,651.3	(0.62% of total)	($m 1,651.3 domestically produced)
Government final consumption	-$m 9.4	-(0.01% of total)	
Gross fixed capital expenditure	$m 311.3	(0.30% of total)	($m 311.3 domestically produced)
Net changes in stocks	$m 113.1	(6.40% of total)	($m 113.1 domestically produced)
Sectoral GNE	**$m 2,066.3**	**(0.45% of GNE)**	**($m 2,066.3 domestically produced)**
Exports	$m 1,046.2	(1.25% of total)	($m 1,046.2 domestically produced)
Final demand	**$m 3,112.5**	**(0.57% of GNT)**	**($m 3,112.5 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 3,039.0	(1.78% of total)	
Gross operating surplus	$m 3,007.6	(1.57% of total)	
Taxes less subsidies	$m 2,156.4	(2.52% of total)	
Sectoral GDP*	**$m 8,202.9**	**(1.83% of GDP)**	
Imports	$m 762.1	(0.78% of total)	
Primary inputs	**$m 8,965.0**	**(1.64% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 3,007.6	(1.57%)	$m 510.3	(0.27%)	$m 1,069.3	(0.56%)
Exports ($m)	$m 1,046.2	(1.25%)	$m 177.5	(0.21%)	$m 358.7	(0.43%)
Imports ($m)	$m 762.1	(0.78%)	$m 129.3	(0.13%)	$m 347.1	(0.36%)
Employment (e-y)	141,607 e-y	(1.99%)	24,028 e-y	(0.34%)	44,331 e-y	(0.62%)
Income ($m)*	$m 3,039.0	(1.78%)	$m 515.7	(0.30%)	$m 1,043.2	(0.61%)
Government revenue ($m)†	$m 2,156.4	(2.00%)	$m 365.9	(0.34%)	$m 647.5	(0.60%)
GHG emissions (kt CO_2-e)	4,774 kt	(0.92%)	810 kt	(0.16%)	1,763 kt	(0.34%)
Water use (ML)	12,547 ML	(0.06%)	2,129 ML	(0.01%)	14,991 ML	(0.07%)
Land disturbance (kha)	37 kha	(0.02%)	6 kha	(0.00%)	43 kha	(0.03%)
Primary energy (TJ)	69,114 TJ	(1.78%)	11,728 TJ	(0.30%)	22,006 TJ	(0.57%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.16	0.34	0.38
Exports ($)	0.06	0.12	0.16
Imports ($)	0.04	0.11	0.19
Employment (min)	0.96	1.78	1.75
Income ($)	0.17	0.34	0.34
Government revenue ($)	0.12	0.21	0.21
GHG emissions (kg CO_2-e)	0.26	0.57	1.02
Water use (L)	0.68	4.82	41.32
Land disturbance (m^2)	0.02	0.14	3.21
Primary energy (MJ)	3.77	7.07	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Rd	0.164	(0; 48.%)	Rd	0.963	(0; 54.%)	Rd	0.26	(0; 46.%)
Rv Rd	0.0154	(1; 4.5%)	Wt Rd	0.048	(1; 2.7%)	El Rd	0.0333	(1; 5.9%)
Cm Rd	0.0111	(1; 3.2%)	Gv Rd	0.046	(1; 2.6%)	Fo Rd	0.0237	(1; 4.2%)
Ms Rd	0.00794	(1; 2.3%)	Rv Rd	0.0411	(1; 2.3%)	Oi Fo Rd	0.00714	(2; 1.3%)
Wt Rd	0.00666	(1; 1.9%)	Ms Rd	0.0356	(1; 2.%)	Wt Rd	0.00665	(1; 1.2%)
Ts Rd	0.00455	(1; 1.3%)	Cm Rd	0.0308	(1; 1.7%)	Ap Rd	0.00604	(1; 1.1%)
Mv Rd	0.00368	(1; 1.1%)	Ts Rd	0.0205	(1; 1.2%)	Fr Rd	0.00546	(1; 0.96%)
Pd Rd	0.00348	(1; 1.%)	Mv Rd	0.02	(1; 1.1%)	Is Mv Rd	0.00362	(2; 0.64%)
Oi Fo Rd	0.00337	(2; 0.98%)	Ho Rd	0.0096	(1; 0.54%)	El Ms Rd	0.00332	(2; 0.59%)
St Rd	0.0025	(1; 0.73%)	Pd Rd	0.00836	(1; 0.47%)	Oi Ap Rd	0.00313	(2; 0.55%)
Gv Rd	0.00196	(1; 0.57%)	Fm Rd	0.00748	(1; 0.42%)	El Gv Rd	0.00309	(2; 0.55%)
Bk Rd	0.00158	(1; 0.46%)	Rh Rd	0.00654	(1; 0.37%)	El Wt Rd	0.002	(2; 0.35%)
Oi Ap Rd	0.00148	(2; 0.43%)	Bk Rd	0.00627	(1; 0.35%)	Bc Mp Ho Rd	0.0019	(3; 0.34%)
El Rd	0.00134	(1; 0.39%)	Os Rd	0.00592	(1; 0.33%)	El Cm Rd	0.00181	(2; 0.32%)
Fo Rd	0.0013	(1; 0.38%)	Bs Rd	0.00576	(1; 0.32%)	El Mv Rd	0.00178	(2; 0.31%)
St Wt Rd	0.00127	(2; 0.37%)	Ru Rd	0.0057	(1; 0.32%)	El Pd Rd	0.00166	(2; 0.29%)
Rh Rd	0.00107	(1; 0.31%)	Ms Wt Rd	0.00433	(2; 0.24%)	El Rv Rd	0.00137	(2; 0.24%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Rd	0.057	(0; 49.%)	Rd	0.166	(0; 49.%)	Rd	0.684	(0; 14.%)
Wt Rd	0.00545	(1; 4.7%)	Gv Rd	0.0116	(1; 3.4%)	Wa Ms Rd	0.204	(2; 4.2%)
Mv Rd	0.00241	(1; 2.1%)	Wt Rd	0.0103	(1; 3.1%)	El Rd	0.184	(1; 3.8%)
Oi Fo Rd	0.0023	(2; 2.%)	Ms Rd	0.00828	(1; 2.5%)	Wa Pd Rd	0.0952	(2; 2.%)
Cm Rd	0.00149	(1; 1.3%)	Cm Rd	0.00699	(1; 2.1%)	Ws Ho Rd	0.0699	(2; 1.5%)
Ms Rd	0.00123	(1; 1.1%)	Rv Rd	0.00663	(1; 2.%)	Wa Ts Rd	0.0613	(2; 1.3%)
Oi Ap Rd	0.00101	(2; 0.88%)	Ts Rd	0.00479	(1; 1.4%)	Bc Mp Ho Rd	0.0502	(3; 1.%)
Fo Rd	0.000963	(1; 0.84%)	Mv Rd	0.00346	(1; 1.%)	Gv Rd	0.0442	(1; 0.92%)
Ts Rd	0.000721	(1; 0.63%)	Pd Rd	0.00314	(1; 0.94%)	Dc Dp Ho Rd	0.0416	(3; 0.86%)
Ee Rd	0.000654	(1; 0.57%)	Os Rd	0.00166	(1; 0.49%)	Dc Dp Rd	0.0408	(2; 0.85%)
St Rd	0.00062	(1; 0.54%)	Bk Rd	0.00155	(1; 0.46%)	Wa Gv Rd	0.0346	(2; 0.72%)
Lg Rd	0.000565	(1; 0.49%)	Ru Rd	0.00144	(1; 0.43%)	Ri Fc Ho Rd	0.0323	(3; 0.67%)
Ru Rd	0.000551	(1; 0.48%)	Ho Rd	0.0014	(1; 0.42%)	Fo Rd	0.0283	(1; 0.59%)
Ho Rd	0.000534	(1; 0.46%)	In Rd	0.0014	(1; 0.42%)	Wt Rd	0.0268	(1; 0.56%)
Eq Rd	0.00044	(1; 0.38%)	Fm Rd	0.00117	(1; 0.35%)	Vf Ho Rd	0.0265	(2; 0.55%)
Wt Rv Rd	0.000392	(2; 0.34%)	St Rd	0.00104	(1; 0.31%)	Wa Ms Wt Rd	0.0248	(3; 0.52%)
Fm Rd	0.000386	(1; 0.33%)	Ms Wt Rd	0.00101	(2; 0.3%)	Vf Ms Rd	0.0226	(2; 0.47%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Rd	0.0415	(0; 37.%)	Rd	0.118	(0; 57.%)	Rd	0.0202	(0; 15.%)
Fo Rd	0.00777	(1; 7.%)	Wt Rd	0.00481	(1; 2.3%)	Bc Mp Ho Rd	0.0138	(3; 10.%)
Mv Rd	0.00605	(1; 5.4%)	Rv Rd	0.00409	(1; 2.%)	Wo Tx Tp Rd	0.00293	(3; 2.1%)
Ap Rd	0.0034	(1; 3.1%)	Gv Rd	0.00403	(1; 1.9%)	Wo Tx Ru Rd	0.00267	(3; 1.9%)
Rv Rd	0.00199	(1; 1.8%)	Ms Rd	0.00393	(1; 1.9%)	Bc Mp Ho Ms	0.00192	(4; 1.4%)
Cm Rd	0.00191	(1; 1.7%)	Cm Rd	0.00334	(1; 1.6%)	Fr Rd	0.00175	(1; 1.3%)
Ru Rd	0.0019	(1; 1.7%)	Ts Rd	0.00236	(1; 1.1%)	Wo Tx Wt Rd	0.00171	(3; 1.2%)
Ms Rd	0.00181	(1; 1.6%)	Pd Rd	0.00206	(1; 0.99%)	Wo Mp Ho Rd	0.00156	(3; 1.1%)
Wt Rd	0.00155	(1; 1.4%)	In Rd	0.0015	(1; 0.72%)	Bc Mp Rd	0.00133	(2; 0.97%)
Ts Rd	0.0013	(1; 1.2%)	Mv Rd	0.00148	(1; 0.71%)	Ba Bm Ho Rd	0.00113	(3; 0.82%)
Gv Rd	0.0012	(1; 1.1%)	Bk Rd	0.000855	(1; 0.41%)	Bc Mp Ho Wt	0.000986	(4; 0.72%)
Ee Rd	0.000638	(1; 0.57%)	Os Rd	0.000769	(1; 0.37%)	Wo Tx Fu Rd	0.000948	(3; 0.69%)
Mv Rv Rd	0.000596	(2; 0.53%)	Ru Rd	0.000759	(1; 0.36%)	Gv Rd	0.00089	(1; 0.65%)
Rh Rd	0.000552	(1; 0.49%)	Ho Rd	0.000737	(1; 0.35%)	Bc Mp Ho Gv	0.00087	(4; 0.63%)
Fm Rd	0.000506	(1; 0.45%)	St Rd	0.000557	(1; 0.27%)	Wo Ts Rd	0.000786	(2; 0.57%)
Pd Rd	0.000501	(1; 0.45%)	Ms Wt Rd	0.000478	(2; 0.23%)	Bc Mp Ms Rd	0.000729	(3; 0.53%)
Pl Rd	0.000475	(1; 0.43%)	Pd Wt Rd	0.000452	(2; 0.22%)	Bc Mp Wt Rd	0.000651	(3; 0.47%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.073 ±0.019	(±1.8%)
Downstream	1.626 ±0.022	(±1.4%)

Sector 62000030: Railway Passenger Transport (Rp)

Railway passenger transport services

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of water use and land disturbance are well below average, while greenhouse emissions are 25% below average and energy use is 10% above average. The social indicators show employment 10% below average, income 25% above average and a negative government revenue indicator due to direct subsidies. The financial indicators show that the operating surplus is 25% below average, export propensity 25% above average and import penetration 55% below average. Future investment into rail seems central to the complexities of urban design which are now grappling with the land use, air pollution, and congestion implications of increasing car use.

Sector Description

Australia has around 44 000 km of railway track with most of the gross activity in bulk freight haulage. However rail provides approximately 630 million passenger trips with 618 million (98%) in urban areas and 10 million (2%) in non-urban. Heavy rail in urban areas accounts for 75% of all passengers. Airlines provide 32 million non-urban passenger trips compared to rail's 10 million per year. Rail accounts for 2% of non-urban travel on a passenger kilometre basis compared to bus with 8%, air with 19%, and cars with 71%. There are 3 000 rail passenger carriages with 90% of these electric and the remainder diesel rail cars. Urban heavy rail has an energy cost of approximately 3 MJ (10^6J) per passenger kilometre compared to 5 MJ per passenger kilometre for private cars on a full life cycle basis. Rail industry lobby groups propose enhanced investment into urban rail, in particular to relieve land use by cars (30% of urban land), congestion costs ($13 billion per year), noise pollution and a wide range of urban air pollutants including carbon monoxide and nitrous oxide. Very fast train networks have been proposed for the eastern seaboard, but have not progressed past the project evaluation stage.

Place of Industry in the Economy

The railway passenger transport sector ranks 70th out of 135 sectors in terms of value adding in the economy and contributes 0.22% of GDP in this analysis. It has moderate employment generation with 15 000 direct employment years used to provide rail transport for final consumers, and another 9 000 in its upstream suppliers giving a total of 24 000 employment years. It has relatively small requirements for land and water with less than one tenth of one percent of national total. It is responsible for around four tenths of one percent of primary energy use and greenhouse emissions. In financial flow terms, exports outweigh imports by a ratio of 4:1. In this year's data, rail received direct government subsidies of $820 million.

Strategic Overview

The spider diagram for the railway passenger sector reveals a reasonably balanced TBL account for eight indicators, with below average performance for two indicators of government revenue and operating surplus. The main upstream issue for the sector is the greenhouse intensity of electricity for electric trains which form the majority for urban commuting. Downstream issues in Australia relate to passenger safety and the high media visibility of relatively infrequent train accidents which is turn are related to the levels of long term investment into infrastructure and management systems.

TBL Account #1

The financial indicator of gross operating surplus is 25% below the economy wide average and about one half of this is a direct within sector effect with smaller contributions from electricity production (5%), property development (5%), wholesale trade (2%), steel products (2%) and equipment repairs (2%). The social indicator of employment generation is slightly below average with a similar composition to the operating surplus. The environmental indicator of greenhouse emissions is 25% below the economy wide average. More recent data will probably improve the operating surplus due to a number of institutional changes underway. However corporate viability issues in some states may negatively affect the economy wide outcome.

TBL Accounts #2 and #3

The second TBL account shows that tourism driven export propensity is 25% greater than average, the social indicator of income is 25% above average and water use is 80% below average. The direct effect is dominant in the export and income indicators. The third TBL account shows that import penetration is 55% below average, government revenue is negative, and land disturbance is 95% below average. In the medium term, the government revenue indicator may require attention, but much of the perceived problem of an inefficient rail system relates to national transport priorities.

Structural Path Analysis and Linkages

Although the greenhouse indicator is currently below the economy wide average, it may require improvement if rail passenger transport is to position itself advantageously in relation to private cars and aeroplane travel. Electricity production makes up 45% of the greenhouse indicator followed by direct fuel combustion of 13%. Minor contributors include sleepers (5%), steel making for rails and construction materials (2%), coal mining for electricity production (2%), and diesel distilling (1%).

Rail passenger transport provides an average stimulus to the sector's upstream suppliers such as steel rails, railway equipment, electricity supply, wholesale trade and property development. There are very low downstream linkages as most of the effect is dissipated by private consumption.

Future Trends in Sector

Under the base case scenario in the *Future Dilemmas* study urban transit requirements will increase by at least 20% in Sydney and Melbourne and as much as 60% in Brisbane and Perth under the internal migration assumptions. Current policy settings focus on providing more roads to meet the demand and this can provide suitable environmental outcomes if there is a modal shift from cars to buses for example. However recent polling in Sydney shows a marked consumer preference for fewer private cars and more train travel for activities within the city. How public policy unfurls over the next 20 years is thus highly uncertain as all public transport infrastructure requires long lead times and large funding commitments over intergenerational timeframes.

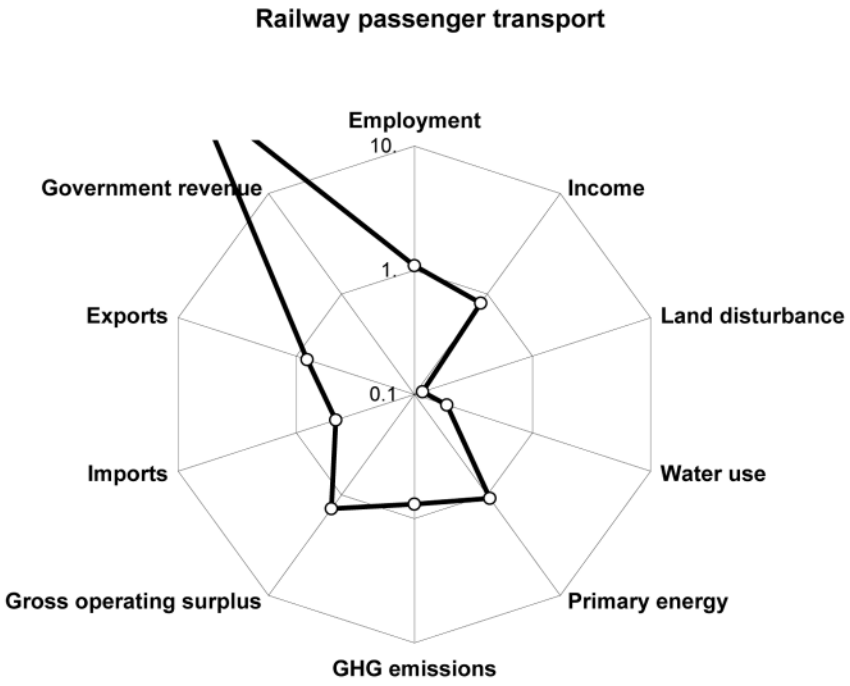
Innovation and Technical Opportunities

Tourism and business travel on Australia's east coast is the most likely area of innovation in this sector, specifically the linking of Melbourne, Sydney and Brisbane and a number of regional cities with a fast train network. The most recent studies suggest a 350 km/hour infrastructure would cost $50 billion, take 20 years to fully implement, and be able to capture a significant market share. In energy and greenhouse terms, current high speed trains with reasonable passenger load factors can operate for 2 MJ (10^6J) per passenger km compared to 5 MJ for intercity air travel. This may confer significant greenhouse benefits to east coast intercity travel, which is forecast to more than triple over the next 50 years. Reducing the greenhouse content of base load electricity would improve rail's energy and CO_2 advantages as intercity plane travel approaches its physical efficiency limits.

Sector **Railway passenger transport** **(Rp)**

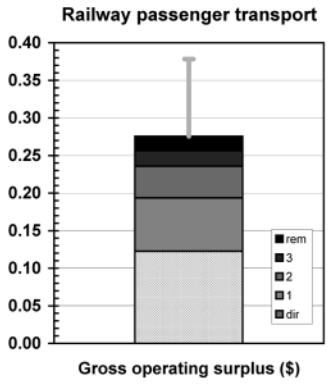
Railway passenger transport services

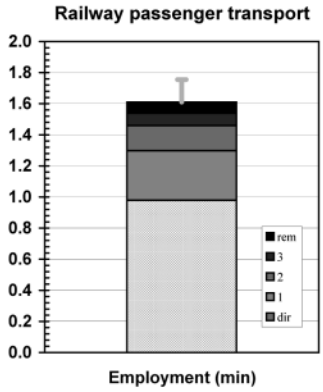
Spider diagram

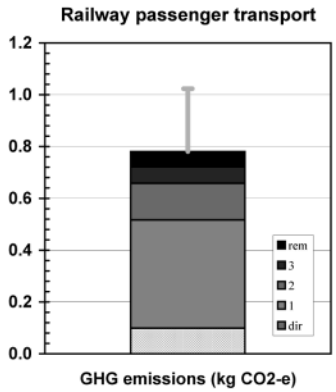


Bar graphs

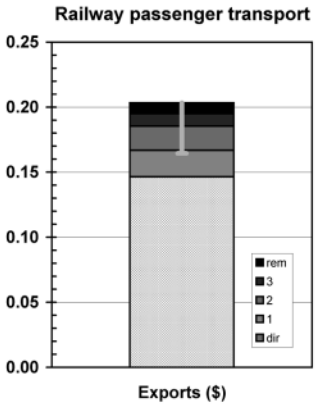
Account #1

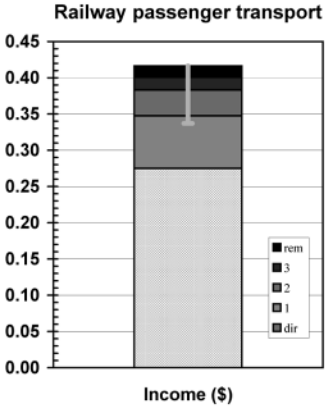


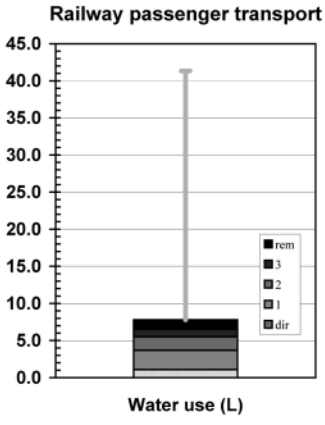




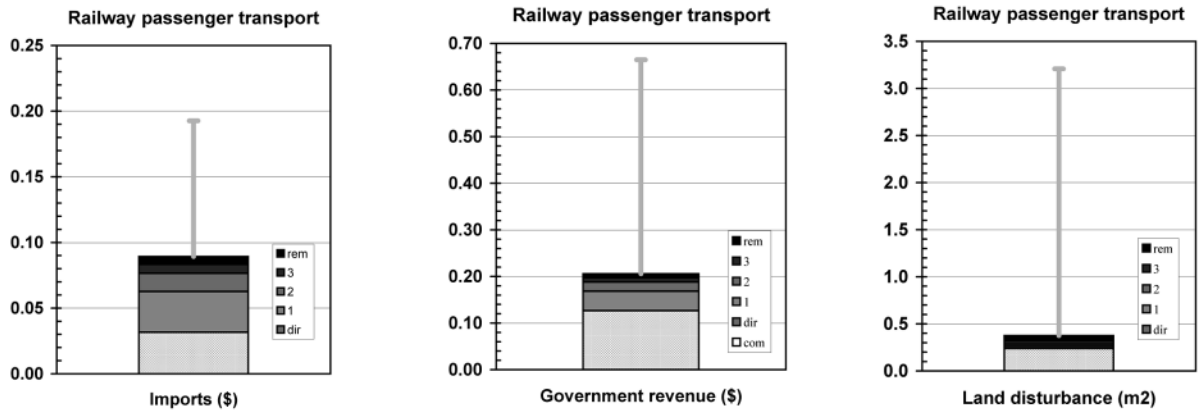
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 1,354.1	(0.51% of total)	($m 1,192.0 domestically produced)
Government final consumption	$m 408.1	(0.46% of total)	($m 408.1 domestically produced)
Gross fixed capital expenditure	$m 0.0		
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 1,762.2**	**(0.38% of GNE)**	**($m 1,600.1 domestically produced)**
Exports	$m 275.0	(0.33% of total)	($m 275.0 domestically produced)
Final demand	**$m 2,037.2**	**(0.38% of GNT)**	**($m 1,875.1 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 516.3	(0.30% of total)	
Gross operating surplus	$m 230.1	(0.12% of total)	
Taxes less subsidies	$m 237.4	(0.28% of total)	
Sectoral GDP*	**$m 983.8**	**(0.22% of GDP)**	
Imports	$m 59.4	(0.06% of total)	
Primary inputs	**$m 1,043.2**	**(0.19% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 230.1	(0.12%)	$m 229.7	(0.12%)	$m 516.7	(0.27%)
Exports ($m)	$m 275.0	(0.33%)	$m 274.6	(0.33%)	$m 381.2	(0.46%)
Imports ($m)	$m 59.4	(0.06%)	$m 59.3	(0.06%)	$m 167.5	(0.17%)
Employment (e-y)	14,734 e-y	(0.21%)	14,710 e-y	(0.21%)	24,200 e-y	(0.34%)
Income ($m)*	$m 516.3	(0.30%)	$m 515.4	(0.30%)	$m 780.9	(0.46%)
Government revenue ($m)†	-$m 609.7	- (0.56%)	-$m 610.1	- (0.56%)	-$m 461.2	- (0.43%)
GHG emissions (kt CO_2-e)	186 kt	(0.04%)	185 kt	(0.04%)	1,465 kt	(0.28%)
Water use (ML)	2,005 ML	(0.01%)	2,002 ML	(0.01%)	14,624 ML	(0.07%)
Land disturbance (kha)	45 kha	(0.03%)	45 kha	(0.03%)	71 kha	(0.04%)
Primary energy (TJ)	2,656 TJ	(0.07%)	2,652 TJ	(0.07%)	15,503 TJ	(0.40%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.12	0.28	0.38
Exports ($)	0.15	0.20	0.16
Imports ($)	0.03	0.09	0.19
Employment (min)	0.98	1.61	1.75
Income ($)	0.27	0.42	0.34
Government revenue ($)	-0.33	-0.25	0.21
GHG emissions (kg CO_2-e)	0.10	0.78	1.02
Water use (L)	1.07	7.80	41.32
Land disturbance (m^2)	0.24	0.38	3.21
Primary energy (MJ)	1.41	8.27	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Rp	0.123	(0; 44.%)	Rp	0.979	(0; 61.%)	El Rp	0.357	(1; 46.%)
El Rp	0.0144	(1; 5.2%)	Sm Rp	0.0437	(1; 2.7%)	Rp	0.0988	(0; 13.%)
Pd Rp	0.0137	(1; 5.%)	Wt Rp	0.0412	(1; 2.6%)	Hw Rp	0.0209	(1; 2.7%)
Wt Rp	0.00573	(1; 2.1%)	Nb Rp	0.038	(1; 2.4%)	Fr Hw Rp	0.0204	(2; 2.6%)
Sm Rp	0.00499	(1; 1.8%)	Pd Rp	0.0329	(1; 2.%)	Is Sm Rp	0.0142	(2; 1.8%)
Rv Rp	0.00437	(1; 1.6%)	El Rp	0.016	(1; 1.%)	Bl El Rp	0.009	(2; 1.2%)
Nb Rp	0.00372	(1; 1.3%)	Rw Rp	0.0135	(1; 0.84%)	Fo Rp	0.0083	(1; 1.1%)
Bl El Rp	0.0023	(2; 0.83%)	Rv Rp	0.0117	(1; 0.73%)	El Pd Rp	0.00652	(2; 0.84%)
Ne Rp	0.0022	(1; 0.8%)	Fm Rp	0.00992	(1; 0.62%)	Wt Rp	0.00571	(1; 0.73%)
Cm Rp	0.00188	(1; 0.68%)	Rh Rp	0.00916	(1; 0.57%)	Is Rp	0.00516	(1; 0.66%)
Sf Rp	0.00167	(1; 0.61%)	Bs Rp	0.00894	(1; 0.55%)	Is Rw Rp	0.00384	(2; 0.49%)
Is Sm Rp	0.00165	(2; 0.6%)	Gv Rp	0.0088	(1; 0.55%)	El Rw Rp	0.00309	(2; 0.4%)
Ts Rp	0.00152	(1; 0.55%)	In Rp	0.00767	(1; 0.48%)	Ch Rp	0.00269	(1; 0.34%)
Rh Rp	0.0015	(1; 0.54%)	Ne Rp	0.00747	(1; 0.46%)	Oi Fo Rp	0.0025	(2; 0.32%)
Rw Rp	0.00142	(1; 0.52%)	Ts Rp	0.00685	(1; 0.43%)	El Sm Rp	0.00223	(2; 0.29%)
Sf In Rp	0.00136	(2; 0.49%)	Fm Sm Rp	0.00667	(2; 0.41%)	Nb Rp	0.00218	(1; 0.28%)
Ms Rp	0.00127	(1; 0.46%)	Bs Pd Rp	0.00596	(2; 0.37%)	El Is Sm Rp	0.00187	(3; 0.24%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Rp	0.146	(0; 72.%)	Rp	0.275	(0; 66.%)	El Rp	1.97	(1; 25.%)
Rw Rp	0.00566	(1; 2.8%)	Pd Rp	0.0123	(1; 3.%)	Rp	1.07	(0; 14.%)
Wt Rp	0.00468	(1; 2.3%)	Wt Rp	0.00885	(1; 2.1%)	Wa Pd Rp	0.374	(2; 4.8%)
Bl El Rp	0.00349	(2; 1.7%)	Sm Rp	0.00754	(1; 1.8%)	Sm Rp	0.278	(1; 3.6%)
Sm Rp	0.00154	(1; 0.76%)	Rw Rp	0.00665	(1; 1.6%)	Dc Dp Rp	0.234	(2; 3.%)
Is Sm Rp	0.00126	(2; 0.62%)	Nb Rp	0.00566	(1; 1.4%)	Wa El Rp	0.114	(2; 1.5%)
Nf Sm Rp	0.00104	(2; 0.51%)	El Rp	0.00434	(1; 1.%)	Bl El Rp	0.0467	(2; 0.6%)
Oi Fo Rp	0.000807	(2; 0.4%)	In Rp	0.00332	(1; 0.8%)	Vf Pd Rp	0.0439	(2; 0.56%)
Ma Rp	0.000661	(1; 0.33%)	Gv Rp	0.00221	(1; 0.53%)	Vf Rp	0.042	(1; 0.54%)
Pd Rp	0.000652	(1; 0.32%)	Rv Rp	0.00188	(1; 0.45%)	Is Sm Rp	0.0377	(2; 0.48%)
In Rp	0.000644	(1; 0.32%)	Ne Rp	0.00171	(1; 0.41%)	Pd Rp	0.037	(1; 0.47%)
Lg Rp	0.00054	(1; 0.27%)	Ts Rp	0.0016	(1; 0.38%)	Wa Rp	0.0366	(1; 0.47%)
Ee Rw Rp	0.000521	(2; 0.26%)	Fm Rp	0.00155	(1; 0.37%)	El Pd Rp	0.0361	(2; 0.46%)
Fm Rp	0.000511	(1; 0.25%)	Ms Rp	0.00132	(1; 0.32%)	Wa Ms Rp	0.0326	(2; 0.42%)
Is Rp	0.000457	(1; 0.22%)	Cm Rp	0.00118	(1; 0.28%)	Wa Bs Rp	0.0274	(2; 0.35%)
Wt Rw Rp	0.000393	(2; 0.19%)	Ed Rp	0.00114	(1; 0.27%)	Sm Rw Rp	0.0267	(2; 0.34%)
Fm Sm Rp	0.000344	(2; 0.17%)	Bs Rp	0.0011	(1; 0.26%)	Bc Mp Rp	0.0261	(2; 0.34%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Rp	0.0316	(0; 35.%)	Rp	0.126	(0; 61.%)	Rp	0.24	(0; 64.%)
Rw Rp	0.00876	(1; 9.8%)	Pd Rp	0.00809	(1; 3.9%)	Hw Rp	0.0108	(1; 2.9%)
Sm Rp	0.00358	(1; 4.%)	Rw Rp	0.00706	(1; 3.4%)	Wo Tx Cl Rp	0.0074	(3; 2.%)
Fo Rp	0.00272	(1; 3.%)	Wt Rp	0.00414	(1; 2.%)	Bc Mp Rp	0.00721	(2; 1.9%)
Pd Rp	0.00197	(1; 2.2%)	In Rp	0.00357	(1; 1.7%)	Fr Hw Rp	0.00656	(2; 1.7%)
Wt Rp	0.00133	(1; 1.5%)	Sm Rp	0.00289	(1; 1.4%)	El Rp	0.00577	(1; 1.5%)
Nb Rp	0.00126	(1; 1.4%)	El Rp	0.00271	(1; 1.3%)	Bc Mp Ho Rp	0.00431	(3; 1.1%)
Ne Rp	0.00106	(1; 1.2%)	Nb Rp	0.00238	(1; 1.2%)	Bc Mp Ho Pd	0.00234	(4; 0.62%)
El Rp	0.001	(1; 1.1%)	Rv Rp	0.00116	(1; 0.56%)	Wo Tx Tp Rp	0.00193	(3; 0.51%)
Ma Rp	0.000781	(1; 0.87%)	Ne Rp	0.000858	(1; 0.42%)	Wo Tx Rw Rp	0.00162	(3; 0.43%)
Rh Rp	0.000773	(1; 0.87%)	Ts Rp	0.00079	(1; 0.38%)	Bc Mp Pd Rp	0.00159	(3; 0.42%)
Fm Rp	0.000671	(1; 0.75%)	Gv Rp	0.00077	(1; 0.37%)	Wo Tx Wt Rp	0.00147	(3; 0.39%)
Pa Rp	0.000647	(1; 0.72%)	In Pd Rp	0.00074	(2; 0.36%)	Wo Tx Rp	0.00139	(2; 0.37%)
Is Sm Rp	0.000593	(2; 0.66%)	Ms Rp	0.000627	(1; 0.3%)	Dc Dp Rp	0.00122	(2; 0.32%)
Rv Rp	0.000565	(1; 0.63%)	Cm Rp	0.000563	(1; 0.27%)	Sm Rp	0.0011	(1; 0.29%)
Ap Rp	0.000536	(1; 0.6%)	Fm Rp	0.000543	(1; 0.26%)	Bc Mp Ch Rp	0.00107	(3; 0.28%)
Ee Rw Rp	0.000509	(2; 0.57%)	Sf Rp	0.000467	(1; 0.23%)	Wo Tx Sm Rp	0.000982	(3; 0.26%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.984 ±0.018	(±1.8%)
Downstream	0.003 ±0.000	(±5.3%)

Sector 65000010: Pipeline Transport (Pi)

Pipeline transport services

Short Summary

The pipeline transport sector reveals a positive environmental account with water use and land disturbance well below average, energy use 5% above average and greenhouse emissions 25% below average. The social indicators show employment generation is 10% below average, income is 25% above average and government revenue is equal to average. The financial indicators show that operating surplus is 25% below average, export propensity is 60% below average and import penetration is 50% below average. The sector provides an average stimulus to upstream suppliers but has larger than average downstream effects. Increasingly, the pipeline sector will revitalise transport function by replacing truck and train transport as the main mode of bulk transport. Pipelines will become more important for transporting bulk commodities such as mineral slurries over longer distances to treatment plants and shipping ports.

Sector Description

The sector transports resources by pipeline. The analysis is complicated by industry and ownership re-organisations that separate for example, new gas pipelines out of the gas production and distribution sector, into this pipeline transport sector. The sector will be prominent in the future transport of mining ores as slurries and some agricultural products. Current operational examples include the 300 km Pasminco slurry pipeline carrying 780 000 tonnes of zinc concentrate and 67 000 tonnes of lead concentrate per year from the Century mine to Kurumba in North Queensland, and an 83 km iron ore concentrate pipeline from the Savage River mine in Tasmania to the north west coast. Water and sewage pipelines are a large part of national infrastructure, but are mostly included within the water supply sector (Wa) unless they have been split off as a separate company.

Place of Industry in the Economy

The pipeline transport sector is ranked 102nd out of 135 sectors in terms of value adding in the economy and contributes 0.11% of GDP in this analysis. It is a small generator of employment with 1 500 direct employment years embodied in final demand, and another 1 000 years in the sector's upstream suppliers giving a total of 2 500 employment years. In addition it contributes 6 000 employment years to the final demand of downstream industries such as non-ferrous metal products, wholesale trade, electricity supply, and domestic construction. It has relatively minor requirements for water and land resources, and is responsible for less than one tenth of one percent of energy use and greenhouse emissions. Imports outweigh exports appreciably because transported material is mostly accounted for in its own sector.

Strategic Overview

The pipeline transport sector provides a relatively good TBL account with two outliers for export propensity and operating surplus. The upstream issues for the sector include the construction process opening a pathway for the ingress of feral plants and animals, the conversion process that makes material suitable for pipeline transport, and the energy cost of pipeline pumping. The energy indicator is less important as pipelines appear to offer a ready substitution option for road and rail if diesel prices rise substantially due to constraints in oil supply. Downstream issues relate mainly to the danger or toxicity posed by the transported material in the unlikely case of a pipeline breakage. A future hydrogen economy will pose some material challenges since hydrogen may cause brittleness in normal pipeline steels. The sector's importance will markedly increase in the future.

TBL Account #1

The financial indicator of gross operating surplus is 25% below the economy wide average and about 40% of the effect is direct with contributions from electricity (5%), property services, wholesale trade (2%), structural metal products (2%) and mechanical repairs (2%). The social indicator of employment generation is 10% below average, and two thirds of this is a direct effect with smaller contributions from structural metal products, wholesale trade, construction and property development. The environmental indicator of greenhouse emissions is 25% below average and one half of this is due to the upstream electricity production sector with a direct sector effect of 9% due to fuel combustion.

TBL Accounts #2 and #3

In the second TBL account, the export propensity indicator is less relevant since pipelines are a distant contributor to an exported good or product, with the delivered gas, water and raw product receiving most of the attributed effect. The social indicator of income is 25% above average and three quarters of this is a direct effect. The environmental indicator of water use is 80% below average. In the third TBL account, the import penetration indicator is 50% below average as infrastructure in this sector is mostly locally made. The social indicator of government revenue is equal to average. The environmental indicator of land disturbance is minimal, but pipeline construction could provide a route for access or weed impacts, leading to broader disturbance.

Structural Path Analysis and Linkages

In this analysis, the operating surplus is 20% below the economy wide average. The structural path analysis reveals 44% of the effect is a direct one and so there may be scope for improvement through within sector management. Other contributions include electricity production (5%), property development (5%), structural metal products (2%), mechanical repairs (2%), non-residential construction and black coal mining for electricity production (1% each).

The pipelines sector provides an average stimulus to upstream suppliers such as steel products, electricity supply, wholesale trade and property development. The downstream linkages are larger than average and suggest that expansion of the pipeline sector must be paralleled by a broad-based expansion of activity in sectors such as metal recycling, electricity supply, domestic home construction, wholesale trade and accommodation cafes and restaurants.

Future Trends in Sector

Pipeline transport is generally unrecognised as a transport mode in many parts of the world because it is not visually prominent. As well as the liquid, slurry, and gas pipeline types already mentioned, a number of additional prototypes are under practical scale testing driven by environmental and safety considerations. Capsule pipelines driven by pneumatic methods allow the safe delivery of different product types. In future, pipelines may be driven electromagnetic methods. It will be possible to send different materials in batches along the same pipeline, or to lay clusters of pipelines at the same time (each for its own product), so improving the efficiency and safety of delivery.

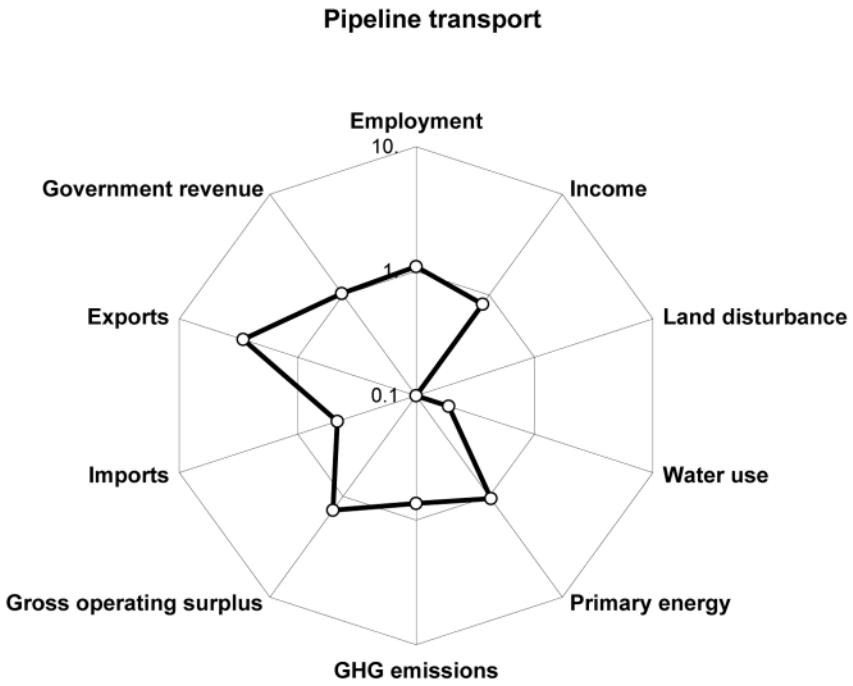
Innovation and Technical Opportunities

The prospective transition to a hydrogen economy requires an extensive augmentation of the current pipeline network since hydrogen requires special pipes in both chemical composition and structural integrity. Given the wide range of materials such as slurries and solids that will be transported by pipelines in the future, an increased knowledge of fluid flows will be required to ensure the energy costs of delivery are minimised. Inspection and management systems will be an essential aspect of these advanced pipeline systems if they are to replace traditional freight modes.

Sector **Pipeline transport** **(Pi)**

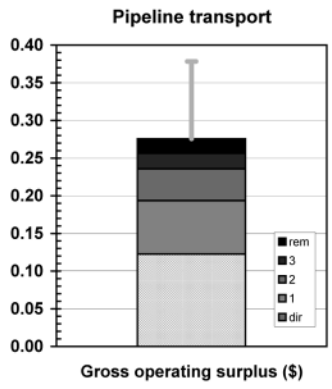
Pipeline transport services

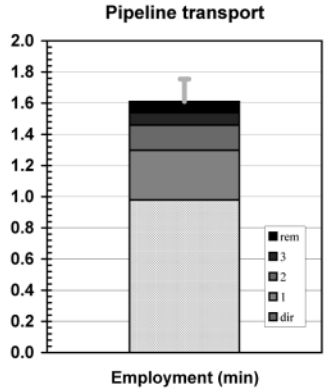
Spider diagram

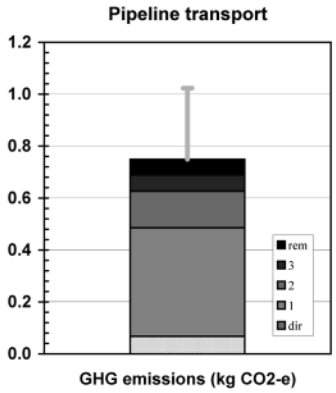


Bar graphs

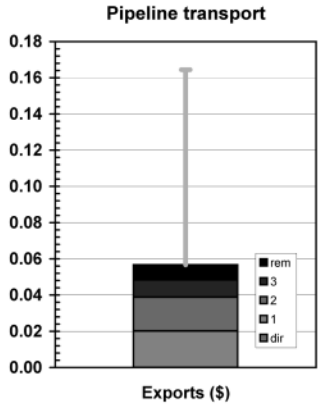
Account #1

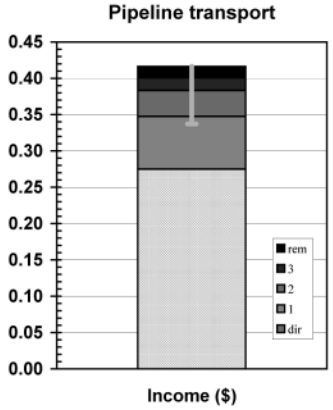


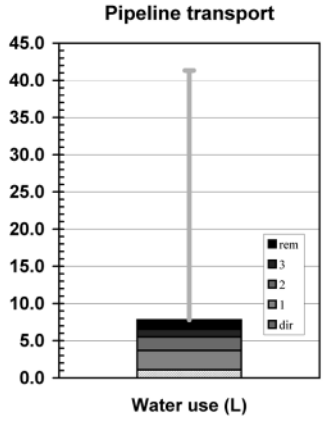




Account #2







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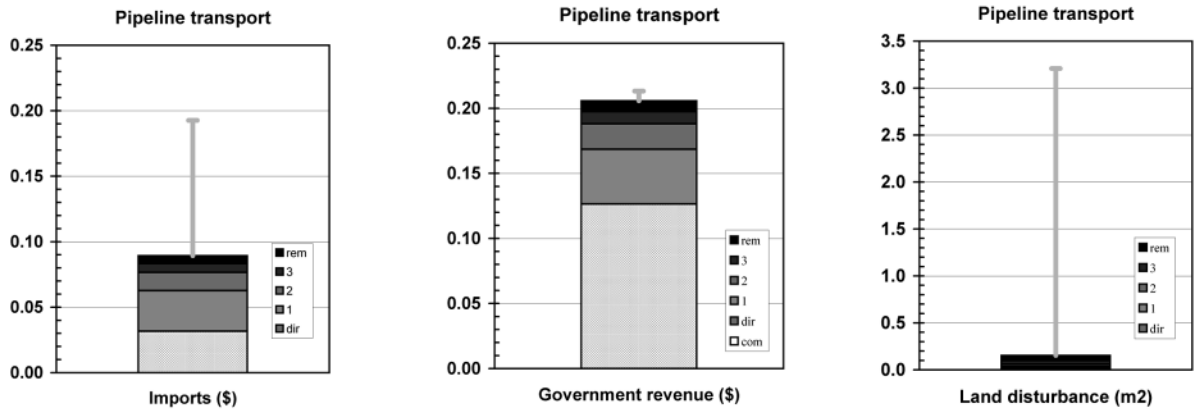


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 199.3	(0.08% of total)	($m 199.3 domestically produced)
Government final consumption	$m 0.0		
Gross fixed capital expenditure	$m 0.0		
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 199.3**	**(0.04% of GNE)**	**($m 199.3 domestically produced)**
Exports	$m 0.0		
Final demand	**$m 199.3**	**(0.04% of GNT)**	**($m 199.3 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 250.2	(0.15% of total)	
Gross operating surplus	$m 111.5	(0.06% of total)	
Taxes less subsidies	$m 115.1	(0.13% of total)	
Sectoral GDP*	**$m 476.8**	**(0.11% of GDP)**	
Imports	$m 28.8	(0.03% of total)	
Primary inputs	**$m 505.5**	**(0.09% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 111.5	(0.06%)	$m 24.4	(0.01%)	$m 54.9	(0.03%)
Exports ($m)	$m 0.0				$m 11.3	(0.01%)
Imports ($m)	$m 28.8	(0.03%)	$m 6.3	(0.01%)	$m 17.8	(0.02%)
Employment (e-y)	7,140 e-y	(0.10%)	1,564 e-y	(0.02%)	2,572 e-y	(0.04%)
Income ($m)*	$m 250.2	(0.15%)	$m 54.8	(0.03%)	$m 83.0	(0.05%)
Government revenue ($m)†	$m 115.1	(0.11%)	$m 25.2	(0.02%)	$m 41.0	(0.04%)
GHG emissions (kt CO_2-e)	61 kt	(0.01%)	13 kt	(0.00%)	149 kt	(0.03%)
Water use (ML)	972 ML	(0.00%)	213 ML	(0.00%)	1,555 ML	(0.01%)
Land disturbance (kha)	2 kha	(0.00%)	0 kha	(0.00%)	3 kha	(0.00%)
Primary energy (TJ)	1,098 TJ	(0.03%)	240 TJ	(0.01%)	1,607 TJ	(0.04%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.12	0.28	0.38
Exports ($)	0.00	0.06	0.16
Imports ($)	0.03	0.09	0.19
Employment (min)	0.98	1.61	1.75
Income ($)	0.27	0.42	0.34
Government revenue ($)	0.13	0.21	0.21
GHG emissions (kg CO_2-e)	0.07	0.75	1.02
Water use (L)	1.07	7.80	41.32
Land disturbance (m^2)	0.02	0.15	3.21
Primary energy (MJ)	1.21	8.06	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Pi	0.123	(0; 44.%)	Pi	0.979	(0; 61.%)	El Pi	0.357	(1; 48.%)
El Pi	0.0144	(1; 5.2%)	Sm Pi	0.0437	(1; 2.7%)	Pi	0.0672	(0; 9.%)
Pd Pi	0.0137	(1; 5.%)	Wt Pi	0.0412	(1; 2.6%)	Hw Pi	0.0209	(1; 2.8%)
Wt Pi	0.00573	(1; 2.1%)	Nb Pi	0.038	(1; 2.4%)	Fr Hw Pi	0.0204	(2; 2.7%)
Sm Pi	0.00499	(1; 1.8%)	Pd Pi	0.0329	(1; 2.%)	Is Sm Pi	0.0142	(2; 1.9%)
Rv Pi	0.00437	(1; 1.6%)	El Pi	0.016	(1; 1.%)	Bl El Pi	0.009	(2; 1.2%)
Nb Pi	0.00372	(1; 1.3%)	Rw Pi	0.0135	(1; 0.84%)	Fo Pi	0.0083	(1; 1.1%)
Bl El Pi	0.0023	(2; 0.83%)	Rv Pi	0.0117	(1; 0.73%)	El Pd Pi	0.00652	(2; 0.87%)
Ne Pi	0.0022	(1; 0.8%)	Fm Pi	0.00992	(1; 0.62%)	Wt Pi	0.00571	(1; 0.76%)
Cm Pi	0.00188	(1; 0.68%)	Rh Pi	0.00916	(1; 0.57%)	Is Pi	0.00516	(1; 0.69%)
Sf Pi	0.00167	(1; 0.61%)	Bs Pi	0.00894	(1; 0.55%)	Is Rw Pi	0.00384	(2; 0.51%)
Is Sm Pi	0.00165	(2; 0.6%)	Gv Pi	0.0088	(1; 0.55%)	El Rw Pi	0.00309	(2; 0.41%)
Ts Pi	0.00152	(1; 0.55%)	In Pi	0.00767	(1; 0.48%)	Ch Pi	0.00269	(1; 0.36%)
Rh Pi	0.0015	(1; 0.54%)	Ne Pi	0.00747	(1; 0.46%)	Oi Fo Pi	0.0025	(2; 0.33%)
Rw Pi	0.00142	(1; 0.52%)	Ts Pi	0.00685	(1; 0.43%)	El Sm Pi	0.00223	(2; 0.3%)
Sf In Pi	0.00136	(2; 0.49%)	Fm Sm Pi	0.00667	(2; 0.41%)	Nb Pi	0.00218	(1; 0.29%)
Ms Pi	0.00127	(1; 0.46%)	Bs Pd Pi	0.00596	(2; 0.37%)	El Is Sm Pi	0.00187	(3; 0.25%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Rw Pi	0.00566	(1; 10.%)	Pi	0.275	(0; 66.%)	El Pi	1.97	(1; 25.%)
Wt Pi	0.00468	(1; 8.3%)	Pd Pi	0.0123	(1; 3.%)	Pi	1.07	(0; 14.%)
Bl El Pi	0.00349	(2; 6.2%)	Wt Pi	0.00885	(1; 2.1%)	Wa Pd Pi	0.374	(2; 4.8%)
Sm Pi	0.00154	(1; 2.7%)	Sm Pi	0.00754	(1; 1.8%)	Sm Pi	0.278	(1; 3.6%)
Is Sm Pi	0.00126	(2; 2.2%)	Rw Pi	0.00665	(1; 1.6%)	Dc Dp Pi	0.234	(2; 3.%)
Nf Sm Pi	0.00104	(2; 1.8%)	Nb Pi	0.00566	(1; 1.4%)	Wa El Pi	0.114	(2; 1.5%)
Oi Fo Pi	0.000807	(2; 1.4%)	El Pi	0.00434	(1; 1.%)	Bl El Pi	0.0467	(2; 0.6%)
Ma Pi	0.000661	(1; 1.2%)	In Pi	0.00332	(1; 0.8%)	Vf Pd Pi	0.0439	(2; 0.56%)
Pd Pi	0.000652	(1; 1.1%)	Gv Pi	0.00221	(1; 0.53%)	Vf Pi	0.042	(1; 0.54%)
In Pi	0.000644	(1; 1.1%)	Rv Pi	0.00188	(1; 0.45%)	Is Sm Pi	0.0377	(2; 0.48%)
Lg Pi	0.00054	(1; 0.95%)	Ne Pi	0.00171	(1; 0.41%)	Pd Pi	0.037	(1; 0.47%)
Ee Rw Pi	0.000521	(2; 0.92%)	Ts Pi	0.0016	(1; 0.38%)	Wa Pi	0.0366	(1; 0.47%)
Fm Pi	0.000511	(1; 0.9%)	Fm Pi	0.00155	(1; 0.37%)	El Pd Pi	0.0361	(2; 0.46%)
Is Pi	0.000457	(1; 0.8%)	Ms Pi	0.00132	(1; 0.32%)	Wa Ms Pi	0.0326	(2; 0.42%)
Wt Rw Pi	0.000393	(2; 0.69%)	Cm Pi	0.00118	(1; 0.28%)	Wa Bs Pi	0.0274	(2; 0.35%)
Fm Sm Pi	0.000344	(2; 0.61%)	Ed Pi	0.00114	(1; 0.27%)	Sm Rw Pi	0.0267	(2; 0.34%)
Io Is Sm Pi	0.000342	(3; 0.6%)	Bs Pi	0.0011	(1; 0.26%)	Bc Mp Pi	0.0261	(2; 0.34%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Pi	0.0316	(0; 35.%)	Pi	0.126	(0; 61.%)	Pi	0.018	(0; 12.%)
Rw Pi	0.00876	(1; 9.8%)	Pd Pi	0.00809	(1; 3.9%)	Hw Pi	0.0108	(1; 7.%)
Sm Pi	0.00358	(1; 4.%)	Rw Pi	0.00706	(1; 3.4%)	Wo Tx Cl Pi	0.0074	(3; 4.8%)
Fo Pi	0.00272	(1; 3.%)	Wt Pi	0.00414	(1; 2.%)	Bc Mp Pi	0.00721	(2; 4.7%)
Pd Pi	0.00197	(1; 2.2%)	In Pi	0.00357	(1; 1.7%)	Fr Hw Pi	0.00656	(2; 4.3%)
Wt Pi	0.00133	(1; 1.5%)	Sm Pi	0.00289	(1; 1.4%)	El Pi	0.00577	(1; 3.7%)
Nb Pi	0.00126	(1; 1.4%)	El Pi	0.00271	(1; 1.3%)	Bc Mp Ho Pi	0.00431	(3; 2.8%)
Ne Pi	0.00106	(1; 1.2%)	Nb Pi	0.00238	(1; 1.2%)	Bc Mp Ho Pd	0.00234	(4; 1.5%)
El Pi	0.001	(1; 1.1%)	Rv Pi	0.00116	(1; 0.56%)	Wo Tx Tp Pi	0.00193	(3; 1.3%)
Ma Pi	0.000781	(1; 0.87%)	Ne Pi	0.000858	(1; 0.42%)	Wo Tx Rw Pi	0.00162	(3; 1.1%)
Rh Pi	0.000773	(1; 0.87%)	Ts Pi	0.00079	(1; 0.38%)	Bc Mp Pd Pi	0.00159	(3; 1.%)
Fm Pi	0.000671	(1; 0.75%)	Gv Pi	0.00077	(1; 0.37%)	Wo Tx Wt Pi	0.00147	(3; 0.95%)
Pa Pi	0.000647	(1; 0.72%)	In Pd Pi	0.00074	(2; 0.36%)	Wo Tx Pi	0.00139	(2; 0.9%)
Is Sm Pi	0.000593	(2; 0.66%)	Ms Pi	0.000627	(1; 0.3%)	Dc Dp Pi	0.00122	(2; 0.79%)
Rv Pi	0.000565	(1; 0.63%)	Cm Pi	0.000563	(1; 0.27%)	Sm Pi	0.0011	(1; 0.72%)
Ap Pi	0.000536	(1; 0.6%)	Fm Pi	0.000543	(1; 0.26%)	Bc Mp Ch Pi	0.00107	(3; 0.69%)
Ee Rw Pi	0.000509	(2; 0.57%)	Sf Pi	0.000467	(1; 0.23%)	Wo Tx Sm Pi	0.000982	(3; 0.64%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.984 ±0.018	(±1.8%)
Downstream	1.571 ±0.019	(±1.2%)

Sector 65000020: Cable Car and Other Transport (Ot)

Cable car excluding tramway, chair lift, monorail, over-snow transport and passenger and freight transport not elsewhere classified

Short Summary

This specialist transport sector provides good environmental outcomes with energy use, greenhouse emissions, water use and land disturbance below the economy wide averages. The social indicators show employment generation is 10% below average, income is 25 % above average and government revenue is equal to average. The financial indicators show that the operating surplus is 25% below average, export propensity is 60% below average and import penetration is 50% below average. The sector shows average linkages to upstream suppliers such as structural metal, railway equipment and property development. The downstream linkages are amongst the strongest shown in this analysis and require expansion in numerous sectors in order to dissipate the effect of investment into this sector. The sector is currently relatively small, but may expand as the quest for more sustainable city structures continues. Cities such as Seattle are planning for 20 km of monorail systems in their CBD area to help link city precincts now fractured by road development and heavy traffic.

Sector Description

The specialist transport sector represents the residual components after railway passenger, railway freight, and pipelines have been expanded out from a broader transport sector in the 106 sector classification normally currently used in national policy analysis. The chair lift and snow transport components relate to winter recreation in the Australian Alps, while the 8.5 km skitube in the Snowy Mountains, the 3.6 km monorail in the Sydney CBD, and shorter systems on the Gold Coast are examples of commercial passenger monorail operations. Mining operations also use monorail systems to transport ore and materials. The 7.5 km cable car connection between Cairns and Kuranda in Queensland is the longest in Australia, and is claimed to be the longest in the world.

Place of Industry in the Economy

The specialist transport sector ranks 112th out of 135 sectors in terms of value adding in the economy and contributes 0.08% of GDP in this analysis. The sector itself generates minimal employment both directly and in its upstream suppliers, but it does contribute over 5 000 employment years to downstream industries. Its requirements for energy and water and contribution to greenhouse gas emissions and land disturbance are minimal, representing less than one tenth of one percent in each of these resource areas. Imports are eight times the size of exports.

Strategic Overview

In the integrated overview provided by the spider diagram, this specialist transport sector shows a relatively good TBL outcome with two outliers for the financial indicators of export propensity and operating surplus. There are few upstream issues for specialist transportation systems such as monorails and cable cars apart from the normal ones that face all large construction projects. The downstream issues, exemplified by the proposed development in Seattle, relate to its cost effectiveness relative to for example advanced transit buses; its load capacity in relation to the total daily transport task; its visual effect both on the broad cityscape terms and as ‘the concrete pylon in the front yard’; and the degree to which iconic projects such as monorails out-compete a wide range of simple less technological innovations that could provide a broader overall solution.

TBL Account #1

The first TBL account shows the operating surplus is 25% below average, employment generation is 10% below average and greenhouse gas emissions are 30% below average. For the surplus and employment indicators, the direct effect is about 50% of the total. However for greenhouse emissions the direct effect is minor with most of the emissions contributed by the first order effect of electricity generation.

TBL Accounts #2 and #3

The second TBL account shows an export propensity 60% below average, income 25% above average and water use 80% below average. The third TBL account shows an import penetration 50% below average, government revenue equal to average and land disturbance 95% below average.

Structural Path Analysis and Linkages

While the greenhouse emissions for the sector are below the economy wide average, there may be scope for further improvement. Only 4% of the emissions come from direct fuel combustion within the sector. The electricity required for electric motors is responsible for 50% of the emissions and is thus open to improvements through purchasing electricity from lower carbon sources such as gas turbines or hydroelectricity. Other emission sources include hardwoods for construction (6%), iron and steel (3%) and black coal mining for electricity production (1%).

The specialist transport sector shows average upstream linkages to the sector's suppliers such as structural metal, railway equipment, wholesale trade and property development. The downstream linkages for this sector are amongst the strongest seen in this analysis and are surpassed only by four other sectors. If this sector expands, then a large number of other sectors in the economy must also expand to dissipate the effect of this investment. These sectors include basic materials such as plastics and steel, and services sectors such as communications, banking and technical services.

Future Trends in Sector

While the sector is a relatively minor one in terms of the nation's transport task, a number of congestion problems in major cities undergoing rapid population growth may increase demand for monorail and other specialist transport forms. Transport systems associated with snow-based recreation may be affected by future global warming impacts in alpine areas.

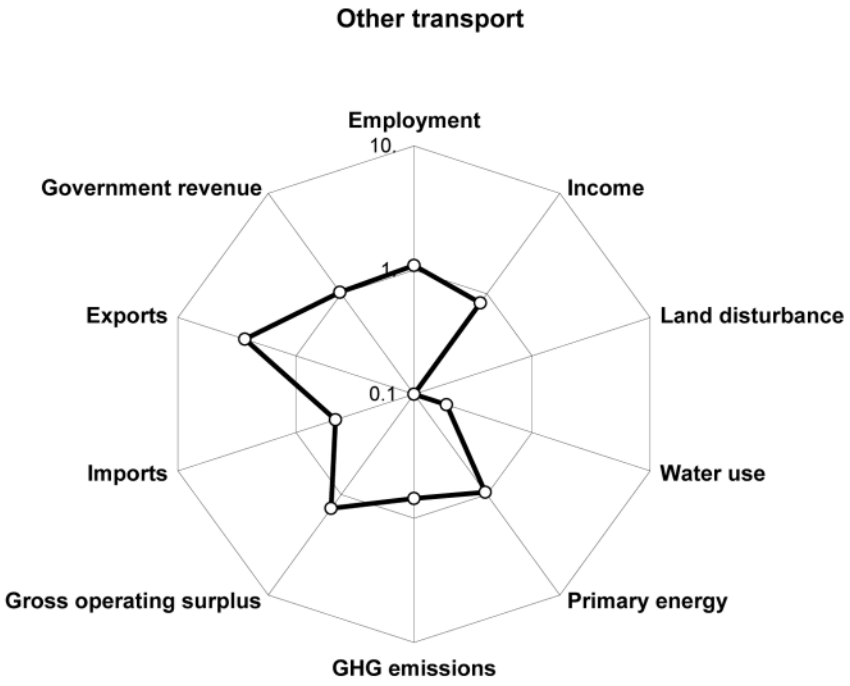
Innovation and Technical Opportunities

While it is unlikely that this specialist transport sector will substantially expand in Australia, a number of overseas cities are planning to or have already implemented monorail systems. These systems do not interfere with surface traffic, have low local air emissions, are safe, are proven technology, can be automated and can be aesthetically pleasing if designed and constructed appropriately. The city of Tokyo has eight monorail systems varying in length from 4 to 17 km. Kuala Lumpur has recently opened an 8.6 km line with 11 stations which carries 85 000 passengers per day. Las Vegas opened a 7 km line in July 2004 linking many of its key resort and tourism areas. With its historical 2 km monorail built for the World Fair in 1962, the city of Seattle is planning to open a 23 km system in late 2007 at a cost of A$3-4 billion as the first stage of a full 70 km system serving the key centres of the city. It is noteworthy that Seattle citizens voted to impose an ongoing yearly vehicle tax of 1.4% of vehicle value to underpin the capital cost of the project. In a broader context, the issue of sustainable mobility for affluent and mobile societies will not be solved solely by iconic technologies such as monorails and cable cars. The prospect of endless growth in world cities will require fully integrated solutions that develop functional and self-reliant local communities first, and then provide efficient linkages between them.

Sector **Other transport** **(Ot)**

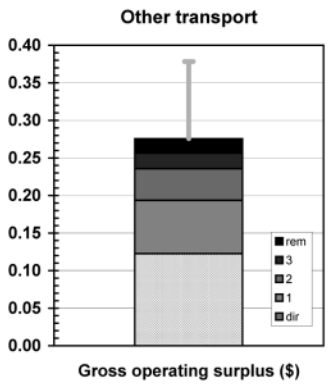
Cable car excluding tramway, chair lift, monorail, over-snow transport and passenger and freight transport not elsewhere classified

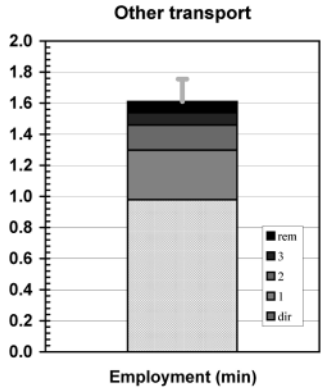
Spider diagram

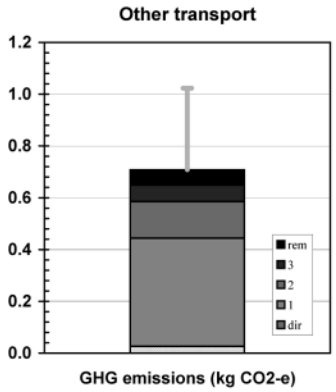


Bar graphs

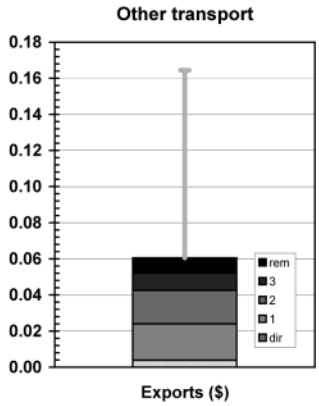
Account #1

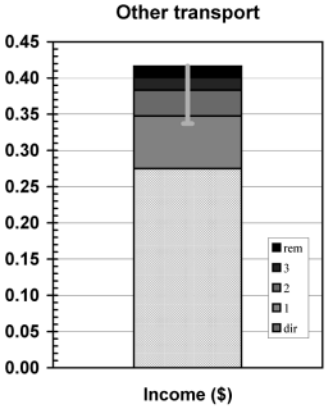


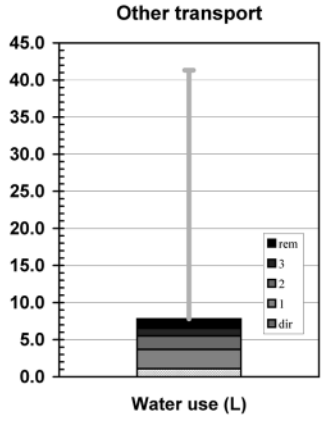




Account #2







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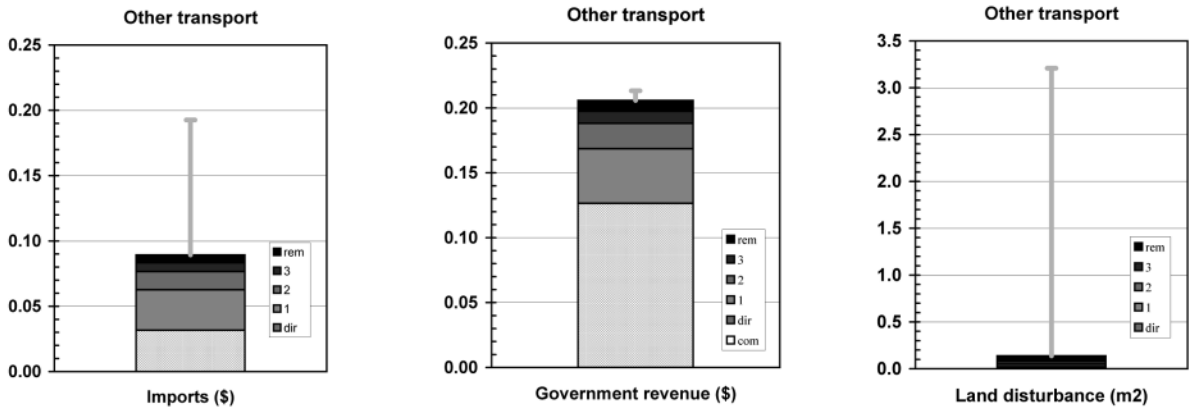


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 0.0		
Government final consumption	$m 0.0		
Gross fixed capital expenditure	$m 0.0		
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 0.0**		
Exports	$m 2.6	(0.00% of total)	($m 2.6 domestically produced)
Final demand	**$m 2.6**	**(0.00% of GNT)**	**($m 2.6 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 186.9	(0.11% of total)	
Gross operating surplus	$m 83.3	(0.04% of total)	
Taxes less subsidies	$m 86.0	(0.10% of total)	
Sectoral GDP*	**$m 356.2**	**(0.08% of GDP)**	
Imports	$m 21.5	(0.02% of total)	
Primary inputs	**$m 377.7**	**(0.07% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 83.3	(0.04%)	$m 0.3	(0.00%)	$m 0.7	(0.00%)
Exports ($m)	$m 2.6	(0.00%)	$m 0.0	(0.00%)	$m 0.2	(0.00%)
Imports ($m)	$m 21.5	(0.02%)	$m 0.1	(0.00%)	$m 0.2	(0.00%)
Employment (e-y)	5,334 e-y	(0.07%)	20 e-y	(0.00%)	33 e-y	(0.00%)
Income ($m)*	$m 186.9	(0.11%)	$m 0.7	(0.00%)	$m 1.1	(0.00%)
Government revenue ($m)†	$m 86.0	(0.08%)	$m 0.3	(0.00%)	$m 0.5	(0.00%)
GHG emissions (kt CO_2-e)	18 kt	(0.00%)	0 kt	(0.00%)	2 kt	(0.00%)
Water use (ML)	726 ML	(0.00%)	3 ML	(0.00%)	20 ML	(0.00%)
Land disturbance (kha)	0 kha	(0.00%)	0 kha	(0.00%)	0 kha	(0.00%)
Primary energy (TJ)	260 TJ	(0.01%)	1 TJ	(0.00%)	19 TJ	(0.00%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.12	0.28	0.38
Exports ($)	0.00	0.06	0.16
Imports ($)	0.03	0.09	0.19
Employment (min)	0.98	1.61	1.75
Income ($)	0.27	0.42	0.34
Government revenue ($)	0.13	0.21	0.21
GHG emissions (kg CO_2-e)	0.03	0.71	1.02
Water use (L)	1.07	7.80	41.32
Land disturbance (m^2)	0.00	0.14	3.21
Primary energy (MJ)	0.38	7.24	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Ot	0.123	(0; 44.%)	Ot	0.979	(0; 61.%)	El Ot	0.357	(1; 50.%)
El Ot	0.0144	(1; 5.2%)	Sm Ot	0.0437	(1; 2.7%)	Ot	0.0262	(0; 3.7%)
Pd Ot	0.0137	(1; 5.%)	Wt Ot	0.0412	(1; 2.6%)	Hw Ot	0.0209	(1; 2.9%)
Wt Ot	0.00573	(1; 2.1%)	Nb Ot	0.038	(1; 2.4%)	Fr Hw Ot	0.0204	(2; 2.9%)
Sm Ot	0.00499	(1; 1.8%)	Pd Ot	0.0329	(1; 2.%)	Is Sm Ot	0.0142	(2; 2.%)
Rv Ot	0.00437	(1; 1.6%)	El Ot	0.016	(1; 1.%)	Bl El Ot	0.009	(2; 1.3%)
Nb Ot	0.00372	(1; 1.3%)	Rw Ot	0.0135	(1; 0.84%)	Fo Ot	0.0083	(1; 1.2%)
Bl El Ot	0.0023	(2; 0.83%)	Rv Ot	0.0117	(1; 0.73%)	El Pd Ot	0.00652	(2; 0.92%)
Ne Ot	0.0022	(1; 0.8%)	Fm Ot	0.00992	(1; 0.62%)	Wt Ot	0.00571	(1; 0.81%)
Cm Ot	0.00188	(1; 0.68%)	Rh Ot	0.00916	(1; 0.57%)	Is Ot	0.00516	(1; 0.73%)
Sf Ot	0.00167	(1; 0.61%)	Bs Ot	0.00894	(1; 0.55%)	Is Rw Ot	0.00384	(2; 0.54%)
Is Sm Ot	0.00165	(2; 0.6%)	Gv Ot	0.0088	(1; 0.55%)	El Rw Ot	0.00309	(2; 0.44%)
Ts Ot	0.00152	(1; 0.55%)	In Ot	0.00767	(1; 0.48%)	Ch Ot	0.00269	(1; 0.38%)
Rh Ot	0.0015	(1; 0.54%)	Ne Ot	0.00747	(1; 0.46%)	Oi Fo Ot	0.0025	(2; 0.35%)
Rw Ot	0.00142	(1; 0.52%)	Ts Ot	0.00685	(1; 0.43%)	El Sm Ot	0.00223	(2; 0.31%)
Sf In Ot	0.00136	(2; 0.49%)	Fm Sm Ot	0.00667	(2; 0.41%)	Nb Ot	0.00218	(1; 0.31%)
Ms Ot	0.00127	(1; 0.46%)	Bs Pd Ot	0.00596	(2; 0.37%)	El Is Sm Ot	0.00187	(3; 0.26%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Rw Ot	0.00566	(1; 9.4%)	Ot	0.275	(0; 66.%)	El Ot	1.97	(1; 25.%)
Wt Ot	0.00468	(1; 7.7%)	Pd Ot	0.0123	(1; 3.%)	Ot	1.07	(0; 14.%)
Ot	0.0038	(0; 6.3%)	Wt Ot	0.00885	(1; 2.1%)	Wa Pd Ot	0.374	(2; 4.8%)
Bl El Ot	0.00349	(2; 5.8%)	Sm Ot	0.00754	(1; 1.8%)	Sm Ot	0.278	(1; 3.6%)
Sm Ot	0.00154	(1; 2.5%)	Rw Ot	0.00665	(1; 1.6%)	Dc Dp Ot	0.234	(2; 3.%)
Is Sm Ot	0.00126	(2; 2.1%)	Nb Ot	0.00566	(1; 1.4%)	Wa El Ot	0.114	(2; 1.5%)
Nf Sm Ot	0.00104	(2; 1.7%)	El Ot	0.00434	(1; 1.%)	Bl El Ot	0.0467	(2; 0.6%)
Oi Fo Ot	0.000807	(2; 1.3%)	In Ot	0.00332	(1; 0.8%)	Vf Pd Ot	0.0439	(2; 0.56%)
Ma Ot	0.000661	(1; 1.1%)	Gv Ot	0.00221	(1; 0.53%)	Vf Ot	0.042	(1; 0.54%)
Pd Ot	0.000652	(1; 1.1%)	Rv Ot	0.00188	(1; 0.45%)	Is Sm Ot	0.0377	(2; 0.48%)
In Ot	0.000644	(1; 1.1%)	Ne Ot	0.00171	(1; 0.41%)	Pd Ot	0.037	(1; 0.47%)
Lg Ot	0.00054	(1; 0.89%)	Ts Ot	0.0016	(1; 0.38%)	Wa Ot	0.0366	(1; 0.47%)
Ee Rw Ot	0.000521	(2; 0.86%)	Fm Ot	0.00155	(1; 0.37%)	El Pd Ot	0.0361	(2; 0.46%)
Fm Ot	0.000511	(1; 0.84%)	Ms Ot	0.00132	(1; 0.32%)	Wa Ms Ot	0.0326	(2; 0.42%)
Is Ot	0.000457	(1; 0.75%)	Cm Ot	0.00118	(1; 0.28%)	Wa Bs Ot	0.0274	(2; 0.35%)
Wt Rw Ot	0.000393	(2; 0.65%)	Ed Ot	0.00114	(1; 0.27%)	Sm Rw Ot	0.0267	(2; 0.34%)
Fm Sm Ot	0.000344	(2; 0.57%)	Bs Ot	0.0011	(1; 0.26%)	Bc Mp Ot	0.0261	(2; 0.34%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Ot	0.0316	(0; 35.%)	Ot	0.126	(0; 61.%)	Hw Ot	0.0108	(1; 7.8%)
Rw Ot	0.00876	(1; 9.8%)	Pd Ot	0.00809	(1; 3.9%)	Wo Tx Cl Ot	0.0074	(3; 5.4%)
Sm Ot	0.00358	(1; 4.%)	Rw Ot	0.00706	(1; 3.4%)	Bc Mp Ot	0.00721	(2; 5.2%)
Fo Ot	0.00272	(1; 3.%)	Wt Ot	0.00414	(1; 2.%)	Fr Hw Ot	0.00656	(2; 4.8%)
Pd Ot	0.00197	(1; 2.2%)	In Ot	0.00357	(1; 1.7%)	El Ot	0.00577	(1; 4.2%)
Wt Ot	0.00133	(1; 1.5%)	Sm Ot	0.00289	(1; 1.4%)	Bc Mp Ho Ot	0.00431	(3; 3.1%)
Nb Ot	0.00126	(1; 1.4%)	El Ot	0.00271	(1; 1.3%)	Bc Mp Ho Pd	0.00234	(4; 1.7%)
Ne Ot	0.00106	(1; 1.2%)	Nb Ot	0.00238	(1; 1.2%)	Wo Tx Tp Ot	0.00193	(3; 1.4%)
El Ot	0.001	(1; 1.1%)	Rv Ot	0.00116	(1; 0.56%)	Wo Tx Rw Ot	0.00162	(3; 1.2%)
Ma Ot	0.000781	(1; 0.87%)	Ne Ot	0.000858	(1; 0.42%)	Bc Mp Pd Ot	0.00159	(3; 1.2%)
Rh Ot	0.000773	(1; 0.87%)	Ts Ot	0.00079	(1; 0.38%)	Wo Tx Wt Ot	0.00147	(3; 1.1%)
Fm Ot	0.000671	(1; 0.75%)	Gv Ot	0.00077	(1; 0.37%)	Wo Tx Ot	0.00139	(2; 1.%)
Pa Ot	0.000647	(1; 0.72%)	In Pd Ot	0.00074	(2; 0.36%)	Ot	0.00138	(0; 1.%)
Is Sm Ot	0.000593	(2; 0.66%)	Ms Ot	0.000627	(1; 0.3%)	Dc Dp Ot	0.00122	(2; 0.89%)
Rv Ot	0.000565	(1; 0.63%)	Cm Ot	0.000563	(1; 0.27%)	Sm Ot	0.0011	(1; 0.8%)
Ap Ot	0.000536	(1; 0.6%)	Fm Ot	0.000543	(1; 0.26%)	Bc Mp Ch Ot	0.00107	(3; 0.78%)
Ee Rw Ot	0.000509	(2; 0.57%)	Sf Ot	0.000467	(1; 0.23%)	Wo Tx Sm Ot	0.000982	(3; 0.71%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.984 ±0.018	(±1.8%)
Downstream	2.257 ±0.032	(±1.4%)

Sector 6201: Railway Freight (Rf)

Railway freight transport services

Short Summary

Against the metric of one dollar of final demand, the environmental indicator of greenhouse emissions is equal to average while water use and land disturbance are 80% and 90% below average respectively. The social indicator of employment generation is 10% below average, income is 20% above average and government revenue is equal to average. The financial indicator of operating surplus is 30% below average, export propensity is 60% above average and import penetration is 55% below average. The rail freight sector underpins a range of important export industries such as coal, iron ores and grains. The rail freight task is expected to increase by around 50% by 2020, and could double by 2050 depending on future prospects for export industries such as coal. A key industry risk is balancing rail electrification and its greenhouse implications, with anticipated increases in the price of diesel fuel out to 2050 if domestic and global oil stocks become constrained. While the greenhouse indicator of kilograms of carbon dioxide equivalent per dollar derived from this analysis shows that rail freight has a higher greenhouse indicator that road freight, physical analyses show rail freight emits 50% less emissions than road freight per tonne kilometre. This suggest the indicator could be improved by increasing the prices charged for rail freight, but the key issue is the greenhouse emissions embodied in electricity from coal generation.

Sector Description

The rail freight sector was responsible for moving 535 million tonnes in the year 2001 and 140 billion tonne kilometres. The composition of freight by weight was coal (37%), ores and minerals (39%), sugar (8%), grain (4%), other bulk (8%) and non-bulk items (4%). The total rail network extends over 40 000 km (including passenger rail) with 2 000 locomotives and 92 000 freight wagons. The network expanded by 1 420 km with the opening of the AustralAsia freight line from Alice Springs to Darwin in 2004 at a project cost of $1.3 billion. The Australasian Railway Association reports that the rail freight industry includes over 180 public and private companies.

Place of Industry in the Economy

In financial terms, the rail freight sector ranks 41st out of 135 sectors in terms of value adding, and contributes 0.48% of GDP in this analysis. It has direct employment requirements of 8 000 employment years with an additional 6 000 years in the sector's suppliers giving a total of 14 000 employment years. In addition, it contributes 24 000 employment years to downstream sectors such as black coal and iron ore mining. It requires one third of one percent of national energy use and emits one fifth of one percent of greenhouse emissions. Water use and land disturbance are both less than one tenth of one percent of national totals. In financial terms, exports are seven times the size of imports.

Strategic Overview

The strategic overview in the spider diagram shows a reasonably balanced TBL outcome with small outliers for operating surplus and primary energy use. Whether rail freight is competitive with road freight is an ongoing debate with claims that infrastructure investment has favoured road transport for more than two decades. The Australasian Railway Association promotes rail freight as underpinning the international competitiveness of key export industries (coal, iron ore, grain etc.) and claims that efficient rail removes large numbers of trucks from national highways and shipping ports routes in the inner city. The major upstream issue is the need to upgrade rail infrastructure.

TBL Account #1

The financial indicator of operating surplus is 30% below the economy wide average with half being a direct effect and smaller contributions from second and third order suppliers such as electricity generation (5%) and equipment and plant hire (5%). The social indicator of employment generation is 10% below the economy wide average with two thirds a direct effect and minor contributions from metal products (3%) and wholesale trade (3%). The environmental indicator of greenhouse emissions is equal to average with electricity generation (for electric freight trains) and direct diesel use in locomotives each responsible for about one third of the effect. This first TBL account portrays a reasonable outcome across the three issues. Subsequent analysis may show improved financial indicators for the freight sector if improved logistics, management efficiencies and increased turnover and profits, result from newly privatised corporate structures.

TBL Accounts #2 and #3

In the second TBL account, export propensity is 60% above the average with four fifths a direct effect due to the sector's facilitation of coal, iron ore and other bulk export industries. The social indicator of income is 20% above average with two thirds a direct effect while water use is 80% below average with most of the effect due to the sector's suppliers. In the third TBL account, the financial indicator of import penetration is 55% below average with one third a direct effect. The social indicator of government revenue is equal to average, similar to revenue outcomes for air and road transport. The land disturbance indicator is 90% below average, reflecting the relatively small direct land footprint of the rail transport sector. Rail industry sources claim that the direct area requirement for rail is one third that of an equivalent road system.

Structural Path Analysis and Linkages

The structural path analysis for the greenhouse indicator shows the direct effect of diesel combustion and the first order effect of electricity generation each contribute 34% of the indicator. Minor effects are shown by the hardwoods sector (for sleepers), and the production chain of 'basic iron and steel to structural metal products' (for rails) which contribute 2% each.

Railway freight shows a strong downstream linkages to sectors such as black coal, wholesale trade, basic iron and steel and crude oil, suggesting that any expansion of rail freight must be led by expansion in these sectors. Increased consumer demand for rail freight gives an average upstream stimulus to the supplying industries and in particular to, plant and equipment hire, wholesale trade, railway equipment and structural metal products.

Future Trends in Sector

The base case scenario from the CSIRO *Future Dilemmas* study anticipates that the national freight task in tonne kilometres will increase 50% by 2020 and more than double by 2050. This is reasonably consistent with analyses by the Bureau of Transport and Regional Economics which predict increases of 40-50% by the year 2020.

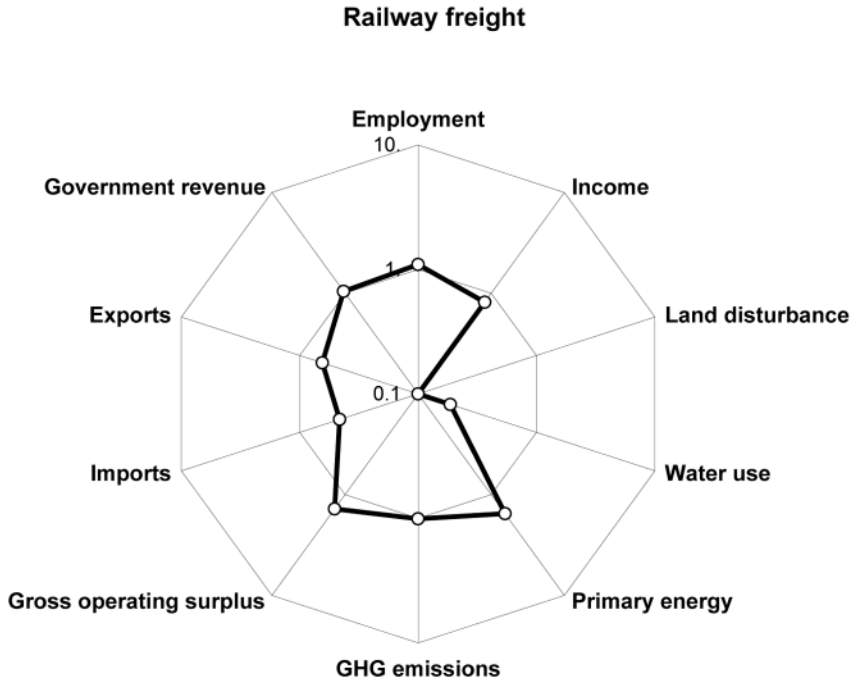
Innovation and Technical Opportunities

Sustained national investment in rail freight infrastructure combined with innovations in logistics management and company arrangements could improve a range of TBL outcomes. The energy and greenhouse indicators for rail freight are poorer than road freight in the current analysis due to coal fired electricity for electric locomotives. Sourcing electricity from gas turbines or hydro could improve this indicator but would be more expensive. Fuel cell powered locomotives could double engine and fuel efficiencies. In the long term, investment decisions must balance inevitable price rises in diesel fuel with expansion of electrification based on abundant coal resources.

Sector **Railway freight** **(Rf)**

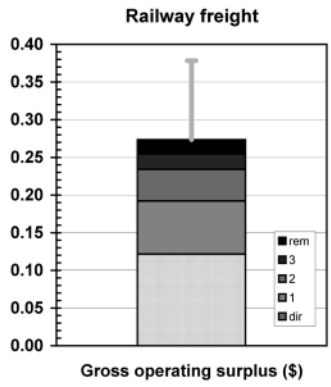
Railway freight transport services

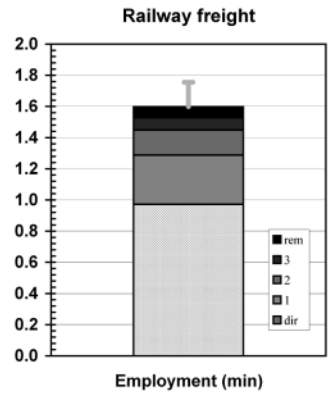
Spider diagram

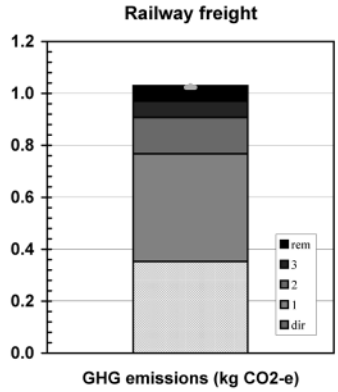


Bar graphs

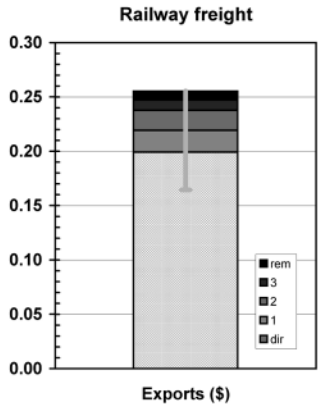
Account #1

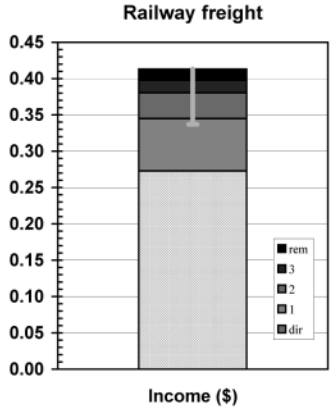


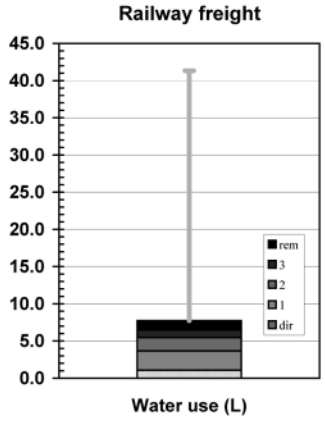




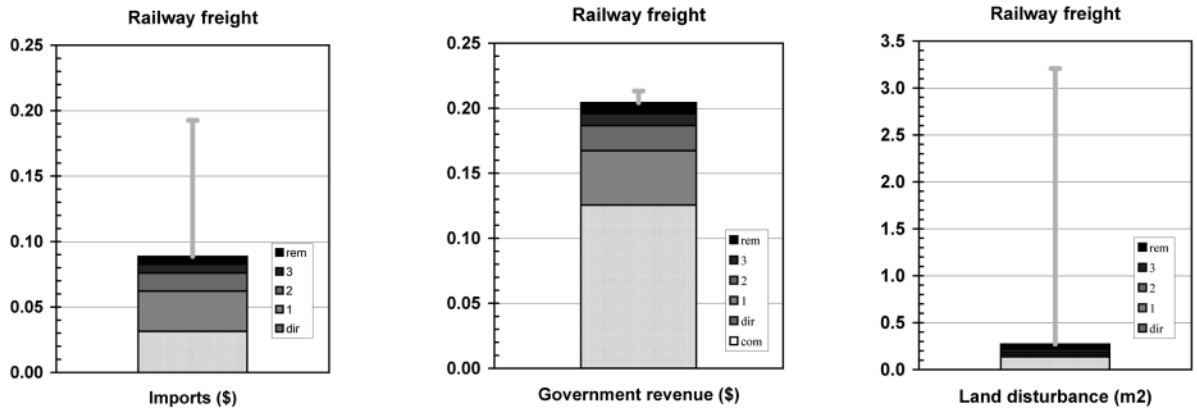
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 154.5	(0.06% of total)	($m 154.5 domestically produced)
Government final consumption	$m 0.0		
Gross fixed capital expenditure	$m 82.1	(0.08% of total)	($m 82.1 domestically produced)
Net changes in stocks	-$m 31.0	-(1.75% of total)	
Sectoral GNE	**$m 205.6**	**(0.04% of GNE)**	**($m 205.6 domestically produced)**
Exports	$m 821.3	(0.99% of total)	($m 821.3 domestically produced)
Final demand	**$m 1,026.9**	**(0.19% of GNT)**	**($m 1,026.9 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 1,124.9	(0.66% of total)	
Gross operating surplus	$m 501.4	(0.26% of total)	
Taxes less subsidies	$m 517.3	(0.61% of total)	
Sectoral GDP*	**$m 2,143.6**	**(0.48% of GDP)**	
Imports	$m 129.4	(0.13% of total)	
Primary inputs	**$m 2,273.0**	**(0.42% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 501.4	(0.26%)	$m 128.6	(0.07%)	$m 289.3	(0.15%)
Exports ($m)	$m 821.3	(0.99%)	$m 210.7	(0.25%)	$m 270.3	(0.32%)
Imports ($m)	$m 129.4	(0.13%)	$m 33.2	(0.03%)	$m 93.8	(0.10%)
Employment (e-y)	32,104 e-y	(0.45%)	8,237 e-y	(0.12%)	13,551 e-y	(0.19%)
Income ($m)*	$m 1,124.9	(0.66%)	$m 288.6	(0.17%)	$m 437.2	(0.26%)
Government revenue ($m)†	$m 517.3	(0.48%)	$m 132.7	(0.12%)	$m 216.1	(0.20%)
GHG emissions (kt CO_2-e)	1,454 kt	(0.28%)	373 kt	(0.07%)	1,089 kt	(0.21%)
Water use (ML)	4,369 ML	(0.02%)	1,121 ML	(0.01%)	8,189 ML	(0.04%)
Land disturbance (kha)	56 kha	(0.03%)	14 kha	(0.01%)	29 kha	(0.02%)
Primary energy (TJ)	20,719 TJ	(0.53%)	5,316 TJ	(0.14%)	12,511 TJ	(0.32%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.12	0.27	0.38
Exports ($)	0.20	0.26	0.16
Imports ($)	0.03	0.09	0.19
Employment (min)	0.97	1.60	1.75
Income ($)	0.27	0.41	0.34
Government revenue ($)	0.13	0.20	0.21
GHG emissions (kg CO_2-e)	0.35	1.03	1.02
Water use (L)	1.06	7.74	41.32
Land disturbance (m^2)	0.14	0.27	3.21
Primary energy (MJ)	5.02	11.83	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Rf	0.122	(0; 44.%)	Rf	0.972	(0; 61.%)	El Rf	0.354	(1; 34.%)
El Rf	0.0143	(1; 5.2%)	Sm Rf	0.0434	(1; 2.7%)	Rf	0.353	(0; 34.%)
Pd Rf	0.0136	(1; 5.%)	Wt Rf	0.0409	(1; 2.6%)	Hw Rf	0.0207	(1; 2.%)
Wt Rf	0.00568	(1; 2.1%)	Nb Rf	0.0377	(1; 2.4%)	Fr Hw Rf	0.0202	(2; 2.%)
Sm Rf	0.00495	(1; 1.8%)	Pd Rf	0.0326	(1; 2.%)	Is Sm Rf	0.0141	(2; 1.4%)
Rv Rf	0.00433	(1; 1.6%)	El Rf	0.0159	(1; 1.%)	Bl El Rf	0.00893	(2; 0.87%)
Nb Rf	0.00369	(1; 1.3%)	Rw Rf	0.0134	(1; 0.84%)	Fo Rf	0.00824	(1; 0.8%)
Bl El Rf	0.00228	(2; 0.83%)	Rv Rf	0.0116	(1; 0.73%)	El Pd Rf	0.00647	(2; 0.63%)
Ne Rf	0.00219	(1; 0.8%)	Fm Rf	0.00985	(1; 0.62%)	Wt Rf	0.00567	(1; 0.55%)
Cm Rf	0.00186	(1; 0.68%)	Rh Rf	0.00909	(1; 0.57%)	Is Rf	0.00512	(1; 0.5%)
Sf Rf	0.00166	(1; 0.61%)	Bs Rf	0.00887	(1; 0.55%)	Is Rw Rf	0.00381	(2; 0.37%)
Is Sm Rf	0.00163	(2; 0.6%)	Gv Rf	0.00873	(1; 0.55%)	El Rw Rf	0.00307	(2; 0.3%)
Ts Rf	0.00151	(1; 0.55%)	In Rf	0.00761	(1; 0.48%)	Ch Rf	0.00267	(1; 0.26%)
Rh Rf	0.00149	(1; 0.54%)	Ne Rf	0.00741	(1; 0.46%)	Oi Fo Rf	0.00248	(2; 0.24%)
Rw Rf	0.00141	(1; 0.52%)	Ts Rf	0.0068	(1; 0.43%)	El Sm Rf	0.00221	(2; 0.21%)
Sf In Rf	0.00135	(2; 0.49%)	Fm Sm Rf	0.00662	(2; 0.41%)	Nb Rf	0.00216	(1; 0.21%)
Ms Rf	0.00126	(1; 0.46%)	Bs Pd Rf	0.00591	(2; 0.37%)	El Is Sm Rf	0.00185	(3; 0.18%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Rf	0.199	(0; 78.%)	Rf	0.273	(0; 66.%)	El Rf	1.96	(1; 25.%)
Rw Rf	0.00562	(1; 2.2%)	Pd Rf	0.0122	(1; 3.%)	Rf	1.06	(0; 14.%)
Wt Rf	0.00465	(1; 1.8%)	Wt Rf	0.00878	(1; 2.1%)	Wa Pd Rf	0.371	(2; 4.8%)
Bl El Rf	0.00346	(2; 1.4%)	Sm Rf	0.00748	(1; 1.8%)	Sm Rf	0.275	(1; 3.6%)
Sm Rf	0.00153	(1; 0.6%)	Rw Rf	0.0066	(1; 1.6%)	Dc Dp Rf	0.233	(2; 3.%)
Is Sm Rf	0.00125	(2; 0.49%)	Nb Rf	0.00562	(1; 1.4%)	Wa El Rf	0.113	(2; 1.5%)
Nf Sm Rf	0.00103	(2; 0.4%)	El Rf	0.00431	(1; 1.%)	Bl El Rf	0.0463	(2; 0.6%)
Oi Fo Rf	0.000801	(2; 0.31%)	In Rf	0.0033	(1; 0.8%)	Vf Pd Rf	0.0435	(2; 0.56%)
Ma Rf	0.000656	(1; 0.26%)	Gv Rf	0.00219	(1; 0.53%)	Vf Rf	0.0417	(1; 0.54%)
Pd Rf	0.000647	(1; 0.25%)	Rv Rf	0.00187	(1; 0.45%)	Is Sm Rf	0.0374	(2; 0.48%)
In Rf	0.000639	(1; 0.25%)	Ne Rf	0.0017	(1; 0.41%)	Pd Rf	0.0367	(1; 0.47%)
Lg Rf	0.000536	(1; 0.21%)	Ts Rf	0.00159	(1; 0.38%)	Wa Rf	0.0363	(1; 0.47%)
Ee Rw Rf	0.000517	(2; 0.2%)	Fm Rf	0.00154	(1; 0.37%)	El Pd Rf	0.0358	(2; 0.46%)
Fm Rf	0.000508	(1; 0.2%)	Ms Rf	0.00131	(1; 0.32%)	Wa Ms Rf	0.0323	(2; 0.42%)
Is Rf	0.000453	(1; 0.18%)	Cm Rf	0.00117	(1; 0.28%)	Wa Bs Rf	0.0272	(2; 0.35%)
Wt Rw Rf	0.00039	(2; 0.15%)	Ed Rf	0.00113	(1; 0.27%)	Sm Rw Rf	0.0265	(2; 0.34%)
Fm Sm Rf	0.000341	(2; 0.13%)	Bs Rf	0.00109	(1; 0.26%)	Bc Mp Rf	0.0259	(2; 0.34%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Rf	0.0314	(0; 35.%)	Rf	0.125	(0; 61.%)	Rf	0.137	(0; 50.%)
Rw Rf	0.0087	(1; 9.8%)	Pd Rf	0.00803	(1; 3.9%)	Hw Rf	0.0107	(1; 3.9%)
Sm Rf	0.00356	(1; 4.%)	Rw Rf	0.007	(1; 3.4%)	Wo Tx Cl Rf	0.00735	(3; 2.7%)
Fo Rf	0.0027	(1; 3.%)	Wt Rf	0.00411	(1; 2.%)	Bc Mp Rf	0.00716	(2; 2.6%)
Pd Rf	0.00196	(1; 2.2%)	In Rf	0.00355	(1; 1.7%)	Fr Hw Rf	0.00651	(2; 2.4%)
Wt Rf	0.00132	(1; 1.5%)	Sm Rf	0.00287	(1; 1.4%)	El Rf	0.00572	(1; 2.1%)
Nb Rf	0.00125	(1; 1.4%)	El Rf	0.00269	(1; 1.3%)	Bc Mp Ho Rf	0.00428	(3; 1.6%)
Ne Rf	0.00105	(1; 1.2%)	Nb Rf	0.00237	(1; 1.2%)	Bc Mp Ho Pd	0.00232	(4; 0.85%)
El Rf	0.000994	(1; 1.1%)	Rv Rf	0.00115	(1; 0.56%)	Wo Tx Tp Rf	0.00192	(3; 0.71%)
Ma Rf	0.000775	(1; 0.87%)	Ne Rf	0.000852	(1; 0.42%)	Wo Tx Rw Rf	0.00161	(3; 0.59%)
Rh Rf	0.000767	(1; 0.87%)	Ts Rf	0.000784	(1; 0.38%)	Bc Mp Pd Rf	0.00158	(3; 0.58%)
Fm Rf	0.000666	(1; 0.75%)	Gv Rf	0.000764	(1; 0.37%)	Wo Tx Wt Rf	0.00146	(3; 0.54%)
Pa Rf	0.000642	(1; 0.72%)	In Pd Rf	0.000735	(2; 0.36%)	Wo Tx Rf	0.00138	(2; 0.51%)
Is Sm Rf	0.000588	(2; 0.66%)	Ms Rf	0.000623	(1; 0.3%)	Dc Dp Rf	0.00121	(2; 0.44%)
Rv Rf	0.000561	(1; 0.63%)	Cm Rf	0.000558	(1; 0.27%)	Sm Rf	0.00109	(1; 0.4%)
Ap Rf	0.000532	(1; 0.6%)	Fm Rf	0.000538	(1; 0.26%)	Bc Mp Ch Rf	0.00106	(3; 0.39%)
Ee Rw Rf	0.000505	(2; 0.57%)	Sf Rf	0.000464	(1; 0.23%)	Wo Tx Sm Rf	0.000974	(3; 0.36%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.977 ±0.018	(±1.8%)
Downstream	1.449 ±0.018	(±1.3%)

Sector 6301: Water Transport (Sp)

Ocean and inland water freight transport services, ship charter and rental, water passenger transport

Short Summary

The water transport sector presents a number of challenging issues across all three facets of the TBL account. The environmental indicators show that the water and land impacts are almost negligible but that energy use and greenhouse emission are well above average. Export propensity and import penetration are above average but operating surplus is below average. The social indicators of employment generation, income and government revenue are all substantially lower than average. This sector is driven by global issues and in particular, the need to keep exports competitive by using lower wages, smaller crews, and technically efficient ships.

Sector Description

The water transport sector is dominated in financial terms by international sea transport (64%), domestic bulk shipping (30%) and river and lake transport (6%). Activities centre on 14 major seaports and there are 1 100 commercial vessels registered locally. Only 80 of these are major cargo carriers with a total capacity of around 2.4 million tonnes. Around 500 million tonnes are exported by sea each year, 60 million tonnes of imports are discharged and domestic coastal shipping has around 50 million tonnes loaded and discharged. Around 3 000 overseas ships enter Australian waters each year and the total number of voyages is around 10 000 or three per ship per year. The major coal and iron ore ports of Dampier, Newcastle, Hay Point and Port Hedland dominate the tonnage stakes with more than 60 million tonnes loaded yearly in each port. However Melbourne, Sydney, Brisbane and Fremantle dominate the value stakes. Over four million shipping containers are exchanged each year. In 2002, the financial turnover in the sector was about $3.4 billion.

Place of Industry in the Economy

The water transport sector ranks 85th out of 135 sectors in terms of value adding in the economy and contributes 0.16% of GDP in this analysis. By way of comparison it is similar in value adding to the pulp, paper and paperboard and pharmaceutical goods sectors. It is a relatively small employer, with around 8 000 direct employment years embodied in final demand, and another 9 000 in upstream suppliers giving a total of 17 000 employment years. It also contributes 1 000 employment years to the final demand of downstream industries. It reveals small requirements for water and land with less than one twentieth of one percent of the national total. However it has moderate requirements for energy and greenhouse emissions with 1.5% and 0.8% of national totals respectively.

Strategic Overview

The strategic overview of the water transport sector shown in the spider diagram highlights a number of issues, many of which are driven by forces outside the sector and the Australian economy and therefore difficult to resolve domestically in triple bottom line terms. While the land disturbance and water use indicators are well below average the energy use and greenhouse indicators are above average, reflecting the energy cost of transporting large amounts of bulk materials with a low dollar value per unit weight. For the financial indicators, operating surplus and imports are lower than average while the export indicator is considerably above average. The social indicators of employment generation, income and government revenue are all well below average. This generally reflects the globalised nature of water transport and the economic advantages offered by lower wage labour and flags of convenience. Given the small capacity of the national fleet and the distance from markets, TBL issues will need to be resolved at the international level.

TBL Account #1

The financial indicator of operating surplus is 30% below the economy wide average indicating the challenging financial realities of the water transport sector. In this analysis the sector received direct domestic subsidies of around $40 million. The social indicator of employment generation is 45% below average and this reflects capital investment and technological innovation designed to reduce labour requirements particularly in the face of competition from seafarers in low wage countries. The environmental indicator of greenhouse emissions is nearly twice the average and most of this is a direct sector effect of fuel combustion. A number of global issues are highlighted by this account.

TBL Accounts #2 and #3

The second TBL account shows an export propensity five times the economy wide average, an income indicator 30% below average and a water indicator 90% below average. The third TBL account shows imports that are nearly twice the average, government revenue 60% below average and a land disturbance indicator 95% below average. While the import penetration indicator may suggest an issue, exports outweigh imports by a factor of two in financial terms.

Structural Path Analysis and Linkages

The analysis shows that greenhouse emissions are well above average. The structural path analysis shows a direct effect of fuel combusted by ships of 88% followed by much smaller supply chain contributions such as electricity production-services to transport-water transport (1.3%), diesel refining (1.1%), electricity production for water transport (0.5%) and steel making-ship building-water transport (0.4%). Most mitigation effects should therefore be focused on the fuel efficiency of marine engines. Fuel switching may provide opportunities but there may be financial implications. Bunker oil used by shipping transport is generally a cheaper and lower quality fuel with significant nitrous oxides emissions with a high global warming potential. Substituting compressed natural gas could increase shipping costs. International shipping is currently outside national greenhouse protocols. Some studies suggest a 10% reduction in vessel speed could reduce emissions by 25%.

The water transport sector is reasonably self contained and reveals below average linkages to its upstream suppliers such as ship making and repairs, services to transport, property development and legal and accounting services. The sector’s downstream linkages are extremely weak with small effects on basic iron and steel making (transport of iron and coal to steel making plants), base metals and motor vehicles (presumably imported cars).

Future Trends in Sector

The base case scenario of the *Future Dilemmas* study suggests that export commodities and manufactures may increase two to three fold over the next 50 years, barring catastrophes that slow economic growth and world trade. Under this scenario there may be a doubling of ship voyages to and from Australia, allowing for an increase in ship size and improvements in logistical efficiency. This may require the development of major new port facilities depending on the relative mix of bulk commodities and manufactures. Smaller faster catamaran type cargo ships may start to compete with air cargo for specific cargo categories if world oil supplies become constrained since air transport requires at least 20 times the energy per tonne kilometre, but offers large time advantages.

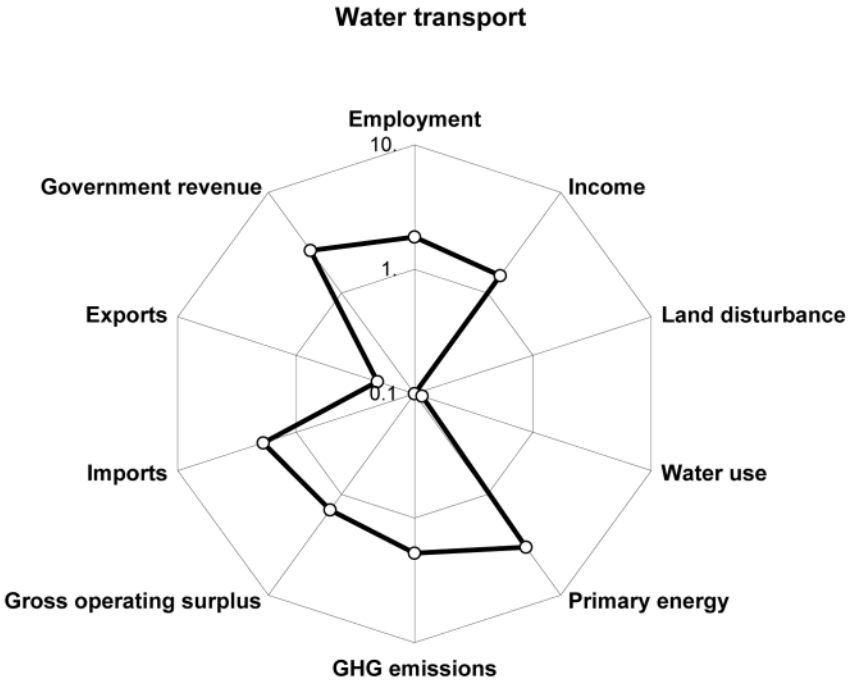
Innovation and Technical Opportunities

The size of container and bulk cargo ships may have peaked. Advanced communications and logistics technologies may facilitate a more directly customised delivery to avoid major ports which are usually close to major cities. A range of new propulsion systems are under development particularly natural gas fuel cells which increase efficiency and reduce pollution loadings.

Sector **Water transport** **(Sp)**

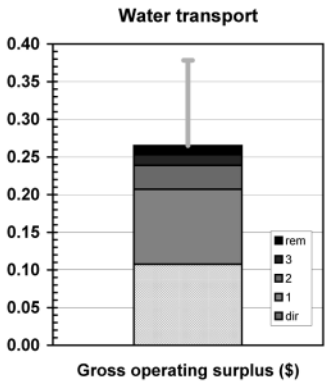
Ocean and inland water freight transport services, ship charter and rental, water passenger transport services

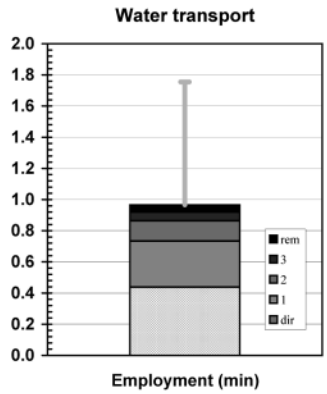
Spider diagram

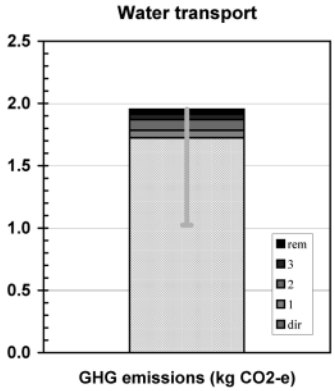


Bar graphs

Account #1







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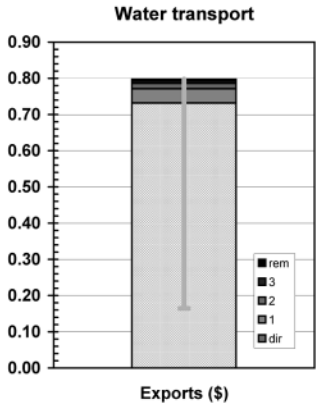
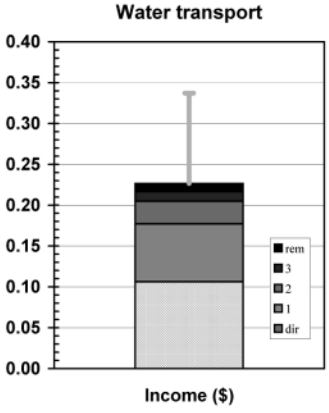
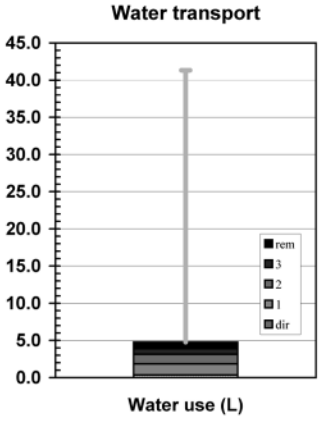
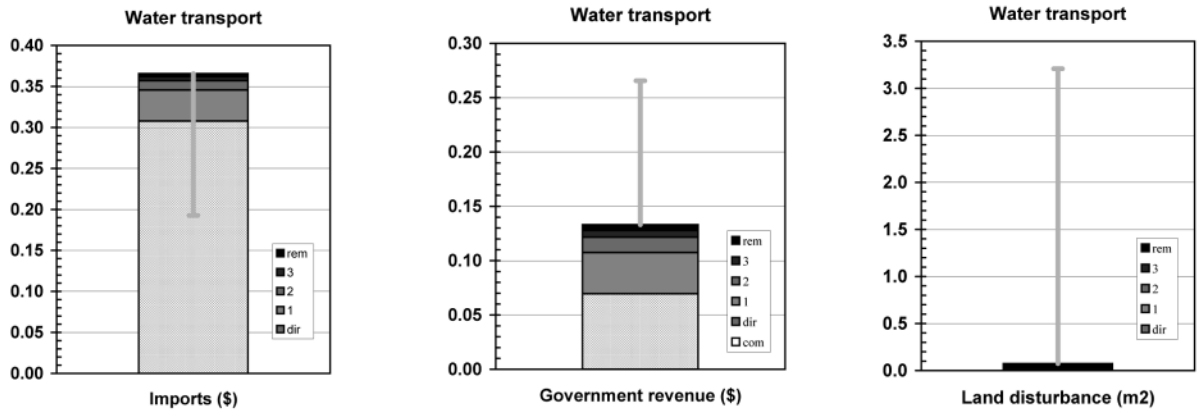






Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 194.2	(0.07% of total)	($m 359.3 domestically produced)
Government final consumption	$m 0.0		
Gross fixed capital expenditure	$m 2.1	(0.00% of total)	($m 2.1 domestically produced)
Net changes in stocks	-$m 14.7	-(0.83% of total)	
Sectoral GNE	**$m 181.6**	**(0.04% of GNE)**	**($m 346.7 domestically produced)**
Exports	$m 1,836.6	(2.20% of total)	($m 1,836.6 domestically produced)
Final demand	**$m 2,018.2**	**(0.37% of GNT)**	**($m 2,183.3 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 266.4	(0.16% of total)	
Gross operating surplus	$m 270.0	(0.14% of total)	
Taxes less subsidies	$m 174.6	(0.20% of total)	
Sectoral GDP*	**$m 710.9**	**(0.16% of GDP)**	
Imports	$m 772.2	(0.79% of total)	
Primary inputs	**$m 1,483.1**	**(0.27% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 270.0	(0.14%)	$m 236.4	(0.12%)	$m 582.8	(0.30%)
Exports ($m)	$m 1,836.6	(2.20%)	$m 1,608.1	(1.93%)	$m 1,754.2	(2.10%)
Imports ($m)	$m 772.2	(0.79%)	$m 676.1	(0.69%)	$m 803.7	(0.82%)
Employment (e-y)	8,800 e-y	(0.12%)	7,705 e-y	(0.11%)	16,999 e-y	(0.24%)
Income ($m)*	$m 266.4	(0.16%)	$m 233.2	(0.14%)	$m 497.8	(0.29%)
Government revenue ($m)†	$m 59.3	(0.05%)	$m 37.6	(0.03%)	$m 177.1	(0.16%)
GHG emissions (kt CO_2-e)	4,327 kt	(0.83%)	3,789 kt	(0.73%)	4,293 kt	(0.83%)
Water use (ML)	844 ML	(0.00%)	739 ML	(0.00%)	10,505 ML	(0.05%)
Land disturbance (kha)	0 kha	(0.00%)	0 kha	(0.00%)	16 kha	(0.01%)
Primary energy (TJ)	57,935 TJ	(1.49%)	50,728 TJ	(1.31%)	56,135 TJ	(1.45%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.11	0.27	0.38
Exports ($)	0.73	0.80	0.16
Imports ($)	0.31	0.37	0.19
Employment (min)	0.44	0.97	1.75
Income ($)	0.11	0.23	0.34
Government revenue ($)	0.02	0.08	0.21
GHG emissions (kg CO_2-e)	1.72	1.95	1.02
Water use (L)	0.34	4.78	41.32
Land disturbance (m^2)	0.00	0.07	3.21
Primary energy (MJ)	23.08	25.54	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Sp	0.108	(0; 41.%)	Sp	0.438	(0; 45.%)	Sp	1.72	(0; 88.%)
St Sp	0.0595	(1; 22.%)	St Sp	0.0971	(1; 10.%)	El St Sp	0.0248	(2; 1.3%)
Ts Sp	0.00986	(1; 3.7%)	Ts Sp	0.0444	(1; 4.6%)	Fo Sp	0.0206	(1; 1.1%)
Ms Sp	0.00843	(1; 3.2%)	Ms Sp	0.0378	(1; 3.9%)	El Sp	0.00918	(1; 0.47%)
Oi Fo Sp	0.00293	(2; 1.1%)	Fm Sp	0.027	(1; 2.8%)	Is Sb Sp	0.00772	(2; 0.4%)
Sb Sp	0.00256	(1; 0.96%)	Wt Sp	0.0138	(1; 1.4%)	St Sp	0.00677	(1; 0.35%)
Fm Sp	0.00243	(1; 0.92%)	Sb Sp	0.0128	(1; 1.3%)	Oi Fo Sp	0.0062	(2; 0.32%)
Cm Sp	0.00193	(1; 0.73%)	Rh Sp	0.0069	(1; 0.72%)	Is Fm Sp	0.00393	(2; 0.2%)
Wt Sp	0.00192	(1; 0.72%)	Cm Sp	0.00533	(1; 0.55%)	El Ms Sp	0.00353	(2; 0.18%)
Wa Sp	0.0013	(1; 0.49%)	Ho Sp	0.00492	(1; 0.51%)	El Sb Sp	0.00273	(2; 0.14%)
Rv Sp	0.0012	(1; 0.45%)	Fm Sb Sp	0.00427	(2; 0.44%)	El Ts Sp	0.00246	(2; 0.13%)
Fo Sp	0.00113	(1; 0.43%)	Ts St Sp	0.00381	(2; 0.4%)	El Fm Sp	0.00206	(2; 0.11%)
Rh Sp	0.00113	(1; 0.43%)	Oe Sb Sp	0.00368	(2; 0.38%)	At Sp	0.00203	(1; 0.1%)
El St Sp	0.001	(2; 0.38%)	Bs Ms Sp	0.00363	(2; 0.38%)	Wt Sp	0.00191	(1; 0.098%)
Pd Sp	0.000924	(1; 0.35%)	Wt Sb Sp	0.00356	(2; 0.37%)	Sb Sp	0.00136	(1; 0.07%)
Is Sb Sp	0.000894	(2; 0.34%)	Ed Sp	0.0034	(1; 0.35%)	El Fo Sp	0.00105	(2; 0.054%)
Ts St Sp	0.000846	(2; 0.32%)	Rv Sp	0.00321	(1; 0.33%)	Nf Sb Sp	0.00104	(2; 0.053%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Sp	0.732	(0; 92.%)	Sp	0.106	(0; 47.%)	Wa Sp	0.958	(1; 20.%)
St Sp	0.0148	(1; 1.8%)	St Sp	0.0248	(1; 11.%)	Sp	0.336	(0; 7.%)
Sb Sp	0.011	(1; 1.4%)	Ts Sp	0.0104	(1; 4.6%)	St Sp	0.257	(1; 5.4%)
Oi Fo Sp	0.002	(2; 0.25%)	Ms Sp	0.00879	(1; 3.9%)	Dc Dp Sp	0.236	(2; 4.9%)
Wt Sp	0.00157	(1; 0.2%)	Sb Sp	0.00727	(1; 3.2%)	Wa Ms Sp	0.217	(2; 4.5%)
Ts Sp	0.00157	(1; 0.2%)	Fm Sp	0.00423	(1; 1.9%)	El St Sp	0.137	(2; 2.9%)
Fm Sp	0.00139	(1; 0.17%)	Wt Sp	0.00296	(1; 1.3%)	Wa Ts Sp	0.133	(2; 2.8%)
Oe Sb Sp	0.00133	(2; 0.17%)	Cm Sp	0.00121	(1; 0.53%)	El Sp	0.0507	(1; 1.1%)
Ms Sp	0.0013	(1; 0.16%)	Ts St Sp	0.000893	(2; 0.39%)	Fm Sp	0.0374	(1; 0.78%)
Fo Sp	0.000836	(1; 0.1%)	Ed Sp	0.000841	(1; 0.37%)	Ws Ho Sp	0.0359	(2; 0.75%)
Nf Sb Sp	0.000764	(2; 0.096%)	Oe Sb Sp	0.000841	(2; 0.37%)	Bc Mp Ho Sp	0.0257	(3; 0.54%)
Is Sb Sp	0.000683	(2; 0.086%)	Pd Sp	0.000833	(1; 0.37%)	Wa Pd Sp	0.0253	(2; 0.53%)
At Sp	0.000645	(1; 0.081%)	Bk Sp	0.000781	(1; 0.34%)	Fo Sp	0.0246	(1; 0.51%)
Wt Sb Sp	0.000404	(2; 0.051%)	Wt Sb Sp	0.000764	(2; 0.34%)	Vf Ms Sp	0.024	(2; 0.5%)
Nf Fm Sp	0.000357	(2; 0.045%)	Rh Sp	0.000755	(1; 0.33%)	Dc Dp Ho Sp	0.0213	(3; 0.45%)
Is Fm Sp	0.000348	(2; 0.044%)	Ho Sp	0.000718	(1; 0.32%)	Wp Sp	0.0213	(1; 0.45%)
Ho Sp	0.000274	(1; 0.034%)	Fm Sb Sp	0.000669	(2; 0.3%)	Ms Sp	0.0211	(1; 0.44%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Sp	0.308	(0; 84.%)	Sp	0.0695	(0; 52.%)	Bc Mp Ho Sp	0.0071	(3; 9.5%)
Sb Sp	0.0115	(1; 3.1%)	St Sp	0.0132	(1; 10.%)	Bc Mp Ho Ms	0.00204	(4; 2.7%)
Fo Sp	0.00674	(1; 1.8%)	Sb Sp	0.00585	(1; 4.4%)	Bc Mp Ho St S	0.0019	(4; 2.5%)
St Sp	0.00539	(1; 1.5%)	Ts Sp	0.00512	(1; 3.9%)	Wo Ts Sp	0.00171	(2; 2.3%)
Ts Sp	0.00283	(1; 0.77%)	Ms Sp	0.00417	(1; 3.1%)	Bc Mp Ts Sp	0.0014	(3; 1.9%)
Ms Sp	0.00192	(1; 0.52%)	Fm Sp	0.00148	(1; 1.1%)	Dc Dp Sp	0.00122	(2; 1.6%)
Fm Sp	0.00183	(1; 0.5%)	Wt Sp	0.00138	(1; 1.%)	Wo Mp Ho Sp	0.000802	(3; 1.1%)
Oe Sb Sp	0.000813	(2; 0.22%)	Cm Sp	0.000578	(1; 0.43%)	Bc Mp Ms Sp	0.000774	(3; 1.%)
Pt Sp	0.000593	(1; 0.16%)	Pd Sp	0.000546	(1; 0.41%)	Bc Mp Ho Ts S	0.000677	(4; 0.91%)
Rh Sp	0.000582	(1; 0.16%)	Ts St Sp	0.00044	(2; 0.33%)	Bc Mp Sp	0.000675	(2; 0.9%)
Wt Sp	0.000445	(1; 0.12%)	Bk Sp	0.000432	(1; 0.32%)	Wo Tx Ts Sp	0.000672	(3; 0.9%)
Ne Sp	0.000333	(1; 0.091%)	Oe Sb Sp	0.000416	(2; 0.31%)	Wo Tx Tp Sp	0.000669	(3; 0.9%)
Cm Sp	0.00033	(1; 0.09%)	Ho Sp	0.000378	(1; 0.28%)	Ba Bm Ho Sp	0.00058	(3; 0.78%)
Is Sb Sp	0.000322	(2; 0.088%)	Wt Sb Sp	0.000357	(2; 0.27%)	Sw Pp Sp	0.000577	(2; 0.77%)
Pa Sp	0.000319	(1; 0.087%)	Oi Fo Sp	0.000355	(2; 0.27%)	Sb Sp	0.000529	(1; 0.71%)
Fm Sb Sp	0.000289	(2; 0.079%)	Rh Sp	0.000347	(1; 0.26%)	Wo Tx Wt Sp	0.000491	(3; 0.66%)
Ma Sp	0.000286	(1; 0.078%)	Pd St Sp	0.000332	(2; 0.25%)	Wa Sp	0.000474	(1; 0.64%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.783 ±0.016	(±2.1%)
Downstream	0.292 ±0.008	(±2.7%)

Sector 6401: Air and Space Transport (At)

Air passenger and freight transport services

Short Summary

Air transport shows low indicators for water use and land disturbance per dollar of final demand both being 90% below average. The greenhouse gas indicator is 30% above average, two thirds of which is directly used within the sector as aircraft fuel. Social indicators show that income generation is 10% below average and employment generation is 40% below average while government revenue is equal to average. The financial indicators show that operating surplus is 30% below average. However the data used in this analysis includes two major airlines, one of which has since failed. Current operations of the remaining airline report good profits and this indicator may improve with new data. Export propensity is more than twice the average due to travel paid by inbound international tourists. Import penetration is equal to average due to fares paid to overseas carriers, and imports of fuel and aircraft. Air transport serves consumers and exports and as such shows average linkages to upstream providers of goods and services, and to the sectors that it serves downstream. Improvements to greenhouse emissions may in the short term focus on emissions offsets, as technical breakthroughs to substantially reduce emissions per passenger kilometre (in a full life cycle context) may be unlikely in the medium term.

Sector Description

The air transport sector includes both passengers and freight (passengers account for 75% of financial volume), as well as domestic and international travel. Around 300 commercial aircraft provide services to 200 airports in Australia. The major airline Qantas operates 186 aircraft, each operating an average of 11 hours per day, and carries 27 million passengers yearly split 70:30 between domestic and international. Total domestic air activity is approximately 30 billion passenger kilometres and 195 million tonne kilometres. For international freight, 350 000 tonnes per year is loaded and 300 000 tonnes discharged while approximately 9 million international passengers arrive and leave Australia each year.

Place of Industry in the Economy

The air transport industry ranks 26th out of 135 in its contribution to value adding in the economy and contributes 0.94% of GDP in this analysis. It is similar in value adding to the sport and recreation and motor vehicle manufacturing sectors. The sector has moderate employment generation with a direct requirement of 22 000 employment years with another 30 000 years in the sector's suppliers giving a total of 52 000 employment years. In addition, the sector contributes 19 000 employment years to the final demand of downstream industries such as wholesale trade and government administration. About 3% of national energy use and 1.5% of emissions can be attributed to air transport but it is responsible for only minor amounts of water use and land disturbance. In absolute financial terms, exports are three times imports.

Strategic Overview

The strategic overview portrayed in the spider diagram gives a mixed result with below average outcomes for energy use, greenhouse emissions, employment generation and operating surplus. The current era may be seen in retrospect as the zenith of affordable air travel due to the strong drivers of international tourism and just-in-time business travel. A return to higher prices for airline travel may help improve the overall TBL outcomes for the sector. Downstream issues include the increased risk of human and other diseases, facilitated by increased frequency and volumes of international traffic.

TBL Account #1

The first TBL account shows operating surplus and employment generation are respectively 30% and 40% below average. The environmental indicator of greenhouse emissions is 50% above average with fuel used in aircraft operations mainly responsible. The financial indicator reflects the cyclical nature of the industry and the intense price and service competition between a limited number of players, which has resulted in a series of high profile collapses. The social indicator of employment generation similarly reflects tight management of labour efficiencies. Compared to 1994, the best discount fares are now 20% cheaper and standard economy fares are 10% dearer. The excise on jet fuel is set at the low rate of three cents per litre to cover only airport and government costs of running civil aviation operations.

TBL Accounts #2 and #3

The second TBL account shows an export propensity over twice the economy wide average, income 10% below average and water use that is 85% below average. The imbalance between a lower employment indicator and higher income indicator partly portrays the skill level of pilots and managers compared to attendants and ground staff but mostly the intense focus on labour efficiency in a globally competitive industry. In the third TBL account, both import penetration and government revenue are equal to average, while the land disturbance indicator is 90% below average with beef and sheep meats dominant factors in this chain.

Structural Path Analysis and Linkages

The structural path for greenhouse gas emissions shows that direct energy use by aeroplanes is the largest component at 70% of the total. Automotive petrol (7%), electricity used in airlines, travel agencies and aircraft maintenance (4%) and kerosene refining (2%) are also important contributors but greenhouse reduction must focus first on aircraft operations.

Increases in consumer demand show an average upstream stimulus to sectors such as petroleum, aircraft, wholesale trade, car hire and marketing. The sector shows a below average downstream linkage and expansion must be led by wholesale trade, marketing and government administration.

Future Trends in Sector

The *Future Dilemmas* base case scenario anticipates a doubling in air travel by 2050 with different trajectories for domestic air travel (driven by population stabilisation and ageing) and continued annual growth of 3-4% for international inbound tourism and outbound travel by Australians (driven by increasing affluence). International shocks such as terrorism and disease epidemics counter these trends making eventual outcomes uncertain. While oil supplies may be a factor past 2020, supplies of jet fuel itself need not be constrained so the availability of airline travel will depend on relative cost and government policy.

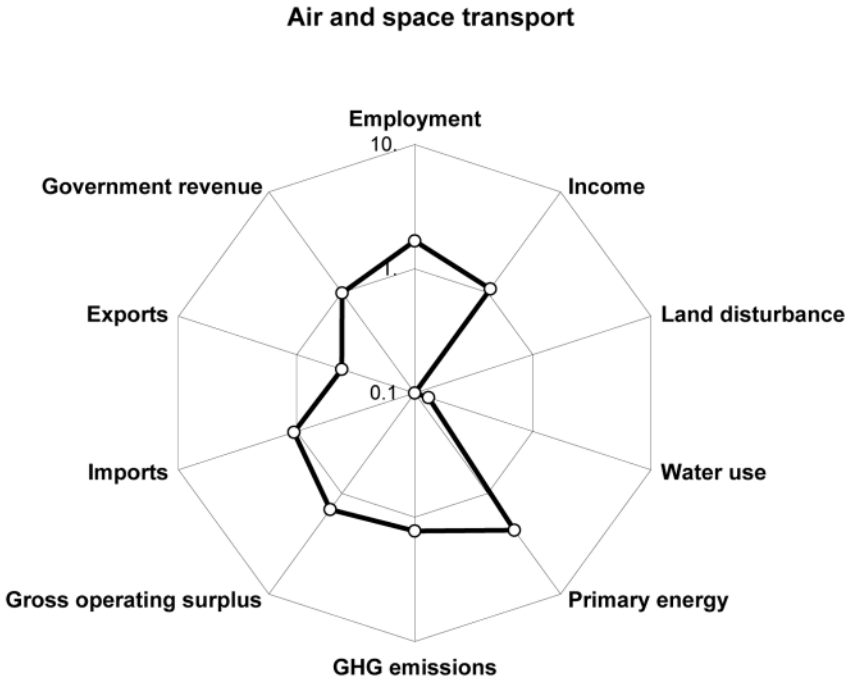
Innovation and Technical Opportunities

The enhanced effect of greenhouse emissions from aircraft at altitude may attract increasing policy attention. Technical operating improvements of 1-2% per annum are possible but will continue to be outpaced by yearly growth rates of 4-6%. Fleet-wide fuel consumption has been static for the last 30 years as technical improvements have been outrun by increasing luxury. NASA studies suggest that fuel use per passenger km could be reduced by 50% by 2025 but one third of the sector's fuel use is indirect and many planes flying today may still be in use in 2020. Aviation fuels such as bio-kerosene and bio-methanol could reduce the carbon intensity of air travel but may substantially increase the cost. Less tangible social issues such as passenger comfort and individual service appear to be 'sleeper' issues which may rapidly become dominant drivers of the sector.

Sector **Air and space transport** **(At)**

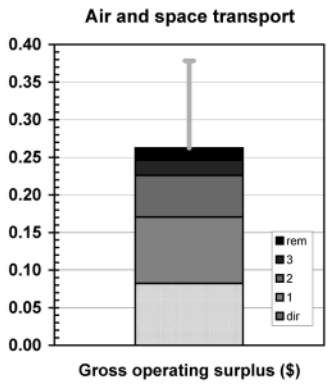
Air passenger and freight transport services

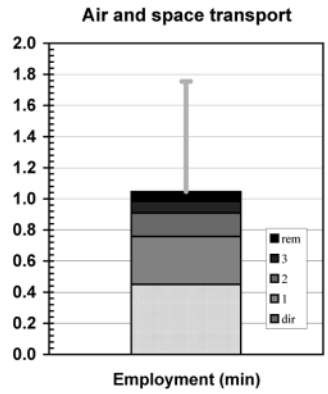
Spider diagram

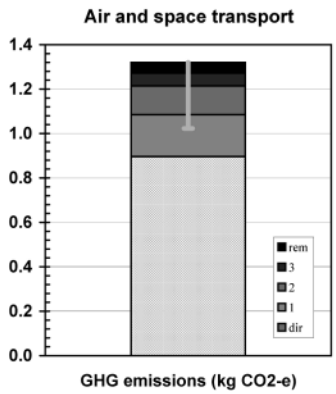


Bar graphs

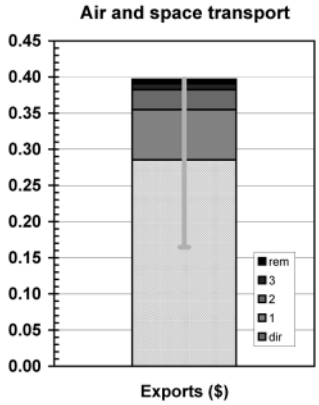
Account #1

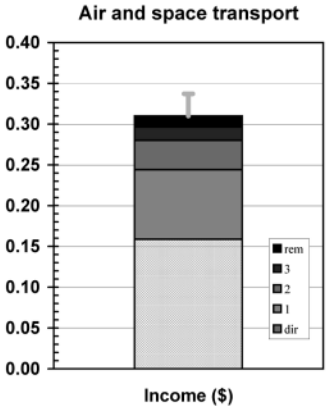


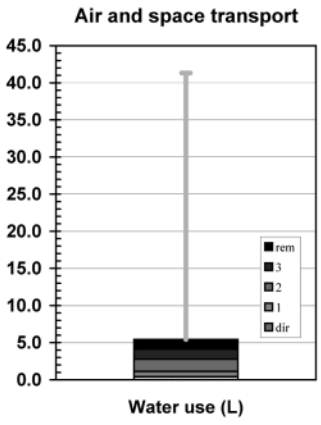




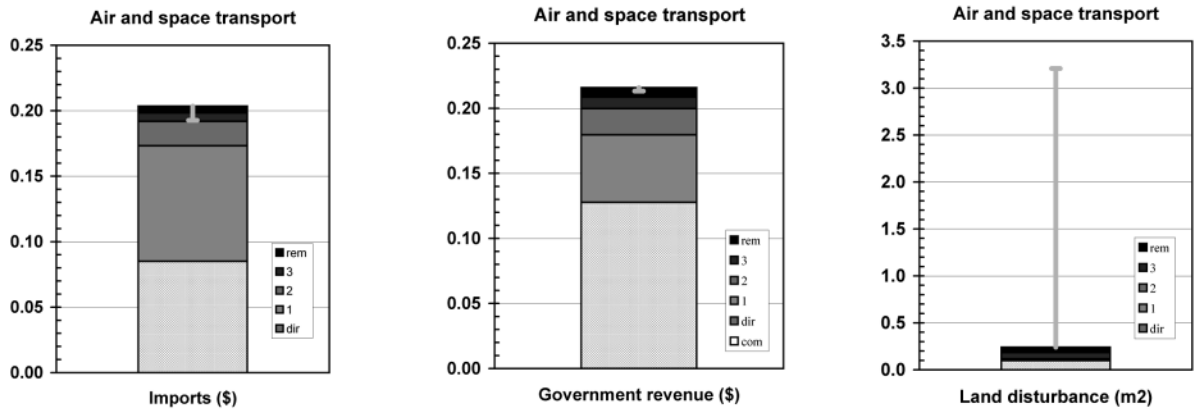
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 4,418.8	(1.67% of total)	($m 2,839.3 domestically produced)
Government final consumption	$m 0.0		
Gross fixed capital expenditure	$m 52.5	(0.05% of total)	($m 52.5 domestically produced)
Net changes in stocks	$m 2.0	(0.11% of total)	($m 2.0 domestically produced)
Sectoral GNE	**$m 4,473.2**	**(0.97% of GNE)**	**($m 2,893.7 domestically produced)**
Exports	$m 3,261.5	(3.91% of total)	($m 3,261.5 domestically produced)
Final demand	**$m 7,734.7**	**(1.43% of GNT)**	**($m 6,155.2 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 1,816.1	(1.06% of total)	
Gross operating surplus	$m 940.4	(0.49% of total)	
Taxes less subsidies	$m 1,459.8	(1.71% of total)	
Sectoral GDP*	**$m 4,216.2**	**(0.94% of GDP)**	
Imports	$m 972.2	(1.00% of total)	
Primary inputs	**$m 5,188.4**	**(0.95% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 940.4	(0.49%)	$m 506.0	(0.26%)	$m 1,615.0	(0.84%)
Exports ($m)	$m 3,261.5	(3.91%)	$m 1,755.1	(2.11%)	$m 2,443.2	(2.93%)
Imports ($m)	$m 972.2	(1.00%)	$m 523.2	(0.54%)	$m 1,252.4	(1.28%)
Employment (e-y)	41,238 e-y	(0.58%)	22,191 e-y	(0.31%)	51,628 e-y	(0.72%)
Income ($m)*	$m 1,816.1	(1.06%)	$m 977.3	(0.57%)	$m 1,907.6	(1.12%)
Government revenue ($m)†	$m 1,459.8	(1.35%)	$m 785.5	(0.73%)	$m 1,328.9	(1.23%)
GHG emissions (kt CO_2-e)	10,250 kt	(1.98%)	5,516 kt	(1.06%)	8,126 kt	(1.57%)
Water use (ML)	4,645 ML	(0.02%)	2,500 ML	(0.01%)	33,379 ML	(0.16%)
Land disturbance (kha)	111 kha	(0.07%)	60 kha	(0.04%)	148 kha	(0.09%)
Primary energy (TJ)	149,342 TJ	(3.85%)	80,363 TJ	(2.07%)	109,086 TJ	(2.81%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.08	0.26	0.38
Exports ($)	0.29	0.40	0.16
Imports ($)	0.08	0.20	0.19
Employment (min)	0.45	1.05	1.75
Income ($)	0.16	0.31	0.34
Government revenue ($)	0.13	0.22	0.21
GHG emissions (kg CO_2-e)	0.90	1.32	1.02
Water use (L)	0.41	5.42	41.32
Land disturbance (m^2)	0.10	0.24	3.21
Primary energy (MJ)	13.06	17.72	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
At	0.0822	(0; 31.%)	At	0.45	(0; 43.%)	At	0.896	(0; 68.%)
St At	0.0401	(1; 15.%)	St At	0.0655	(1; 6.3%)	Ap At	0.0569	(1; 4.3%)
Oi Ap At	0.0139	(2; 5.3%)	Ho At	0.027	(1; 2.6%)	Oi Ap At	0.0295	(2; 2.2%)
Pd At	0.00626	(1; 2.4%)	Ai At	0.0251	(1; 2.4%)	El At	0.0204	(1; 1.5%)
Ap At	0.00538	(1; 2.1%)	Wt At	0.0249	(1; 2.4%)	Ke At	0.0197	(1; 1.5%)
Ms At	0.00532	(1; 2.%)	Ms At	0.0239	(1; 2.3%)	El St At	0.0167	(2; 1.3%)
Oi Ke At	0.00487	(2; 1.9%)	Ts At	0.0178	(1; 1.7%)	Oi Ke At	0.0103	(2; 0.78%)
Ts At	0.00394	(1; 1.5%)	Pd At	0.015	(1; 1.4%)	El Ai At	0.00704	(2; 0.53%)
Wt At	0.00346	(1; 1.3%)	Bs At	0.01	(1; 0.96%)	Bc Mp Ho At	0.00536	(3; 0.41%)
Cm At	0.0023	(1; 0.88%)	Ap At	0.0076	(1; 0.73%)	El Ap At	0.00502	(2; 0.38%)
Ho At	0.00215	(1; 0.82%)	Cm At	0.00636	(1; 0.61%)	St At	0.00456	(1; 0.35%)
Ke At	0.00188	(1; 0.72%)	Rd At	0.00559	(1; 0.53%)	El Ho At	0.00353	(2; 0.27%)
Bk At	0.00139	(1; 0.53%)	Bk At	0.00553	(1; 0.53%)	Wt At	0.00346	(1; 0.26%)
Ai At	0.0013	(1; 0.5%)	Oi Ap At	0.00538	(2; 0.51%)	El Oi Ap At	0.00336	(3; 0.25%)
Bs At	0.00101	(1; 0.39%)	Pl At	0.00525	(1; 0.5%)	El Pd At	0.00299	(2; 0.23%)
Pl At	0.000987	(1; 0.38%)	Rh At	0.00409	(1; 0.39%)	El Ms At	0.00223	(2; 0.17%)
Rd At	0.000952	(1; 0.36%)	Ed At	0.00348	(1; 0.33%)	Ch Pl At	0.0022	(2; 0.17%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
At	0.285	(0; 72.%)	At	0.159	(0; 51.%)	At	0.406	(0; 7.5%)
Ai At	0.0194	(1; 4.9%)	St At	0.0167	(1; 5.4%)	Ws Ho At	0.197	(2; 3.6%)
St At	0.00994	(1; 2.5%)	Ai At	0.0163	(1; 5.3%)	St At	0.173	(1; 3.2%)
Oi Ap At	0.00952	(2; 2.4%)	Pd At	0.00565	(1; 1.8%)	Wa Pd At	0.171	(2; 3.2%)
Ke At	0.00621	(1; 1.6%)	Ms At	0.00555	(1; 1.8%)	Bc Mp Ho At	0.141	(3; 2.6%)
Oi Ke At	0.00332	(2; 0.84%)	Wt At	0.00535	(1; 1.7%)	Wa Ms At	0.137	(2; 2.5%)
Wt At	0.00283	(1; 0.71%)	Ts At	0.00416	(1; 1.3%)	Dc Dp Ho At	0.117	(3; 2.2%)
Ap At	0.00152	(1; 0.38%)	Ho At	0.00394	(1; 1.3%)	Ap At	0.117	(1; 2.2%)
Ho At	0.0015	(1; 0.38%)	Oi Ap At	0.00233	(2; 0.75%)	El At	0.113	(1; 2.1%)
Ms At	0.000824	(1; 0.21%)	Ap At	0.00185	(1; 0.6%)	El St At	0.0924	(2; 1.7%)
Ts At	0.000626	(1; 0.16%)	Cm At	0.00144	(1; 0.47%)	Ri Fc Ho At	0.0909	(3; 1.7%)
Lg Ap At	0.000448	(2; 0.11%)	Bk At	0.00137	(1; 0.44%)	Dc Dp At	0.0786	(2; 1.4%)
Rf Oi Ap At	0.000339	(3; 0.085%)	Bs At	0.00123	(1; 0.4%)	Vf Ho At	0.0746	(2; 1.4%)
Rd At	0.000331	(1; 0.083%)	Pl At	0.00106	(1; 0.34%)	Oi Ap At	0.0703	(2; 1.3%)
Cm At	0.000307	(1; 0.077%)	Rd At	0.000962	(1; 0.31%)	Wa Ts At	0.0532	(2; 0.98%)
Pd At	0.000298	(1; 0.075%)	Ed At	0.000862	(1; 0.28%)	Ri Ws Ho At	0.044	(3; 0.81%)
Pl At	0.000286	(1; 0.072%)	In At	0.00086	(1; 0.28%)	Wa Ap At	0.0438	(2; 0.81%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
At	0.085	(0; 42.%)	At	0.128	(0; 59.%)	At	0.0972	(0; 41.%)
Ap At	0.0321	(1; 16.%)	Ai At	0.0115	(1; 5.3%)	Bc Mp Ho At	0.039	(3; 16.%)
Ai At	0.0246	(1; 12.%)	St At	0.00892	(1; 4.1%)	Wo Mp Ho At	0.0044	(3; 1.8%)
Ke At	0.0112	(1; 5.5%)	Pd At	0.0037	(1; 1.7%)	Ba Bm Ho At	0.00318	(3; 1.3%)
St At	0.00363	(1; 1.8%)	Ms At	0.00263	(1; 1.2%)	Wo Tx Ai At	0.0013	(3; 0.54%)
Ms At	0.00121	(1; 0.59%)	Wt At	0.0025	(1; 1.2%)	Bc Mp Ho Ms	0.00129	(4; 0.54%)
Ts At	0.00113	(1; 0.56%)	Ho At	0.00207	(1; 0.96%)	Bc Mp Ho St A	0.00128	(4; 0.53%)
Oi Ap At	0.00103	(2; 0.51%)	Ts At	0.00205	(1; 0.95%)	Wo Tx Cl At	0.00115	(3; 0.48%)
Pl At	0.00101	(1; 0.5%)	Oi Ap At	0.00169	(2; 0.78%)	Wo Tx Ho At	0.0011	(3; 0.46%)
Ho At	0.001	(1; 0.49%)	Ap At	0.00119	(1; 0.55%)	Bc Mp Ho Pd .	0.00107	(4; 0.45%)
Pd At	0.000902	(1; 0.44%)	In At	0.000925	(1; 0.43%)	Wo Tx Pl At	0.00101	(3; 0.42%)
Wt At	0.000805	(1; 0.4%)	Bk At	0.000754	(1; 0.35%)	Wo Tx Wt At	0.000888	(3; 0.37%)
Pa At	0.000586	(1; 0.29%)	Cm At	0.00069	(1; 0.32%)	Bc Mp Ch Pl A	0.000872	(4; 0.36%)
Cm At	0.000394	(1; 0.19%)	Rd At	0.000682	(1; 0.32%)	Wh Fc Ho At	0.000786	(3; 0.33%)
Oi Ke At	0.000359	(2; 0.18%)	Oi Ke At	0.000591	(2; 0.27%)	Bc Mp Fd At	0.000734	(3; 0.31%)
Rh At	0.000345	(1; 0.17%)	Pl At	0.000463	(1; 0.21%)	Bc Mp Pd At	0.000729	(3; 0.3%)
Ch Pl At	0.000256	(2; 0.13%)	Ke At	0.000417	(1; 0.19%)	Wo Ts At	0.000682	(2; 0.28%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.089 ±0.019	(±1.8%)
Downstream	0.914 ±0.016	(±1.8%)

Sector 6601: Other Services to Transport (St)

Travel, tourist and customs agency services, forwarding, storage, parking, stevedoring, port handling and other services to transport

Short Summary

Against the metric of one dollar of final demand, the environmental indicators are lower than the economy wide average. The financial indicators are mixed with the operating surplus above average while both import penetration and export propensity are below average. The three social indicators of employment generation, income and government revenue are all below average. The sector occupies an important position for Australia's international trading transactions with the world, as well as containing key areas within the national transport system such as toll roads and parking stations. The sector's importance will probably increase in the future as the volume, complexity and due diligence and security required in international trade increases. The interactions between the stimulus from e-commerce, the complexity of world trade and just in time deliveries are still to be worked out. Environmental and congestion problems may create complex challenges for the sector.

Sector Description

The services to transport sector is dominated by the freight forwarding components, both internally and for export, which together make up over half of the financial activity in the sector. Travel agencies and storage each make up around one tenth of the financial activity, while components such as stevedoring, parking, water transport terminals, and toll roads are each typically less than one twentieth. Annual turnover in the sector is around $18 billion. There is both considerable innovation and political activity in the sector at various times. As a portal for the trans-shipment of most of Australia's imports and exports, the sector occupies a strategic position in economic and social terms, and is liable to be scrutinised more in triple bottom line terms.

Place of Industry in the Economy

The services to transport sector ranks 14th out of 135 sectors in terms of value adding in the economy, and contributes 2.35% of GDP in this analysis. By way of comparison it is similar in size to the banking, and accommodation cafes and restaurants sectors. It is a moderate generator of employment with 30 000 direct employment years embodied in final demand and a further 17 000 in upstream suppliers giving a total of 47 000 employment years. The industry also contributes 54 000 employment years to the final demand of downstream industries. It has small requirements for land and water resources, typically less than one fifth of one percent, while energy and greenhouse emissions are one half of one percent of total. Imports are one third of exports in financial terms.

Strategic Overview

The sector has both service and physical sector characteristics, but retains the key elements of a service sector. The strategic overview provided by the spider diagram shows all four environmental indicators are significantly lower than the economy wide average. For the financial indicators, operating surplus and import penetration are higher than average while export propensity is lower than average. The social indicators are all below average, perhaps due to two important strategic drivers. First, innovations in technology and labour relations have improved labour efficiencies in many areas of the sector, resulting in lower labour requirements and less income paid per dollar of final demand and providing a higher operating surplus. Second, the government revenue indicator is relatively low since imposing further costs on the nation's international trading transactions (both imports and exports) would not advantage Australia's international trading activities.

TBL Account #1

The financial indicator of operating surplus is 35% greater than the economy wide average and four fifths of this is a direct within sector effect. The social indicator of employment generation is 40% below average while the environmental indicator of greenhouse gas emissions is 65% below average. While the greenhouse indicator is well below average, one half of it is derived from electricity generation, 13% is due to fuel combusted within the sector, and relatively small amounts are due to second and third order effects such as road transport and 'black coal mining for electricity production for services to transport'. Further reductions in emissions could be sought from more efficient motors or sourcing electricity from gas turbines or hydro-electricity.

TBL Accounts #2 and #3

The second TBL account reveals the financial indicator of export propensity as 10% below average, the social indicator of income as 25% below average and the environmental indicator of water use as 85% below average. The third TBL account shows that import penetration is 65% below average, the government revenue indicator is 35% below average and the land disturbance indicator is 95% below average. The social indicators may require further scrutiny but are set against positive environmental indicators and protocols for trading off social and environmental issues are difficult.

Structural Path Analysis and Linkages

In triple bottom line accounting terms, there may be some scrutiny of the employment indicator since this analysis reveals it is 30% below the economy wide average while the operating surplus is 50% higher than average. The structural path analysis reveals that 63% of the employment effect is a direct within sector effect. Supplementing this are a number of first order effects each representing one to three percent of total, such as technical and computing services, wholesale trade, road transport, office services, communications, legal and accounting services, and repairs to motor vehicles. It is possible that with the increased scrutiny of traded items due to trade certification and security concerns, current relatively minor contributors could increase employment activity.

The services to transport sector shows weak upstream linkages to suppliers such as property development, technical and computing services, and legal and accounting services. There are stronger than average downstream linkages, particularly to the wholesale trade and air transport sectors. This suggests that investment into the sector will have to be matched by expansion in these downstream sectors.

Future Trends in Sector

The base case scenario of the *Future Dilemmas* study suggests that many components within this sector face healthy growth prospects, as the export volume of many commodities and manufactured goods may expand two or three fold out to 2050. However some of the 'purer' service components may have their activities curtailed by the rapid ingress of internet based travel services, where consumers undertake most of their own research and travel bookings. Physical services sectors such as toll roads and parking could provide a novel approach to more sustainable transport systems by charging for energy use or emissions per passenger kilometre rather than raw traffic volume.

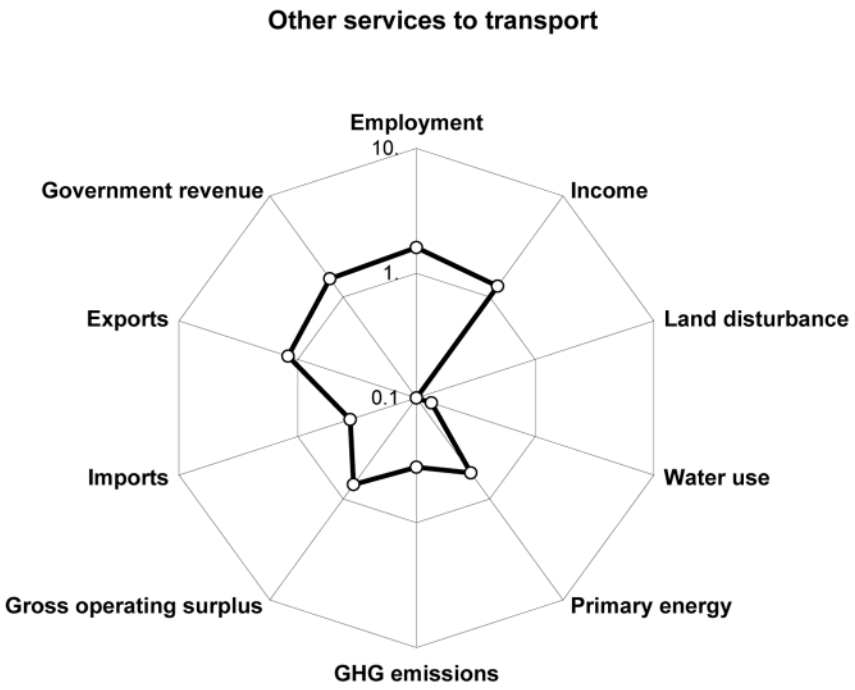
Innovation and Technical Opportunities

The literature reveals tensions between e-commerce and the integrated logistical systems already in operation. The e-commerce revolution may further increase the requirement for freight and management services as better logistics and decreased inventories stimulate more deliveries. Global shocks from civil unrest, disease epidemics and oil constraints run counter to this trend. This might suggest that agile operators and companies may have more resilient business futures.

Sector **Other services to transport** **(St)**

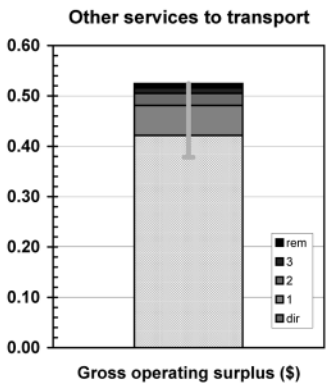
Travel, tourist and customs agency services, forwarding, storage, parking, stevedoring, port handling and other services to transport

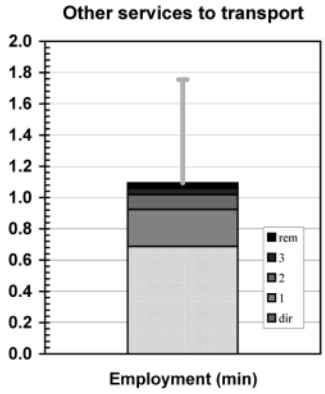
Spider diagram

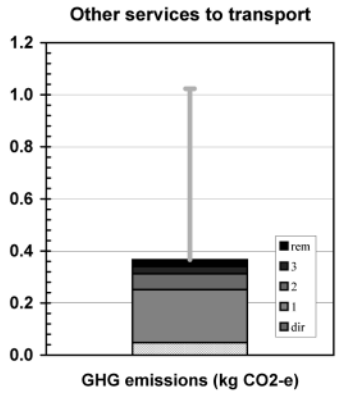


Bar graphs

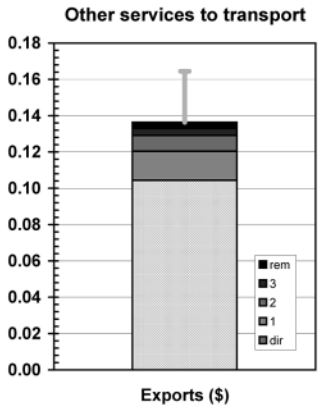
Account #1

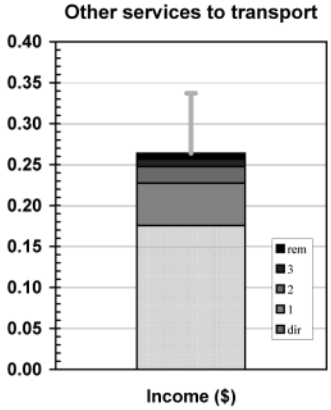


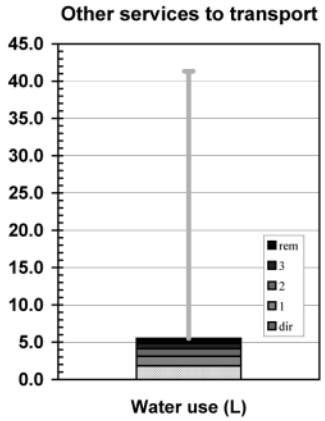




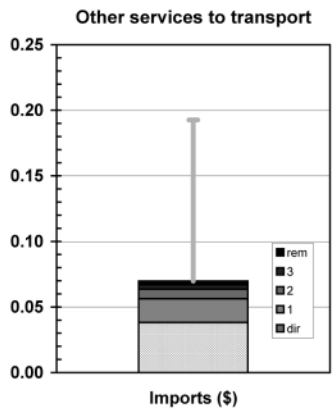
Account #2

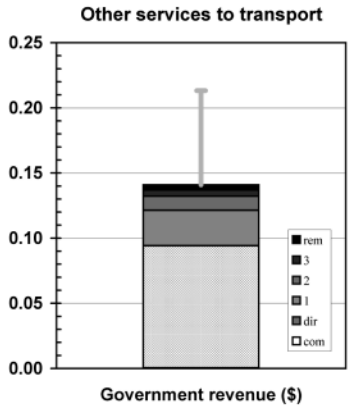


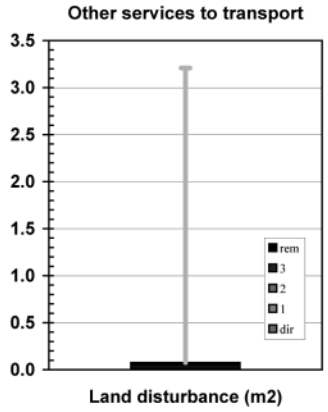




Account #3







National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 303.1	(0.11% of total)	($m 224.8 domestically produced)
Government final consumption	$m 3,569.1	(4.03% of total)	($m 3,569.1 domestically produced)
Gross fixed capital expenditure	$m 24.1	(0.02% of total)	($m 24.1 domestically produced)
Net changes in stocks	-$m 2.3	-(0.13% of total)	
Sectoral GNE	**$m 3,894.0**	**(0.85% of GNE)**	**($m 3,815.7 domestically produced)**
Exports	$m 1,594.8	(1.91% of total)	($m 1,594.8 domestically produced)
Final demand	**$m 5,488.8**	**(1.01% of GNT)**	**($m 5,410.5 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 2,681.3	(1.57% of total)	
Gross operating surplus	$m 6,436.5	(3.36% of total)	
Taxes less subsidies	$m 1,431.3	(1.68% of total)	
Sectoral GDP*	**$m 10,549.1**	**(2.35% of GDP)**	
Imports	$m 582.7	(0.60% of total)	
Primary inputs	**$m 11,131.8**	**(2.04% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 6,436.5	(3.36%)	$m 2,280.7	(1.19%)	$m 2,839.2	(1.48%)
Exports ($m)	$m 1,594.8	(1.91%)	$m 565.1	(0.68%)	$m 737.7	(0.88%)
Imports ($m)	$m 582.7	(0.60%)	$m 206.5	(0.21%)	$m 377.6	(0.39%)
Employment (e-y)	84,138 e-y	(1.18%)	29,813 e-y	(0.42%)	47,434 e-y	(0.67%)
Income ($m)*	$m 2,681.3	(1.57%)	$m 950.1	(0.56%)	$m 1,428.1	(0.84%)
Government revenue ($m)†	$m 1,433.8	(1.33%)	$m 509.7	(0.47%)	$m 762.9	(0.71%)
GHG emissions (kt CO_2-e)	732 kt	(0.14%)	259 kt	(0.05%)	1,983 kt	(0.38%)
Water use (ML)	27,809 ML	(0.13%)	9,854 ML	(0.05%)	29,878 ML	(0.14%)
Land disturbance (kha)	3 kha	(0.00%)	1 kha	(0.00%)	41 kha	(0.03%)
Primary energy (TJ)	12,668 TJ	(0.33%)	4,489 TJ	(0.12%)	22,867 TJ	(0.59%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.42	0.52	0.38
Exports ($)	0.10	0.14	0.16
Imports ($)	0.04	0.07	0.19
Employment (min)	0.69	1.09	1.75
Income ($)	0.18	0.26	0.34
Government revenue ($)	0.09	0.14	0.21
GHG emissions (kg CO_2-e)	0.05	0.37	1.02
Water use (L)	1.82	5.52	41.32
Land disturbance (m^2)	0.00	0.08	3.21
Primary energy (MJ)	0.83	4.22	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
St	0.421	(0; 80.%)	St	0.687	(0; 63.%)	El St	0.176	(1; 48.%)
El St	0.00709	(1; 1.4%)	Ts St	0.027	(1; 2.5%)	St	0.0479	(0; 13.%)
Ts St	0.00599	(1; 1.1%)	Wt St	0.017	(1; 1.6%)	Rd St	0.00446	(1; 1.2%)
Cm St	0.00581	(1; 1.1%)	Rd St	0.0165	(1; 1.5%)	Bl El St	0.00442	(2; 1.2%)
Rv St	0.00492	(1; 0.94%)	Bs St	0.0165	(1; 1.5%)	Fo St	0.00439	(1; 1.2%)
Pd St	0.00397	(1; 0.76%)	Cm St	0.0161	(1; 1.5%)	El Rf St	0.00264	(2; 0.72%)
Ms St	0.00352	(1; 0.67%)	Ms St	0.0158	(1; 1.4%)	Rf St	0.00263	(1; 0.72%)
Rd St	0.00281	(1; 0.54%)	Rv St	0.0132	(1; 1.2%)	Fr St	0.00246	(1; 0.67%)
Wt St	0.00236	(1; 0.45%)	Pd St	0.00955	(1; 0.87%)	At St	0.00241	(1; 0.66%)
Bs St	0.00167	(1; 0.32%)	Ho St	0.00933	(1; 0.85%)	Wt St	0.00235	(1; 0.64%)
Bk St	0.00163	(1; 0.31%)	El St	0.00789	(1; 0.72%)	El Pd St	0.00189	(2; 0.52%)
Bl El St	0.00113	(2; 0.22%)	Nb St	0.00728	(1; 0.67%)	Bc Mp Ho St	0.00185	(3; 0.51%)
Rh St	0.0011	(1; 0.21%)	Rf St	0.00724	(1; 0.66%)	El Ts St	0.00149	(2; 0.41%)
Rf St	0.000906	(1; 0.17%)	Rh St	0.00672	(1; 0.61%)	El Ms St	0.00147	(2; 0.4%)
Ho St	0.000743	(1; 0.14%)	Bk St	0.00646	(1; 0.59%)	Ap St	0.00133	(1; 0.36%)
Nb St	0.000713	(1; 0.14%)	Ed St	0.00635	(1; 0.58%)	Oi Fo St	0.00132	(2; 0.36%)
Oi Fo St	0.000625	(2; 0.12%)	Os St	0.00424	(1; 0.39%)	El Ho St	0.00122	(2; 0.33%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
St	0.104	(0; 77.%)	St	0.176	(0; 67.%)	St	1.82	(0; 33.%)
Wt St	0.00193	(1; 1.4%)	Ts St	0.00632	(1; 2.4%)	El St	0.97	(1; 18.%)
Bl El St	0.00172	(2; 1.3%)	Ms St	0.00367	(1; 1.4%)	Wa Pd St	0.109	(2; 2.%)
Rf St	0.00148	(1; 1.1%)	Wt St	0.00364	(1; 1.4%)	Wa Ms St	0.0905	(2; 1.6%)
Ai St	0.00129	(1; 0.94%)	Cm St	0.00364	(1; 1.4%)	Vf St	0.0837	(1; 1.5%)
Rd St	0.000977	(1; 0.72%)	Pd St	0.00358	(1; 1.4%)	Wa Ts St	0.0808	(2; 1.5%)
Ts St	0.00095	(1; 0.7%)	Rd St	0.00284	(1; 1.1%)	Ws Ho St	0.068	(2; 1.2%)
En St	0.000909	(1; 0.67%)	El St	0.00214	(1; 0.81%)	Wa El St	0.0561	(2; 1.%)
Cm St	0.000775	(1; 0.57%)	Rv St	0.00212	(1; 0.8%)	Wa Bs St	0.0504	(2; 0.91%)
At St	0.000767	(1; 0.56%)	Rf St	0.00203	(1; 0.77%)	Bc Mp Ho St	0.0488	(3; 0.88%)
Ms St	0.000545	(1; 0.4%)	Bs St	0.00202	(1; 0.77%)	Dc Dp Ho St	0.0404	(3; 0.73%)
Ho St	0.000519	(1; 0.38%)	Bk St	0.00159	(1; 0.6%)	Dc Dp St	0.0361	(2; 0.65%)
Oi Fo St	0.000427	(2; 0.31%)	Ed St	0.00157	(1; 0.6%)	Ri Fc Ho St	0.0314	(3; 0.57%)
Mv St	0.000351	(1; 0.26%)	Ho St	0.00136	(1; 0.52%)	Vf Ho St	0.0258	(2; 0.47%)
Bs St	0.000309	(1; 0.23%)	Os St	0.00119	(1; 0.45%)	Bl El St	0.023	(2; 0.42%)
Oi Ap St	0.000221	(2; 0.16%)	Nb St	0.00109	(1; 0.41%)	Ws St	0.0212	(1; 0.38%)
Fm St	0.000206	(1; 0.15%)	Ai St	0.00108	(1; 0.41%)	Su Fd St	0.0206	(2; 0.37%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
St	0.0381	(0; 55.%)	St	0.0937	(0; 67.%)	Bc Mp Ho St	0.0135	(3; 18.%)
Ts St	0.00172	(1; 2.5%)	Ts St	0.00311	(1; 2.2%)	El St	0.00283	(1; 3.7%)
Ai St	0.00164	(1; 2.4%)	Pd St	0.00235	(1; 1.7%)	Wo Tx Cl St	0.00233	(3; 3.1%)
Fo St	0.00144	(1; 2.1%)	Rd St	0.00201	(1; 1.4%)	St	0.00208	(0; 2.7%)
En St	0.00106	(1; 1.5%)	Ms St	0.00174	(1; 1.2%)	Wo Mp Ho St	0.00152	(3; 2.%)
Cm St	0.000994	(1; 1.4%)	Cm St	0.00174	(1; 1.2%)	Ba Bm Ho St	0.0011	(3; 1.4%)
Mv St	0.000879	(1; 1.3%)	Wt St	0.0017	(1; 1.2%)	Wo Ts St	0.00104	(2; 1.4%)
Ms St	0.000801	(1; 1.1%)	El St	0.00133	(1; 0.95%)	Rf St	0.00102	(1; 1.3%)
Ap St	0.000747	(1; 1.1%)	Rv St	0.00131	(1; 0.93%)	Bc Mp Ho Ms	0.000853	(4; 1.1%)
Rd St	0.000712	(1; 1.%)	Rf St	0.000934	(1; 0.67%)	Bc Mp Ts St	0.000847	(3; 1.1%)
Rv St	0.000637	(1; 0.91%)	In St	0.000915	(1; 0.65%)	Fr St	0.000793	(1; 1.%)
Pd St	0.000572	(1; 0.82%)	Bk St	0.000881	(1; 0.63%)	Bc Mp Ho Pd	0.000678	(4; 0.89%)
Rh St	0.000567	(1; 0.81%)	Ai St	0.000768	(1; 0.55%)	Wo Tx Wt St	0.000605	(3; 0.79%)
Wt St	0.000548	(1; 0.79%)	Ho St	0.000716	(1; 0.51%)	Bc Mp St	0.000536	(2; 0.7%)
El St	0.000492	(1; 0.71%)	Bs St	0.000599	(1; 0.43%)	Bc Mp Pd St	0.000463	(3; 0.61%)
Ho St	0.000346	(1; 0.5%)	Ed St	0.000577	(1; 0.41%)	Wo Tx Tp St	0.000433	(3; 0.57%)
Bs St	0.000332	(1; 0.48%)	Os St	0.000551	(1; 0.39%)	Bc Mp Ho Ts	0.000411	(4; 0.54%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.550 ±0.009	(±1.6%)
Downstream	1.248 ±0.025	(±2.0%)

Sector 7101: Communication (Cm)

Postal, courier and telecommunication services, Pay-TV

Short Summary

The environmental indicators are typical of a service sector with greenhouse emissions, water use and land disturbance at least 70% below economy wide averages. The social indicator of employment generation is 20% below average, income is 10% below average and government revenue is 30% below average. The financial indicator of operating surplus is 15% above average while exports and imports are both 45% below average. While the technological future seems virtually limitless with the promise of seamless integration of most of the mobile and stationary devices that underpin a consumer's daily life, some management problems loom.

Sector Description

Domestic telecommunication services dominate the sector with around 70% of the financial activity. Overseas telecommunications (7%), postal services (10%), courier services (10%) and pay TV (3%) also feature although pay TV may have increased its share in the last few years. Companies such as Telstra and Singtel-Optus dominate the telecommunications component, Australia Post is the sole provider in postal services, and there are over 600 companies supplying courier services. There are currently over 10 million land line connections for phone and data services and over 14 million mobile phones. The postal service delivers approximately 5 billion articles yearly to 9 million delivery points from nearly 4 000 post offices. There are nearly 1.5 million pay TV subscribers and 4 million internet connections.

Place of Industry in the Economy

The communications sector ranks 10th out of 135 sectors in terms of value adding in the economy, and contributes 2.73% of GDP in this analysis. By way of comparison it has similar value adding to the sectors of property development and scientific and technical services. In meeting final demand, the sector has direct requirements of 41 000 employment years with another 26 000 in upstream suppliers, giving a total of 67 000. It also supplies 100 000 employment years to the final demand of downstream industries. Similar to many service sectors, it has relatively small requirements for land and water with less than one tenth of one percent of national totals. Energy use and greenhouse emissions are slightly higher, with one half and one third of one percent of national totals respectively. In absolute financial terms, imports and exports are roughly in balance in these data.

Strategic Overview

The integrated overview of the communications sector shown in the spider diagram portrays mixed TBL outcomes with six indicators showing better than average performance and four indicators showing below average performance. This sector is expected to expand in line with economic growth. Given the importance of service sectors in the economy, the below average export propensity may be an issue requiring further examination. With the centrality of communications to modern economies, the performance of the government revenue indicator may prove challenging to improve. However a levy on mobile phone calls and SMS messages could provide a strong and growing revenue stream as Australians currently send over three billion SMS messages each year. Upstream issues for the sector relate to the energy intensity of activities such as courier services, while downstream issues relate to concerns regarding social equity across the digital divide.

TBL Account #1

The financial indicator of gross operating surplus is 15% higher than the economy wide average and three quarters of this is a direct effect with relatively small contributions from upstream sectors such as wholesale trade, equipment repairs, property development and multimedia publishing. The social indicator of employment generation is 20% lower than average with sectoral contributions similar to the operating surplus. The greenhouse emissions indicator is 70% lower than the economy wide average. Of this, the direct sector effect is only 11% with contributions from electricity generation (18%), airlines (4%), wholesale trade (3%) and chemicals used for plastics in communications (2%).

TBL Accounts #2 and #3

The second TBL account shows an export propensity 45% below average, income 10% below average and water use 90% below average. The third TBL account shows an import penetration 50% below average, government revenue 30% below average and land disturbance 95% below average. While land use is very low, proposed locations for towers sometimes provoke controversy. The possibility of improvements in export propensity and government revenue could be explored.

Structural Path Analysis and Linkages

The export propensity indicator is below average. An examination of the structural path analysis shows a direct effect of 45% followed by wholesale trade (7%), road transport (2%), repairs (2%), hotels (1%) and publishing (1%). Given the size of the direct effect, it would seem export enhancement activities should focus directly on the sector. New data may show improvements as the domestic sector continually searches globally for partners and technologies. Telecommunication firms such as Telstra have investments in 19 countries including cellular networks in Hong Kong, a telephone company in New Zealand, and a 50% stake in Reach (a submarine cable network).

The communications sector shows relatively weak upstream linkages to the sector's suppliers such as wholesale trade and property development. The sector shows relatively strong downstream linkages. Increases in investment into the sector would require downstream sectors such as wholesale and retail trade, legal and accounting services, property development and government administration to expand in order to dissipate the expansionary effect.

Future Trends in Sector

The scientific literature notes the extreme difficulty in forecasting the future of telecommunication in an environment of fast changing technology and intense competition. Financial analyses by corporate telecoms note that revenues grow in line with GDP growth i.e. a doubling every 25 years if the GDP growth rate averages 3% over the long run. In physical terms the numbers of landline connections and mobile devices will be dictated by population issues. Under the *Future Dilemmas* base case scenario of 25 million people by 2050, connections would increase by 25%. Capacity will also be driven by new opportunities and products such as full length movies on demand.

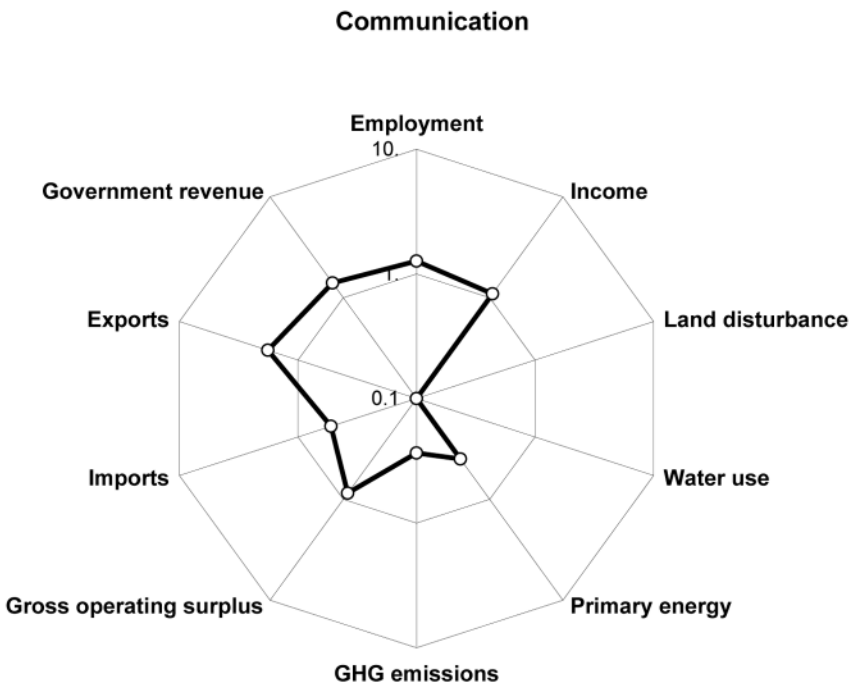
Innovation and Technical Opportunities

Three key issues emerge from the literature. The first is to design and implement equipment architectures and data protocols that are compatible worldwide, with sufficient redundancy within the system to allow communications to survive disruptive attacks and failures brought about by system complexity and overload. The second is the merging of technologies and devices, and the possible market dominance by powerful monopolistic corporations that are beyond the reach of national institutions and global governance. The third may be the need to re-establish personal contact in value added services, if consumer enthusiasm for technological wizardry wanes.

Sector **Communication** **(Cm)**

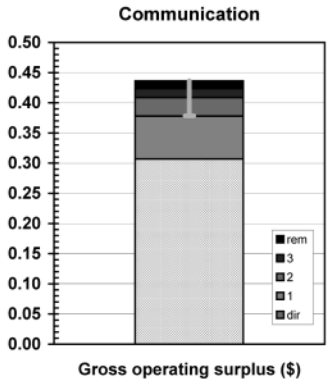
Postal, courier and telecommunication services, Pay-TV

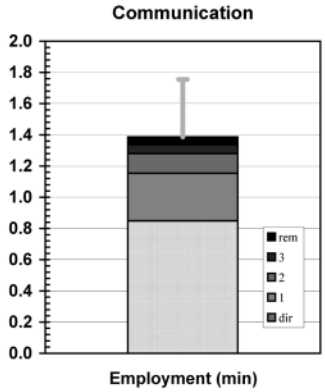
Spider diagram

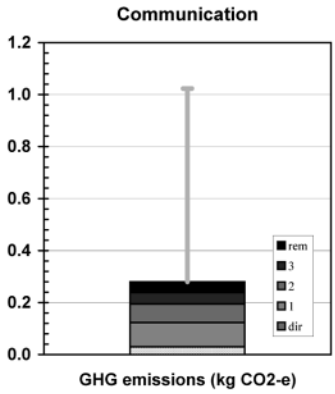


Bar graphs

Account #1







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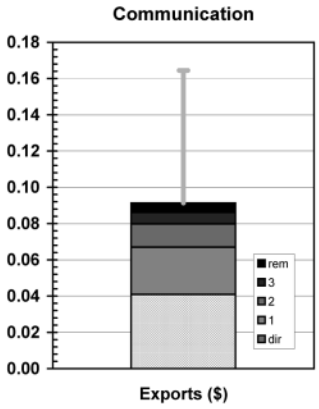

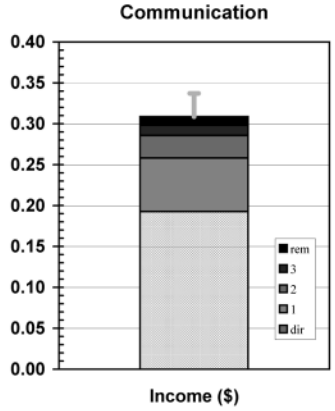

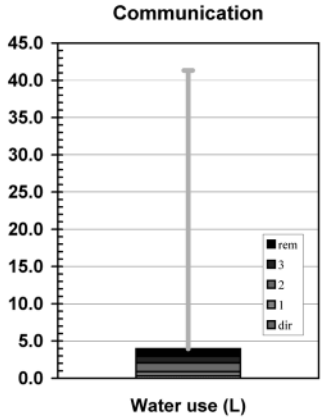

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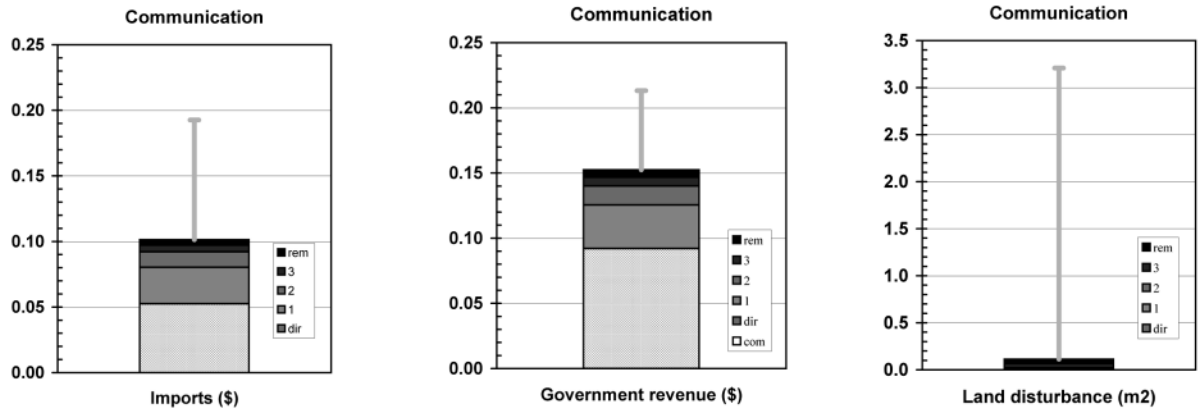


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 5,462.7	(2.07% of total)	($m 5,145.9 domestically produced)
Government final consumption	$m 50.2	(0.06% of total)	($m 50.2 domestically produced)
Gross fixed capital expenditure	$m 9.3	(0.01% of total)	($m 9.3 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 5,522.1**	**(1.20% of GNE)**	**($m 5,205.3 domestically produced)**
Exports	$m 844.9	(1.01% of total)	($m 844.9 domestically produced)
Final demand	**$m 6,367.0**	**(1.17% of GNT)**	**($m 6,050.3 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 3,975.7	(2.33% of total)	
Gross operating surplus	$m 6,335.5	(3.30% of total)	
Taxes less subsidies	$m 1,899.6	(2.22% of total)	
Sectoral GDP*	**$m 12,210.8**	**(2.73% of GDP)**	
Imports	$m 1,083.8	(1.11% of total)	
Primary inputs	**$m 13,294.6**	**(2.44% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 6,335.5	(3.30%)	$m 1,857.0	(0.97%)	$m 2,639.1	(1.38%)
Exports ($m)	$m 844.9	(1.01%)	$m 247.7	(0.30%)	$m 552.8	(0.66%)
Imports ($m)	$m 1,083.8	(1.11%)	$m 317.7	(0.33%)	$m 613.1	(0.63%)
Employment (e-y)	140,300 e-y	(1.97%)	41,123 e-y	(0.58%)	67,198 e-y	(0.94%)
Income ($m)*	$m 3,975.7	(2.33%)	$m 1,165.3	(0.68%)	$m 1,867.4	(1.09%)
Government revenue ($m)†	$m 1,899.6	(1.76%)	$m 556.8	(0.52%)	$m 922.0	(0.85%)
GHG emissions (kt CO_2-e)	615 kt	(0.12%)	180 kt	(0.03%)	1,692 kt	(0.33%)
Water use (ML)	5,958 ML	(0.03%)	1,746 ML	(0.01%)	23,966 ML	(0.11%)
Land disturbance (kha)	6 kha	(0.00%)	2 kha	(0.00%)	68 kha	(0.04%)
Primary energy (TJ)	9,197 TJ	(0.24%)	2,696 TJ	(0.07%)	18,453 TJ	(0.48%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.31	0.44	0.38
Exports ($)	0.04	0.09	0.16
Imports ($)	0.05	0.10	0.19
Employment (min)	0.85	1.39	1.75
Income ($)	0.19	0.31	0.34
Government revenue ($)	0.09	0.15	0.21
GHG emissions (kg CO_2-e)	0.03	0.28	1.02
Water use (L)	0.29	3.96	41.32
Land disturbance (m^2)	0.00	0.11	3.21
Primary energy (MJ)	0.45	3.05	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Cm	0.307	(0; 70.%)	Cm	0.848	(0; 61.%)	El Cm	0.05	(1; 18.%)
Wt Cm	0.00722	(1; 1.7%)	Wt Cm	0.052	(1; 3.8%)	Cm	0.0298	(0; 11.%)
Rv Cm	0.0047	(1; 1.1%)	Rh Cm	0.0171	(1; 1.2%)	At Cm	0.012	(1; 4.3%)
Pd Cm	0.0034	(1; 0.78%)	Rv Cm	0.0126	(1; 0.91%)	Wt Cm	0.0072	(1; 2.6%)
Ne Cm	0.00302	(1; 0.69%)	Gv Cm	0.0126	(1; 0.91%)	Ch Pl Cm	0.0042	(2; 1.5%)
Rh Cm	0.0028	(1; 0.64%)	Rd Cm	0.0109	(1; 0.79%)	El En Cm	0.00365	(2; 1.3%)
El Cm	0.00202	(1; 0.46%)	Ee Cm	0.0106	(1; 0.76%)	Is Sh Cm	0.00312	(2; 1.1%)
Pl Cm	0.00189	(1; 0.43%)	Ho Cm	0.0105	(1; 0.76%)	Rd Cm	0.00295	(1; 1.1%)
St Cm	0.00187	(1; 0.43%)	Ne Cm	0.0102	(1; 0.74%)	El Pl Cm	0.00219	(2; 0.78%)
Rd Cm	0.00186	(1; 0.43%)	Pl Cm	0.0101	(1; 0.73%)	El Wt Cm	0.00217	(2; 0.78%)
Ms Cm	0.00177	(1; 0.4%)	Pd Cm	0.00816	(1; 0.59%)	Bc Mp Ho Cm	0.00209	(3; 0.75%)
Ee Cm	0.00171	(1; 0.39%)	Ms Cm	0.00792	(1; 0.57%)	Ga Cm	0.00187	(1; 0.67%)
Ts Cm	0.00154	(1; 0.35%)	Pr Cm	0.00721	(1; 0.52%)	Ap Cm	0.00183	(1; 0.65%)
St Wt Cm	0.00138	(2; 0.32%)	Ts Cm	0.00693	(1; 0.5%)	El Rh Cm	0.00182	(2; 0.65%)
Sf Cm	0.00136	(1; 0.31%)	En Cm	0.00644	(1; 0.46%)	El Pd Cm	0.00162	(2; 0.58%)
En Cm	0.00114	(1; 0.26%)	Sh Cm	0.0064	(1; 0.46%)	Ng Cm	0.00147	(1; 0.53%)
At Cm	0.0011	(1; 0.25%)	At Cm	0.00605	(1; 0.44%)	Fo Cm	0.00145	(1; 0.52%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Cm	0.0409	(0; 45.%)	Cm	0.193	(0; 62.%)	Cm	0.289	(0; 7.3%)
Wt Cm	0.0059	(1; 6.5%)	Wt Cm	0.0112	(1; 3.6%)	El Cm	0.276	(1; 7.%)
At Cm	0.00383	(1; 4.2%)	Gv Cm	0.00315	(1; 1.%)	Dc Dp Cm	0.25	(2; 6.3%)
En Cm	0.00343	(1; 3.8%)	Pd Cm	0.00306	(1; 0.99%)	Wa Pd Cm	0.0929	(2; 2.3%)
Ee Cm	0.00171	(1; 1.9%)	Ne Cm	0.00235	(1; 0.76%)	Ws Ho Cm	0.0768	(2; 1.9%)
Rf Cm	0.000717	(1; 0.78%)	At Cm	0.00213	(1; 0.69%)	Bc Mp Ho Cm	0.0551	(3; 1.4%)
Lg Cm	0.000706	(1; 0.77%)	Pl Cm	0.00203	(1; 0.66%)	Dc Dp Ho Cm	0.0457	(3; 1.2%)
Rd Cm	0.000647	(1; 0.71%)	Ee Cm	0.00203	(1; 0.66%)	Wa Ms Cm	0.0454	(2; 1.1%)
Ho Cm	0.000586	(1; 0.64%)	Rv Cm	0.00202	(1; 0.66%)	Ri Fc Ho Cm	0.0355	(3; 0.9%)
Pl Cm	0.000547	(1; 0.6%)	Rd Cm	0.00188	(1; 0.61%)	Pp Cm	0.0312	(1; 0.79%)
Bl El Cm	0.000489	(2; 0.53%)	Rh Cm	0.00187	(1; 0.61%)	Su Bv Cm	0.0295	(2; 0.74%)
Ch Pl Cm	0.000489	(2; 0.53%)	Ms Cm	0.00184	(1; 0.6%)	Vf Ho Cm	0.0291	(2; 0.74%)
Nf Cm	0.000475	(1; 0.52%)	En Cm	0.00163	(1; 0.53%)	Wt Cm	0.0291	(1; 0.73%)
St Cm	0.000463	(1; 0.51%)	Ts Cm	0.00162	(1; 0.53%)	Wa Ms Wt Cm	0.0269	(3; 0.68%)
Ne Cm	0.000441	(1; 0.48%)	Ho Cm	0.00154	(1; 0.5%)	Vf Pl Cm	0.0249	(2; 0.63%)
Nf Ee Cm	0.000401	(2; 0.44%)	Pr Cm	0.00144	(1; 0.47%)	Wa Pd Wt Cm	0.0227	(3; 0.57%)
Mv Cm	0.000368	(1; 0.4%)	Sh Cm	0.00127	(1; 0.41%)	Ee Cm	0.0223	(1; 0.56%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Cm	0.0525	(0; 52.%)	Cm	0.092	(0; 60.%)	Bc Mp Ho Cm	0.0152	(3; 14.%)
En Cm	0.00398	(1; 3.9%)	Wt Cm	0.00522	(1; 3.4%)	Bc Mp Cm	0.00539	(2; 4.8%)
Pl Cm	0.00193	(1; 1.9%)	Pd Cm	0.00201	(1; 1.3%)	Cm	0.00308	(0; 2.7%)
Wt Cm	0.00168	(1; 1.7%)	At Cm	0.00172	(1; 1.1%)	Wo Tx Tp Cm	0.00266	(3; 2.4%)
Ee Cm	0.00166	(1; 1.6%)	Rd Cm	0.00133	(1; 0.88%)	Wo Tx Pl Cm	0.00194	(3; 1.7%)
Ne Cm	0.00146	(1; 1.4%)	Rv Cm	0.00125	(1; 0.82%)	Wo Tx Wt Cm	0.00185	(3; 1.6%)
Rh Cm	0.00144	(1; 1.4%)	Ne Cm	0.00118	(1; 0.77%)	Wo Mp Ho Cm	0.00172	(3; 1.5%)
Pr Cm	0.00129	(1; 1.3%)	Gv Cm	0.0011	(1; 0.72%)	Bc Mp Ch Pl C	0.00167	(4; 1.5%)
At Cm	0.00114	(1; 1.1%)	En Cm	0.000989	(1; 0.65%)	Wo Tx Cl Cm	0.00147	(3; 1.3%)
Ap Cm	0.00103	(1; 1.%)	Ee Cm	0.000887	(1; 0.58%)	At Cm	0.00131	(1; 1.2%)
Mv Cm	0.000922	(1; 0.91%)	Pl Cm	0.000887	(1; 0.58%)	Dc Dp Cm	0.00129	(2; 1.2%)
Sh Cm	0.00074	(1; 0.73%)	Ms Cm	0.000875	(1; 0.57%)	Ba Bm Ho Cm	0.00124	(3; 1.1%)
Rv Cm	0.000608	(1; 0.6%)	Rh Cm	0.000858	(1; 0.56%)	Bc Mp Ho Wt	0.00107	(4; 0.95%)
Pd Cm	0.000489	(1; 0.48%)	Ho Cm	0.000809	(1; 0.53%)	Wo Tx Fu Cm	0.00104	(3; 0.93%)
Ch Pl Cm	0.000489	(2; 0.48%)	Ts Cm	0.000799	(1; 0.52%)	Sw Pp Cm	0.001	(2; 0.89%)
Fo Cm	0.000475	(1; 0.47%)	In Cm	0.000749	(1; 0.49%)	Bc Ch Pl Cm	0.00084	(3; 0.75%)
Rd Cm	0.000471	(1; 0.47%)	Pr Cm	0.000698	(1; 0.46%)	El Cm	0.000807	(1; 0.72%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.744 ±0.013	(±1.7%)
Downstream	1.427 ±0.023	(±1.6%)

Sector 7301: Banking (Bk)

Financial services from major banks

Short Summary

The banking sector provides environmental indicators typical of a service sector with most of the activity generated within the sector and few physical inputs required per dollar of final demand generated. The environmental indicators are at least 85% below economy wide averages with a small direct effect and the majority due to the sector's supply chain. The social indicator of employment generation is 15% below average, income is equal to average and government revenue is 35% above average. The financial indicators show operating surplus is 10% above average, export propensity is 70% below average while import penetration is 75% below average. Overall the banking sector performs well against this TBL indicator set and improvements, if required, should focus on export performance. However Australian banks have achieved mixed results for overseas acquisitions over the last five years. Increases in consumer demand provide below average stimulus to upstream suppliers. Downstream linkages are average and suggest that expansion in the banking sector must be led by expansion in the housing, wholesale and retail sectors. The sector is far more important than this analysis suggests because of the pivotal place banking occupies in development decisions at many scales. Future banking services may include environmental and social issues in their assessment of financing risk.

Sector Description

The banking sector occupies a pivotal position in the lifestyles of the nation's citizens, business operations and international affairs. There are more than 50 banks operating of which the four major Australian banks account for more than half of the total assets. There are over 5 000 bank branches and a further 5 000 bank agencies supplemented with more than 12 000 automatic teller machines and 3 000 giroPost locations. The level of banking profits (one to four billion dollars yearly) attracts some adverse comment but must be judged against an asset base of more than $800 billion. Banks such as Westpac have led the implementation of TBL accounting in Australia. Their *Fresh Perspective* social impact statement reported against 14 environmental, 41 social and 14 economic indicators. Other major banks such as the ANZ have signed the UNEP Finance Initiative.

Place of Industry in the Economy

The banking sector ranks 15th out of 135 in its contribution to value adding in the economy and contributes 2.34% of GDP in this analysis. The sector has moderate employment generation with a direct requirement of 54 000 employment years and another 32 000 in the sector's suppliers giving a total of 86 000 employment years. In addition the sector contributes 78 000 employment years to downstream sectors such as ownership of dwellings, wholesale and retail trade. In common with many service sectors, banking's requirements for water, land, energy and greenhouse emissions are relatively small representing less than three tenths of one percent of the national totals for these resources. In absolute financial terms, imports are 30% greater than exports.

Strategic Overview

The strategic overview in the spider diagram shows very positive outcomes with one outlier for export propensity. Upstream issues for the banking sector relate to the balancing of customer service and employment generation with profits. Downstream issues relate to the sector's potential influence over the social and environmental performance of major infrastructure projects, as well as the total effect of individual consumer decisions relating to domestic housing and motor vehicles.

TBL Account #1

In the first TBL account, the financial indicator of operating surplus is 10% above average, employment generation is 15% below average and greenhouse gas emissions are 85% below average. Over half of the surplus is a direct effect with another 30% due to a range of first order suppliers such as broking and dealing, communications, property development and repairs and maintenance. Greenhouse emissions are mostly due to electricity derived from coal, used by the banks and by their first order suppliers. Emissions also arise from the paper production chain behind the paper used in bank offices and corporate promotion.

TBL Accounts #2 and #3

The second TBL account shows an export propensity indicator 70% below average, income equal to average and water use 90% below average. The two social indicators of employment generation and income may move apart in future analyses, as job shedding in the banking sector continues and remuneration for senior management grows. The third TBL account shows an import penetration indicator 75% below average, government revenue 35% above average (transaction taxes on accounts) and land disturbance 95% below average.

Structural Path Analysis and Linkages

Given the better-than-average performance for most indicators, improvement efforts may focus on export performance which is 70% below average. The sector's direct effect is 40% of the export indicator and sector specific actions are an obvious priority. However a focus on first order effects such as broking (6%), air travel (4%) hotels (3%) and communications, education, travel agencies and wholesale trade (each 2%) may provide some opportunities for export improvement.

The banking sector shows very weak upstream linkages to its suppliers such as security broking, property development and communications. Thus major increases in consumer demand for bank services show few flow-on effects to a wider set of industries. Decisions to substantially invest into the banking sector reveal average downstream linkages.

Future Trends in Sector

While technological change is reducing personal contact between the banker and the customer, and the industry claims "[future banking requires]……a customer-centric multi-channel middle ware infrastructure that gives customers a consistent experience independent of the channel used to reach each bank", social interest in community banks suggests an unsatisfied requirement for more personal contact and advice (so called 'customer-facing') compared to the 'leaner, smarter, bigger, faster' trend of the last twenty years. While globalisation trends seem hard to resist, some studies reveal strong business preference for nationally owned and located banks.

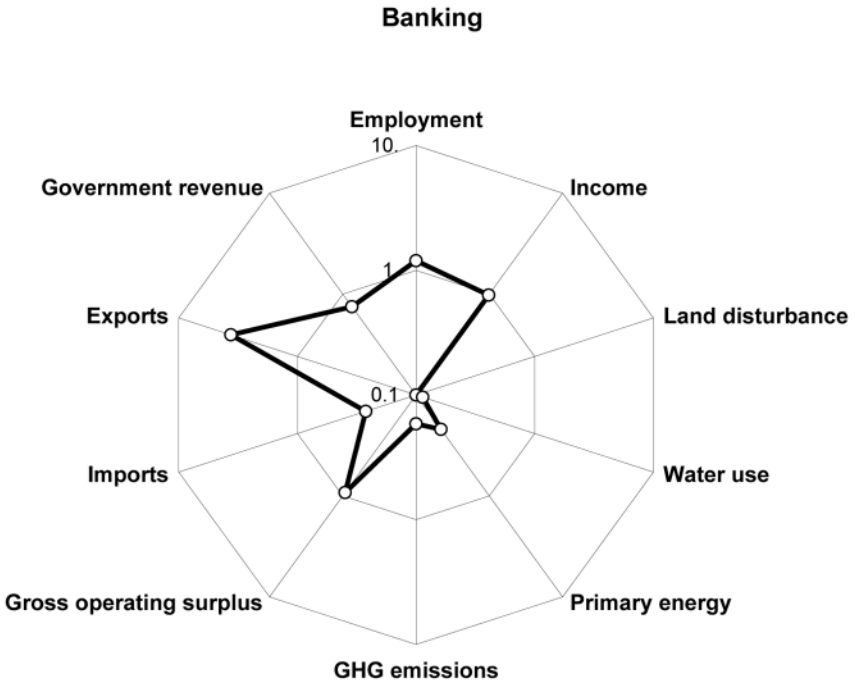
Innovation and Technical Opportunities

Much of this sector's scope for improvement arises from the potential influence of banks over their customers. Banks may choose to focus on growth, customers, profits and shareholder value. However some commentators note a growing tension between the 'shareholder value' view of the world, and an individual's requirements for robust communities and a rewarding life. Banks that provide stable mortgage rates advantaging domestic housing with high environmental performance could drive a profound change in the national stock of housing infrastructure. Banks could reduce the interest rate risks of wind farm developments and solar thermal power plants, or local production lines for low-emission hybrid cars. As banking becomes fully globalised, there could be a move towards national currency substitutes possibly backed by physical endowments of infrastructure, energy, water and land. Banks have the potential to lead the sustainability revolution.

Sector **Banking** **(Bk)**

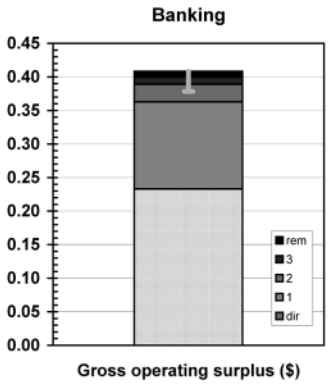
Bank services

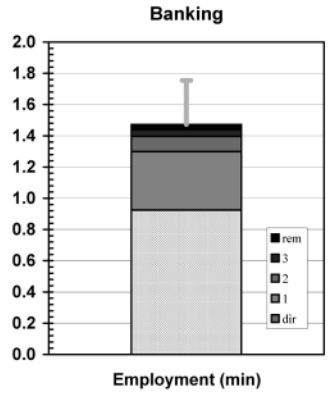
Spider diagram

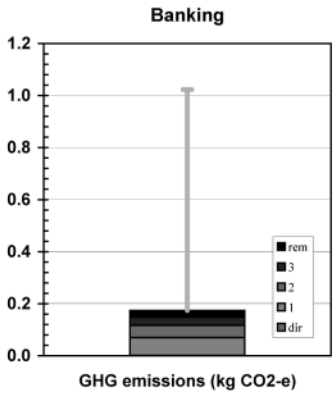


Bar graphs

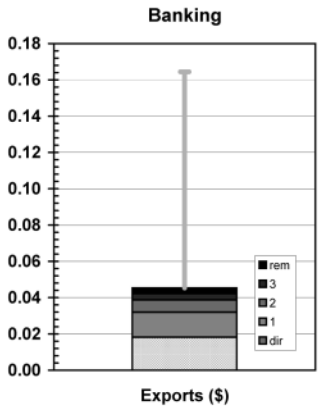
Account #1

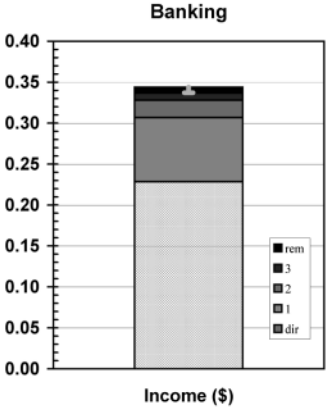


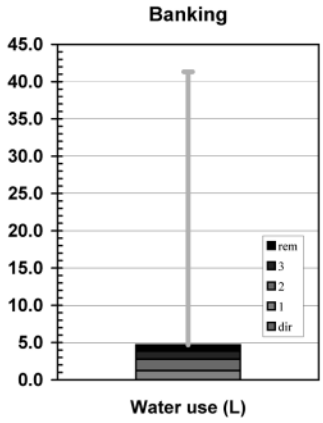




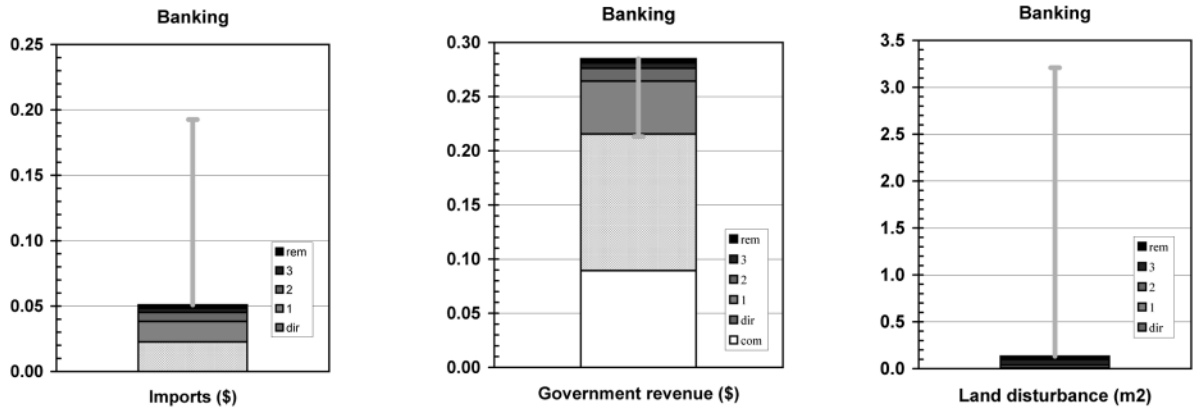
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 7,112.1	(2.69% of total)	($m 6,985.3 domestically produced)
Government final consumption	$m 0.1	(0.00% of total)	($m 0.1 domestically produced)
Gross fixed capital expenditure	$m 0.4	(0.00% of total)	($m 0.4 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 7,112.6**	**(1.55% of GNE)**	**($m 6,985.8 domestically produced)**
Exports	$m 323.9	(0.39% of total)	($m 323.9 domestically produced)
Final demand	**$m 7,436.4**	**(1.37% of GNT)**	**($m 7,309.7 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 4,075.2	(2.39% of total)	
Gross operating surplus	$m 4,159.3	(2.17% of total)	
Taxes less subsidies	$m 2,251.2	(2.64% of total)	
Sectoral GDP*	**$m 10,485.7**	**(2.34% of GDP)**	
Imports	$m 402.3	(0.41% of total)	
Primary inputs	**$m 10,888.0**	**(2.00% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 4,159.3	(2.17%)	$m 1,703.1	(0.89%)	$m 2,986.3	(1.56%)
Exports ($m)	$m 323.9	(0.39%)	$m 132.6	(0.16%)	$m 331.2	(0.40%)
Imports ($m)	$m 402.3	(0.41%)	$m 164.7	(0.17%)	$m 372.8	(0.38%)
Employment (e-y)	132,274 e-y	(1.86%)	54,162 e-y	(0.76%)	86,238 e-y	(1.21%)
Income ($m)*	$m 4,075.2	(2.39%)	$m 1,668.7	(0.98%)	$m 2,515.3	(1.47%)
Government revenue ($m)†	$m 2,904.2	(2.69%)	$m 1,574.8	(1.46%)	$m 2,082.9	(1.93%)
GHG emissions (kt CO_2-e)	12 kt	(0.00%)	5 kt	(0.00%)	1,273 kt	(0.25%)
Water use (ML)	180 ML	(0.00%)	74 ML	(0.00%)	34,376 ML	(0.16%)
Land disturbance (kha)	4 kha	(0.00%)	2 kha	(0.00%)	97 kha	(0.06%)
Primary energy (TJ)	184 TJ	(0.00%)	75 TJ	(0.00%)	12,253 TJ	(0.32%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.23	0.41	0.38
Exports ($)	0.02	0.05	0.16
Imports ($)	0.02	0.05	0.19
Employment (min)	0.92	1.47	1.75
Income ($)	0.23	0.34	0.34
Government revenue ($)	0.22	0.28	0.21
GHG emissions (kg CO_2-e)	0.00	0.17	1.02
Water use (L)	0.01	4.70	41.32
Land disturbance (m^2)	0.00	0.13	3.21
Primary energy (MJ)	0.01	1.68	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Bk	0.233	(0; 57.%)	Bk	0.925	(0; 63.%)	El Bk	0.0537	(1; 31.%)
Sf Bk	0.0814	(1; 20.%)	Sf Bk	0.106	(1; 7.2%)	At Bk	0.00506	(1; 2.9%)
Cm Bk	0.00833	(1; 2.%)	Ed Bk	0.033	(1; 2.2%)	Bc Mp Ho Bk	0.00465	(3; 2.7%)
Pd Bk	0.00571	(1; 1.4%)	Rh Bk	0.0268	(1; 1.8%)	El Ho Bk	0.00306	(2; 1.8%)
Rh Bk	0.00439	(1; 1.1%)	Bs Bk	0.0247	(1; 1.7%)	El Rh Bk	0.00286	(2; 1.6%)
Ms Bk	0.00334	(1; 0.82%)	Ho Bk	0.0234	(1; 1.6%)	Bc Mp Bk	0.00275	(2; 1.6%)
St Bk	0.00323	(1; 0.79%)	Cm Bk	0.023	(1; 1.6%)	El Pd Bk	0.00272	(2; 1.6%)
Bs Bk	0.0025	(1; 0.61%)	Fa Bk	0.0159	(1; 1.1%)	El Ed Bk	0.00154	(2; 0.89%)
Et Bk	0.0022	(1; 0.54%)	Ms Bk	0.015	(1; 1.%)	El Bs Bk	0.00153	(2; 0.88%)
El Bk	0.00217	(1; 0.53%)	Pd Bk	0.0137	(1; 0.93%)	El Ms Bk	0.0014	(2; 0.8%)
Fn Bk	0.00208	(1; 0.51%)	Pr Bk	0.0114	(1; 0.77%)	El Cm Bk	0.00136	(2; 0.78%)
Ts Bk	0.00193	(1; 0.47%)	Et Bk	0.0104	(1; 0.71%)	Bl El Bk	0.00135	(2; 0.78%)
Ho Bk	0.00187	(1; 0.46%)	Ts Bk	0.00868	(1; 0.59%)	El St Bk	0.00135	(2; 0.77%)
Pr Bk	0.00136	(1; 0.33%)	Fn Bk	0.0083	(1; 0.56%)	Sw Pp Bk	0.00118	(2; 0.68%)
Ed Bk	0.00109	(1; 0.27%)	Wt Bk	0.00681	(1; 0.46%)	Sw Pp Pr Bk	0.00117	(3; 0.67%)
Ne Bk	0.000984	(1; 0.24%)	St Bk	0.00528	(1; 0.36%)	Pp Bk	0.00115	(1; 0.66%)
Wt Bk	0.000945	(1; 0.23%)	In Bk	0.00428	(1; 0.29%)	Pp Pr Bk	0.00114	(2; 0.66%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Bk	0.0181	(0; 40.%)	Bk	0.228	(0; 66.%)	Ws Bk	0.336	(1; 7.1%)
Sf Bk	0.00253	(1; 5.6%)	Sf Bk	0.0262	(1; 7.6%)	El Bk	0.297	(1; 6.3%)
At Bk	0.00161	(1; 3.6%)	Ed Bk	0.00816	(1; 2.4%)	Wa Bk	0.27	(1; 5.7%)
Ho Bk	0.0013	(1; 2.9%)	Cm Bk	0.00523	(1; 1.5%)	Dc Dp Bk	0.194	(2; 4.1%)
Cm Bk	0.00111	(1; 2.5%)	Pd Bk	0.00515	(1; 1.5%)	Ws Ho Bk	0.171	(2; 3.6%)
Ed Bk	0.000804	(1; 1.8%)	Ms Bk	0.00348	(1; 1.%)	Wa Pd Bk	0.156	(2; 3.3%)
St Bk	0.000801	(1; 1.8%)	Ho Bk	0.00342	(1; 0.99%)	Bc Mp Ho Bk	0.122	(3; 2.6%)
Wt Bk	0.000773	(1; 1.7%)	Bs Bk	0.00303	(1; 0.88%)	Dc Dp Ho Bk	0.102	(3; 2.2%)
Bl El Bk	0.000525	(2; 1.2%)	Rh Bk	0.00293	(1; 0.85%)	Vf Bk	0.0874	(1; 1.9%)
Ms Bk	0.000517	(1; 1.1%)	Pr Bk	0.00228	(1; 0.66%)	Wa Ms Bk	0.0859	(2; 1.8%)
Bs Bk	0.000464	(1; 1.%)	Ts Bk	0.00203	(1; 0.59%)	Ri Fc Ho Bk	0.0788	(3; 1.7%)
In Bk	0.000359	(1; 0.79%)	In Bk	0.00185	(1; 0.54%)	Wa Bs Bk	0.0756	(2; 1.6%)
Et Bk	0.00034	(1; 0.75%)	Et Bk	0.00183	(1; 0.53%)	Ri Ws Bk	0.0751	(2; 1.6%)
Ts Bk	0.000306	(1; 0.67%)	Fn Bk	0.00155	(1; 0.45%)	Bc Mp Bk	0.0725	(2; 1.5%)
En Bk	0.000299	(1; 0.66%)	Wt Bk	0.00146	(1; 0.42%)	Vf Ws Bk	0.0681	(2; 1.4%)
Ws Bk	0.00029	(1; 0.64%)	St Bk	0.00135	(1; 0.39%)	Vf Ho Bk	0.0647	(2; 1.4%)
Pd Bk	0.000272	(1; 0.6%)	At Bk	0.000896	(1; 0.26%)	Vf Et Bk	0.0424	(2; 0.9%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Bk	0.0225	(0; 44.%)	Bk	0.126	(0; 64.%)	Bc Mp Ho Bk	0.0338	(3; 25.%)
Rh Bk	0.00226	(1; 4.4%)	Sf Bk	0.0228	(1; 12.%)	Bc Mp Bk	0.02	(2; 15.%)
Pr Bk	0.00204	(1; 4.%)	Pd Bk	0.00338	(1; 1.7%)	Wo Mp Ho Bk	0.00381	(3; 2.9%)
Et Bk	0.00155	(1; 3.%)	Ed Bk	0.00299	(1; 1.5%)	Wo Tx Tp Bk	0.00337	(3; 2.5%)
Cm Bk	0.00142	(1; 2.8%)	Cm Bk	0.0025	(1; 1.3%)	Ba Bm Ho Bk	0.00276	(3; 2.1%)
Ho Bk	0.000868	(1; 1.7%)	In Bk	0.00199	(1; 1.%)	Wo Mp Bk	0.00226	(2; 1.7%)
Pd Bk	0.000823	(1; 1.6%)	Ho Bk	0.0018	(1; 0.92%)	Bk	0.00222	(0; 1.7%)
Ms Bk	0.000759	(1; 1.5%)	Ms Bk	0.00165	(1; 0.85%)	Bc Mp Bp Bk	0.00203	(3; 1.5%)
Ts Bk	0.000553	(1; 1.1%)	Rh Bk	0.00135	(1; 0.69%)	Wo Tx Bk	0.00116	(2; 0.87%)
Bs Bk	0.000497	(1; 0.98%)	Pr Bk	0.0011	(1; 0.56%)	Dc Dp Bk	0.001	(2; 0.75%)
At Bk	0.00048	(1; 0.94%)	Ts Bk	0.001	(1; 0.51%)	Bc Mp Ho Pd	0.000975	(4; 0.73%)
Ne Bk	0.000474	(1; 0.93%)	Bs Bk	0.000898	(1; 0.46%)	Wo Tx Ho Bk	0.000957	(3; 0.72%)
Ed Bk	0.000426	(1; 0.84%)	Et Bk	0.000766	(1; 0.39%)	Sw Pp Bk	0.000931	(2; 0.7%)
Sf Bk	0.000374	(1; 0.73%)	Fn Bk	0.000759	(1; 0.39%)	Sw Pp Pr Bk	0.00092	(3; 0.69%)
En Bk	0.000348	(1; 0.68%)	At Bk	0.000721	(1; 0.37%)	Ba Bm Bk	0.000872	(2; 0.66%)
St Bk	0.000293	(1; 0.57%)	St Bk	0.000719	(1; 0.37%)	El Bk	0.000867	(1; 0.65%)
Wt Bk	0.00022	(1; 0.43%)	Wt Bk	0.000683	(1; 0.35%)	Bc Mp Ho Ms	0.000809	(4; 0.61%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.689 ±0.016	(±2.3%)
Downstream	1.006 ±0.015	(±1.5%)

Sector 7302: Non-Bank Finance (Fn)

Money market corporation, credit union, building society and other non-bank finance services

Short Summary

In common with many other service sectors, the non-bank finance sector provides environmental indicators that are significantly lower than the economy wide average. The social indicators of employment and income are 10% and 5% below average respectively while government revenue is equal to average. The financial indicator of operating surplus is 20% above average while export propensity and import penetration are 80% and 75% below average respectively. Like other financial sectors, the non-bank sector presides over important decisions that affect significant downstream consumption activities. Strategically informed building societies and car leasing services could drive more energy efficient domestic houses and private vehicles. A 'Tobin tax' applied to international money market transactions may improve the government revenue indicator.

Sector Description

The non-bank finance sector includes the services of building societies and credit unions (15%), money market corporations (40%) and financial services (30%). Money market corporations deal in securities such as bonds issued by governments and the short term money market. The financial services component is physically important because of the vehicle leasing operations for fleet and private cars, which manage over one million vehicles and substantially underpin domestic vehicle manufacturing. In 2002 the turnover of the sector was about $24 billion.

Place of Industry in the Economy

The non-bank finance sector ranks 39th out of 135 sectors in its contribution to value adding in the economy, and contributes 0.53% of GDP in this analysis. By way of comparison it is similar in size to the beef cattle, and gold and lead sectors. It is a relatively small creator of jobs with around 12 000 employment years required directly, and a further 9 000 years required by its upstream suppliers. It also contributes 23 000 employment years to downstream industries. It has a low need for physical resources requiring less than one tenth of one percent of national water, land, energy, and greenhouse emissions. In financial flow terms, imports are five times the size of exports.

Strategic Overview

The non-bank finance sector provides a strategic overview that is reasonably typical of a service sector. The environmental indicators of water, land, energy and greenhouse are all extremely low. For the financial indicators, operating surplus is higher than average while import penetration and export propensity are below average. For the social indicators, both employment and income are close to the economy wide average while the government revenue indicator is lower than average. It is questionable whether these particular TBL outcomes can or should be improved. Occasional calls for a 'Tobin tax' of 0.5% to 1.0% to be applied to international money market transactions may improve the government revenue indicator and possibly dampen market volatility. If the export indicator is examined, its supply chain is reasonable broad in origin with around 10 sectors making contributions ranging from one to ten percent. In addition to the sector itself (11%), there are security broking (10%), banking (10%), airline travel (4%), wholesale trade (4%) and restaurants and accommodation (3%). Improved export performance in all financial sectors would obviously improve the export propensity indicator in this sector although overseas forays may prove risky.

TBL Account #1

The financial indicator of operating surplus is 20% greater than average and about one half of this is a direct sector effect, with a further one quarter due to first order effects from security broking and banking. The social indicator of employment generation is 10% below the economy wide average with slightly more than half being a direct effect. The environmental indicator of greenhouse emissions is 85% below average, and the direct sector effect is negligible with electricity, airline travel and beef products (for entertainment) being the important contributors.

TBL Accounts #2 and #3

The second TBL account shows an export propensity 80% below average, income 5% below average and water use 85% below average. The third TBL account shows an import propensity 70% below average, government revenue equal to average and land disturbance 95% below average. The export propensity and government revenue indicators may require further attention.

Structural Path Analysis and Linkages

The government revenue indicator is 30% below average and the supply chain reveals that 54% of the effect is direct while security broking (includes credit cards) contributes 21% and banking 7%. Thus there are several routes by which the indicator could be improved although many options may meet consumer and industry resistance.

The sector shows linkages to upstream sectors such as banking, services to finance, property development, and legal and accounting that are slightly below the economy wide average. The downstream linkages are stronger than average. They indicate that an expansion in this sector would also require the expansion of sectors such as ownership of dwellings, government administration, retail trade and wholesale trade.

Future Trends in Sector

Most of the financial components of this sector are judged to be in a mature phase of their life cycle suggesting that they may grow in line with population i.e. an expansion of 25% over the next 50 years under the base case scenario in the *Future Dilemmas* study. The exception is the sub-sector of ‘other financiers’ which provides credit or leasing services without handling the goods. This is judged to be in an expansionary phase of its life cycle. The sub-sectors of credit unions and building societies may expand if consumers are attracted to local branch networks and personalised services as major banks focus on cost savings, staff reductions, and higher yielding business opportunities. Studies in the US (perhaps several years ahead of Australia) suggest that private vehicle leasing may be at its peak and will now follow population growth after rapid growth during the last 15 years.

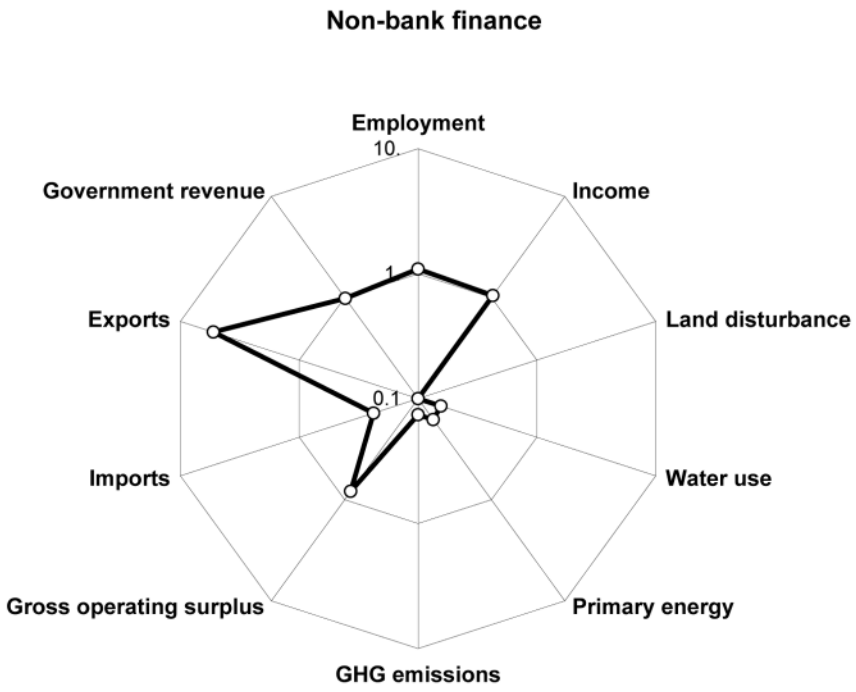
Innovation and Technical Opportunities

For money market operations, some of the international literature suggests that national currencies are already being replaced by privately issued electronic currencies backed by advanced forms of record keeping (in some ways analogous to the gold standard of bygone eras). How this impacts on the management of national financial systems is unclear and more frequent financial crises may see retraction to national domains with more regulation. Others suggest that complete privatisation of currencies with little government involvement is the way ahead. Some literature on credit unions and building societies suggest that the wave of mergers in the past decade in an attempt to stay competitive with the major banks does not necessarily produce increased efficiencies and is often accompanied by personal services that are less effective and less personal. Future possibilities include a full embrace of call centres and web delivered services, accompanied by the enthusiastic maintenance of locally focused lending to combat regional social and financial exclusion.

Sector **Non-bank finance** **(Fn)**

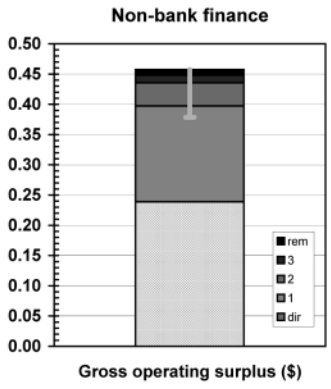
Money market corporation, credit union, building society and other non-bank finance services

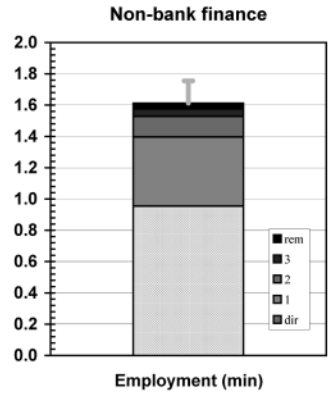
Spider diagram

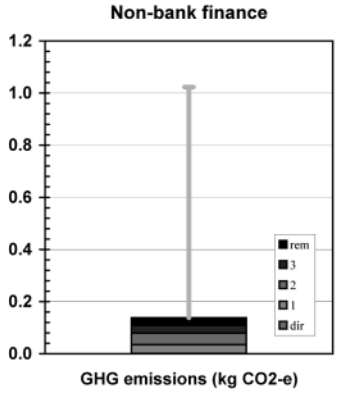


Bar graphs

Account #1







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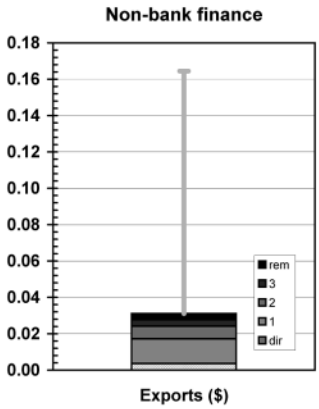
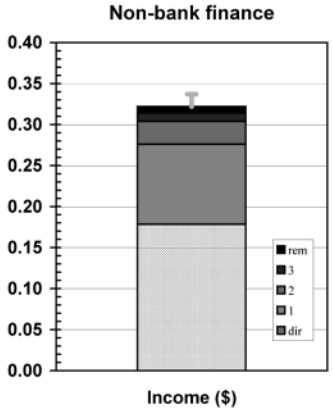
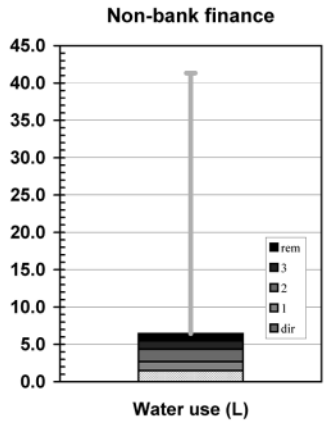
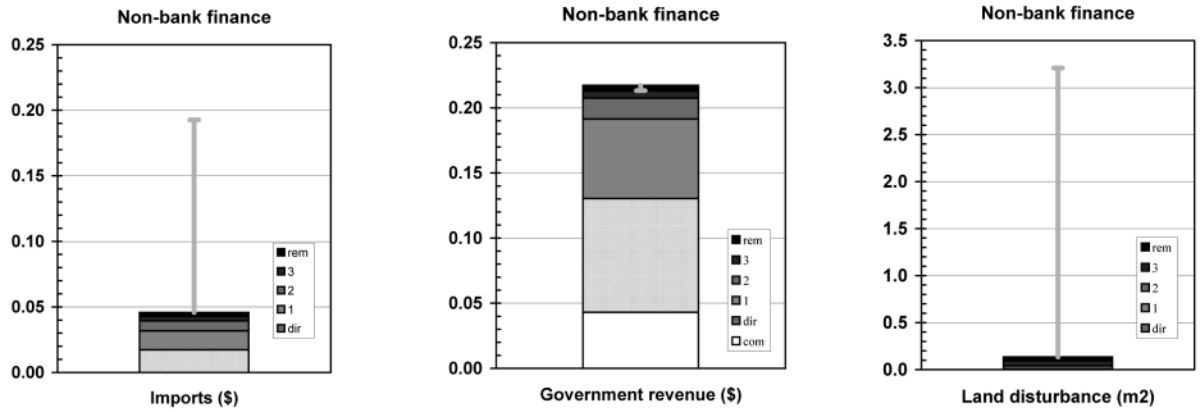






Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 1,523.9	(0.58% of total)	($m 1,522.3 domestically produced)
Government final consumption	$m 18.3	(0.02% of total)	($m 18.3 domestically produced)
Gross fixed capital expenditure	$m 65.8	(0.06% of total)	($m 65.8 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 1,608.1**	**(0.35% of GNE)**	**($m 1,606.5 domestically produced)**
Exports	$m 16.7	(0.02% of total)	($m 16.7 domestically produced)
Final demand	**$m 1,624.8**	**(0.30% of GNT)**	**($m 1,623.1 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 836.7	(0.49% of total)	
Gross operating surplus	$m 1,120.3	(0.58% of total)	
Taxes less subsidies	$m 409.8	(0.48% of total)	
Sectoral GDP*	**$m 2,366.9**	**(0.53% of GDP)**	
Imports	$m 80.8	(0.08% of total)	
Primary inputs	**$m 2,447.6**	**(0.45% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 1,120.3	(0.58%)	$m 387.7	(0.20%)	$m 742.6	(0.39%)
Exports ($m)	$m 16.7	(0.02%)	$m 5.8	(0.01%)	$m 50.4	(0.06%)
Imports ($m)	$m 80.8	(0.08%)	$m 28.0	(0.03%)	$m 74.2	(0.08%)
Employment (e-y)	35,876 e-y	(0.50%)	12,415 e-y	(0.17%)	20,971 e-y	(0.29%)
Income ($m)*	$m 836.7	(0.49%)	$m 289.5	(0.17%)	$m 522.5	(0.31%)
Government revenue ($m)†	$m 479.6	(0.44%)	$m 211.6	(0.20%)	$m 352.5	(0.33%)
GHG emissions (kt CO_2-e)	2 kt	(0.00%)	1 kt	(0.00%)	224 kt	(0.04%)
Water use (ML)	6,972 ML	(0.03%)	2,413 ML	(0.01%)	10,452 ML	(0.05%)
Land disturbance (kha)	1 kha	(0.00%)	0 kha	(0.00%)	22 kha	(0.01%)
Primary energy (TJ)	33 TJ	(0.00%)	11 TJ	(0.00%)	2,003 TJ	(0.05%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.24	0.46	0.38
Exports ($)	0.00	0.03	0.16
Imports ($)	0.02	0.05	0.19
Employment (min)	0.95	1.61	1.75
Income ($)	0.18	0.32	0.34
Government revenue ($)	0.13	0.22	0.21
GHG emissions (kg CO_2-e)	0.00	0.14	1.02
Water use (L)	1.49	6.44	41.32
Land disturbance (m^2)	0.00	0.14	3.21
Primary energy (MJ)	0.01	1.23	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Fn	0.239	(0; 52.%)	Fn	0.955	(0; 59.%)	El Fn	0.0182	(1; 13.%)
Sf Fn	0.0952	(1; 21.%)	Sf Fn	0.124	(1; 7.7%)	El Bk Fn	0.0054	(2; 3.9%)
Bk Fn	0.0234	(1; 5.1%)	Bk Fn	0.093	(1; 5.8%)	At Fn	0.00352	(1; 2.6%)
Sf Bk Fn	0.00819	(2; 1.8%)	Bs Fn	0.0251	(1; 1.6%)	Gd Fn	0.00338	(1; 2.5%)
Ms Fn	0.00538	(1; 1.2%)	Ms Fn	0.0241	(1; 1.5%)	Bc Mp Fn	0.00327	(2; 2.4%)
Ts Fn	0.00385	(1; 0.84%)	Rh Fn	0.0177	(1; 1.1%)	Bc Mp Ho Fn	0.00309	(3; 2.2%)
Pd Fn	0.00362	(1; 0.79%)	Ts Fn	0.0173	(1; 1.1%)	El Ms Fn	0.00225	(2; 1.6%)
Cm Fn	0.00302	(1; 0.66%)	Ho Fn	0.0156	(1; 0.97%)	El Ho Fn	0.00204	(2; 1.5%)
Rh Fn	0.00289	(1; 0.63%)	Ed Fn	0.0135	(1; 0.84%)	El Rh Fn	0.00188	(2; 1.4%)
Bs Fn	0.00255	(1; 0.56%)	Sf Bk Fn	0.0106	(2; 0.66%)	El Pd Fn	0.00172	(2; 1.3%)
St Fn	0.00166	(1; 0.36%)	Wt Fn	0.00961	(1; 0.6%)	El Bs Fn	0.00155	(2; 1.1%)
Wt Fn	0.00134	(1; 0.29%)	Pd Fn	0.00869	(1; 0.54%)	Wt Fn	0.00133	(1; 0.97%)
Ho Fn	0.00124	(1; 0.27%)	Cm Fn	0.00835	(1; 0.52%)	Sw Pp Fn	0.00108	(2; 0.79%)
Pr Fn	0.000958	(1; 0.21%)	Pr Fn	0.00802	(1; 0.5%)	Pp Fn	0.00106	(1; 0.77%)
Ne Fn	0.000864	(1; 0.19%)	Fa Fn	0.0067	(1; 0.42%)	El Ts Fn	0.000958	(2; 0.69%)
Cm Bk Fn	0.000838	(2; 0.18%)	Gv Fn	0.00589	(1; 0.37%)	Sw Pp Pr Fn	0.000823	(3; 0.6%)
El Fn	0.000734	(1; 0.16%)	Rt Fn	0.00491	(1; 0.3%)	Pp Pr Fn	0.000804	(2; 0.58%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Fn	0.00355	(0; 11.%)	Fn	0.178	(0; 55.%)	Fn	1.49	(0; 23.%)
Sf Fn	0.00295	(1; 9.5%)	Sf Fn	0.0306	(1; 9.5%)	Ws Fn	0.522	(1; 8.1%)
Bk Fn	0.00182	(1; 5.9%)	Bk Fn	0.023	(1; 7.1%)	Dc Dp Fn	0.244	(2; 3.8%)
At Fn	0.00112	(1; 3.6%)	Ms Fn	0.00561	(1; 1.7%)	Wa Fn	0.218	(1; 3.4%)
Wt Fn	0.00109	(1; 3.5%)	Ts Fn	0.00406	(1; 1.3%)	Wa Ms Fn	0.138	(2; 2.1%)
Ho Fn	0.000867	(1; 2.8%)	Ed Fn	0.00335	(1; 1.%)	Vf Fn	0.124	(1; 1.9%)
Ms Fn	0.000833	(1; 2.7%)	Pd Fn	0.00326	(1; 1.%)	Ri Ws Fn	0.117	(2; 1.8%)
Ts Fn	0.00061	(1; 2.%)	Bs Fn	0.00308	(1; 0.96%)	Ws Ho Fn	0.114	(2; 1.8%)
Bs Fn	0.000472	(1; 1.5%)	Sf Bk Fn	0.00263	(2; 0.82%)	Vf Ws Fn	0.106	(2; 1.6%)
Ws Fn	0.000451	(1; 1.5%)	Ho Fn	0.00227	(1; 0.71%)	El Fn	0.1	(1; 1.6%)
St Fn	0.000411	(1; 1.3%)	Wt Fn	0.00206	(1; 0.64%)	Wa Pd Fn	0.099	(2; 1.5%)
Cm Fn	0.000403	(1; 1.3%)	Rh Fn	0.00193	(1; 0.6%)	Bc Mp Fn	0.0861	(2; 1.3%)
Ed Fn	0.00033	(1; 1.1%)	Cm Fn	0.00189	(1; 0.59%)	Bc Mp Ho Fn	0.0815	(3; 1.3%)
Sf Bk Fn	0.000254	(2; 0.82%)	Pr Fn	0.00161	(1; 0.5%)	Wa Bs Fn	0.0769	(2; 1.2%)
In Fn	0.000251	(1; 0.81%)	Gv Fn	0.00148	(1; 0.46%)	Dc Dp Ho Fn	0.0676	(3; 1.%)
Bl El Fn	0.000177	(2; 0.57%)	In Fn	0.0013	(1; 0.4%)	Ri Fc Bp Fn	0.0612	(3; 0.95%)
Pd Fn	0.000172	(1; 0.55%)	Os Fn	0.000983	(1; 0.31%)	Ri Fc Ho Fn	0.0525	(3; 0.81%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Fn	0.0172	(0; 38.%)	Fn	0.0874	(0; 50.%)	Bc Mp Fn	0.0238	(2; 18.%)
Bk Fn	0.00227	(1; 5.%)	Sf Fn	0.0267	(1; 15.%)	Bc Mp Ho Fn	0.0225	(3; 17.%)
Rh Fn	0.00149	(1; 3.3%)	Bk Fn	0.0127	(1; 7.3%)	Bc Mp Ho Bk I	0.0034	(4; 2.5%)
Pr Fn	0.00144	(1; 3.1%)	Ms Fn	0.00266	(1; 1.5%)	Bc Mp Bp Fn	0.00297	(3; 2.2%)
Ms Fn	0.00122	(1; 2.7%)	Sf Bk Fn	0.00229	(2; 1.3%)	Wo Mp Fn	0.00268	(2; 2.%)
Ts Fn	0.0011	(1; 2.4%)	Pd Fn	0.00214	(1; 1.2%)	Bc Mp Rt Fn	0.00263	(3; 1.9%)
Ho Fn	0.000578	(1; 1.3%)	Ts Fn	0.002	(1; 1.1%)	Wo Mp Ho Fn	0.00254	(3; 1.9%)
Pd Fn	0.000521	(1; 1.1%)	In Fn	0.00139	(1; 0.8%)	Fn	0.00221	(0; 1.6%)
Cm Fn	0.000517	(1; 1.1%)	Ed Fn	0.00123	(1; 0.7%)	Wo Tx Tp Fn	0.00204	(3; 1.5%)
Bs Fn	0.000506	(1; 1.1%)	Ho Fn	0.0012	(1; 0.69%)	Bc Mp Bk Fn	0.00201	(3; 1.5%)
Et Fn	0.00049	(1; 1.1%)	Wt Fn	0.000964	(1; 0.55%)	Ba Bm Ho Fn	0.00184	(3; 1.4%)
Sf Fn	0.000438	(1; 0.96%)	Bs Fn	0.000914	(1; 0.52%)	Bc Mp Ho Ms	0.0013	(4; 0.96%)
Ne Fn	0.000416	(1; 0.91%)	Cm Fn	0.000905	(1; 0.52%)	Dc Dp Fn	0.00127	(2; 0.93%)
At Fn	0.000334	(1; 0.73%)	Rh Fn	0.000887	(1; 0.51%)	Sw Pp Fn	0.000852	(2; 0.63%)
Wt Fn	0.00031	(1; 0.68%)	Pr Fn	0.000776	(1; 0.45%)	Wo Tx Fn	0.000787	(2; 0.58%)
Pa Fn	0.000255	(1; 0.56%)	Gv Fn	0.000515	(1; 0.3%)	Wo Ts Fn	0.000665	(2; 0.49%)
Rh Bk Fn	0.000228	(2; 0.5%)	At Fn	0.000501	(1; 0.29%)	Sw Pp Pr Fn	0.000648	(3; 0.48%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.834 ±0.021	(±2.5%)
Downstream	1.126 ±0.016	(±1.4%)

Sector 7401: Insurance (In)

Life, health, fire, special risk, house, motor vehicle, liability, indemnity, travel and other insurance

Short Summary

The insurance sector has environmental indicators that are at least 90% below the economy wide average. This is typical for a service sector. The social indicator of income is 5% above average while government revenue is 75% above average. However the employment generation indicator is 40% below average reflecting technological changes such as on-line service and labour efficiency improvements in the sector. The financial indicators provide mixed outcomes with operating surplus and export propensity 30% and 55% below average respectively, while import penetration is 80% below average. The sector in Australia and worldwide has been buffeted by a number of large insurance pay-outs as well as failures in management and ethics. Decisions on which activities and industries to insure, and at what margin, will influence the future economic and industrial structures of many countries. Insurance risks are increasing, driven by population growth, rapid urbanisation and the concentration of financial assets and decision making in major cities.

Sector Description

The insurance sector has a current annual turnover of around $78 billion and is dominated by life insurance (45%), general insurance (36%) and health insurance (12%). By way of example, life insurance in Australia consists of 42 direct insurers with $195 billion of assets and $220 billion of liabilities. For general insurance in Australia, there are around 110 licensed insurers with assets of $50 billion and liabilities of $38 billion. The top ten companies undertake 75% of the general insurance activity. Currently 8.7 million Australians or 44% of the population are covered by private health insurance and pay $5 billion annually for hospital cover, plus extra for ancillary benefits.

Place of Industry in the Economy

The insurance industry ranks 20th out of 135 sectors in terms of value adding and contributes 1.58% of GDP in this analysis. It is a moderate sized employer with 32 000 employment years directly employed, and another 19 000 in upstream suppliers, giving a total 51 000 employment years. It contributes another 22 000 employment years to downstream industries such as property development, wholesale and retail trade. It has small requirements for resources with less than one tenth of one percent of national totals for energy, water, land, and greenhouse emissions. Exports outweigh imports by a factor of five in absolute financial flow terms.

Strategic Overview

The strategic overview depicted in the spider diagram shows a seemingly typical service sector, however it has several anomalies. The environmental indicators of greenhouse emissions, energy use, water use and land disturbance are very small. This is typical of most service sectors. The social indicators are mixed with higher outcomes for income and government revenue and lower outcomes for employment generation. This reflects several issues. Improved computer processing and on-line access has introduced increased labour efficiencies (less people and higher wages) but has transferred many of the insurance tasks back to the individual consumer. The financial indicators show a good outcome for import penetration, but poorer outcomes for exports and operating surplus. The operating surplus indicator may reflect the cyclical nature of a risk based industry. However over the past decade, the sector's reputation has been damaged by a number of corporate collapses and poor investment decisions. This high profile corporate malfeasance has highlighted a poor record of governance, auditing structures and ethical attitudes among some high profile firms.

TBL Account #1

The financial indicator of operating surplus is 30% below average while the social indicator of employment generation is 40% below average. Direct effects make up one half of the total for each of these indicators. The environmental indicator of greenhouse emissions is 90% below average, a situation typical for many service industries. However the sectors served by insurance are typically physical ones such as housing, farming and transportation. Thus the sector occupies a pivotal place in decision making and may increasingly be influenced by social and environmental information.

TBL Accounts #2 and #3

The second TBL account shows exports 55% below average, income 5% below average and water use 95% below average. The third TBL account shows imports 85% below average, government revenue 75% above average and land disturbance that is negligible.

Structural Path Analysis and Linkages

While insurance is a cyclical industry, long run improvements might be sought in the operating surplus indicator. The path analysis shows the direct sector effect is 37% while financial services and security broking provide 43% of the effect. Examination of the broking sector shows that its surplus is well above average and there may be opportunities for alterations to fee arrangements.

The insurance sector is essentially self contained, and shows weak linkages to upstream suppliers in general with the exception of the banking and financial services sectors. The downstream linkages are below average but property development, wholesale, and retail trade are notable.

Future Trends in Sector

In a world sense, insurance risks are increasing as urban populations grow, particularly in larger cities thus concentrating property values and insurance risk. There is the possibility of self reinforcing trends as population growth and economic growth lead to more energy use, greenhouse emissions, global warming and atmospheric water vapour. In turn this could result in more extreme storm events, and certainly higher rainfall events. The base case scenario of the *Future Dilemmas* study has 25 million people by 2050. In the absence of radical policy and market shifts, Australian cities will grow, human population will age, there will be more motor vehicles, and more age-related health problems. Traditionally the insurance industry owes its survival to the assessment and quantification of risk. It is possible that many new climate related risks could become uninsurable, and that health, business, and liability insurance premiums will focus only on low risk areas.

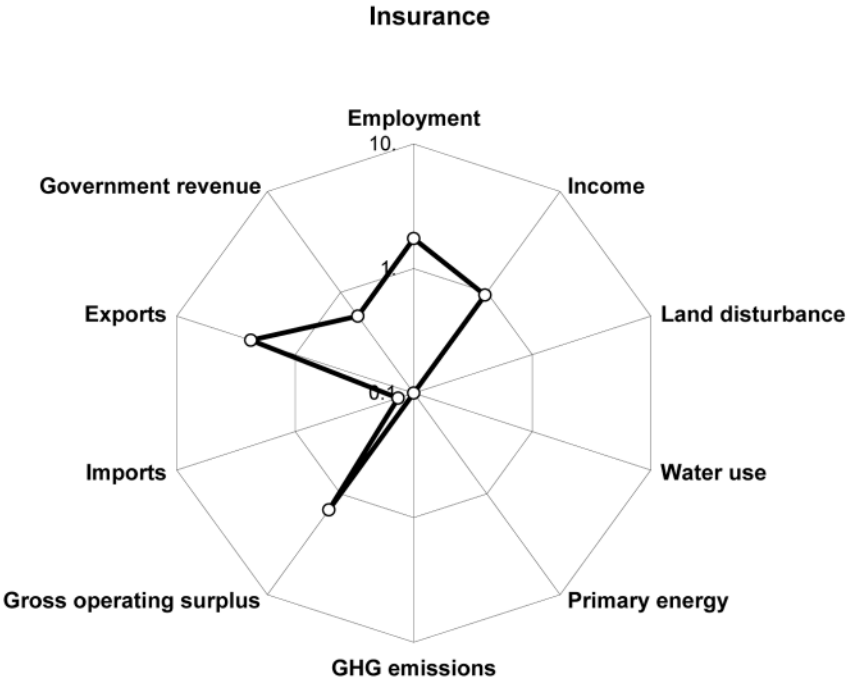
Innovation and Technical Opportunities

Many experienced insurance assessors with intimate knowledge of their risk portfolios have been replaced by on-line quotation services and call centres. Innovation now seems focussed on eliminating the ‘bare patches in the risk landscape’ and four issues are prevalent in the literature. Regulation is re-emerging as critical for infrastructure insurance particularly in areas such as earthquake, storm damage and flooding. Redressing the ethical problems of the last two decades seems a priority with a shift in focus from corporate profits to client needs. In ethics, credibility is seen as a fragile commodity, difficult to obtain and easy to lose. The third area is described as a tension between the increased un-insurability of future major catastrophes (climate change, terrorism, disease pandemics etc.) and the leading edge of capitalist ingenuity or ‘how to insure the uninsurable’. The fourth area is health insurance in relation to population ageing which foresees a transfer from the current pay-as-you-go systems to the accumulation of large capital funds to comprehensively cover future risks. This seems dependent on the resurgence of a collective ownership of health and care issues, with less focus on individual self interest backed by safety nets.

Sector **Insurance** **(In)**

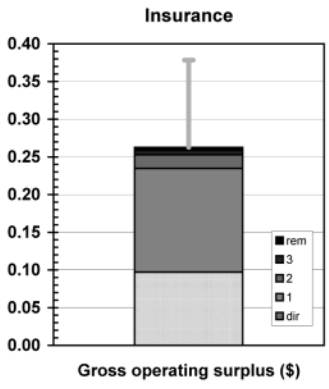
Life, health, fire, special risk, house, motor vehicle, liability, indemnity, travel and other insurance

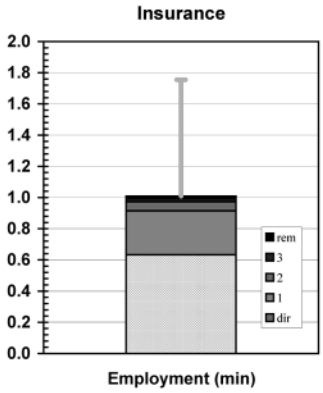
Spider diagram

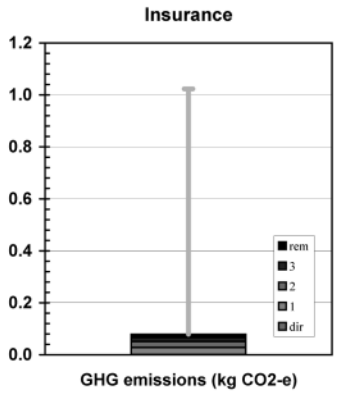


Bar graphs

Account #1







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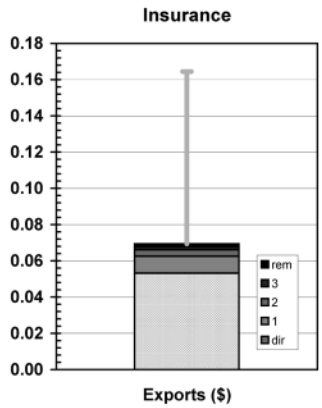

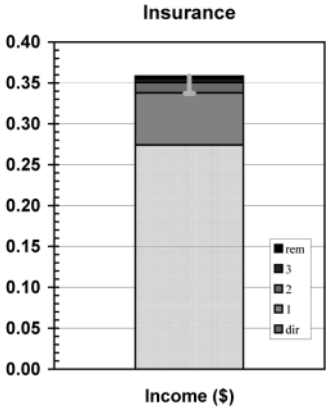

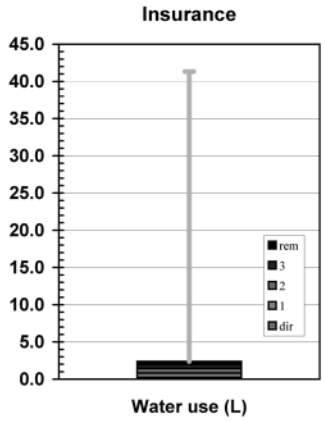

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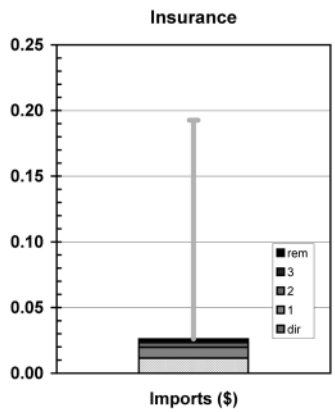
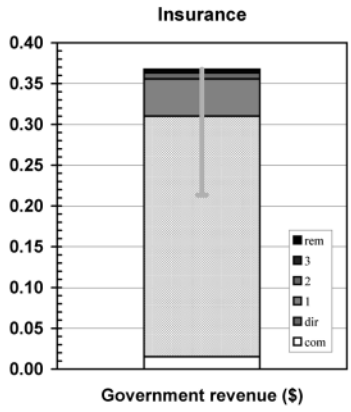
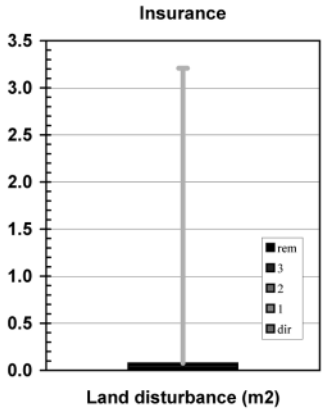






National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 5,814.8	(2.20% of total)	($m 5,680.7 domestically produced)
Government final consumption	$m 0.9	(0.00% of total)	($m 0.9 domestically produced)
Gross fixed capital expenditure	$m 40.9	(0.04% of total)	($m 40.9 domestically produced)
Net changes in stocks	$m 0.1	(0.01% of total)	($m 0.1 domestically produced)
Sectoral GNE	**$m 5,856.8**	**(1.28% of GNE)**	**($m 5,722.6 domestically produced)**
Exports	$m 564.2	(0.68% of total)	($m 564.2 domestically produced)
Final demand	**$m 6,421.0**	**(1.18% of GNT)**	**($m 6,286.8 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 2,910.9	(1.70% of total)	
Gross operating surplus	$m 1,030.5	(0.54% of total)	
Taxes less subsidies	$m 3,131.2	(3.67% of total)	
Sectoral GDP*	**$m 7,072.7**	**(1.58% of GDP)**	
Imports	$m 122.0	(0.12% of total)	
Primary inputs	**$m 7,194.7**	**(1.32% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 1,030.5	(0.54%)	$m 610.0	(0.32%)	$m 1,651.3	(0.86%)
Exports ($m)	$m 564.2	(0.68%)	$m 333.9	(0.40%)	$m 435.9	(0.52%)
Imports ($m)	$m 122.0	(0.12%)	$m 72.2	(0.07%)	$m 164.1	(0.17%)
Employment (e-y)	53,875 e-y	(0.76%)	31,889 e-y	(0.45%)	50,850 e-y	(0.71%)
Income ($m)*	$m 2,910.9	(1.70%)	$m 1,723.0	(1.01%)	$m 2,253.5	(1.32%)
Government revenue ($m)†	$m 3,226.2	(2.99%)	$m 1,948.4	(1.80%)	$m 2,310.5	(2.14%)
GHG emissions (kt CO_2-e)	7 kt	(0.00%)	4 kt	(0.00%)	497 kt	(0.10%)
Water use (ML)	2,432 ML	(0.01%)	1,440 ML	(0.01%)	14,994 ML	(0.07%)
Land disturbance (kha)	2 kha	(0.00%)	1 kha	(0.00%)	47 kha	(0.03%)
Primary energy (TJ)	112 TJ	(0.00%)	66 TJ	(0.00%)	4,753 TJ	(0.12%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.10	0.26	0.38
Exports ($)	0.05	0.07	0.16
Imports ($)	0.01	0.03	0.19
Employment (min)	0.63	1.01	1.75
Income ($)	0.27	0.36	0.34
Government revenue ($)	0.31	0.37	0.21
GHG emissions (kg CO_2-e)	0.00	0.08	1.02
Water use (L)	0.23	2.39	41.32
Land disturbance (m^2)	0.00	0.07	3.21
Primary energy (MJ)	0.01	0.76	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Sf In	0.112	(1; 43.%)	In	0.633	(0; 63.%)	El In	0.017	(1; 22.%)
In	0.097	(0; 37.%)	Sf In	0.146	(1; 14.%)	At In	0.00614	(1; 7.8%)
Bk In	0.00647	(1; 2.5%)	Bk In	0.0257	(1; 2.5%)	Bc Mp Ho In	0.00243	(3; 3.1%)
Rh In	0.00298	(1; 1.1%)	Rh In	0.0182	(1; 1.8%)	Bc Mp In	0.0021	(2; 2.7%)
Fn In	0.00277	(1; 1.1%)	Ed In	0.0136	(1; 1.3%)	El Rh In	0.00194	(2; 2.5%)
Cm In	0.00242	(1; 0.92%)	Ho In	0.0122	(1; 1.2%)	El Ho In	0.0016	(2; 2.%)
Sf Bk In	0.00226	(2; 0.86%)	Fn In	0.0111	(1; 1.1%)	El Bk In	0.00149	(2; 1.9%)
Pd In	0.00142	(1; 0.54%)	Cm In	0.0067	(1; 0.66%)	In	0.000687	(0; 0.87%)
Sf Fn In	0.0011	(2; 0.42%)	Pr In	0.00626	(1; 0.62%)	El Pd In	0.000675	(2; 0.85%)
Ts In	0.000989	(1; 0.38%)	Ts In	0.00445	(1; 0.44%)	Sw Pp Pr In	0.000642	(3; 0.81%)
Ho In	0.000975	(1; 0.37%)	Pd In	0.0034	(1; 0.34%)	El Ed In	0.000637	(2; 0.81%)
Bk Sf In	0.000749	(2; 0.29%)	Wt In	0.00324	(1; 0.32%)	Pp Pr In	0.000627	(2; 0.79%)
Pr In	0.000747	(1; 0.28%)	Fa In	0.0032	(1; 0.32%)	Sw Pp In	0.000592	(2; 0.75%)
El In	0.000688	(1; 0.26%)	At In	0.00308	(1; 0.31%)	Pp In	0.000578	(1; 0.73%)
Ne In	0.00065	(1; 0.25%)	Bk Sf In	0.00297	(2; 0.29%)	El Ot In	0.000518	(2; 0.66%)
Ms In	0.00064	(1; 0.24%)	Sf Bk In	0.00294	(2; 0.29%)	Wt In	0.000448	(1; 0.57%)
At In	0.000563	(1; 0.21%)	Ms In	0.00287	(1; 0.28%)	Bl El In	0.000429	(2; 0.54%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
In	0.0531	(0; 77.%)	In	0.274	(0; 76.%)	In	0.229	(0; 9.6%)
Sf In	0.00349	(1; 5.%)	Sf In	0.0362	(1; 10.%)	Wa In	0.153	(1; 6.4%)
At In	0.00195	(1; 2.8%)	Bk In	0.00634	(1; 1.8%)	Ws In	0.115	(1; 4.8%)
Ho In	0.000681	(1; 0.98%)	Ed In	0.00337	(1; 0.94%)	El In	0.0941	(1; 3.9%)
Bk In	0.000504	(1; 0.73%)	Fn In	0.00207	(1; 0.58%)	Ws Ho In	0.0892	(2; 3.7%)
Wt In	0.000367	(1; 0.53%)	Rh In	0.00199	(1; 0.56%)	Vf In	0.0715	(1; 3.%)
Ed In	0.000332	(1; 0.48%)	Ho In	0.00179	(1; 0.5%)	Bc Mp Ho In	0.064	(3; 2.7%)
Cm In	0.000323	(1; 0.47%)	Cm In	0.00152	(1; 0.42%)	Dc Dp In	0.0638	(2; 2.7%)
Bl El In	0.000166	(2; 0.24%)	Pd In	0.00128	(1; 0.36%)	Bc Mp In	0.0553	(2; 2.3%)
Ts In	0.000157	(1; 0.23%)	Pr In	0.00125	(1; 0.35%)	Dc Dp Ho In	0.0531	(3; 2.2%)
St In	0.000134	(1; 0.19%)	At In	0.00109	(1; 0.3%)	Sf In	0.049	(1; 2.1%)
Ai At In	0.000133	(2; 0.19%)	Ts In	0.00104	(1; 0.29%)	Ri Fc Ho In	0.0412	(3; 1.7%)
En In	0.000129	(1; 0.19%)	Bk Sf In	0.000734	(2; 0.2%)	Wa Pd In	0.0387	(2; 1.6%)
Ws In	0.0000998	(1; 0.14%)	Sf Bk In	0.000727	(2; 0.2%)	Vf Ho In	0.0338	(2; 1.4%)
Ms In	0.0000991	(1; 0.14%)	Wt In	0.000695	(1; 0.19%)	Ri Ws In	0.0258	(2; 1.1%)
Ne In	0.0000949	(1; 0.14%)	Ms In	0.000668	(1; 0.19%)	Vf Ws In	0.0234	(2; 0.98%)
Mp Ho In	0.0000944	(2; 0.14%)	Ne In	0.000505	(1; 0.14%)	Ri Ws Ho In	0.0199	(3; 0.84%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
In	0.0115	(0; 44.%)	In	0.295	(0; 84.%)	Bc Mp Ho In	0.0177	(3; 24.%)
Rh In	0.00154	(1; 5.9%)	Sf In	0.0315	(1; 8.9%)	Bc Mp In	0.0153	(2; 20.%)
Pr In	0.00112	(1; 4.3%)	Bk In	0.0035	(1; 0.99%)	In	0.00222	(0; 3.%)
Bk In	0.000626	(1; 2.4%)	Ed In	0.00124	(1; 0.35%)	Wo Mp Ho In	0.00199	(3; 2.7%)
At In	0.000582	(1; 2.2%)	Fn In	0.00101	(1; 0.29%)	Wo Tx Tp In	0.00181	(3; 2.4%)
Sf In	0.000517	(1; 2.%)	Ho In	0.00094	(1; 0.27%)	Wo Mp In	0.00172	(2; 2.3%)
Ho In	0.000454	(1; 1.7%)	Rh In	0.000915	(1; 0.26%)	Ba Bm Ho In	0.00144	(3; 1.9%)
Cm In	0.000415	(1; 1.6%)	At In	0.000874	(1; 0.25%)	Bc Mp Ho Bk I	0.000937	(4; 1.3%)
Et In	0.000362	(1; 1.4%)	Pd In	0.000837	(1; 0.24%)	Wo Tx In	0.000916	(2; 1.2%)
Ne In	0.000313	(1; 1.2%)	Cm In	0.000727	(1; 0.21%)	Bc Mp Bp In	0.00085	(3; 1.1%)
Ts In	0.000284	(1; 1.1%)	Sf Bk In	0.000633	(2; 0.18%)	Bc Mp Ho Sf I	0.000672	(4; 0.9%)
Ap At In	0.00022	(2; 0.84%)	Pr In	0.000606	(1; 0.17%)	At In	0.000666	(1; 0.89%)
Pd In	0.000204	(1; 0.78%)	Ts In	0.000514	(1; 0.15%)	Bc Mp Bk In	0.000555	(3; 0.74%)
Fn In	0.0002	(1; 0.77%)	Bk Sf In	0.000405	(2; 0.12%)	Sw Pp Pr In	0.000505	(3; 0.67%)
Ed In	0.000176	(1; 0.67%)	Wt In	0.000325	(1; 0.092%)	Wo Tx Ho In	0.0005	(3; 0.67%)
Ai At In	0.000169	(2; 0.65%)	Ms In	0.000317	(1; 0.09%)	Sw Pp In	0.000466	(2; 0.62%)
En In	0.00015	(1; 0.57%)	Sf Fn In	0.000309	(2; 0.088%)	Sf In	0.000428	(1; 0.57%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.499 ±0.019	(±3.7%)
Downstream	0.849 ±0.016	(±1.9%)

Sector 7501: Services to Finance (Sf)

Security broking and dealing and other services to finance, investment and insurance

Short Summary

The environmental indicators of greenhouse emissions, water use and land disturbance are almost negligible and typical of a service sector. For the financial indicators, the operating surplus is 60% above average, import penetration is 95% lower than average and export propensity is 90% lower than average. The social indicator of employment is 50% below average, while income and government revenue are 40% and 15% below average respectively, perhaps reflecting the ingress of computerised trading and management. This sector will become increasingly important as the population ages and becomes mostly self funded in retirement. One of the sector's challenges is to provide more realistic value added products where integrated 'whole of life' investment plans are expressed in terms of education-years or retirement-years, rather than just financial expressions of value.

Sector Description

The words 'broking' and 'dealing' are used to describe activities in this sector and it occupies an important node of decision making in the economy. The sector includes the Australian stock exchange's operations and share registries, credit card administration, financial consulting advice, currency exchange, fund raising for share or company floats and management of investments. There are about 13-14 million share trades each year and 130 billion shares traded with a total value of $420 billion. In the ten years to 2001, the capitalisation of the domestic share market increased from $200 billion to $700 billion. About one half of Australian adults own shares directly or through a managed fund. Credit and debit card transactions average around 130 per person annually. Credit card debt was recently reported at a total of $24 billion (about $2 400 per account). New financial equity of $20 billion is released annually including approximately 70 new company floats per year.

Place of Industry in the Economy

The services to finance sector is ranked 18th out of 135 sectors in terms of value adding in the economy and contributes 1.8% of GDP in this analysis. It is similar in value adding to the road freight transport sector, and the repairs to motor vehicles and machinery sector. It is a relatively small employer with a direct requirement of 5 300 employment years and 700 years from suppliers to give a total of 6 000 employment years embodied in the sectors final demand. However it contributes 47 000 employment years to downstream industries such as banking, credit unions, insurance and government administration. It has small requirements for physical resources such as water, energy and land. In financial flow terms, exports are eight times the size of imports.

Strategic Overview

The strategic overview for the sector shows a mixed outcome with all of the environmental indicators close to the centre of the spider diagram denoting lower impacts. For the financial indicators, both operating surplus and import penetration are significantly better than average, but export propensity is well below average. This reflects the sector's primary focus on domestic downstream industries and that Australia is generally a capital importing country and does not operate as a centre of global finance. Perhaps surprising is the sector's performance for the social indicators with employment, income and government revenue all significantly below average. When these social outcomes are offset against the sector's operating surplus, it may reflect the high skills requirement and a general transition to highly automated systems of financial management.

TBL Account #1

The first TBL account shows a financial surplus that is 60% higher than average. Most of this is a direct effect. The social indicator of employment is 50% below average and again most of this is a direct effect. The environmental indicator of greenhouse gas emissions is 95% below average. The employment indicator may reflect technological innovations such as computerised trading and on-line broking, as well as the outsourcing of credit card processing and administration to lower wage countries such as India who have a competitive advantage in data and records processing.

TBL Accounts #2 and #3

The second TBL account shows export propensity at 90% below average, income at 40% below average and water use 95% below average. The third TBL account shows import penetration at 95% below average, government revenue that is 15% below average and negligible land disturbance. Overall, the social indicators may require more attention.

Structural Path Analysis and Linkages

The sector shows poorer than average outcomes for the social indicators yet an operating surplus that is 60% better than average. This suggests there may be some room for improvement of social areas. The structural path analysis reveals that 90% of the indicators of employment, income and government revenue are direct within sector effects. Within the supply chain banking and money market corporations are the larger contributors. Improving social outcomes probably should be focused internally but it could also be argued that the nature of the financial services derived from the sector facilitates a wide range of socially positive opportunities delivered from the sector's downstream industries. As such, the sector's efficiency (high financial returns from low labour and wages) is accessed in downstream products such as banking and insurance. The sector could prepare an advocacy position on its relatively modest social returns.

The sector shows one of the smallest upstream linkages to its suppliers reported in this analysis. This emphasises the fact that the sector is essentially self sourced and relies little on services and products from other sectors. However it shows extremely strong downstream linkages to sectors such as banking, credit unions, insurance and government administration.

Future Trends in Sector

Under the *Future Dilemmas* base case scenario with 25 million people by 2050 the activity in this sector should expand by at least one quarter in the next 50 years. However with the expectation that Australians will mostly self-fund their retirement years as well as an increasing share of medical and educational expenses, the importance of the sector and activity within it seems destined to grow. Current superannuation funds in excess of $500 billion are growing at 6% per year suggesting a doubling time of 12 years, or fourfold as the population grows to 25 million in the next 50 years. As consumer spending drives more than one half of GDP and is actively encouraged by credit card availability, a GDP growth rate of 3% could see card transaction volumes double every 30 years.

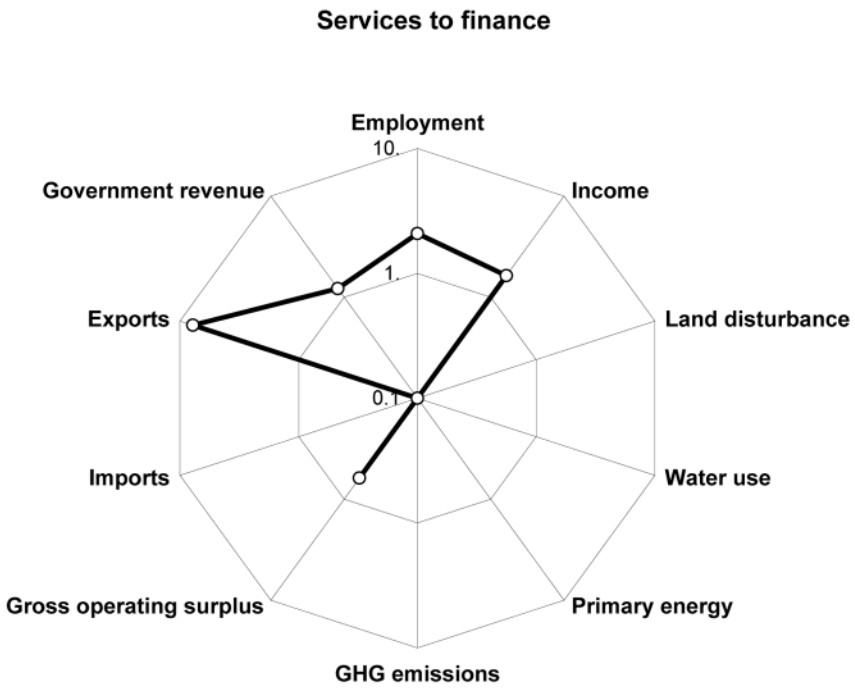
Innovation and Technical Opportunities

The financial services literature reveals at least three important issues requiring innovation. Increasingly, the sector is becoming more complex but much of the requirement for decision making is being relayed back to the individual consumer. New financial services integrating the 'whole of life' requirements into a seamless package with units of 'comfortable retirement years' and 'children's education years' rather than simply dollars, may be required. Secondly, regulation requiring socially and environmentally responsible investment may increase. Thirdly, a slow down in economic growth looms at a global level for many developed economies with ageing populations.

Sector **Services to finance** **(Sf)**

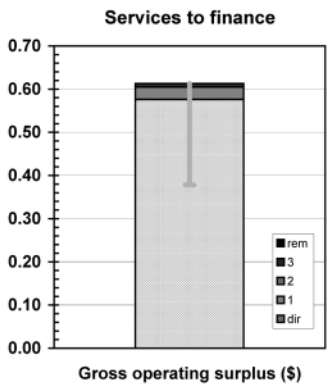
Security broking and dealing and other services to finance, investment and insurance

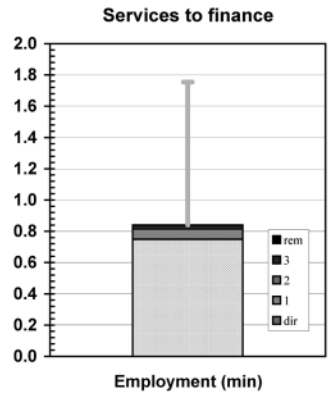
Spider diagram

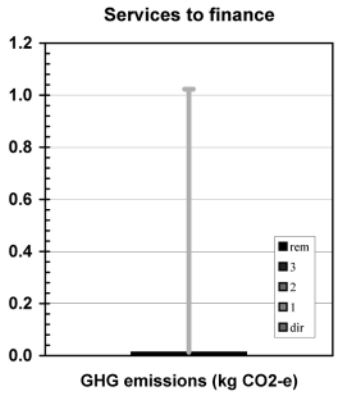


Bar graphs

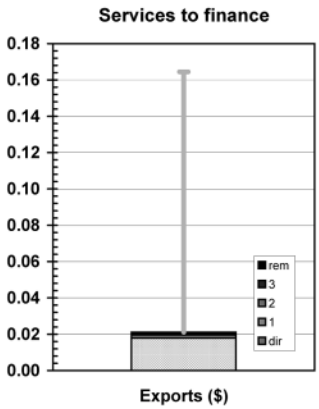
Account #1

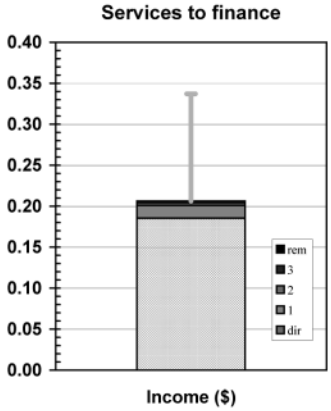


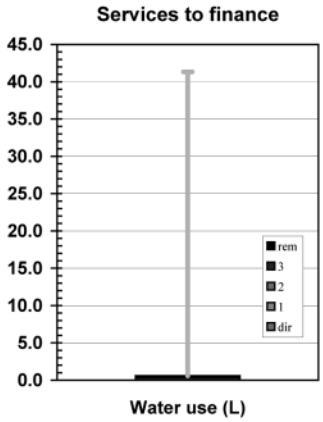




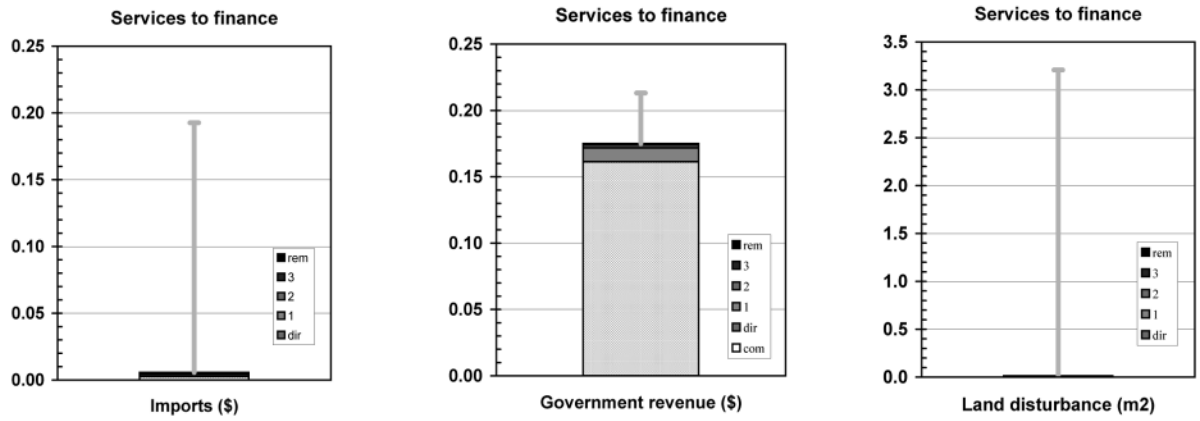
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 732.4	(0.28% of total)	($m 714.3 domestically produced)
Government final consumption	$m 0.2	(0.00% of total)	($m 0.2 domestically produced)
Gross fixed capital expenditure	$m 18.2	(0.02% of total)	($m 18.2 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 750.8**	**(0.16% of GNE)**	**($m 732.7 domestically produced)**
Exports	$m 156.5	(0.19% of total)	($m 156.5 domestically produced)
Final demand	**$m 907.3**	**(0.17% of GNT)**	**($m 889.3 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 1,623.7	(0.95% of total)	
Gross operating surplus	$m 5,046.0	(2.63% of total)	
Taxes less subsidies	$m 1,413.0	(1.65% of total)	
Sectoral GDP*	**$m 8,082.7**	**(1.80% of GDP)**	
Imports	$m 23.2	(0.02% of total)	
Primary inputs	**$m 8,105.9**	**(1.49% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 5,046.0	(2.63%)	$m 512.2	(0.27%)	$m 545.2	(0.28%)
Exports ($m)	$m 156.5	(0.19%)	$m 15.9	(0.02%)	$m 18.8	(0.02%)
Imports ($m)	$m 23.2	(0.02%)	$m 2.4	(0.00%)	$m 5.0	(0.01%)
Employment (e-y)	52,525 e-y	(0.74%)	5,332 e-y	(0.07%)	5,991 e-y	(0.08%)
Income ($m)*	$m 1,623.7	(0.95%)	$m 164.8	(0.10%)	$m 183.4	(0.11%)
Government revenue ($m)†	$m 1,413.0	(1.31%)	$m 143.4	(0.13%)	$m 155.6	(0.14%)
GHG emissions (kt CO_2-e)	0 kt	(0.00%)	0 kt	(0.00%)	11 kt	(0.00%)
Water use (ML)	2,197 ML	(0.01%)	223 ML	(0.00%)	530 ML	(0.00%)
Land disturbance (kha)	2 kha	(0.00%)	0 kha	(0.00%)	1 kha	(0.00%)
Primary energy (TJ)	6 TJ	(0.00%)	1 TJ	(0.00%)	105 TJ	(0.00%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.58	0.61	0.38
Exports ($)	0.02	0.02	0.16
Imports ($)	0.00	0.01	0.19
Employment (min)	0.75	0.84	1.75
Income ($)	0.19	0.21	0.34
Government revenue ($)	0.16	0.18	0.21
GHG emissions (kg CO_2-e)	0.00	0.01	1.02
Water use (L)	0.25	0.60	41.32
Land disturbance (m^2)	0.00	0.01	3.21
Primary energy (MJ)	0.00	0.12	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Sf	0.576	(0; 94.%)	Sf	0.748	(0; 89.%)	At Sf	0.00105	(1; 8.4%)
Bk Sf	0.00384	(1; 0.63%)	Bk Sf	0.0152	(1; 1.8%)	El Bk Sf	0.000884	(2; 7.1%)
Fn Sf	0.00226	(1; 0.37%)	Fn Sf	0.00905	(1; 1.1%)	El Sf	0.000883	(1; 7.%)
Sf Bk Sf	0.00134	(2; 0.22%)	Ed Sf	0.00421	(1; 0.5%)	Bc Mp Ho Sf	0.000473	(3; 3.8%)
Sf Fn Sf	0.000903	(2; 0.15%)	Rh Sf	0.00249	(1; 0.3%)	El Ho Sf	0.000312	(2; 2.5%)
Rh Sf	0.000408	(1; 0.067%)	Ho Sf	0.00238	(1; 0.28%)	El Rh Sf	0.000266	(2; 2.1%)
Bk Fn Sf	0.000222	(2; 0.036%)	Sf Bk Sf	0.00174	(2; 0.21%)	El Ed Sf	0.000197	(2; 1.6%)
Cm Sf	0.000202	(1; 0.033%)	Pr Sf	0.00132	(1; 0.16%)	El Fn Sf	0.000172	(2; 1.4%)
Ho Sf	0.00019	(1; 0.031%)	Sf Fn Sf	0.00117	(2; 0.14%)	Sw Pp Sf	0.000149	(2; 1.2%)
Pr Sf	0.000158	(1; 0.026%)	Ps Sf	0.000996	(1; 0.12%)	Pp Sf	0.000146	(1; 1.2%)
Sf In Sf	0.000148	(2; 0.024%)	Bk Fn Sf	0.000882	(2; 0.1%)	Sw Pp Pr Sf	0.000136	(3; 1.1%)
Ms Sf	0.000142	(1; 0.023%)	In Sf	0.000831	(1; 0.099%)	Pp Pr Sf	0.000132	(2; 1.1%)
Ed Sf	0.000139	(1; 0.023%)	Ms Sf	0.000639	(1; 0.076%)	At Bk Sf	0.0000833	(2; 0.66%)
Cm Bk Sf	0.000137	(2; 0.022%)	Cm Sf	0.000558	(1; 0.066%)	El Pr Sf	0.000083	(2; 0.66%)
In Sf	0.000127	(1; 0.021%)	Ed Bk Sf	0.000543	(2; 0.065%)	Bc Mp Ho Bk S	0.0000765	(4; 0.61%)
At Sf	0.0000961	(1; 0.016%)	At Sf	0.000526	(1; 0.063%)	Ho Sf	0.0000713	(1; 0.57%)
Pd Bk Sf	0.000094	(2; 0.015%)	Rh Bk Sf	0.000442	(2; 0.053%)	Ap At Sf	0.0000666	(2; 0.53%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Sf	0.0179	(0; 85.%)	Sf	0.185	(0; 90.%)	Sf	0.251	(0; 42.%)
At Sf	0.000333	(1; 1.6%)	Bk Sf	0.00376	(1; 1.8%)	Ws Ho Sf	0.0174	(2; 2.9%)
Bk Sf	0.000299	(1; 1.4%)	Fn Sf	0.00169	(1; 0.82%)	Fn Sf	0.0141	(1; 2.4%)
Ho Sf	0.000133	(1; 0.63%)	Ed Sf	0.00104	(1; 0.51%)	Bc Mp Ho Sf	0.0125	(3; 2.1%)
Ed Sf	0.000103	(1; 0.49%)	Sf Bk Sf	0.000431	(2; 0.21%)	Dc Dp Ho Sf	0.0103	(3; 1.7%)
In Sf	0.0000697	(1; 0.33%)	In Sf	0.00036	(1; 0.17%)	Ri Fc Ho Sf	0.00802	(3; 1.3%)
Wt Sf	0.0000417	(1; 0.2%)	Ho Sf	0.000348	(1; 0.17%)	Vf Ho Sf	0.00659	(2; 1.1%)
Sf Bk Sf	0.0000416	(2; 0.2%)	Sf Fn Sf	0.000291	(2; 0.14%)	Ws Bk Sf	0.00553	(2; 0.93%)
Fn Sf	0.0000337	(1; 0.16%)	Rh Sf	0.000273	(1; 0.13%)	Wa Sf	0.00511	(1; 0.86%)
Sf Fn Sf	0.000028	(2; 0.13%)	Pr Sf	0.000265	(1; 0.13%)	Ws Fn Sf	0.00495	(2; 0.83%)
Cm Sf	0.0000269	(1; 0.13%)	Bk Fn Sf	0.000218	(2; 0.11%)	El Bk Sf	0.00489	(2; 0.82%)
At Bk Sf	0.0000265	(2; 0.13%)	At Sf	0.000186	(1; 0.09%)	El Sf	0.00488	(1; 0.82%)
Ai At Sf	0.0000226	(2; 0.11%)	Ms Sf	0.000149	(1; 0.072%)	Wa Bk Sf	0.00445	(2; 0.75%)
Ms Sf	0.0000221	(1; 0.1%)	Ed Bk Sf	0.000134	(2; 0.065%)	Vf Sf	0.00409	(1; 0.69%)
Ho Bk Sf	0.0000214	(2; 0.1%)	Cm Sf	0.000127	(1; 0.061%)	Ri Ws Ho Sf	0.00388	(3; 0.65%)
Mp Ho Sf	0.0000184	(2; 0.087%)	Cm Bk Sf	0.0000861	(2; 0.042%)	Wa Ms Sf	0.00366	(2; 0.61%)
Cm Bk Sf	0.0000183	(2; 0.087%)	Pd Bk Sf	0.0000848	(2; 0.041%)	Pp Sf	0.00365	(1; 0.61%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Sf	0.00265	(0; 47.%)	Sf	0.161	(0; 92.%)	Bc Mp Ho Sf	0.00344	(3; 25.%)
Bk Sf	0.000371	(1; 6.6%)	Bk Sf	0.00208	(1; 1.2%)	Sf	0.00219	(0; 16.%)
Pr Sf	0.000237	(1; 4.2%)	Fn Sf	0.000828	(1; 0.47%)	Bc Mp Ho Bk S	0.000556	(4; 4.1%)
Rh Sf	0.00021	(1; 3.7%)	In Sf	0.000387	(1; 0.22%)	Wo Mp Ho Sf	0.000388	(3; 2.8%)
Fn Sf	0.000163	(1; 2.9%)	Ed Sf	0.000383	(1; 0.22%)	Bc Mp Bk Sf	0.000329	(3; 2.4%)
At Sf	0.0000993	(1; 1.8%)	Sf Bk Sf	0.000375	(2; 0.21%)	Ba Bm Ho Sf	0.000281	(3; 2.%)
Ho Sf	0.0000884	(1; 1.6%)	Sf Fn Sf	0.000253	(2; 0.14%)	Bc Mp Fn Sf	0.000225	(3; 1.6%)
Ed Sf	0.0000544	(1; 0.96%)	Ho Sf	0.000183	(1; 0.1%)	Bc Mp Ho Fn S	0.000213	(4; 1.6%)
Ap At Sf	0.0000375	(2; 0.66%)	At Sf	0.000149	(1; 0.085%)	Wo Tx Tp Sf	0.000193	(3; 1.4%)
Rh Bk Sf	0.0000373	(2; 0.66%)	Pr Sf	0.000128	(1; 0.073%)	Bc Mp Sf	0.00016	(2; 1.2%)
Cm Sf	0.0000345	(1; 0.61%)	Rh Sf	0.000125	(1; 0.072%)	Sw Pp Sf	0.000117	(2; 0.86%)
Pr Bk Sf	0.0000336	(2; 0.59%)	Bk Fn Sf	0.00012	(2; 0.069%)	At Sf	0.000114	(1; 0.83%)
Ms Sf	0.0000324	(1; 0.57%)	Ms Sf	0.0000706	(1; 0.04%)	Sw Pp Pr Sf	0.000107	(3; 0.78%)
Ai At Sf	0.0000288	(2; 0.51%)	Cm Sf	0.0000606	(1; 0.035%)	Wo Tx Ho Sf	0.0000974	(3; 0.71%)
Et Bk Sf	0.0000254	(2; 0.45%)	Pd Bk Sf	0.0000556	(2; 0.032%)	Wh Fc Ho Sf	0.0000694	(3; 0.51%)
Ps Sf	0.000025	(1; 0.44%)	Ed Bk Sf	0.0000493	(2; 0.028%)	Wo Mp Ho Bk	0.0000628	(4; 0.46%)
Cm Bk Sf	0.0000235	(2; 0.42%)	Sf In Sf	0.0000414	(2; 0.024%)	Wo Tx Sf	0.0000602	(2; 0.44%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.118 ±0.004	(±3.5%)
Downstream	1.748 ±0.039	(±2.3%)

Sector 7701: Ownership of Dwellings (Dw)

Gross rent of dwellings (actual rent paid in the case of tenanted dwellings and imputed rent for owner-occupied dwellings)

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of greenhouse emissions, water use and land disturbance are all at least 90% below the economy wide average. The social indicators of employment generation and income are both 85% below average while government revenue is 55% below average. The financial indicators show that operating surplus is over twice the average, while export propensity and import penetration are both 90% below average. A realistic appreciation of this sector is hampered by the conventions of national accounting which add real income from rental dwellings to imputed rental from owned and mortgaged buildings. Compared to the analytical outcomes for other sectors, this accounting convention tends to dilute the social and environmental indicators and possibly inflates the sector's contribution to GDP.

Sector Description

The sector reports the real rent and imputed rent from rented, mortgaged and owned domestic dwellings. It has a value added of over $60 billion and represents nearly 10% of GDP. There are over 7 800 000 private dwellings in Australia which are owned (39%), being purchased (31%), rented (27%) or other tenure (3%). The homes are split 65:35 between capital city and non-capital city, and are classified into separate houses (80%), semi-detached (9%) and flats (11%).

Place of Industry in the Economy

The ownership of dwellings sector occupies the first place in value adding of the economy ranking 1st out of 135 sectors and contributing nearly 9.4% of GDP in this analysis, almost twice the value adding of the next three sectors, wholesale trade, health and education. It is a mid-sized employer requiring 88 000 employment years, just over one percent of national total, all of them in upstream sectors such as banking, residential building and real estate. The sector has energy use and greenhouse emissions of 1% of national totals and it requires less than one half of one percent of water use and land disturbance. This sector could be seen as an artefact within the System of National Accounts as it uses imputed rent from owned and mortgaged properties, as well as real rent from rented properties. As owned or mortgaged dwellings contribute three quarters of sector production, this rent imputation contributes appreciably to the sector's contribution to GDP.

Strategic Overview

The spider diagram depicts the sector with better than average performance for six environmental and financial indicators, while three social indicators and the financial indicator of export propensity have below average performance. As noted above, the use of imputed rent for owned and mortgaged buildings advantages indicators such as operating surplus, imports, energy, greenhouse, water and land disturbance, and disadvantages indicators such as employment, income and government revenue. The export propensity indicator is less valid as the sector, by definition, is focused on domestic dwelling occupation. Some of the outcomes portrayed in the spider diagram are strongly affected by national accounting protocols, which reflect the economy's strong focus on the aspiration of home ownership. The upstream focus of this methodology does not reveal that private consumption in households directly produce 20% of national greenhouse emissions (15 tonnes per household per year) and directly use 8% (2 000 GL (10^9L) per year) of national water flows.

TBL Account #1

The financial indicator of operating surplus is more than twice the economy wide average and this is partially an artefact of the imputed rent from owned and mortgaged buildings. If the dilution effect of rent imputation were removed, then the indicator would reduce to be 40% below the average. The employment generation indicator is 90% below average but if it is rescaled (i.e. owned and mortgaged homes taken out) then it would increase to 40% below average. The greenhouse indicator is 90% below average and after rescaling it would increase to 50% below average.

TBL Accounts #2 and #3

In the second TBL account, the social indicator of income is 85% below average while water use is 95% below average. Export propensity is a less valid indicator for this domestic dwelling sector. In the third TBL account, import propensity is 90% below average, government revenue is 55% below average and land disturbance is 95% below average.

Structural Path Analysis and Linkages

In absolute financial terms the sector's government revenue chain contributes over 4% of all government revenue, although the imputed rent issue substantially dilutes its intensity in the indicator. The direct effect is 88%, presumably as the result of state and local transaction taxes such as stamp duty on the purchase of houses. First order effects such as banking (3%) and residential building (1%), and second order effects such as 'security broking-banking-home ownership' (1%), show the importance of various financial levies for government revenue.

While the upstream effect of increases in consumer demand are portrayed strongly in the residential building sector, in this sector they are reasonably weak affecting residential building, banking and real estate. There is little downstream effect as investment in home ownership is dissipated by the sector itself.

Future Trends in Sector

In the base case scenario of the Future Dilemmas study with 25 million people by 2050, 3.7 million dwellings will be added to the stock by 2050 and 70% of these will be in capital cities. If current consumption and social preferences continue, it is likely that dwellings will be larger and contain fewer people. Trends in population ageing will require that new houses be constructed as flexible, and 'aged compliant', suitable for all ages and a full life's cycle without expensive retro-fitting.

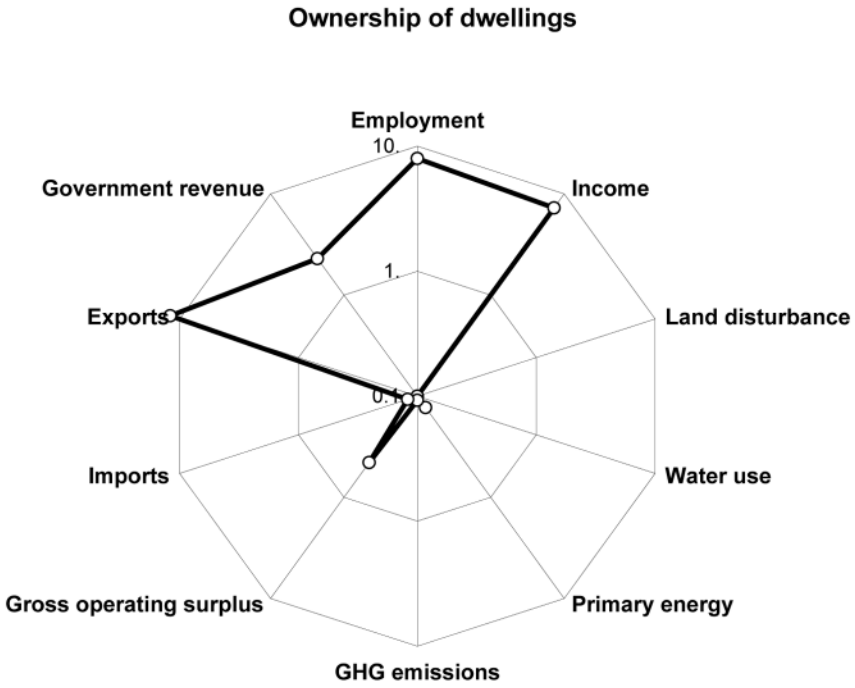
Innovation and Technical Opportunities

This sector functions as a consumption sink for many economic activities. It is important because of its contribution to GDP and more importantly because the housing stock is so long lived. Many of the houses constructed today will still be in use in 75 years time and will carry poor design facets through their entire life. The policy challenge is to design methods of cross compliance so that measures of sector activity (eg real and imputed rent and thereby sector value adding) are tied to technical standards of resource and energy use, and subsequent waste generation and greenhouse emissions. If a major component of housing rental was determined by physical performance standards, the sector's activity could contribute positively to the environmental quality of national value adding. Housing with low environmental performance would attract low rentals and thereby send performance signals to national measures of GDP. At a macro level, households are ultimately where most economic and physical consumption activities take place. While the performance of housing stock is important, five star ratings need to be accompanied by more sustainable household consumer behaviour. Merging upstream producers with downstream consumers through radical innovations in household consumption will start the sustainability transition.

Sector **Ownership of dwellings** **(Dw)**

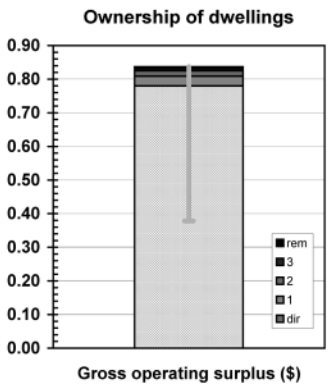
Gross rent of dwellings (actual rent paid in the case of tenanted dwellings and imputed rent for owner-occupied dwellings)

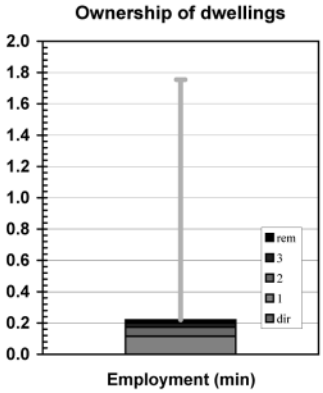
Spider diagram

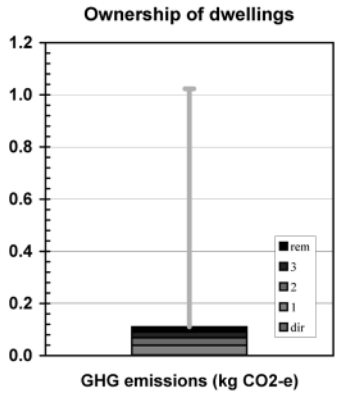


Bar graphs

Account #1







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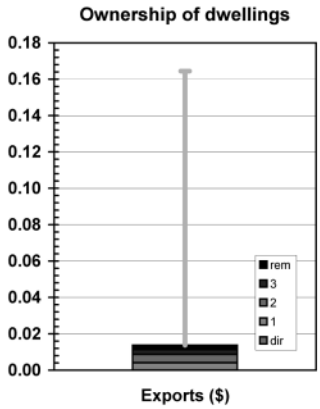

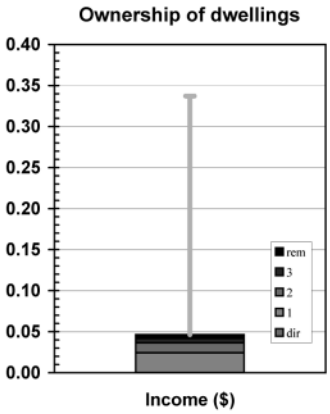

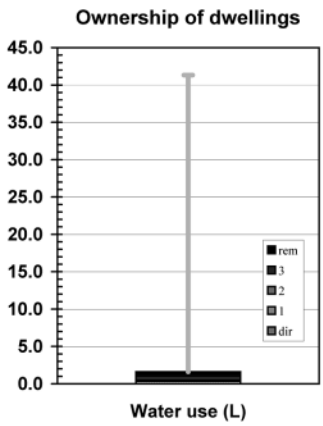

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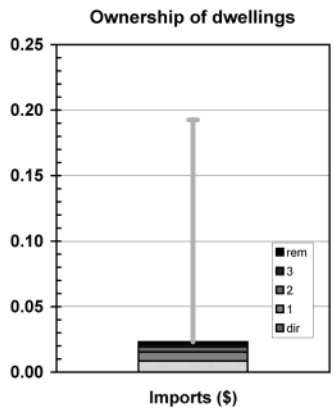
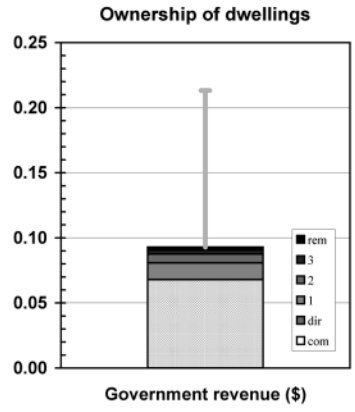
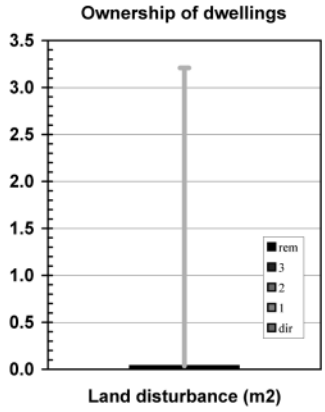






National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 49,674.2	(18.79% of total)	($m 49,674.2 domestically produced)
Government final consumption	-$m 28.1	-(0.03% of total)	
Gross fixed capital expenditure	$m 0.0		
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 49,646.1**	**(10.81% of GNE)**	**($m 49,646.1 domestically produced)**
Exports	$m 0.0		
Final demand	**$m 49,646.1**	**(9.15% of GNT)**	**($m 49,646.1 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 0.0		
Gross operating surplus	$m 38,710.0	(20.18% of total)	
Taxes less subsidies	$m 3,369.0	(3.94% of total)	
Sectoral GDP*	**$m 42,079.0**	**(9.39% of GDP)**	
Imports	$m 422.2	(0.43% of total)	
Primary inputs	**$m 42,501.2**	**(7.79% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 38,710.0	(20.18%)	$m 38,710.0	(20.18%)	$m 41,558.7	(21.67%)
Exports ($m)	$m 0.0				$m 679.7	(0.82%)
Imports ($m)	$m 422.2	(0.43%)	$m 422.2	(0.43%)	$m 1,151.1	(1.18%)
Employment (e-y)					87,650 e-y	(1.23%)
Income ($m)*	$m 0.0				$m 2,304.6	(1.35%)
Government revenue ($m)†	$m 3,369.0	(3.12%)	$m 3,369.0	(3.12%)	$m 4,616.1	(4.27%)
GHG emissions (kt CO_2-e)	82 kt	(0.02%)	82 kt	(0.02%)	5,472 kt	(1.06%)
Water use (ML)	15,721 ML	(0.08%)	15,721 ML	(0.08%)	79,899 ML	(0.38%)
Land disturbance (kha)	0 kha	(0.00%)	0 kha	(0.00%)	185 kha	(0.11%)
Primary energy (TJ)	1,229 TJ	(0.03%)	1,229 TJ	(0.03%)	49,173 TJ	(1.27%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.78	0.84	0.38
Exports ($)	0.00	0.01	0.16
Imports ($)	0.01	0.02	0.19
Employment (min)	0.00	0.22	1.75
Income ($)	0.00	0.05	0.34
Government revenue ($)	0.07	0.09	0.21
GHG emissions (kg CO_2-e)	0.00	0.11	1.02
Water use (L)	0.32	1.61	41.32
Land disturbance (m^2)	0.00	0.04	3.21
Primary energy (MJ)	0.02	0.99	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Dw	0.78	(0; 93.%)	Bk Dw	0.0371	(1; 17.%)	El Dw	0.0126	(1; 11.%)
Bk Dw	0.00936	(1; 1.1%)	Rb Dw	0.0212	(1; 9.6%)	Ce Dw	0.00812	(1; 7.4%)
Rb Dw	0.00802	(1; 0.96%)	Fn Dw	0.00729	(1; 3.3%)	Is Dw	0.00589	(1; 5.3%)
Sf Bk Dw	0.00327	(2; 0.39%)	Ms Dw	0.00558	(1; 2.5%)	Lm Dw	0.00276	(1; 2.5%)
Pd Dw	0.00192	(1; 0.23%)	Sm Dw	0.00486	(1; 2.2%)	El Bk Dw	0.00216	(2; 2.%)
Fn Dw	0.00182	(1; 0.22%)	Pd Dw	0.00461	(1; 2.1%)	Dw	0.00165	(0; 1.5%)
Ms Dw	0.00124	(1; 0.15%)	Wt Dw	0.00442	(1; 2.%)	Is Sm Dw	0.00158	(2; 1.4%)
Sf Fn Dw	0.000727	(2; 0.087%)	Sf Bk Dw	0.00425	(2; 1.9%)	Rb Dw	0.00154	(1; 1.4%)
Is Dw	0.000682	(1; 0.082%)	Rh Dw	0.00411	(1; 1.9%)	Ch Dw	0.00129	(1; 1.2%)
Rh Dw	0.000672	(1; 0.08%)	Wp Dw	0.00407	(1; 1.8%)	Mi Dw	0.00122	(1; 1.1%)
Wt Dw	0.000614	(1; 0.073%)	Fm Dw	0.00307	(1; 1.4%)	Sw Ti Rb Dw	0.00118	(3; 1.1%)
Sm Dw	0.000554	(1; 0.066%)	Rt Dw	0.00285	(1; 1.3%)	Cr Rb Dw	0.000972	(2; 0.88%)
El Dw	0.000509	(1; 0.061%)	Pl Dw	0.00188	(1; 0.85%)	El Pd Dw	0.000916	(2; 0.83%)
Wp Dw	0.000453	(1; 0.054%)	Sm Rb Dw	0.00167	(2; 0.76%)	Cc Rb Dw	0.000835	(2; 0.76%)
Cp Rb Dw	0.000364	(2; 0.043%)	Wp Rb Dw	0.00164	(2; 0.75%)	Ch Pl Dw	0.000786	(2; 0.71%)
Pl Dw	0.000353	(1; 0.042%)	Is Dw	0.00163	(1; 0.74%)	El Is Dw	0.000773	(2; 0.7%)
Cm Bk Dw	0.000335	(2; 0.04%)	In Dw	0.00163	(1; 0.74%)	Sw Wp Dw	0.000746	(2; 0.68%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Bk Dw	0.000729	(1; 5.3%)	Bk Dw	0.00917	(1; 20.%)	Dw	0.317	(0; 20.%)
Is Dw	0.000522	(1; 3.8%)	Rb Dw	0.00316	(1; 6.8%)	El Dw	0.0696	(1; 4.3%)
Wt Dw	0.000502	(1; 3.7%)	Pd Dw	0.00173	(1; 3.7%)	Wa Pd Dw	0.0525	(2; 3.3%)
Nf Dw	0.000362	(1; 2.6%)	Fn Dw	0.00136	(1; 2.9%)	Wp Dw	0.0335	(1; 2.1%)
Ms Dw	0.000192	(1; 1.4%)	Ms Dw	0.0013	(1; 2.8%)	Wa Ms Dw	0.032	(2; 2.%)
Ti Rb Dw	0.000186	(2; 1.4%)	Sf Bk Dw	0.00105	(2; 2.3%)	Sm Dw	0.0308	(1; 1.9%)
Sm Dw	0.000171	(1; 1.3%)	Wt Dw	0.000948	(1; 2.%)	Mi Dw	0.0206	(1; 1.3%)
Wt Rb Dw	0.000169	(2; 1.2%)	Sm Dw	0.000837	(1; 1.8%)	Su Fd Dw	0.0175	(2; 1.1%)
Fm Dw	0.000158	(1; 1.2%)	Wp Dw	0.000788	(1; 1.7%)	Is Dw	0.0156	(1; 0.97%)
Ch Dw	0.00015	(1; 1.1%)	In Dw	0.000704	(1; 1.5%)	Wp Rb Dw	0.0135	(2; 0.84%)
Io Is Dw	0.000142	(2; 1.%)	Fm Dw	0.000481	(1; 1.%)	Ws Bk Dw	0.0135	(2; 0.84%)
Is Sm Dw	0.00014	(2; 1.%)	Rh Dw	0.000449	(1; 0.97%)	Wa Rb Dw	0.0124	(2; 0.77%)
In Dw	0.000137	(1; 1.%)	Is Dw	0.000388	(1; 0.84%)	El Bk Dw	0.0119	(2; 0.74%)
Mi Dw	0.000127	(1; 0.92%)	Pl Dw	0.00038	(1; 0.82%)	Fn Dw	0.0114	(1; 0.71%)
Bl El Dw	0.000123	(2; 0.9%)	Rt Dw	0.000337	(1; 0.73%)	Wa Bk Dw	0.0109	(2; 0.67%)
Nf Sm Dw	0.000116	(2; 0.84%)	Ed Bk Dw	0.000328	(2; 0.71%)	Sm Rb Dw	0.0106	(2; 0.66%)
Ee Dw	0.000107	(1; 0.78%)	Wt Rb Dw	0.000319	(2; 0.69%)	Dc Dp Bk Dw	0.00777	(3; 0.48%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Dw	0.00851	(0; 37.%)	Dw	0.0679	(0; 73.%)	Wo Tx Tp Dw	0.00335	(3; 9.%)
Rb Dw	0.00158	(1; 6.8%)	Bk Dw	0.00507	(1; 5.4%)	Bc Mp Rt Dw	0.00152	(3; 4.1%)
Bk Dw	0.000905	(1; 3.9%)	Rb Dw	0.0017	(1; 1.8%)	Bc Mp Ho Bk I	0.00136	(4; 3.6%)
Wp Dw	0.000401	(1; 1.7%)	Pd Dw	0.00114	(1; 1.2%)	Wo Tx Dw	0.00129	(2; 3.5%)
Sm Dw	0.000398	(1; 1.7%)	Sf Bk Dw	0.000916	(2; 0.99%)	Sw Ti Rb Dw	0.00093	(3; 2.5%)
Pl Dw	0.000362	(1; 1.6%)	In Dw	0.000758	(1; 0.81%)	Bc Mp Bk Dw	0.000803	(3; 2.1%)
Rh Dw	0.000347	(1; 1.5%)	Fn Dw	0.000667	(1; 0.72%)	Sw Wp Dw	0.000587	(2; 1.6%)
Pt Dw	0.000307	(1; 1.3%)	Ms Dw	0.000616	(1; 0.66%)	Sw Ti Wp Dw	0.000523	(3; 1.4%)
Ms Dw	0.000283	(1; 1.2%)	Wt Dw	0.000443	(1; 0.48%)	Bc Mp Ch Dw	0.000514	(3; 1.4%)
Pd Dw	0.000277	(1; 1.2%)	Wp Dw	0.000383	(1; 0.41%)	Wo Tx Rb Dw	0.000424	(3; 1.1%)
Is Dw	0.000246	(1; 1.1%)	Sm Dw	0.000321	(1; 0.35%)	Wo Tx Pl Dw	0.000363	(3; 0.97%)
Fm Dw	0.000208	(1; 0.9%)	Rh Dw	0.000206	(1; 0.22%)	Bc Mp Ho Pd	0.000328	(4; 0.88%)
Wp Rb Dw	0.000162	(2; 0.7%)	Sf Fn Dw	0.000204	(2; 0.22%)	Bc Mp Fd Dw	0.000315	(3; 0.84%)
Ch Dw	0.00015	(1; 0.65%)	Is Dw	0.000178	(1; 0.19%)	Bc Mp Ch Pl D	0.000312	(4; 0.84%)
Wt Dw	0.000143	(1; 0.62%)	Fm Dw	0.000168	(1; 0.18%)	Bc Mp Ho Ms	0.000301	(4; 0.81%)
Sm Rb Dw	0.000137	(2; 0.59%)	Pl Dw	0.000166	(1; 0.18%)	Bc Ch Dw	0.000258	(2; 0.69%)
Hh Dw	0.000135	(1; 0.58%)	Wp Rb Dw	0.000155	(2; 0.17%)	Sw Wp Rb Dw	0.000237	(3; 0.63%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.314 ±0.006	(±1.8%)
Downstream	0.000 ±0.000	#DIV/0!

Sector 7702: Property Services (Pd)

Property development, real estate, renting, leasing, plant, transport container and vehicle hire

Short Summary

The property services sector provides positive environmental indicators which is typical for services sectors. For each dollar of final demand, greenhouse emissions, water and land disturbance are 70% to 90% below the economy wide average and most of the effect is indirect from the sector's suppliers. For the social indicators, employment generation is 30% below average while income and government revenue are equal to average. The sector provides strong stimulus to other sectors such as construction and basic materials which may offset its lower than average employment generation. The operating surplus is equal to average while export propensity and import penetration are 70% and 60% below average respectively. Generally the direct effects of the sector are less than one third of the total suggesting that improvement efforts should be directed at the chain of suppliers. Sector decisions on design and function of leased and operated infrastructure are critically important since infrastructure is so long lived.

Sector Description

The sector is a diverse one focused on leasing and hiring services with property development and operation responsible for three quarters of the financial activity. Real estate and equipment leasing make up about one tenth each, and car hire about one twentieth of turnover. Property development represents a key node of economic activity both for overseas funds investing in business infrastructure and for Australian superannuation funds seeking stable returns in yearly income and capital growth. Nearly three million shipping containers are leased on a yearly basis, mostly used for export trade. The car hire industry covers around 5 000 hire desks across Australia managing 55 000 hire cars. The real estate industry sells product from 9 000 offices.

Place of Industry in the Economy

The sector ranks 9th out of 135 in its contribution to value adding in the economy and contributes 2.9% of GDP in this analysis. The sector is a moderate employment generator with a direct requirement of 8 000 employment years and a further 19 000 years in the sector's suppliers giving a total of 27 000 employment years. In addition, the sector contributes 92 000 employment years to the final demand of downstream sectors such as wholesale trade, retail trade and non-dwelling construction. While the sector's management activities directs key nodes of resource use such as commercial buildings and hire cars, the sector itself has small requirements for water, land, energy and emissions, generally accounting for less than one fifth of one percent of national totals. In absolute financial terms, imports are three times the size of exports.

Strategic Overview

The strategic overview in the spider diagram presents a typical service sector with good overall performance, an outlier for export propensity and below average performance for employment generation. Like the banking sector, the decisions of this sector have important consequences for the long term social and environmental performance of infrastructure. The car hire fleet of more than 55 000 vehicles could help drive Australian made cars to higher levels of energy and emission performance if its procurement policies signalled those strategic directions. Industry sources note that commercial developments have only average environmental performance since they are driven by lease turnover rates of seven to ten years, where the lessee pays for the yearly operational costs (energy and water), while the developer focuses primarily on rate of return and capital appreciation.

TBL Account #1

The financial indicator of operating surplus is equal to average and one third is a direct effect with contributions from service sectors such as legal, research, communications, office and broking services. The social indicator of employment generation is 30% below the average with a similar composition to surplus. It is possible that increases in efficiency of service provision (being smarter, quicker and adopting technology) contributes to better profits with less employment generation. The environmental indicator of greenhouse gas emissions is 70% below average with the largest contributor from the supply chain the electricity used by the sector (one fifth of total emissions).

TBL Accounts #2 and #3

The second TBL account shows an export propensity 70% below average. This could improve as Australian development firms diversify overseas by purchasing development firms and repatriating profits. Income is equal to average which, when balanced with below average employment generation, suggests higher per capita remuneration. Water use is 70% below average. The third TBL account shows import penetration as 60% below average, while government revenue is equal to average and land disturbance is 95% below average.

Structural Path Analysis and Linkages

Increased consumer demand for services from the sector stimulates higher than average upstream linkages to suppliers such as architecture, consulting engineering services and legal services. The sector shows one of the strongest downstream linkages in this analysis, and any expansion must be led by expansion in the building construction, wholesale trade and retail trade sectors.

Future Trends in Sector

The base case scenario in the CSIRO *Future Dilemmas* report anticipates that dwelling space and non-dwelling space will increase by 50-60% over the next 50 years. Barring world crises and local catastrophes, this sector would appear to have a relatively buoyant future for property developers and real estate agents. The equipment and vehicle hiring components of the sector should follow similar trends, but car hire will depend for extra growth on inbound international tourism. Car hire may be limited by constrained oil supplies past 2020 which may shift international tourists back to buses and trains, or perhaps the multiple hiring of larger vehicles.

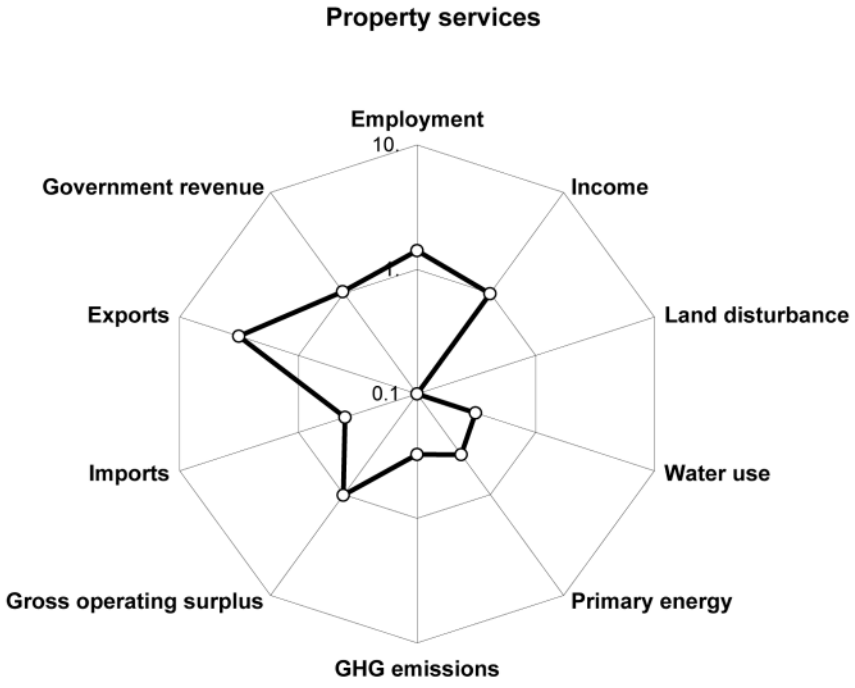
Innovation and Technical Opportunities

Because it designs, locates, manages and sells commercial and domestic building developments, this sector could lead innovation in energy efficient and people friendly building designs. A major Australian multinational developer recently launched the first large office complex to attract a five star rating in Sydney, and reduce CO_2 emissions by 30% compared to a standard design. While this shows the way forward, the Australian Conservation Foundation's refurbished building in Melbourne has reduced energy consumption by at least 60% and mains water use by 90%, thus demonstrating a proven benchmark. The real estate sector could also lead the way if it promoted environmentally appropriate design in addition to the common industry adage of 'position, position, position'. Similar leadership could be shown by the car hire sector, which could move its fleet of 55 000 vehicles to hybrid vehicles which halved petrol consumption and tailpipe emissions. The property management industry, and the superannuation or investment funds behind them, could be the primary stimulus in Australia's transition to low impact habitation and lifestyle. Socially innovative investment products are now appearing in many centres based on the commercial equivalent concept of 'co-housing'. These designs attempt to develop adjacent commercial and living arrangements with exacting environmental performance standards in an attempt to reduce daily transport requirements, while generating close knit community relations and a village lifestyle.

Sector **Property services** **(Pd)**

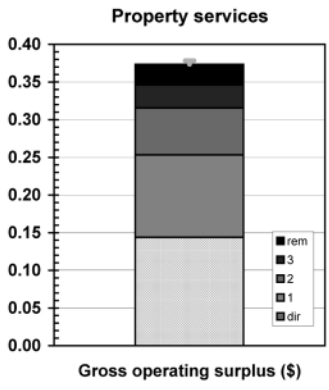
Property operator and developer, real estate agents, property broking, leasing, renting or valuing, container, plant and vehicle hire and other property services

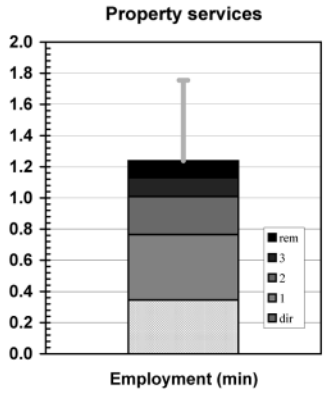
Spider diagram

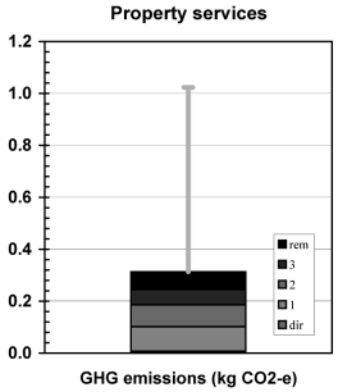


Bar graphs

Account #1







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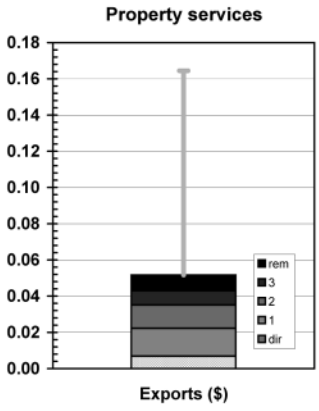
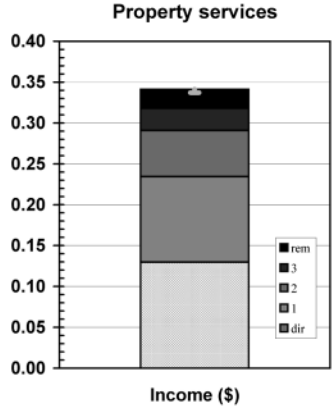
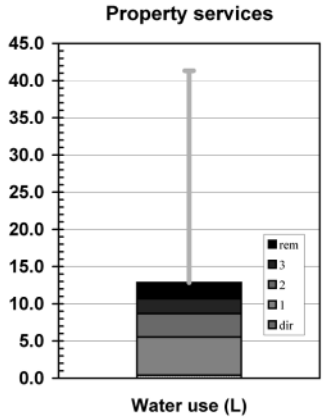
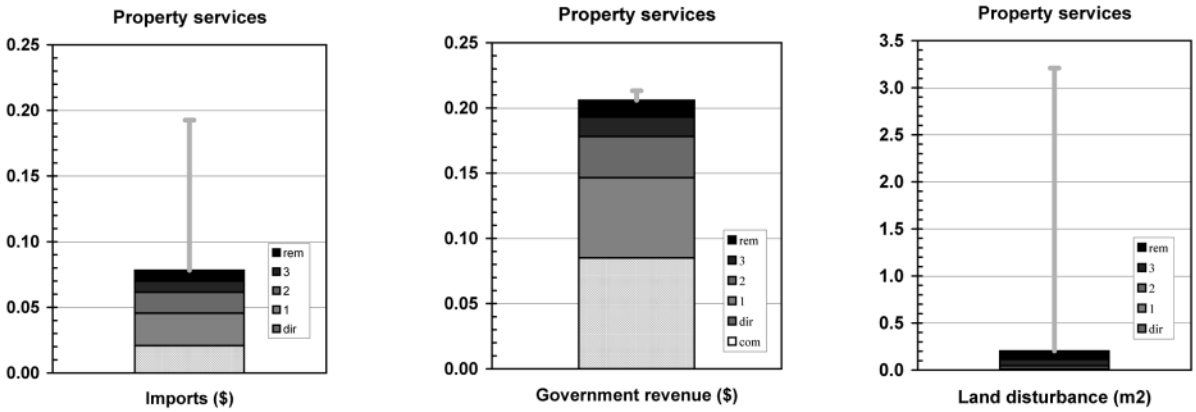






Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 623.9	(0.24% of total)	($m 558.9 domestically produced)
Government final consumption	-$m 7.9	-(0.01% of total)	
Gross fixed capital expenditure	$m 1,964.1	(1.88% of total)	($m 1,959.8 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 2,580.1**	**(0.56% of GNE)**	**($m 2,510.8 domestically produced)**
Exports	$m 248.2	(0.30% of total)	($m 248.2 domestically produced)
Final demand	**$m 2,828.3**	**(0.52% of GNT)**	**($m 2,758.9 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 4,699.8	(2.75% of total)	
Gross operating surplus	$m 5,211.0	(2.72% of total)	
Taxes less subsidies	$m 3,080.5	(3.61% of total)	
Sectoral GDP*	**$m 12,991.3**	**(2.90% of GDP)**	
Imports	$m 750.6	(0.77% of total)	
Primary inputs	**$m 13,741.8**	**(2.52% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 5,211.0	(2.72%)	$m 396.8	(0.21%)	$m 1,030.3	(0.54%)
Exports ($m)	$m 248.2	(0.30%)	$m 18.9	(0.02%)	$m 142.5	(0.17%)
Imports ($m)	$m 750.6	(0.77%)	$m 57.2	(0.06%)	$m 215.7	(0.22%)
Employment (e-y)	100,325 e-y	(1.41%)	7,639 e-y	(0.11%)	27,371 e-y	(0.38%)
Income ($m)*	$m 4,699.8	(2.75%)	$m 357.9	(0.21%)	$m 941.9	(0.55%)
Government revenue ($m)†	$m 3,080.5	(2.85%)	$m 234.6	(0.22%)	$m 568.0	(0.53%)
GHG emissions (kt CO_2-e)	250 kt	(0.05%)	19 kt	(0.00%)	864 kt	(0.17%)
Water use (ML)	14,090 ML	(0.07%)	1,073 ML	(0.01%)	35,482 ML	(0.17%)
Land disturbance (kha)	22 kha	(0.01%)	2 kha	(0.00%)	56 kha	(0.03%)
Primary energy (TJ)	3,789 TJ	(0.10%)	289 TJ	(0.01%)	8,461 TJ	(0.22%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.14	0.37	0.38
Exports ($)	0.01	0.05	0.16
Imports ($)	0.02	0.08	0.19
Employment (min)	0.35	1.24	1.75
Income ($)	0.13	0.34	0.34
Government revenue ($)	0.09	0.21	0.21
GHG emissions (kg CO_2-e)	0.01	0.31	1.02
Water use (L)	0.39	12.86	41.32
Land disturbance (m^2)	0.01	0.20	3.21
Primary energy (MJ)	0.10	3.07	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Pd	0.144	(0; 39.%)	Pd	0.346	(0; 28.%)	El Pd	0.0686	(1; 22.%)
Ms Pd	0.00982	(1; 2.6%)	Bs Pd	0.0626	(1; 5.1%)	Pd	0.00691	(0; 2.2%)
Ts Pd	0.00703	(1; 1.9%)	Ms Pd	0.044	(1; 3.6%)	At Pd	0.00433	(1; 1.4%)
Cm Pd	0.00638	(1; 1.7%)	Ts Pd	0.0317	(1; 2.6%)	El Ms Pd	0.00411	(2; 1.3%)
Bs Pd	0.00635	(1; 1.7%)	Cm Pd	0.0176	(1; 1.4%)	El Bs Pd	0.00387	(2; 1.2%)
Wa Pd	0.00536	(1; 1.4%)	Ho Pd	0.017	(1; 1.4%)	Gd Pd	0.0037	(1; 1.2%)
Sf Pd	0.00303	(1; 0.81%)	In Pd	0.0167	(1; 1.3%)	Bc Mp Ho Pd	0.00338	(3; 1.1%)
Sf In Pd	0.00297	(2; 0.8%)	Et Pd	0.0106	(1; 0.86%)	Bc Mp Pd	0.0023	(2; 0.74%)
El Pd	0.00277	(1; 0.74%)	Nb Pd	0.00952	(1; 0.77%)	El Ho Pd	0.00223	(2; 0.71%)
In Pd	0.00256	(1; 0.69%)	Wt Pd	0.0069	(1; 0.56%)	El Ts Pd	0.00175	(2; 0.56%)
Et Pd	0.00224	(1; 0.6%)	Wa Pd	0.00682	(1; 0.55%)	El Wa Pd	0.00174	(2; 0.56%)
St Pd	0.00209	(1; 0.56%)	Bk Pd	0.00647	(1; 0.52%)	Bl El Pd	0.00173	(2; 0.55%)
Ne Pd	0.00167	(1; 0.45%)	Pr Pd	0.00646	(1; 0.52%)	Wa Pd	0.00166	(1; 0.53%)
Bk Pd	0.00163	(1; 0.44%)	Os Pd	0.00581	(1; 0.47%)	Ga Pd	0.00115	(1; 0.37%)
Rv Pd	0.0014	(1; 0.38%)	Ne Pd	0.00567	(1; 0.46%)	El Cm Pd	0.00104	(2; 0.33%)
Ho Pd	0.00136	(1; 0.36%)	Rh Pd	0.00541	(1; 0.44%)	Fo Pd	0.00104	(1; 0.33%)
Wt Pd	0.000959	(1; 0.26%)	Gv Pd	0.00498	(1; 0.4%)	Wt Pd	0.000957	(1; 0.31%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Pd	0.00685	(0; 13.%)	Pd	0.13	(0; 38.%)	Wa Pd	3.93	(1; 31.%)
Ms Pd	0.00152	(1; 2.9%)	Ms Pd	0.0102	(1; 3.%)	Vf Pd	0.461	(1; 3.6%)
In Pd	0.0014	(1; 2.7%)	Bs Pd	0.00769	(1; 2.3%)	Pd	0.389	(0; 3.%)
At Pd	0.00138	(1; 2.7%)	Ts Pd	0.00741	(1; 2.2%)	El Pd	0.379	(1; 2.9%)
Bs Pd	0.00118	(1; 2.3%)	In Pd	0.00724	(1; 2.1%)	Wa Ms Pd	0.252	(2; 2.%)
Ts Pd	0.00112	(1; 2.2%)	Cm Pd	0.004	(1; 1.2%)	Wa Bs Pd	0.192	(2; 1.5%)
Ho Pd	0.000947	(1; 1.8%)	Ho Pd	0.00248	(1; 0.73%)	Ws Ho Pd	0.124	(2; 0.96%)
Cm Pd	0.000851	(1; 1.6%)	Et Pd	0.00187	(1; 0.55%)	Dc Dp Pd	0.119	(2; 0.92%)
Wt Pd	0.000784	(1; 1.5%)	Os Pd	0.00163	(1; 0.48%)	Wa Ts Pd	0.0948	(2; 0.74%)
Bl El Pd	0.00067	(2; 1.3%)	Bk Pd	0.0016	(1; 0.47%)	Bc Mp Ho Pd	0.089	(3; 0.69%)
St Pd	0.000517	(1; 1.%)	Wa Pd	0.00154	(1; 0.45%)	Dc Dp Ho Pd	0.0738	(3; 0.57%)
Et Pd	0.000347	(1; 0.67%)	Wt Pd	0.00148	(1; 0.43%)	Bc Mp Pd	0.0607	(2; 0.47%)
Ne Pd	0.000244	(1; 0.47%)	Nb Pd	0.00142	(1; 0.42%)	Ri Fc Ho Pd	0.0573	(3; 0.45%)
En Pd	0.000194	(1; 0.38%)	Ne Pd	0.0013	(1; 0.38%)	Sc Cg Vf Pd	0.0478	(3; 0.37%)
At Ms Pd	0.000176	(2; 0.34%)	Pr Pd	0.0013	(1; 0.38%)	Vf Ho Pd	0.047	(2; 0.37%)
Om Pd	0.000154	(1; 0.3%)	Gv Pd	0.00125	(1; 0.37%)	Vf Et Pd	0.0434	(2; 0.34%)
Sg Pd	0.000135	(1; 0.26%)	Ed Pd	0.00123	(1; 0.36%)	Ws Pd	0.0289	(1; 0.22%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Pd	0.0207	(0; 27.%)	Pd	0.085	(0; 41.%)	Bc Mp Ho Pd	0.0245	(3; 12.%)
Ms Pd	0.00223	(1; 2.9%)	In Pd	0.00778	(1; 3.8%)	Bc Mp Pd	0.0167	(2; 8.2%)
Ts Pd	0.00202	(1; 2.6%)	Ms Pd	0.00486	(1; 2.4%)	Wo Tx Tp Pd	0.00606	(3; 3.%)
Et Pd	0.00158	(1; 2.%)	Ts Pd	0.00365	(1; 1.8%)	Pd	0.00599	(0; 2.9%)
Bs Pd	0.00126	(1; 1.6%)	Bs Pd	0.00228	(1; 1.1%)	Wo Mp Ho Pd	0.00277	(3; 1.4%)
Pr Pd	0.00116	(1; 1.5%)	Cm Pd	0.00191	(1; 0.93%)	Wo Tx Pd	0.00273	(2; 1.3%)
Cm Pd	0.00109	(1; 1.4%)	Ho Pd	0.00131	(1; 0.63%)	Bc Mp Ho Ms	0.00238	(4; 1.2%)
Wa Pd	0.000814	(1; 1.%)	Wa Pd	0.00116	(1; 0.56%)	Wo Tx Cl Pd	0.0023	(3; 1.1%)
Ne Pd	0.000806	(1; 1.%)	Bk Pd	0.000882	(1; 0.43%)	Ba Bm Ho Pd	0.00201	(3; 0.99%)
Ho Pd	0.000631	(1; 0.81%)	Sf Pd	0.000849	(1; 0.41%)	Wa Pd	0.00195	(1; 0.96%)
Rh Pd	0.000456	(1; 0.58%)	Sf In Pd	0.000832	(2; 0.4%)	Wo Mp Pd	0.00189	(2; 0.93%)
At Pd	0.000411	(1; 0.53%)	Et Pd	0.000783	(1; 0.38%)	Wo Tx Fu Pd	0.00158	(3; 0.78%)
Pt Pd	0.000374	(1; 0.48%)	Os Pd	0.000755	(1; 0.37%)	Bc Mp Ho Bs I	0.00135	(4; 0.66%)
Fo Pd	0.000339	(1; 0.43%)	Wt Pd	0.000693	(1; 0.34%)	Wo Ts Pd	0.00122	(2; 0.6%)
Nb Pd	0.000316	(1; 0.4%)	Ne Pd	0.000651	(1; 0.32%)	Wo Bs Pd	0.0012	(2; 0.59%)
In Pd	0.000303	(1; 0.39%)	Pr Pd	0.000626	(1; 0.3%)	El Pd	0.00111	(1; 0.54%)
Ap Pd	0.000236	(1; 0.3%)	At Pd	0.000617	(1; 0.3%)	Bc Mp Bs Pd	0.00109	(3; 0.54%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.410 ±0.045	(±3.2%)
Downstream	2.054 ±0.051	(±2.5%)

Sector 7801: Scientific and Technical Services (Ts)

Scientific research, architectural, surveying, engineering, data processing, technical and computer services

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of greenhouse emissions, water use and land disturbance are respectively 75%, 80% and 95% below the economy wide averages. The social indicator of employment generation is 5% below average, while income is 5% above average and government revenue is 15% below average. The financial indicator of operating surplus is 10% below average while the indicators for export propensity and import penetration are 55% and 40% below average respectively. Recent trends in export performance may improve the export indicator. The future for scientific and technical services to the construction and building sectors seems moderately assured under the assumption that the domestic population will grow to 25 million by 2050. Other industries such as computing services may be affected by globalised competition from low wage countries.

Sector Description

The sector covers a broad collection of non-university scientific disciplines including research, meteorology, surveying, computer consulting, engineering and architecture. In financial flow terms it is dominated by computing services (68%) with engineering (15%) and scientific research (6%) relatively small by comparison. Of the approximately 150 000 workers classified into this industry group the composition is research (15%), architecture (16%), surveying (7%), engineering (22%), technical services such as laboratory analysis and meteorology (19%) and computer services (20%).

Place of Industry in the Economy

The industry occupies the top quartile in value adding in the economy ranking 11th out of 135 sectors and contributing 2.6% of GDP in this analysis. It is similar in size to communication services and residential building industries. It directly produces 59 000 employment years and is responsible for another 35 000 years in upstream sectors such as legal and accounting services and other business services giving a total of 1.3% of national employment. It contributes 106 000 employment years to downstream industries such as wholesale trade, property development and government administration. It has moderate requirements for resources with energy, greenhouse emissions, water and land disturbance all less than one half of one percent of national totals. Imports are twice the size of exports in financial flow terms.

Strategic Overview

This spider diagram shows a reasonable TBL account with two outliers, the indicators for export propensity and government revenue. The export indicator will probably improve over time as computer consulting services shows grows services exports, although Australia runs a large trade deficit in computer equipment (not in this sector). The government revenue indicator may be difficult to improve given that the sector is a composite of commercial activities such as engineering, computing and architecture, and government funded activities in research and public good services, such as meteorology. Given the importance of the sector as an enabler of many important downstream activities, strategies to maximise the sector's effect on technology may be more rewarding than improving government revenue by transaction levies and user fees.

TBL Account #1

The financial indicator of operating surplus is 10% below the economy wide average and two thirds of the effect is a direct one with first order effects legal and accounting (4%), communications (2%), other business services (2%), water reticulation (1%) and wholesale trade (1%) also making significant contributions. The social indicator of employment generation is 5% below average with a high direct component and a supply chain similar in composition to operating surplus. The greenhouse indicator is 75% below average, and one quarter of this is a first order effect of electricity generation.

TBL Accounts #2 and #3

The second TBL account shows an export propensity 55% below average, income 5% above average and water use 80% below average. The third TBL account shows import penetration 40% below average, government revenue 5% above average and land disturbance 95% below average.

Structural Path Analysis and Linkages

The export indicator is well below average. The supply chain shows that the direct effect is 49% augmented by a long chain of first order effects including wholesale trade (4%), legal and accounting (3%), airline travel (3%), other business services (2%) and communications (2%). Improving the export indicator through a focus on the sector should be the obvious priority. However multiplier effects from the supply chain appear promising once direct exports are in place.

Increases in consumer demand for scientific services give a weaker than average stimulus to the sector's upstream suppliers such as legal and accounting services, other business services, wholesale trade and communications. There is a strong downstream effect, with expansion of wholesale and retail trade, property development and government administration required to dissipate the effect of increased investment in this sector.

Future Trends in Sector

The *Future Dilemmas* study anticipates growth potential for a number of professions engaged in building and construction, with the floor space of domestic and non-domestic buildings expected to expand by 90% and 60% respectively by 2050. New roads may expand by 10%, but there will be a continuing task of road reconstruction and upgrading. A number of professions such as computing may be adversely affected by outsourcing to cheaper wage countries. Conversely data security concerns could roll back the globalisation trends in critical areas such as government and defence and thus stimulate the domestic sector.

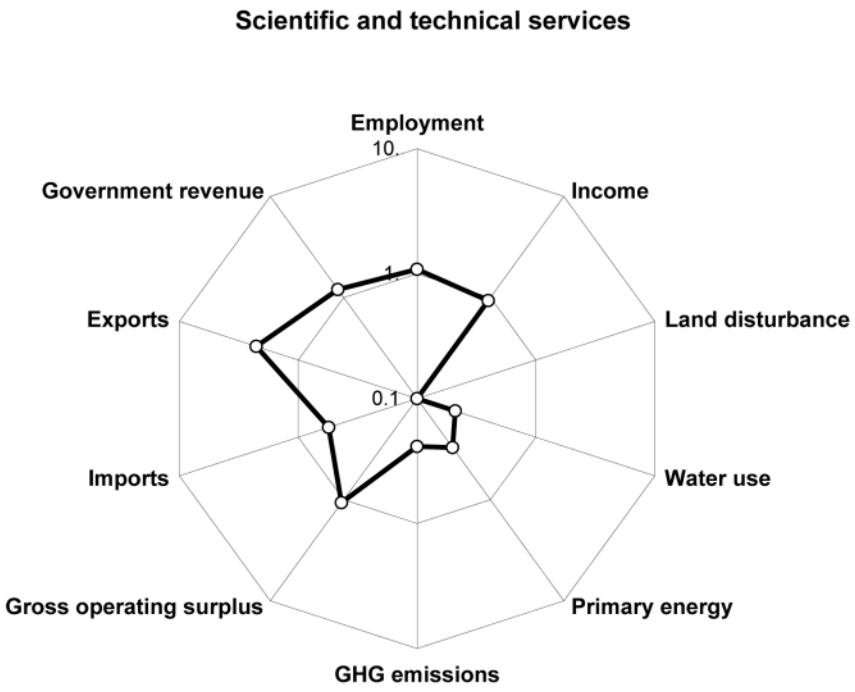
Innovation and Technical Opportunities

There seems to be a recurring theme in much scientific and technical literature which focuses on the education issues that surround and drive the merging of the disciplines. The writers question whether it is better to form multidisciplinary teams to deal with complex issues of design and transformation, or whether a new breed of polymaths should be trained in new seats of learning. Other discussions include the ethical dimensions in science and technical areas that are emerging, with and increasing emphasis being placed on so-called 'disinterested science' that is dissociated from the purely material interests of profit driven corporate science. These discussions assert that disinterested and academic science can form reliable and imaginative public knowledge that is independent and self critical. Currently all modes of technical and scientific knowledge production are seen to be influenced by utilitarian goals that drive a post-academic research culture that supports economic ideologies. This sector includes the more commercial and less commercial disciplines that highlight the differences between profit driven, and academic science.

Sector **Scientific and technical services** **(Ts)**

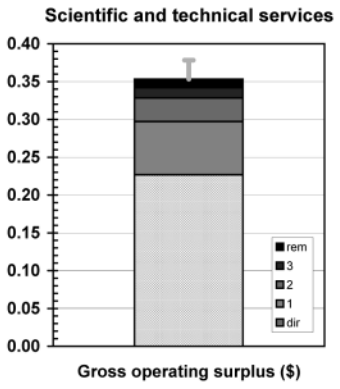
Scientific research, architectural, surveying, engineering, data processing, technical and computer services

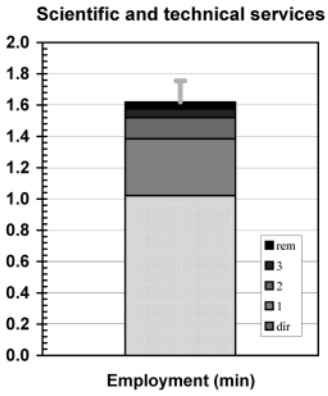
Spider diagram

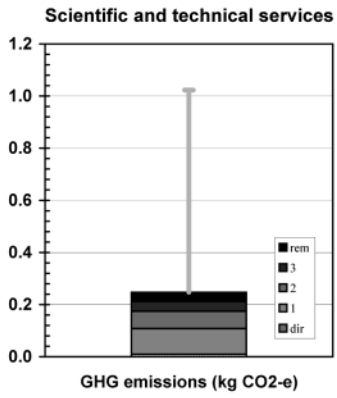


Bar graphs

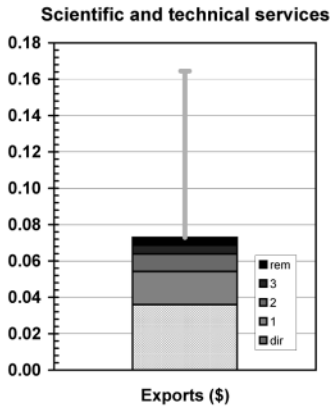
Account #1

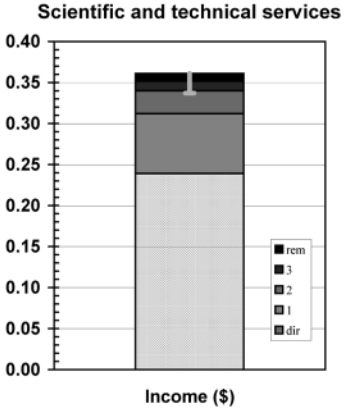


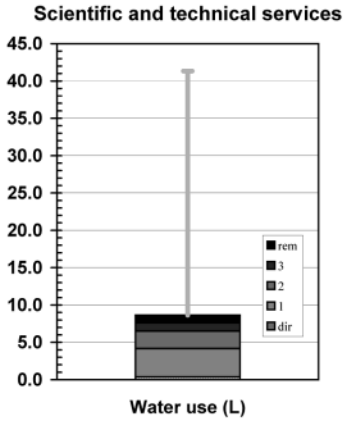




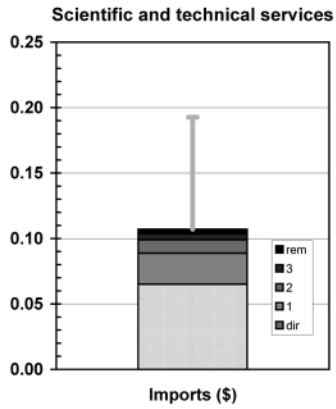
Account #2

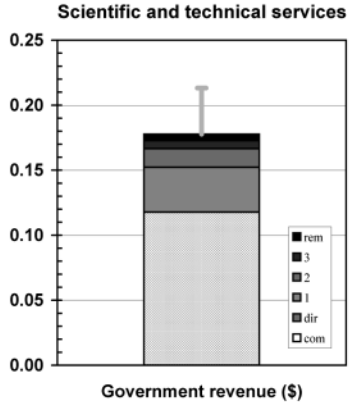


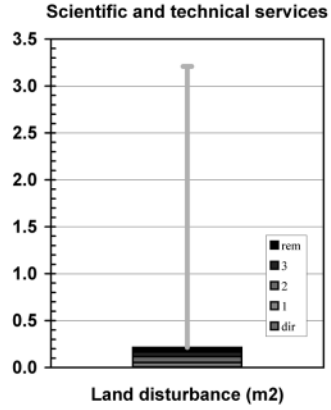




Account #3







National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 14.2	(0.01% of total)	($m 11.7 domestically produced)
Government final consumption	$m 635.5	(0.72% of total)	($m 635.5 domestically produced)
Gross fixed capital expenditure	$m 5,936.9	(5.67% of total)	($m 5,882.0 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 6,586.7**	**(1.43% of GNE)**	**($m 6,529.2 domestically produced)**
Exports	$m 728.1	(0.87% of total)	($m 728.1 domestically produced)
Final demand	**$m 7,314.7**	**(1.35% of GNT)**	**($m 7,257.3 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 4,839.1	(2.83% of total)	
Gross operating surplus	$m 4,588.8	(2.39% of total)	
Taxes less subsidies	$m 2,384.0	(2.79% of total)	
Sectoral GDP*	**$m 11,811.9**	**(2.64% of GDP)**	
Imports	$m 1,316.4	(1.35% of total)	
Primary inputs	**$m 13,128.3**	**(2.41% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 4,588.8	(2.39%)	$m 1,644.7	(0.86%)	$m 2,563.0	(1.34%)
Exports ($m)	$m 728.1	(0.87%)	$m 260.9	(0.31%)	$m 529.1	(0.63%)
Imports ($m)	$m 1,316.4	(1.35%)	$m 471.8	(0.48%)	$m 776.7	(0.80%)
Employment (e-y)	165,663 e-y	(2.32%)	59,374 e-y	(0.83%)	94,153 e-y	(1.32%)
Income ($m)*	$m 4,839.1	(2.83%)	$m 1,734.3	(1.02%)	$m 2,620.4	(1.53%)
Government revenue ($m)†	$m 2,384.0	(2.21%)	$m 854.4	(0.79%)	$m 1,290.1	(1.19%)
GHG emissions (kt CO_2-e)	178 kt	(0.03%)	64 kt	(0.01%)	1,793 kt	(0.35%)
Water use (ML)	7,147 ML	(0.03%)	2,562 ML	(0.01%)	62,785 ML	(0.30%)
Land disturbance (kha)	12 kha	(0.01%)	4 kha	(0.00%)	155 kha	(0.10%)
Primary energy (TJ)	2,669 TJ	(0.07%)	957 TJ	(0.02%)	16,924 TJ	(0.44%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.23	0.35	0.38
Exports ($)	0.04	0.07	0.16
Imports ($)	0.07	0.11	0.19
Employment (min)	1.02	1.62	1.75
Income ($)	0.24	0.36	0.34
Government revenue ($)	0.12	0.18	0.21
GHG emissions (kg CO_2-e)	0.01	0.25	1.02
Water use (L)	0.35	8.65	41.32
Land disturbance (m^2)	0.01	0.21	3.21
Primary energy (MJ)	0.13	2.33	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Ts	0.227	(0; 64.%)	Ts	1.02	(0; 63.%)	El Ts	0.0564	(1; 23.%)
Ms Ts	0.014	(1; 4.%)	Bs Ts	0.0632	(1; 3.9%)	Gd Ts	0.00969	(1; 3.9%)
Cm Ts	0.00826	(1; 2.3%)	Ms Ts	0.063	(1; 3.9%)	Ts	0.00881	(0; 3.6%)
Bs Ts	0.00641	(1; 1.8%)	Wt Ts	0.0275	(1; 1.7%)	El Ms Ts	0.00587	(2; 2.4%)
Wa Ts	0.00416	(1; 1.2%)	Cm Ts	0.0228	(1; 1.4%)	At Ts	0.0058	(1; 2.3%)
Wt Ts	0.00382	(1; 1.1%)	Rh Ts	0.0133	(1; 0.82%)	Bc Mp Ts	0.00441	(2; 1.8%)
Et Ts	0.00256	(1; 0.73%)	Et Ts	0.0122	(1; 0.75%)	El Bs Ts	0.0039	(2; 1.6%)
El Ts	0.00228	(1; 0.65%)	Ho Ts	0.0108	(1; 0.67%)	Wt Ts	0.00381	(1; 1.5%)
Rh Ts	0.00217	(1; 0.61%)	Ed Ts	0.0107	(1; 0.66%)	Fo Ts	0.00259	(1; 1.%)
Bk Ts	0.00212	(1; 0.6%)	Pr Ts	0.00888	(1; 0.55%)	Bc Mp Ho Ts	0.00214	(3; 0.87%)
St Ts	0.00193	(1; 0.55%)	Bk Ts	0.0084	(1; 0.52%)	Ch Ts	0.00194	(1; 0.78%)
Ne Ts	0.00192	(1; 0.54%)	Os Ts	0.00728	(1; 0.45%)	Lm Ts	0.00176	(1; 0.71%)
Cm Ms Ts	0.00106	(2; 0.3%)	Gv Ts	0.00683	(1; 0.42%)	Ce Ts	0.00166	(1; 0.67%)
Pr Ts	0.00106	(1; 0.3%)	Ne Ts	0.00652	(1; 0.4%)	Wo Ts	0.00163	(1; 0.66%)
Ms Bs Ts	0.000873	(2; 0.25%)	Bs Ms Ts	0.00605	(2; 0.37%)	Bl El Ts	0.00142	(2; 0.58%)
Ho Ts	0.000859	(1; 0.24%)	Ps Ts	0.00559	(1; 0.35%)	El Rh Ts	0.00141	(2; 0.57%)
Sf Bk Ts	0.000739	(2; 0.21%)	Wa Ts	0.0053	(1; 0.33%)	El Ho Ts	0.00141	(2; 0.57%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Ts	0.036	(0; 49.%)	Ts	0.239	(0; 66.%)	Wa Ts	3.06	(1; 35.%)
Wt Ts	0.00312	(1; 4.3%)	Ms Ts	0.0146	(1; 4.1%)	Wa Ms Ts	0.361	(2; 4.2%)
Ms Ts	0.00217	(1; 3.%)	Bs Ts	0.00776	(1; 2.1%)	Ts	0.353	(0; 4.1%)
At Ts	0.00185	(1; 2.5%)	Wt Ts	0.0059	(1; 1.6%)	El Ts	0.312	(1; 3.6%)
Bs Ts	0.00119	(1; 1.6%)	Cm Ts	0.00519	(1; 1.4%)	Sc Cg Ts	0.3	(2; 3.5%)
Cm Ts	0.0011	(1; 1.5%)	Ed Ts	0.00265	(1; 0.73%)	Dc Dp Ts	0.255	(2; 2.9%)
En Ts	0.000714	(1; 0.98%)	Et Ts	0.00214	(1; 0.59%)	Wa Bs Ts	0.194	(2; 2.2%)
Ho Ts	0.0006	(1; 0.82%)	Bk Ts	0.00207	(1; 0.57%)	Vf Ts	0.159	(1; 1.8%)
Bl El Ts	0.000552	(2; 0.76%)	Os Ts	0.00204	(1; 0.57%)	Bc Mp Ts	0.116	(2; 1.3%)
Eq Ts	0.000534	(1; 0.73%)	Pr Ts	0.00178	(1; 0.49%)	Ri Fc Ts	0.103	(2; 1.2%)
St Ts	0.000477	(1; 0.65%)	Gv Ts	0.00172	(1; 0.48%)	Su Fd Ts	0.0805	(2; 0.93%)
Et Ts	0.000397	(1; 0.54%)	Ho Ts	0.00157	(1; 0.44%)	Ws Ho Ts	0.0786	(2; 0.91%)
Ne Ts	0.000281	(1; 0.39%)	Ne Ts	0.00149	(1; 0.41%)	Bc Mp Ho Ts	0.0564	(3; 0.65%)
Ed Ts	0.000261	(1; 0.36%)	Rh Ts	0.00145	(1; 0.4%)	Wo Ts	0.0528	(1; 0.61%)
Oi Fo Ts	0.000252	(2; 0.35%)	Wa Ts	0.0012	(1; 0.33%)	Vf Et Ts	0.0496	(2; 0.57%)
At Ms Ts	0.000251	(2; 0.34%)	Gd Ts	0.00107	(1; 0.3%)	Dc Dp Ho Ts	0.0467	(3; 0.54%)
Oe Ts	0.000249	(1; 0.34%)	At Ts	0.00103	(1; 0.28%)	Vf Ms Ts	0.04	(2; 0.46%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Ts	0.065	(0; 61.%)	Ts	0.118	(0; 66.%)	Wo Ts	0.0392	(1; 18.%)
Ms Ts	0.00319	(1; 3.%)	Ms Ts	0.00695	(1; 3.9%)	Bc Mp Ts	0.0321	(2; 15.%)
Et Ts	0.0018	(1; 1.7%)	Wt Ts	0.00276	(1; 1.6%)	Bc Mp Ho Ts	0.0156	(3; 7.3%)
Pr Ts	0.00159	(1; 1.5%)	Cm Ts	0.00248	(1; 1.4%)	Wo Tx Ts	0.0154	(2; 7.2%)
Cm Ts	0.00141	(1; 1.3%)	Bs Ts	0.0023	(1; 1.3%)	Ts	0.00609	(0; 2.8%)
Bs Ts	0.00127	(1; 1.2%)	Bk Ts	0.00114	(1; 0.64%)	Wo Mp Ts	0.00362	(2; 1.7%)
Rh Ts	0.00112	(1; 1.%)	Ed Ts	0.000972	(1; 0.55%)	Bc Mp Ho Ms	0.0034	(4; 1.6%)
Ne Ts	0.000927	(1; 0.87%)	Os Ts	0.000946	(1; 0.53%)	Wo Tx Cl Ts	0.00268	(3; 1.2%)
Wt Ts	0.000888	(1; 0.83%)	Wa Ts	0.000898	(1; 0.51%)	Wo Tx Tp Ts	0.00201	(3; 0.94%)
Fo Ts	0.000848	(1; 0.79%)	Et Ts	0.000895	(1; 0.5%)	Wo Mp Ho Ts	0.00176	(3; 0.82%)
En Ts	0.000829	(1; 0.77%)	Pr Ts	0.00086	(1; 0.48%)	Wa Ts	0.00151	(1; 0.71%)
Wa Ts	0.000632	(1; 0.59%)	Ho Ts	0.000828	(1; 0.47%)	Bc Mp Fd Ts	0.00145	(3; 0.67%)
At Ts	0.00055	(1; 0.51%)	At Ts	0.000826	(1; 0.46%)	Bc Mp Ho Bs	0.00136	(4; 0.63%)
Ho Ts	0.0004	(1; 0.37%)	Ne Ts	0.000749	(1; 0.42%)	Dc Dp Ts	0.00132	(2; 0.62%)
Eq Ts	0.000353	(1; 0.33%)	Rh Ts	0.000666	(1; 0.37%)	Bc Mp Ms Ts	0.00129	(3; 0.6%)
Pt Ts	0.000317	(1; 0.3%)	Gv Ts	0.000598	(1; 0.34%)	Ba Bm Ho Ts	0.00127	(3; 0.59%)
Oc Ts	0.000313	(1; 0.29%)	In Ts	0.000564	(1; 0.32%)	Wo Bs Ts	0.00121	(2; 0.57%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.712 ±0.012	(±1.7%)
Downstream	1.272 ±0.019	(±1.5%)

Sector 7801: Business Management Services (Ms)

Legal, accounting, advertising, market research, administrative and business management services

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of greenhouse emissions, water use and land disturbance are respectively 70%, 70% and 95% below their economy wide averages. The social indicator of employment generation is 5% below average, income is 5% above average while government revenue is 15% below average. The financial indicators of operating surplus, export propensity and import penetration are respectively 5%, 55% and 40% below average. The activities within the sector could be judged as reasonably mature and as such will grow steadily in line with population growth. The ageing of the population may stimulate challenges for service delivery to older people for whom the rapidly evolving cyber world is less functional as a medium for service communication. The literature appears to suggest that services are more difficult to sell and export than physical products, and that services have a much shorter shelf life. Overall this sector has a reasonable TBL account with potential improvement in export and government revenue. Future service provision may have to document the downstream implications of its advice and decisions in social and environmental terms.

Sector Description

This sector includes a range of professions and in financial terms is dominated by legal services (24%) followed by business management (22%), accounting (18%) and advertising (10%). Nationally there are 31 000 solicitors and barristers, 38 000 accountants and 1 600 market researchers. Accounting is dominated by taxation services (36%) followed by general business accounting (30%) and auditing practices (20%). Solicitors' business is primarily commercial law (30%), property law (19%) and personal injury law (16%). Barristers' business is primarily personal injury law (28%), commercial law (27%) and criminal law (11%).

Place of Industry in the Economy

The legal, accounting, and marketing sector is an important one for value adding in the economy, ranking 6th out of 135 sectors and contributing 3.6% of GDP. It is similar in value adding to retail trade and non-residential construction. It has direct employment of 27 000 employment years with another 23 000 year embodied in upstream suppliers such as communications and other business services giving a total of 50 000 employment years. In addition it supplies 202 000 employment years to downstream industries. It has a relatively small requirement for resources with less than three tenths of one percent of national totals for energy, greenhouse emissions, water use and land disturbance. Imports are 50% greater than exports in financial terms.

Strategic Overview

The integrated overview in the spider diagram is typical of service sectors with eight of the ten indicators better than average, and government revenue and export propensity as outliers. Much of the problems with exports in these professional sectors lie with the large numbers of relatively small firms which lack the acumen, scale or drive to enter export markets, especially if they are operating comfortably and profitably onshore. The sector is judged to have limited export potential unless service workers are prepared to physically locate in overseas markets. Traditionally, Australia is the country exported to, and lacks firms of globalised scale from which to build export performance.

TBL Account #1

The financial indicator of operating surplus is 5% below average with two thirds a direct sector effect and the rest due to first order effects such communications (4%), other business services (3%), technical and scientific services (2%), water supply and sewage (2%) and electricity generation (1%). The employment generation indicator is 5% higher than average and has a similar composition to that of operating surplus. The greenhouse indicator is 70% below average, with very little direct effect and most being due to first and second order supply chain effects, the largest of which is electricity generation (27%).

TBL Accounts #2 and #3

The second TBL account shows export propensity is 55% lower than average, income is 5% above average and water use is 70% lower than average. The third TBL account shows import penetration is 40% below average, government revenue is 15% below average and land disturbance is 95% below average. Opportunities to increase government revenue and exports could be explored.

Structural Path Analysis and Linkages

The structural paths for the export indicator shows that the direct effect is 42% which is supplemented by first order effects such as air travel (5%), communications (3%), hotels (3%), other business services (2%), scientific and technical services (2%) and wholesale trade (2%). Once direct trade is increased these first order effects show there are options for significant multiplier effects.

Increases in consumer demand produce a slightly lower than average stimulus to the upstream suppliers such as communications, property development and other business services. There is a strong downstream effect and wholesale and retail trade and property development may also have to expand to dissipate the effect of investment into this sector.

Future Trends in Sector

The demand for this sector's services should grow in line with population and thus could increase by 25% by 2050 under the base case scenario of the *Future Dilemmas* study. Most importantly the nature of the services may have to change markedly with the ageing of the human population. While the potential of the virtual law firm and e-law (and similarly for the other professions) is strongly promoted, an ageing population may require professions who are willing to develop more complex and useful service products that are provided in a person to person situation, and at a slower people-friendly pace.

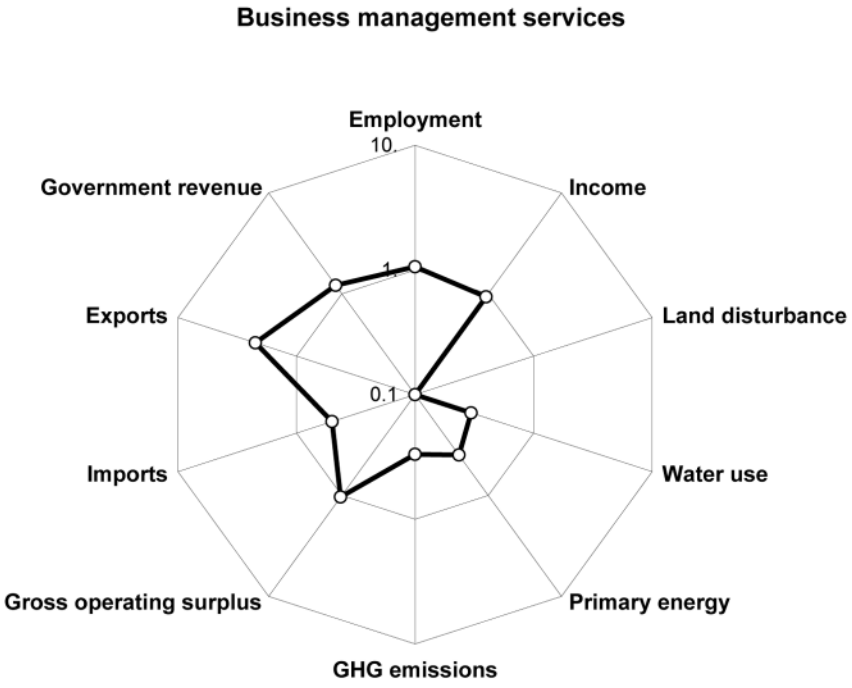
Innovation and Technical Opportunities

The literature on future services suggests that competitive advantage will not come from doing the same things better, rather it will come from doing the critical things better in ways that are hard to copy. Law, accounting, market research and advertising face this challenge already having being partly overtaken by computer technology that has jumped the barrier of knowledge provision. Professionals must extend their mandate in order to remain relevant and viable. Since the blame for many corporate collapses is being allocated to faulty audits or legal advice, professional diligence must increase to buffer professions against the pervasive nature of these business and political shocks. As professional services firms take on TBL auditing (as an example of a complex set of interdependencies), the traditional tort and the balance sheet will prove too narrow an information base. Because civil society relies on a previously defined rule of precedent, professional services will need to integrate and balance past evidence with the implications for a different society. The challenge appears to be at the interface of the disciplines. How society and the professions organise and implement this revolution in effective skills and their integration is yet to be determined.

Sector **Business management services** **(Ms)**

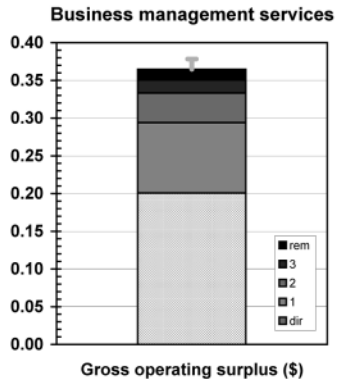
Legal, accounting, advertising, market research, administrative and business management services

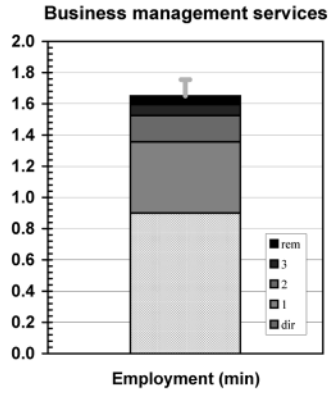
Spider diagram

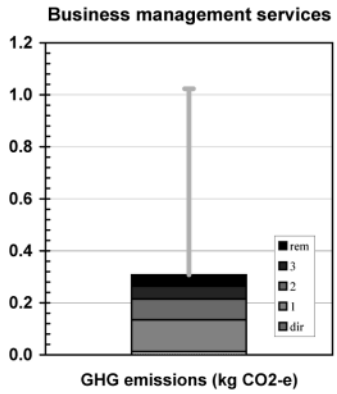


Bar graphs

Account #1







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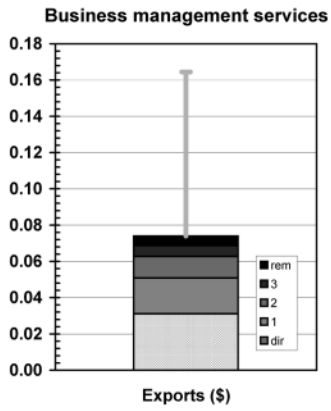

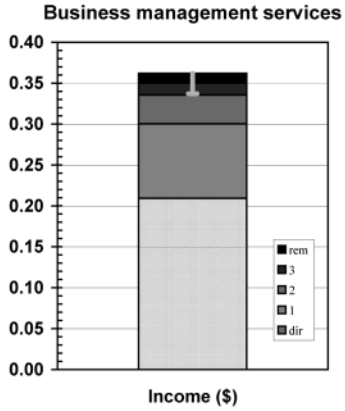

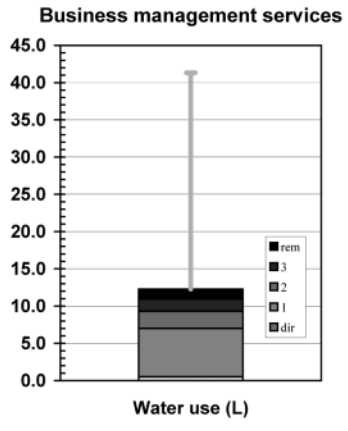

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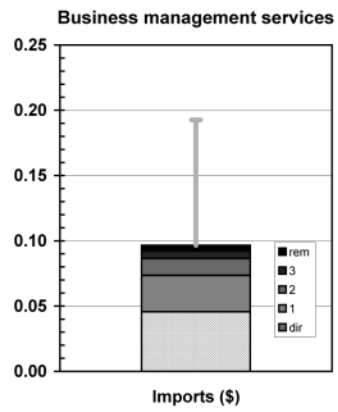
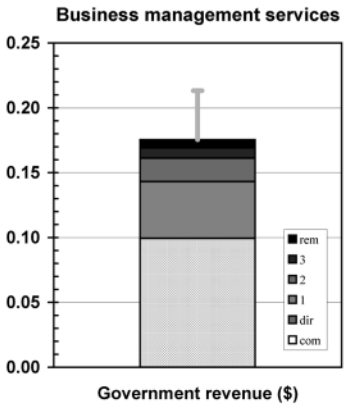
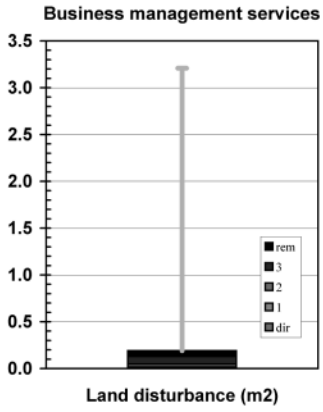






National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 1,778.5	(0.67% of total)	($m 1,765.3 domestically produced)
Government final consumption	$m 262.8	(0.30% of total)	($m 262.8 domestically produced)
Gross fixed capital expenditure	$m 798.3	(0.76% of total)	($m 791.3 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 2,839.6**	**(0.62% of GNE)**	**($m 2,819.4 domestically produced)**
Exports	$m 989.5	(1.19% of total)	($m 989.5 domestically produced)
Final demand	**$m 3,829.1**	**(0.71% of GNT)**	**($m 3,808.9 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 6,664.1	(3.90% of total)	
Gross operating surplus	$m 6,389.8	(3.33% of total)	
Taxes less subsidies	$m 3,165.4	(3.71% of total)	
Sectoral GDP*	**$m 16,219.3**	**(3.62% of GDP)**	
Imports	$m 1,453.3	(1.49% of total)	
Primary inputs	**$m 17,672.6**	**(3.24% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 6,389.8	(3.33%)	$m 764.1	(0.40%)	$m 1,389.0	(0.72%)
Exports ($m)	$m 989.5	(1.19%)	$m 118.3	(0.14%)	$m 281.6	(0.34%)
Imports ($m)	$m 1,453.3	(1.49%)	$m 173.8	(0.18%)	$m 367.7	(0.38%)
Employment (e-y)	229,625 e-y	(3.22%)	27,460 e-y	(0.39%)	50,381 e-y	(0.71%)
Income ($m)*	$m 6,664.1	(3.90%)	$m 796.9	(0.47%)	$m 1,379.5	(0.81%)
Government revenue ($m)†	$m 3,165.4	(2.93%)	$m 378.5	(0.35%)	$m 668.2	(0.62%)
GHG emissions (kt CO_2-e)	383 kt	(0.07%)	46 kt	(0.01%)	1,173 kt	(0.23%)
Water use (ML)	16,010 ML	(0.08%)	1,915 ML	(0.01%)	46,743 ML	(0.22%)
Land disturbance (kha)	20 kha	(0.01%)	2 kha	(0.00%)	73 kha	(0.04%)
Primary energy (TJ)	5,737 TJ	(0.15%)	686 TJ	(0.02%)	11,583 TJ	(0.30%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.20	0.36	0.38
Exports ($)	0.03	0.07	0.16
Imports ($)	0.05	0.10	0.19
Employment (min)	0.90	1.65	1.75
Income ($)	0.21	0.36	0.34
Government revenue ($)	0.10	0.18	0.21
GHG emissions (kg CO_2-e)	0.01	0.31	1.02
Water use (L)	0.50	12.27	41.32
Land disturbance (m^2)	0.01	0.19	3.21
Primary energy (MJ)	0.18	3.04	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Ms	0.201	(0; 55.%)	Ms	0.9	(0; 55.%)	El Ms	0.0839	(1; 27.%)
Cm Ms	0.0152	(1; 4.2%)	Bs Ms	0.0865	(1; 5.2%)	Ms	0.012	(0; 3.9%)
Bs Ms	0.00876	(1; 2.4%)	Cm Ms	0.042	(1; 2.5%)	At Ms	0.0113	(1; 3.7%)
Ts Ms	0.00711	(1; 2.%)	Ho Ms	0.0337	(1; 2.%)	Bc Mp Ho Ms	0.00669	(3; 2.2%)
Wa Ms	0.00702	(1; 1.9%)	Ts Ms	0.0321	(1; 1.9%)	Gd Ms	0.00588	(1; 1.9%)
El Ms	0.00339	(1; 0.93%)	Et Ms	0.015	(1; 0.91%)	El Bs Ms	0.00534	(2; 1.7%)
St Ms	0.00338	(1; 0.93%)	Rh Ms	0.015	(1; 0.91%)	El Ho Ms	0.00441	(2; 1.4%)
Et Ms	0.00316	(1; 0.87%)	Pr Ms	0.012	(1; 0.73%)	Bc Mp Ms	0.00253	(2; 0.82%)
Ne Ms	0.00278	(1; 0.76%)	Ed Ms	0.0113	(1; 0.69%)	El Cm Ms	0.00247	(2; 0.8%)
Bk Ms	0.00275	(1; 0.75%)	Bk Ms	0.0109	(1; 0.66%)	El Wa Ms	0.00229	(2; 0.74%)
Ho Ms	0.00269	(1; 0.74%)	Wt Ms	0.00976	(1; 0.59%)	Wa Ms	0.00217	(1; 0.71%)
Pd Ms	0.00247	(1; 0.68%)	Os Ms	0.0095	(1; 0.58%)	Bl El Ms	0.00212	(2; 0.69%)
Rh Ms	0.00245	(1; 0.67%)	Ne Ms	0.0094	(1; 0.57%)	El Ts Ms	0.00177	(2; 0.58%)
Pr Ms	0.00144	(1; 0.39%)	Gv Ms	0.00935	(1; 0.57%)	El Rh Ms	0.0016	(2; 0.52%)
Wt Ms	0.00136	(1; 0.37%)	Wa Ms	0.00894	(1; 0.54%)	Cm Ms	0.00148	(1; 0.48%)
Ms Bs Ms	0.00119	(2; 0.33%)	Ps Ms	0.00671	(1; 0.41%)	Fo Ms	0.00147	(1; 0.48%)
At Ms	0.00104	(1; 0.28%)	Pd Ms	0.00594	(1; 0.36%)	El St Ms	0.00141	(2; 0.46%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Ms	0.0311	(0; 42.%)	Ms	0.209	(0; 58.%)	Wa Ms	5.16	(1; 42.%)
At Ms	0.00359	(1; 4.9%)	Bs Ms	0.0106	(1; 2.9%)	Vf Ms	0.572	(1; 4.7%)
Cm Ms	0.00203	(1; 2.7%)	Cm Ms	0.00954	(1; 2.6%)	Ms	0.503	(0; 4.1%)
Ho Ms	0.00187	(1; 2.5%)	Ts Ms	0.0075	(1; 2.1%)	El Ms	0.464	(1; 3.8%)
Bs Ms	0.00162	(1; 2.2%)	Ho Ms	0.00492	(1; 1.4%)	Wa Bs Ms	0.265	(2; 2.2%)
Ts Ms	0.00113	(1; 1.5%)	Ed Ms	0.00281	(1; 0.77%)	Ws Ho Ms	0.246	(2; 2.%)
Wt Ms	0.00111	(1; 1.5%)	Bk Ms	0.00269	(1; 0.74%)	Bc Mp Ho Ms	0.176	(3; 1.4%)
St Ms	0.000837	(1; 1.1%)	Os Ms	0.00266	(1; 0.73%)	Dc Dp Ho Ms	0.146	(3; 1.2%)
Bl El Ms	0.000821	(2; 1.1%)	Et Ms	0.00264	(1; 0.73%)	Dc Dp Ms	0.114	(2; 0.93%)
Et Ms	0.000489	(1; 0.66%)	Pr Ms	0.00241	(1; 0.67%)	Ri Fc Ho Ms	0.113	(3; 0.92%)
Ne Ms	0.000405	(1; 0.55%)	Gv Ms	0.00235	(1; 0.65%)	Wa Ts Ms	0.0959	(2; 0.78%)
En Ms	0.000371	(1; 0.5%)	Pd Ms	0.00223	(1; 0.62%)	Vf Ho Ms	0.0931	(2; 0.76%)
Ke Ms	0.000309	(1; 0.42%)	Ne Ms	0.00216	(1; 0.6%)	Wa Pd Ms	0.0677	(2; 0.55%)
Wt Cm Ms	0.000292	(2; 0.4%)	Wt Ms	0.0021	(1; 0.58%)	Bc Mp Ms	0.0668	(2; 0.54%)
Ed Ms	0.000276	(1; 0.37%)	Wa Ms	0.00202	(1; 0.56%)	Vf Et Ms	0.0611	(2; 0.5%)
Mp Ho Ms	0.00026	(2; 0.35%)	At Ms	0.002	(1; 0.55%)	Sc Cg Vf Ms	0.0594	(3; 0.48%)
Ai At Ms	0.000244	(2; 0.33%)	Rh Ms	0.00164	(1; 0.45%)	Cu Ms	0.0557	(1; 0.45%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Ms	0.0456	(0; 47.%)	Ms	0.0994	(0; 57.%)	Bc Mp Ho Ms	0.0486	(3; 25.%)
Cm Ms	0.0026	(1; 2.7%)	Cm Ms	0.00456	(1; 2.6%)	Bc Mp Ms	0.0184	(2; 9.7%)
Et Ms	0.00222	(1; 2.3%)	Ts Ms	0.0037	(1; 2.1%)	Ms	0.00625	(0; 3.3%)
Pr Ms	0.00216	(1; 2.2%)	Bs Ms	0.00315	(1; 1.8%)	Wo Mp Ho Ms	0.00549	(3; 2.9%)
Ts Ms	0.00204	(1; 2.1%)	Ho Ms	0.00259	(1; 1.5%)	Ba Bm Ho Ms	0.00397	(3; 2.1%)
Bs Ms	0.00174	(1; 1.8%)	At Ms	0.00161	(1; 0.92%)	Wa Ms	0.00256	(1; 1.3%)
Ne Ms	0.00134	(1; 1.4%)	Wa Ms	0.00152	(1; 0.86%)	Wo Mp Ms	0.00208	(2; 1.1%)
Rh Ms	0.00126	(1; 1.3%)	Bk Ms	0.00149	(1; 0.85%)	Bc Mp Ho Bs I	0.00186	(4; 0.97%)
Ho Ms	0.00125	(1; 1.3%)	Pd Ms	0.00146	(1; 0.83%)	Wo Bs Ms	0.00166	(2; 0.87%)
At Ms	0.00107	(1; 1.1%)	Os Ms	0.00123	(1; 0.7%)	Bc Mp Bs Ms	0.00151	(3; 0.79%)
Wa Ms	0.00107	(1; 1.1%)	Pr Ms	0.00117	(1; 0.66%)	Wo Tx Ho Ms	0.00138	(3; 0.72%)
Ke Ms	0.000558	(1; 0.58%)	Et Ms	0.0011	(1; 0.63%)	El Ms	0.00136	(1; 0.71%)
Fo Ms	0.000483	(1; 0.5%)	Ne Ms	0.00108	(1; 0.62%)	Wo Ts Ms	0.00123	(2; 0.65%)
En Ms	0.00043	(1; 0.45%)	Ed Ms	0.00103	(1; 0.59%)	At Ms	0.00122	(1; 0.64%)
Ap Ms	0.000426	(1; 0.44%)	Wt Ms	0.000979	(1; 0.56%)	Bc Mp De Ms	0.00119	(3; 0.62%)
Ap At Ms	0.000404	(2; 0.42%)	In Ms	0.000834	(1; 0.48%)	Wo Tx Tp Ms	0.00111	(3; 0.58%)
Pd Ms	0.000356	(1; 0.37%)	Gv Ms	0.000818	(1; 0.47%)	Bc Mp Ts Ms	0.00101	(3; 0.53%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.902 ±0.016	(±1.8%)
Downstream	1.728 ±0.032	(±1.8%)

Sector 7803: Other Business Services (Bs)

Typing, copying, mailing, cleaning, pest control, staff placement, credit collecting and reporting, security, investigative and other business services

Short Summary

Against the metric of one dollar of final demand, this sector portrays typical service sector environmental outcomes with greenhouse emissions, water use and land disturbance respectively 60%, 70%, and 90% below economy wide averages. The social indicators of employment generation and income are 45% and 15% higher than average while the government revenue indicator is 30% below average. The opportunities for improving government revenue seem limited since this is a small business sector and a good generator of employment. For the financial indicators, the surplus is equal to average while the export propensity and import penetration indicators are balanced in percentage and absolute financial terms at 50% of average. While the future of the sector seems assured, societal and technological developments could diminish the requirement for some of the services in the sector. For example a retraction from outsourcing, a transition to self sufficient lifestyles or the development of safe communities could reduce the requirement for cleaning and security services.

Sector Description

This sector is an accumulation of small business enterprises which generally facilitate the operation of a wide range of important downstream sectors. Employment and staff services are the largest component with 30% of financial production, followed by cleaning services (21%), typing and copying (14%) and security services (12%). There are over 20 000 individual enterprises in the sector making it an important node of small business activity particularly at local level. In 2002 the turnover of the sector was about $14 billion.

Place of Industry in the Economy

The industry sits in the top quartile of value adding within the economy ranking 23rd out of 135 sectors and contributing 1.19% of GDP in this analysis. The sector is similar in value adding to black coal mining and defence. The sector is directly responsible for 24 000 employment years and another 13 000 years in the upstream suppliers to the sector giving a total of 37 000 employment years or 0.5% of the national total. The sector also contributes 140 000 employment years to downstream industries. It is a relatively small user of resources requiring less than one fifth of one percent of national energy, greenhouse emissions, water use and land disturbance. In absolute financial terms, imports are approximately equal to exports.

Strategic Overview

The integrated overview provided by the spider diagram shows better than average outcomes for most indicators with the exception of government revenue and exports. In social terms the sector provides good employment generation and income while in environmental terms all indicators are much better than average. The financial indicators of operating surplus and imports are above average and while the export propensity indicator is below average, this outcome may improve over time as Australian service firms expand overseas. Upstream issues for the sector relate to the occupational health and safety of workers, many of whom work in a typical small business environment which often relies on low overheads and long working hours to maintain profitability. Downstream issues focus on how the service provided impacts on its delivery focus. For example, poor training of staff could lead to inappropriate use of chemicals in cleaning and pest control.

TBL Account #1

The financial indicator of surplus is equal to the economy wide average with half of this due to the direct effect of the sector, and another third due to first order effects including accounting and marketing (6%), communications (4%) and equipment repairs (3%). The social indicator of employment generation is 45% above average and over half of this is a direct effect. This highlights that small business service industries such as these are excellent drivers of social advantage in Australia, provided that the industries they serve maintain good prospects and keep expanding. The greenhouse emissions indicator is 60% below average with a minor direct contribution and larger contributions from first and second order effects particularly electricity generation (28%).

TBL Accounts #2 and #3

The second TBL account shows an export indicator 50% below average, income 15% above average and water use 70% below average. The third TBL account shows import penetration 50% below average, government revenue 30% below average and land disturbance 90% below average.

Structural Path Analysis and Linkages

The export propensity indicator is below average and an examination of the structural path shows that the direct within sector effect is 40% of the total. Contributions from marketing (5%), airline travel (4%) and communications, accommodation, and travel agencies each with 2%, suggest there is a wide base for export enhancement, provided that the sector's primary service tasks can gain a substantial foothold in export markets.

Increases in consumer demand provide an above average stimulus to the sector's upstream suppliers such as legal and accounting services, property development, communications, and technical and computing services. Decisions to invest into the sector show extremely strong downstream linkages, and require that property development, legal and accounting services, wholesale and retail trade, and technical services also expand to help dissipate the effect of the investment.

Future Trends in Sector

Apart from the observation that this service sector will grow in line with population growth and perhaps inbound international tourism, analyses such as *Future Dilemmas* provide little insight into the future of this sector. Current management ideologies promote staff contracting services as many workforces are trimmed to fewer permanent staff. Typing and copying services may decrease with continual innovations in communications technology and the eventual implementation of the paperless office. Security services may find increasing opportunities if social factors such as employment and equity deteriorate. Services such as cleaning may have difficulty attracting suitable staff due to the nature of the work, and the separation of employees from the workplace community.

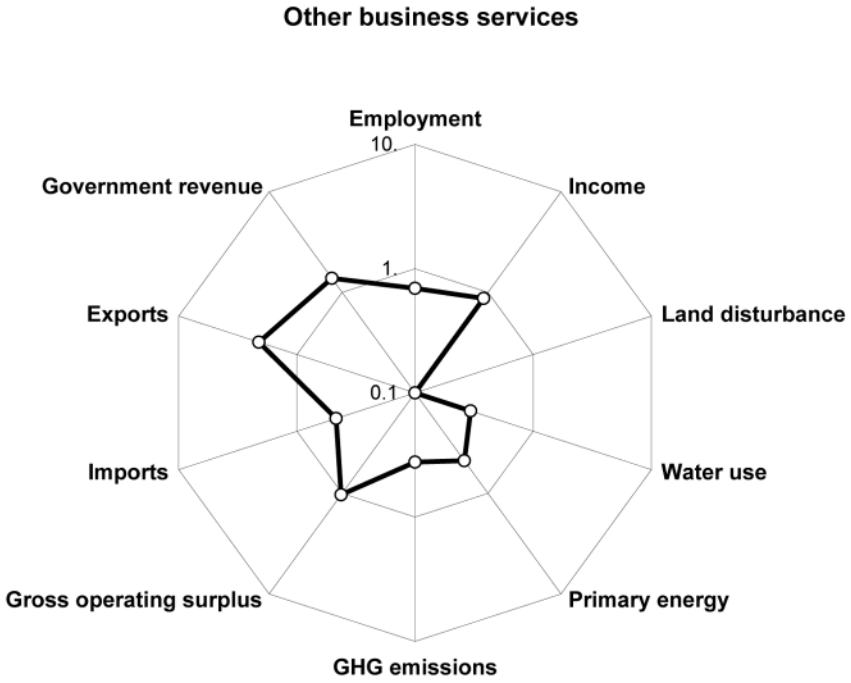
Innovation and Technical Opportunities

Three potential developments could drive interesting innovations in this sector. The search for innovative types of services which provide market edge is ongoing and relies on a delicate interplay between the servers and the served. If either party become unwilling, feel unsatisfied, or simply want change, then service categories could disappear. For example a transformation to an urban structure of interdependent communities may not require security services. Cleaning services could be transformed if the technology of surfaces and buildings develop towards self cleaning systems with nano-machines for example. Similarly pest control in urban areas may become biological rather than chemical, as chemical residue concerns mount. These developments would all require increasing sophistication of service management and possibly require higher skilled labour than at present. Financial returns could improve with an increasing perception of service value.

Sector **Other business services** **(Bs)**

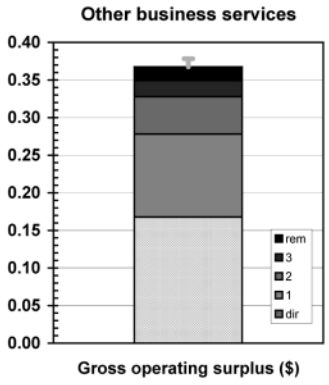
Typing, copying, mailing, cleaning, pest control, staff placement, credit collecting and reporting, security, investigative and other business services

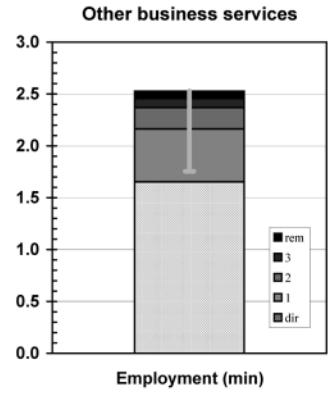
Spider diagram

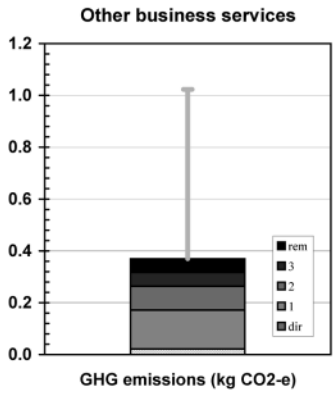


Bar graphs

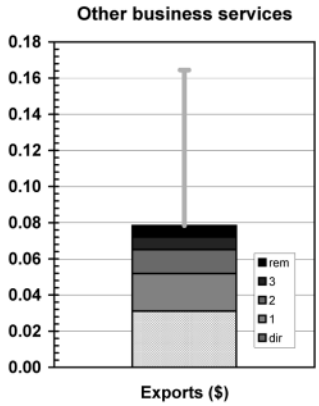
Account #1

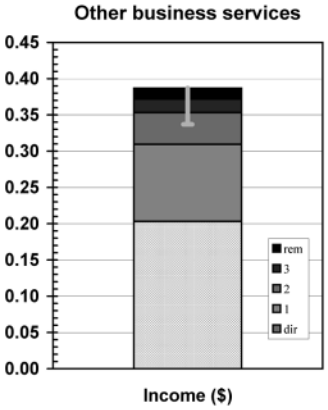


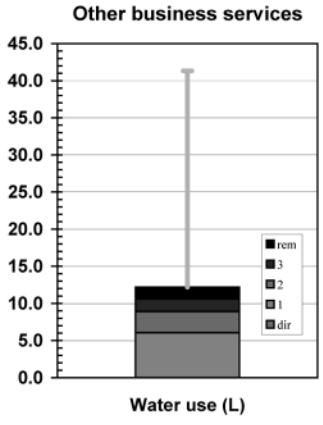




Account #2







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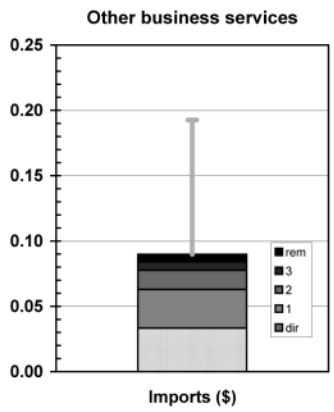
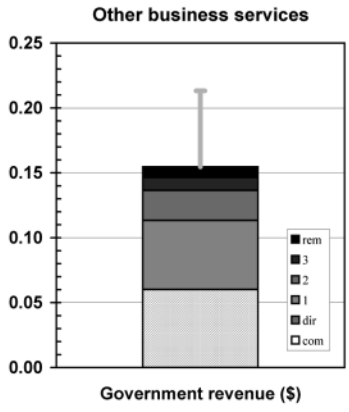
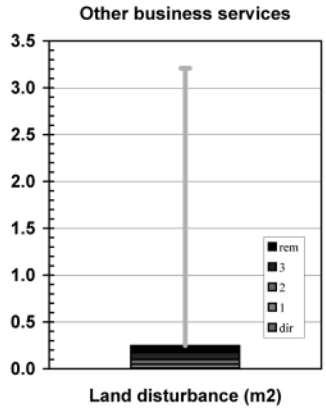






National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 502.7	(0.19% of total)	($m 500.4 domestically produced)
Government final consumption	$m 904.2	(1.02% of total)	($m 904.2 domestically produced)
Gross fixed capital expenditure	$m 26.0	(0.02% of total)	($m 26.0 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 1,433.0**	**(0.31% of GNE)**	**($m 1,430.7 domestically produced)**
Exports	$m 385.3	(0.46% of total)	($m 385.3 domestically produced)
Final demand	**$m 1,818.3**	**(0.34% of GNT)**	**($m 1,816.0 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 2,517.2	(1.47% of total)	
Gross operating surplus	$m 2,078.5	(1.08% of total)	
Taxes less subsidies	$m 746.2	(0.87% of total)	
Sectoral GDP*	**$m 5,341.9**	**(1.19% of GDP)**	
Imports	$m 413.2	(0.42% of total)	
Primary inputs	**$m 5,755.0**	**(1.05% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 2,078.5	(1.08%)	$m 304.3	(0.16%)	$m 667.1	(0.35%)
Exports ($m)	$m 385.3	(0.46%)	$m 56.4	(0.07%)	$m 142.5	(0.17%)
Imports ($m)	$m 413.2	(0.42%)	$m 60.5	(0.06%)	$m 163.0	(0.17%)
Employment (e-y)	164,338 e-y	(2.31%)	24,061 e-y	(0.34%)	36,775 e-y	(0.52%)
Income ($m)*	$m 2,517.2	(1.47%)	$m 368.6	(0.22%)	$m 702.9	(0.41%)
Government revenue ($m)†	$m 746.2	(0.69%)	$m 109.2	(0.10%)	$m 280.8	(0.26%)
GHG emissions (kt CO_2-e)	261 kt	(0.05%)	38 kt	(0.01%)	671 kt	(0.13%)
Water use (ML)	4 ML	(0.00%)	1 ML	(0.00%)	22,159 ML	(0.11%)
Land disturbance (kha)	8 kha	(0.01%)	1 kha	(0.00%)	45 kha	(0.03%)
Primary energy (TJ)	3,903 TJ	(0.10%)	571 TJ	(0.01%)	6,572 TJ	(0.17%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.17	0.37	0.38
Exports ($)	0.03	0.08	0.16
Imports ($)	0.03	0.09	0.19
Employment (min)	1.65	2.53	1.75
Income ($)	0.20	0.39	0.34
Government revenue ($)	0.06	0.15	0.21
GHG emissions (kg CO_2-e)	0.02	0.37	1.02
Water use (L)	0.00	12.20	41.32
Land disturbance (m^2)	0.01	0.25	3.21
Primary energy (MJ)	0.31	3.62	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Bs	0.168	(0; 46.%)	Bs	1.65	(0; 65.%)	El Bs	0.102	(1; 28.%)
Ms Bs	0.0228	(1; 6.2%)	Ms Bs	0.102	(1; 4.1%)	Bs	0.0211	(0; 5.7%)
Cm Bs	0.0135	(1; 3.7%)	Cm Bs	0.0373	(1; 1.5%)	Gd Bs	0.0114	(1; 3.1%)
Pd Bs	0.0102	(1; 2.8%)	Ts Bs	0.0294	(1; 1.2%)	El Ms Bs	0.00956	(2; 2.6%)
Wa Bs	0.00689	(1; 1.9%)	Bk Bs	0.0247	(1; 0.98%)	At Bs	0.00917	(1; 2.5%)
Ts Bs	0.00652	(1; 1.8%)	Ho Bs	0.0246	(1; 0.97%)	Bc Mp Ho Bs	0.00489	(3; 1.3%)
Bk Bs	0.00621	(1; 1.7%)	Pd Bs	0.0245	(1; 0.97%)	El Pd Bs	0.00486	(2; 1.3%)
St Bs	0.00514	(1; 1.4%)	Rh Bs	0.0235	(1; 0.93%)	Bc Mp Bs	0.00397	(2; 1.1%)
El Bs	0.00413	(1; 1.1%)	Ed Bs	0.0134	(1; 0.53%)	El Ho Bs	0.00322	(2; 0.87%)
Rh Bs	0.00385	(1; 1.%)	Et Bs	0.0116	(1; 0.46%)	Bl El Bs	0.00257	(2; 0.7%)
Ne Bs	0.00298	(1; 0.81%)	Wt Bs	0.0106	(1; 0.42%)	El Rh Bs	0.00251	(2; 0.68%)
Et Bs	0.00243	(1; 0.66%)	Os Bs	0.0102	(1; 0.4%)	El Wa Bs	0.00224	(2; 0.61%)
Sf Bk Bs	0.00217	(2; 0.59%)	Ne Bs	0.0101	(1; 0.4%)	El Cm Bs	0.0022	(2; 0.6%)
Ho Bs	0.00196	(1; 0.53%)	Bs Ms Bs	0.00984	(2; 0.39%)	El St Bs	0.00214	(2; 0.58%)
Cm Ms Bs	0.00173	(2; 0.47%)	Gv Bs	0.00934	(1; 0.37%)	Wa Bs	0.00213	(1; 0.58%)
Wt Bs	0.00147	(1; 0.4%)	Wa Bs	0.00877	(1; 0.35%)	Fo Bs	0.00179	(1; 0.48%)
Fn Bs	0.00146	(1; 0.4%)	St Bs	0.00839	(1; 0.33%)	Lm Bs	0.00169	(1; 0.46%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Bs	0.0311	(0; 40.%)	Bs	0.203	(0; 52.%)	Wa Bs	5.06	(1; 41.%)
Ms Bs	0.00354	(1; 4.5%)	Ms Bs	0.0238	(1; 6.2%)	Wa Ms Bs	0.587	(2; 4.8%)
At Bs	0.00292	(1; 3.7%)	Pd Bs	0.0092	(1; 2.4%)	El Bs	0.565	(1; 4.6%)
Cm Bs	0.0018	(1; 2.3%)	Cm Bs	0.00847	(1; 2.2%)	Wa Pd Bs	0.279	(2; 2.3%)
Ho Bs	0.00137	(1; 1.7%)	Ts Bs	0.00688	(1; 1.8%)	Dc Dp Bs	0.232	(2; 1.9%)
St Bs	0.00127	(1; 1.6%)	Bk Bs	0.00609	(1; 1.6%)	Ws Ho Bs	0.18	(2; 1.5%)
Wt Bs	0.0012	(1; 1.5%)	Ho Bs	0.00359	(1; 0.93%)	Bc Mp Ho Bs	0.129	(3; 1.1%)
Ts Bs	0.00103	(1; 1.3%)	Ed Bs	0.00333	(1; 0.86%)	Dc Dp Ho Bs	0.107	(3; 0.88%)
Bl El Bs	0.000999	(2; 1.3%)	Os Bs	0.00285	(1; 0.74%)	Bc Mp Bs	0.105	(2; 0.86%)
Pd Bs	0.000486	(1; 0.62%)	Rh Bs	0.00258	(1; 0.67%)	Wa Ts Bs	0.088	(2; 0.72%)
Bk Bs	0.000484	(1; 0.62%)	Gv Bs	0.00235	(1; 0.61%)	Ri Fc Ho Bs	0.0829	(3; 0.68%)
Ne Bs	0.000435	(1; 0.55%)	Ne Bs	0.00232	(1; 0.6%)	Vf Ho Bs	0.0681	(2; 0.56%)
En Bs	0.000422	(1; 0.54%)	Wt Bs	0.00227	(1; 0.59%)	Vf Ms Bs	0.0651	(2; 0.53%)
In Bs	0.000418	(1; 0.53%)	In Bs	0.00216	(1; 0.56%)	Ms Bs	0.0572	(1; 0.47%)
At Ms Bs	0.000409	(2; 0.52%)	St Bs	0.00214	(1; 0.55%)	Vf Bs	0.0553	(1; 0.45%)
Et Bs	0.000377	(1; 0.48%)	Et Bs	0.00203	(1; 0.53%)	El Ms Bs	0.0528	(2; 0.43%)
Ed Bs	0.000328	(1; 0.42%)	Wa Bs	0.00198	(1; 0.51%)	Sc Cg Bs	0.0515	(2; 0.42%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Bs	0.0333	(0; 37.%)	Bs	0.0602	(0; 39.%)	Bc Mp Ho Bs	0.0355	(3; 14.%)
Ms Bs	0.00519	(1; 5.8%)	Ms Bs	0.0113	(1; 7.3%)	Wo Bs	0.0317	(1; 13.%)
Cm Bs	0.00231	(1; 2.6%)	Pd Bs	0.00603	(1; 3.9%)	Bc Mp Bs	0.0289	(2; 12.%)
Rh Bs	0.00199	(1; 2.2%)	Cm Bs	0.00405	(1; 2.6%)	Wo Tx Bs	0.007	(2; 2.8%)
Ts Bs	0.00187	(1; 2.1%)	Ts Bs	0.00339	(1; 2.2%)	Bs	0.00672	(0; 2.7%)
Et Bs	0.00171	(1; 1.9%)	Bk Bs	0.00336	(1; 2.2%)	Bc Mp Ho Ms	0.00553	(4; 2.2%)
Pd Bs	0.00147	(1; 1.6%)	In Bs	0.00232	(1; 1.5%)	Wo Mp Ho Bs	0.00401	(3; 1.6%)
Ne Bs	0.00144	(1; 1.6%)	Ho Bs	0.00189	(1; 1.2%)	Wo Mp Bs	0.00326	(2; 1.3%)
Pr Bs	0.00128	(1; 1.4%)	Wa Bs	0.00149	(1; 0.96%)	Ba Bm Ho Bs	0.0029	(3; 1.2%)
Wa Bs	0.00105	(1; 1.2%)	Os Bs	0.00132	(1; 0.85%)	Wa Bs	0.00251	(1; 1.%)
Ho Bs	0.000913	(1; 1.%)	At Bs	0.00131	(1; 0.84%)	Wo Tx Cl Bs	0.00239	(3; 0.97%)
At Bs	0.00087	(1; 0.97%)	Ed Bs	0.00122	(1; 0.79%)	Wo Tx Tp Bs	0.00235	(3; 0.95%)
Ap Bs	0.000755	(1; 0.84%)	Rh Bs	0.00118	(1; 0.76%)	Bc Mp Ms Bs	0.0021	(3; 0.85%)
Bk Bs	0.000601	(1; 0.67%)	Ne Bs	0.00116	(1; 0.75%)	Bc Mp Ho Pd	0.00174	(4; 0.71%)
Fo Bs	0.000587	(1; 0.65%)	St Bs	0.00114	(1; 0.74%)	El Bs	0.00165	(1; 0.67%)
En Bs	0.00049	(1; 0.55%)	Wt Bs	0.00106	(1; 0.69%)	Dc Dp Bs	0.0012	(2; 0.49%)
St Bs	0.000466	(1; 0.52%)	Et Bs	0.00085	(1; 0.55%)	Bc Mp Pd Bs	0.00119	(3; 0.48%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.107 ±0.021	(±1.9%)
Downstream	1.796 ±0.032	(±1.8%)

Sector 8101: Government Administration (Gv)

Federal, state and local government administrative services, judicial services

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of greenhouse emissions, water use and land disturbance are respectively 70%, 80% and 95% below economy wide averages. The social indicators of employment generation and income are 20% and 50% above average emphasising that government service has many social positives. Government revenue is equal to average. The financial indicator of operating surplus is 40% below average while export propensity and import penetration are 70% and 60% below average respectively. Many government services are seen as outcomes of a civil society rather than merely a source of profit. The export indicator could be improved in a trade balance sense by using procurement objectives that reduce imports and stimulate regional development objectives and domestic industry. While small government and efficiency are currently the dominant policy objective, some literature questions the effectiveness of this approach. For example, do digital governments implement e-government or e-governance, and do government administrations serve themselves, or their citizens?

Sector Description

Against a total financial expenditure of around $40 billion per year, the makeup of activity in the government administration sector is due to Commonwealth (47%), State (31%), local (12%) and judicial services (5%). In broad terms, the administration covers over 1 600 Federal institutions, 8 State administrations and 727 local government councils. This sector is solely for the administration of government, as major functions such as health, education etc. have their own individual sectors.

Place of Industry in the Economy

The government administration sector is an important part of value adding in the economy, ranking 8th out of 135 sectors and contributing 3.4% of GDP in this analysis. Sectors such as non-residential construction and property development have similar levels of value adding. There are 246 000 employment years directly used in the sector, and another 134 000 years are embodied in the sector's upstream suppliers giving a total of 380 000 employment years or 5.3% of the national total. In addition the sector supplies 73 000 employment years to the output of downstream industries. The sector uses nearly two percent of primary energy and produces one and one half percent of greenhouse emissions. Its requirement for water and land is less than one percent of national total. Imports outweigh exports by a factor of 26:1 in financial flow terms.

Strategic Overview

Given that government administration is not seen as a profit making enterprise, the integrated overview in the spider diagram shows generally positive outcomes. The social indicators are equal to or above, the economy wide average. All of the environmental variables and the import indicator are better than average. There are two outliers, operating surplus and export propensity, both of which are bounded by government's role as a facilitator of service delivery rather than a profit centre, although direct user charges are becoming more common. The export indicator is less relevant for institutions focused on domestic service delivery. However it is possible to manage the trade balance implications of low exports by using procurement guidelines which give preference to Australian made goods and services and also improve regional development outcomes.

TBL Account #1

The financial indicator of operating surplus is 40% below the economy wide average and about one quarter of this is a direct within sector effect, with contributions from security broking (9%), technical services (5%), communications (5%), legal and accounting services (3%), travel agencies (3%) and electricity generation (2%). The social indicator of employment generation is 20% above average and over half of this is a direct effect, with the supply chain having a similar composition to that of the surplus indicator. The greenhouse emissions indicator is 70% below average and only one tenth of this is a direct within sector effect, the rest being due to the chain of suppliers including electricity generation (27%) and airline travel (4%).

TBL Accounts #2 and #3

The second TBL account shows an export propensity that is 70% below average, income 50% above average with most of this a direct effect, and water use 80% below average. The third TBL account shows import penetration 60% below average, government revenue equal to average and land disturbance 95% below average.

Structural Path Analysis and Linkages

While there is limited opportunity to improve the export indicator (perhaps government services to other countries is an option), there may be some scope to further reduce the import penetration indicator. The structural path shows the direct effect is 42% of the total indicating opportunity to improve through domestic procurement guidelines. The first order effects are also important and include printing (4%), computer services (4%), communications (2%), accounting and marketing (2%), and books and recorded media, airline travel, and rubber goods, each with 1%.

Increased consumer demand for government administration services stimulates a slightly less than average effect for the upstream suppliers such as scientific and technical services, legal and accounting services, communications, and security and broking services. Decisions to substantially invest in government administration show very weak downstream effects, as most of the investment is dissipated by the sector itself and by services to citizens.

Future Trends in Sector

While the *Future Dilemmas* study does not simulate government administration directly, the general employment category of office workers increases 40% by 2050 when the domestic population has stabilised at 25 million (25% greater than currently). This outcome is somewhat at odds with the general shrinking of the public sector over the last 10-15 years, and could be considered uncertain.

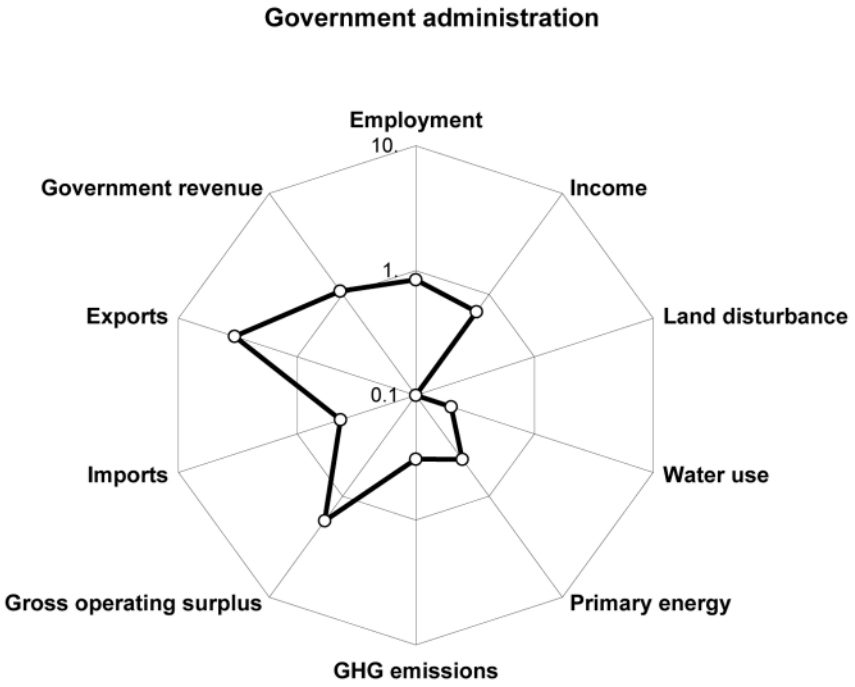
Innovation and Technical Opportunities

The literature on public administration reveals a number of emerging tensions distilled in some studies on the two intersecting axes of ‘e-government or e-governance’ and ‘citizen-centric or organisational-centric’. In this schema, a devolved digital government aims to provide information but does not provide solutions unless there is a fortunate coincidence in the ‘citizen-centric’ and the ‘e-governance’ quadrant. These studies assert that in the end, the goal of government administration remains as efficiency, responsiveness and integrity. Reducing costs and employment in the public sector certainly improves efficiency, but perhaps at the expense of responsiveness and integrity. All too often, call centres and web sites become very adept at providing information. However they usually do not provide solutions to the complex problems frequently confronting the individual citizen. It is unlikely that solutions to these tensions will see a reversion to increased numbers of government workers and expansion of the services they provide. The approach currently is to empower and fund local bodies to provide access and advice tailored to particular populations.

Sector **Government administration** **(Gv)**

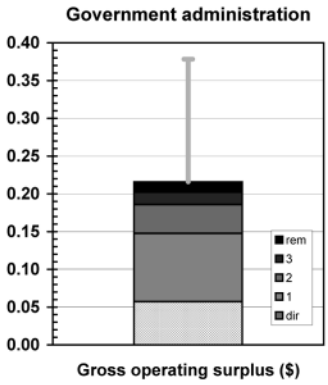
Fedetal, state and local government administrative services, judicial services

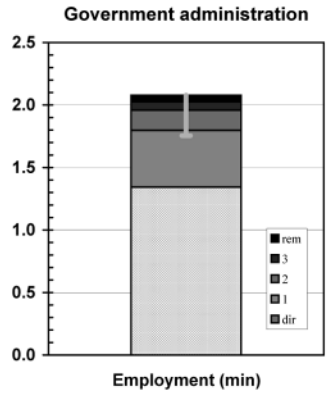
Spider diagram

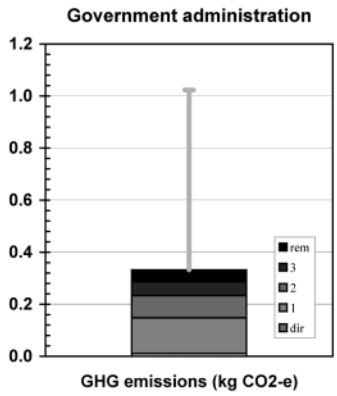


Bar graphs

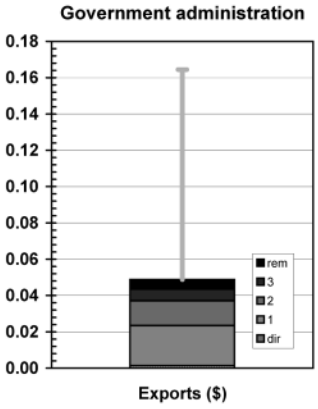
Account #1

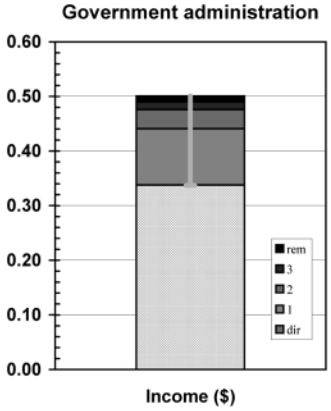


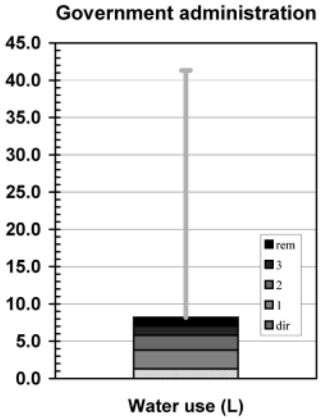




Account #2







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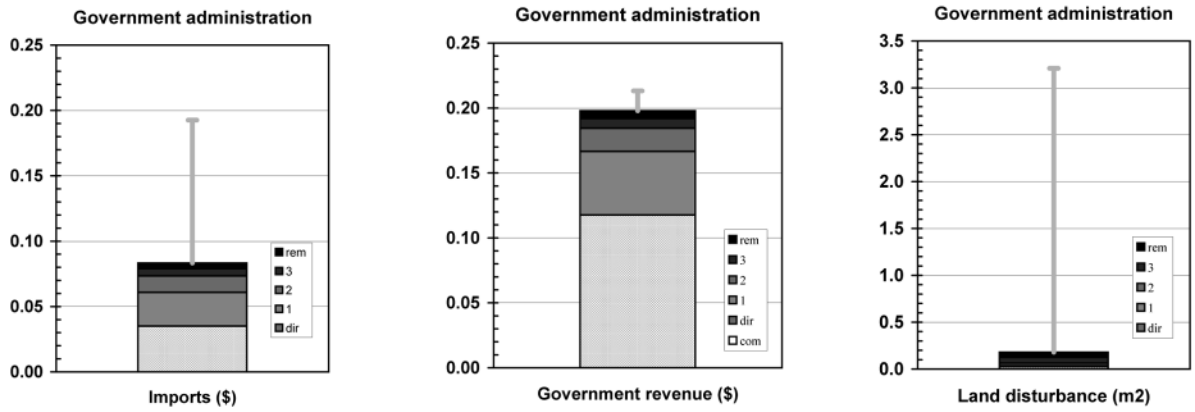


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 775.2	(0.29% of total)	($m 775.2 domestically produced)
Government final consumption	$m 21,678.8	(24.49% of total)	($m 21,678.8 domestically produced)
Gross fixed capital expenditure	$m 308.4	(0.29% of total)	($m 308.4 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 22,762.4**	**(4.96% of GNE)**	**($m 22,762.4 domestically produced)**
Exports	$m 39.3	(0.05% of total)	($m 39.3 domestically produced)
Final demand	**$m 22,801.7**	**(4.20% of GNT)**	**($m 22,801.7 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 9,988.0	(5.85% of total)	
Gross operating surplus	$m 1,690.2	(0.88% of total)	
Taxes less subsidies	$m 3,477.7	(4.07% of total)	
Sectoral GDP*	**$m 15,155.8**	**(3.38% of GDP)**	
Imports	$m 1,034.0	(1.06% of total)	
Primary inputs	**$m 16,189.8**	**(2.97% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 1,690.2	(0.88%)	$m 1,303.4	(0.68%)	$m 4,921.4	(2.57%)
Exports ($m)	$m 39.3	(0.05%)	$m 30.3	(0.04%)	$m 1,113.3	(1.34%)
Imports ($m)	$m 1,034.0	(1.06%)	$m 797.4	(0.82%)	$m 1,898.9	(1.94%)
Employment (e-y)	318,413 e-y	(4.47%)	245,550 e-y	(3.45%)	379,680 e-y	(5.33%)
Income ($m)*	$m 9,988.0	(5.85%)	$m 7,702.4	(4.51%)	$m 11,424.1	(6.69%)
Government revenue ($m)†	$m 3,477.7	(3.22%)	$m 2,681.9	(2.48%)	$m 4,511.7	(4.17%)
GHG emissions (kt CO_2-e)	311 kt	(0.06%)	240 kt	(0.05%)	7,566 kt	(1.46%)
Water use (ML)	38,202 ML	(0.18%)	29,460 ML	(0.14%)	187,106 ML	(0.89%)
Land disturbance (kha)	77 kha	(0.05%)	59 kha	(0.04%)	413 kha	(0.25%)
Primary energy (TJ)	5,244 TJ	(0.14%)	4,044 TJ	(0.10%)	75,088 TJ	(1.94%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.06	0.22	0.38
Exports ($)	0.00	0.05	0.16
Imports ($)	0.03	0.08	0.19
Employment (min)	1.34	2.08	1.75
Income ($)	0.34	0.50	0.34
Government revenue ($)	0.12	0.20	0.21
GHG emissions (kg CO_2-e)	0.01	0.33	1.02
Water use (L)	1.29	8.21	41.32
Land disturbance (m^2)	0.03	0.18	3.21
Primary energy (MJ)	0.18	3.29	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Gv	0.0572	(0; 26.%)	Gv	1.34	(0; 65.%)	El Gv	0.0902	(1; 27.%)
Sf Gv	0.0195	(1; 9.%)	Ts Gv	0.0498	(1; 2.4%)	At Gv	0.0116	(1; 3.5%)
Ts Gv	0.0111	(1; 5.1%)	Ms Gv	0.0279	(1; 1.3%)	Gv	0.0105	(0; 3.2%)
Cm Gv	0.00966	(1; 4.5%)	Cm Gv	0.0267	(1; 1.3%)	Sw Pp Gv	0.00464	(2; 1.4%)
Ms Gv	0.00622	(1; 2.9%)	Sf Gv	0.0253	(1; 1.2%)	Pp Gv	0.00453	(1; 1.4%)
St Gv	0.0062	(1; 2.9%)	Bs Gv	0.0196	(1; 0.94%)	Nf Gv	0.00427	(1; 1.3%)
El Gv	0.00365	(1; 1.7%)	Pr Gv	0.0192	(1; 0.92%)	Bc Mp Ho Gv	0.0035	(3; 1.1%)
Ne Gv	0.00234	(1; 1.1%)	Ho Gv	0.0176	(1; 0.85%)	Gd Gv	0.00317	(1; 0.96%)
Pr Gv	0.00229	(1; 1.1%)	Wt Gv	0.0154	(1; 0.74%)	El Ts Gv	0.00275	(2; 0.83%)
Bk Gv	0.00215	(1; 1.%)	St Gv	0.0101	(1; 0.49%)	Ta Gv	0.00273	(1; 0.82%)
Wt Gv	0.00214	(1; 0.99%)	Os Gv	0.00953	(1; 0.46%)	El Ms Gv	0.0026	(2; 0.78%)
Bs Gv	0.00198	(1; 0.92%)	Ed Gv	0.00876	(1; 0.42%)	El St Gv	0.00258	(2; 0.78%)
Fn Gv	0.00186	(1; 0.86%)	Bk Gv	0.00854	(1; 0.41%)	El Ho Gv	0.00231	(2; 0.69%)
Pd Gv	0.00156	(1; 0.72%)	Ne Gv	0.00792	(1; 0.38%)	Bl El Gv	0.00227	(2; 0.69%)
Ho Gv	0.0014	(1; 0.65%)	Fn Gv	0.00743	(1; 0.36%)	Wt Gv	0.00214	(1; 0.64%)
Wa Gv	0.00138	(1; 0.64%)	Nb Gv	0.00692	(1; 0.33%)	Fr Sw Pp Gv	0.002	(3; 0.6%)
At Gv	0.00106	(1; 0.49%)	At Gv	0.00581	(1; 0.28%)	Sw Pp Pr Gv	0.00197	(3; 0.59%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
At Gv	0.00368	(1; 7.5%)	Gv	0.338	(0; 67.%)	Gv	1.29	(0; 16.%)
Nf Gv	0.00312	(1; 6.4%)	Ts Gv	0.0117	(1; 2.3%)	Wa Gv	1.01	(1; 12.%)
Ts Gv	0.00175	(1; 3.6%)	Ms Gv	0.00649	(1; 1.3%)	El Gv	0.499	(1; 6.1%)
Wt Gv	0.00175	(1; 3.6%)	Sf Gv	0.00627	(1; 1.3%)	Sc Cg Gv	0.267	(2; 3.3%)
St Gv	0.00154	(1; 3.1%)	Cm Gv	0.00606	(1; 1.2%)	Ws Gv	0.258	(1; 3.1%)
Gv	0.00133	(0; 2.7%)	Pr Gv	0.00385	(1; 0.77%)	Vf Gv	0.228	(1; 2.8%)
Cm Gv	0.00129	(1; 2.6%)	Wt Gv	0.00331	(1; 0.66%)	Wa Ms Gv	0.16	(2; 2.%)
Ho Gv	0.00098	(1; 2.%)	Os Gv	0.00267	(1; 0.53%)	Wa Ts Gv	0.149	(2; 1.8%)
Ms Gv	0.000964	(1; 2.%)	St Gv	0.00258	(1; 0.52%)	Ws Ho Gv	0.128	(2; 1.6%)
Bl El Gv	0.000882	(2; 1.8%)	Ho Gv	0.00257	(1; 0.51%)	Pp Gv	0.113	(1; 1.4%)
Sf Gv	0.000604	(1; 1.2%)	Bs Gv	0.0024	(1; 0.48%)	Bc Mp Ho Gv	0.0921	(3; 1.1%)
Gl Nf Gv	0.000568	(2; 1.2%)	Ed Gv	0.00217	(1; 0.43%)	Dc Dp Ho Gv	0.0764	(3; 0.93%)
Lg Gv	0.000553	(1; 1.1%)	Bk Gv	0.00211	(1; 0.42%)	Wa Bs Gv	0.0599	(2; 0.73%)
Ta Gv	0.000488	(1; 1.%)	At Gv	0.00205	(1; 0.41%)	Ri Fc Ho Gv	0.0593	(3; 0.72%)
En Gv	0.000388	(1; 0.79%)	Ne Gv	0.00182	(1; 0.36%)	Ri Ws Gv	0.0576	(2; 0.7%)
Bs Gv	0.000368	(1; 0.75%)	Pd Gv	0.00141	(1; 0.28%)	Vf Ws Gv	0.0523	(2; 0.64%)
Uo Nf Gv	0.000346	(2; 0.71%)	Fn Gv	0.00139	(1; 0.28%)	Vf Ho Gv	0.0487	(2; 0.59%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Gv	0.035	(0; 42.%)	Gv	0.118	(0; 59.%)	Gv	0.026	(0; 14.%)
Pr Gv	0.00344	(1; 4.1%)	Ts Gv	0.00574	(1; 2.9%)	Bc Mp Ho Gv	0.0254	(3; 14.%)
Ts Gv	0.00317	(1; 3.8%)	Sf Gv	0.00546	(1; 2.8%)	Bc Mp Gv	0.00642	(2; 3.6%)
Cm Gv	0.00165	(1; 2.%)	Ms Gv	0.00308	(1; 1.6%)	Wo Tx Gv	0.00505	(2; 2.8%)
Ms Gv	0.00142	(1; 1.7%)	Cm Gv	0.0029	(1; 1.5%)	Sw Pp Gv	0.00365	(2; 2.%)
Ne Gv	0.00113	(1; 1.4%)	Pr Gv	0.00186	(1; 0.94%)	Wo Tx Fu Gv	0.00356	(3; 2.%)
At Gv	0.0011	(1; 1.3%)	At Gv	0.00165	(1; 0.83%)	Wo Tx Tp Gv	0.0033	(3; 1.8%)
Ru Gv	0.000732	(1; 0.88%)	Wt Gv	0.00155	(1; 0.78%)	Wo Mp Ho Gv	0.00287	(3; 1.6%)
Pp Gv	0.000695	(1; 0.83%)	St Gv	0.00138	(1; 0.7%)	Ba Bm Ho Gv	0.00208	(3; 1.1%)
Ho Gv	0.000653	(1; 0.78%)	Ho Gv	0.00135	(1; 0.68%)	Wo Ts Gv	0.00191	(2; 1.1%)
Pa Gv	0.000592	(1; 0.71%)	Os Gv	0.00124	(1; 0.63%)	Bc Mp Ts Gv	0.00156	(3; 0.86%)
St Gv	0.000562	(1; 0.67%)	Bk Gv	0.00116	(1; 0.59%)	Sw Pp Pr Gv	0.00155	(3; 0.86%)
Wt Gv	0.000498	(1; 0.6%)	Pd Gv	0.000921	(1; 0.47%)	Bc Mp Ho Ms	0.00151	(4; 0.83%)
En Gv	0.000451	(1; 0.54%)	Ne Gv	0.00091	(1; 0.46%)	El Gv	0.00146	(1; 0.81%)
Ap At Gv	0.000415	(2; 0.5%)	Ed Gv	0.000796	(1; 0.4%)	At Gv	0.00126	(1; 0.69%)
Bs Gv	0.000394	(1; 0.47%)	Bs Gv	0.000712	(1; 0.36%)	Wo Tx Ru Gv	0.00103	(3; 0.57%)
Nf Gv	0.000376	(1; 0.45%)	El Gv	0.000684	(1; 0.35%)	Bc Mp Fd Gv	0.000772	(3; 0.43%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.896 ±0.015	(±1.6%)
Downstream	0.401 ±0.010	(±2.6%)

Sector 8201: Defence (Df)

Defence services

Short Summary

Against the metric of one dollar of final demand, and the image of the defence forces as a materially intensive sector, the environmental indicators of greenhouse emissions, water use and land disturbance are respectively 55%, 85% and 95% below economy wide average. The social indicators of employment generation and government revenue are equal to average while income is 25% above average. The financial indicators of operating surplus and export propensity are 50% and 45% below average respectively while the import penetration indicator is equal to average. Balancing defence imports and exports is difficult due to the increasing sophistication of defence platforms and Australia's reliance on the defence equipment capabilities of the big three exporting countries, the US, France and Britain. The future of the sector is determined by government policy but driven by a range of external factors outside Australia's control. Investing in the development of our near neighbours may be one way to forestall the need for more soldiers, but this is not certain.

Sector Description

With a current expenditure of around $13 billion per year, defence represents a major government investment but is still less than one quarter of the combined spending on education and health. As a proportion of GDP, the current expenditure is 2%, but during major periods of warfare such as the second world war this has risen to over 30% of GDP. About one half of defence force personnel are army, with the navy and airforce each having one quarter. The principle components of the defence force include 12 large ships, six submarines, six army battalions, five squadrons of fighter aircraft and two squadrons of maritime patrol aircraft. Major equipment items or platforms typically last about 30 years and their replacements take ten or more years to develop. While warfare is becoming more technologically sophisticated, many defence tasks such as peacekeeping are people orientated.

Place of Industry in the Economy

The defence sector is in the top quartile of value adding in the economy ranking 24th out of 135 and contributing 0.99% of GDP in this analysis. Other industries of similar value adding include air transport and sport and recreation. The sector is directly responsible for 79 000 employment years and indirectly for another 50 000 years in the sector's upstream suppliers, giving a total of 130 000 or 1.8% of national total. In addition the sector supplies 1 000 employment years to downstream industries. The sector is responsible for around one percent of national energy use and greenhouse emissions and less than three tenths of one percent of water use and land disturbance. In absolute financial terms, imports in this sector outweigh exports by a factor of six in these data.

Strategic Overview

Given the special nature of the defence sector, the integrated overview presented in the spider diagram shows reasonable outcomes. The two social indicators of employment generation and income are equal to and above average respectively, income presumably reflecting the high skill levels required in the operation of sophisticated defence equipment. The four environmental indicators are below average, and the energy and greenhouse ones are surprising given the machine and firepower based image of the defence sector. Both the import and export indicators could be improved. Domestic defence manufacturing and offset programs have long been a policy priority for the introduction of new defence platforms such as frigates and submarines. In broader TBL terms, there are a wide range of ethical issues associated with the global arms trade.

TBL Account #1

The financial indicator of operating surplus is 50% below average and about half of this is a direct effect with the remainder from first and second order effects such as construction, freight forwarding, wholesale trade, ship building and legal and accounting services. The social indicator of employment generation is equal to average with a similar contribution to that of surplus. The greenhouse emissions indicator is 55% below average with one third of the effect being a direct one. The greenhouse chain shows additional contributions from electricity generation (7%), steel making for ship building for defence (2%), airline travel (2%) and diesel refining, construction, wholesale trade and LPG fuel (1% each).

TBL Accounts #2 and #3

The second TBL account shows export propensity 40% below average, income 25% above average and water use 85% below average. The third TBL account shows import penetration and government revenue equal to average and land disturbance 95% below average. The land indicator may understate the direct impact of activities such as war games and live bombing, and the analysis could be improved by a more precise land disturbance account at a national level.

Structural Path Analysis and Linkages

The import indicator is higher than average. The direct effect is 58% presumably for materials consumed in normal defence activities. Additional contributions from shipbuilding (9%), construction (2%), aircraft (2%), rubber goods (2%), printing (1%), and distillate (1%) together make up 17% of total and when added to the direct effect account for three quarters of the total.

Increases in demand for defence sector services give a slightly less than average stimulus to upstream suppliers such as ship building, construction, wholesale trade and property development. Decisions to invest into the sector show almost no downstream linkages since most of the investment is dissipated by the sector’s defence activities.

Future Trends in Sector

The future size and function of the sector are mostly governed by outside influences which are highly uncertain. Current government policy notes the fast moving nature of conflict both in distant countries such as Afghanistan and Iraq, and in the local region including Indonesia, Papua New Guinea and the Pacific Islands where political weakness, a decline in governance, and low rates of economic development are providing social conditions that could lead to unrest.

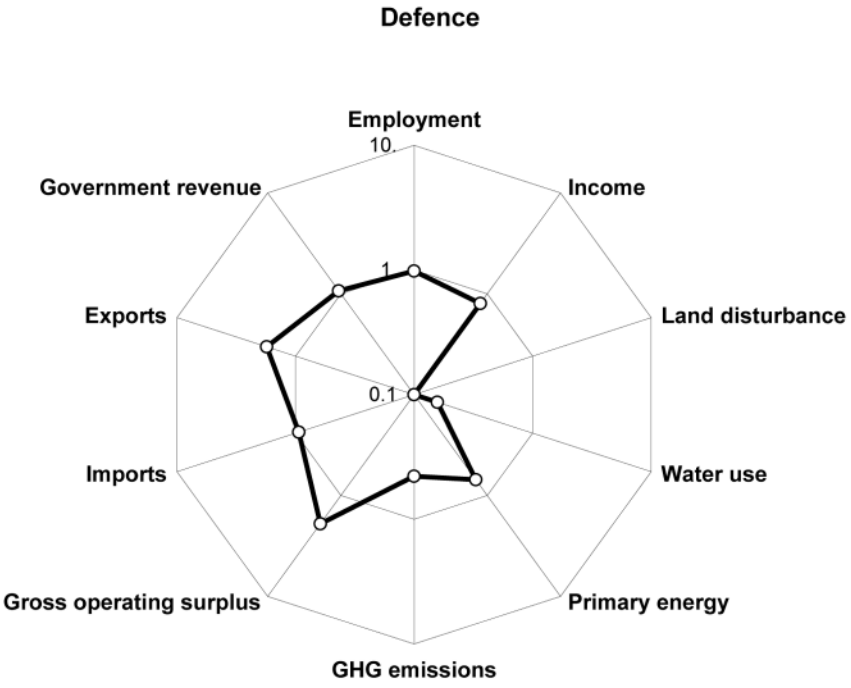
Innovation and Technical Opportunities

In such a technological sector, the process of innovation seems limitless, as do the potential costs. Warfare is becoming more complex as it now includes information warfare, bio-terrorism, machines fighting machines without humans, stealth technology and so on. The literature seems to point towards new weapons being developed at the interface of many disciplines (eg the intersection between information and gene technology) and the huge untapped repertoire of biological toxins. Such developments call for an expansion and integration of what are now called defence forces into the realm of health laboratories, urban management, and information accreditation. In common with several service sectors such as health and education, increasing specialisation can increase the risk of catastrophic failure. Increasingly the defence forces have to blend their traditional strategic and analytical skills with developing science areas such as complex systems science. In modern theatres of conflict, defence personnel must combine fighting capability with political skills and community development attitudes. This requires skilled generalists whose numbers are lacking in most modern defence forces. Increasingly, private firms provide a skills backup for most defence forces.

Sector Defence (Df)

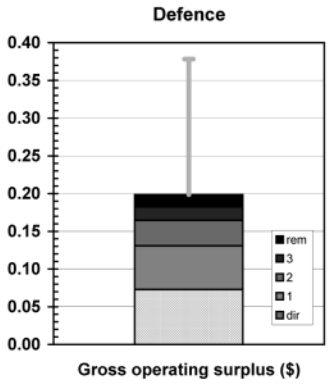
Defence services

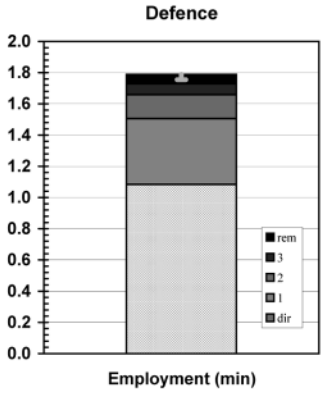
Spider diagram

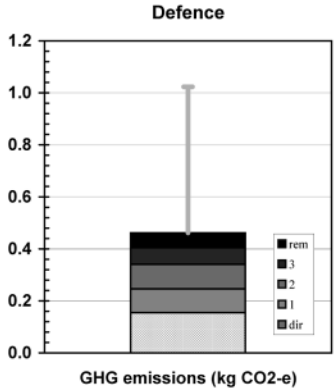


Bar graphs

Account #1







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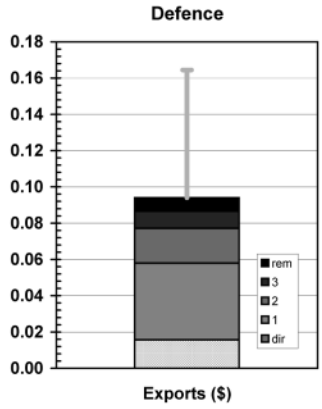

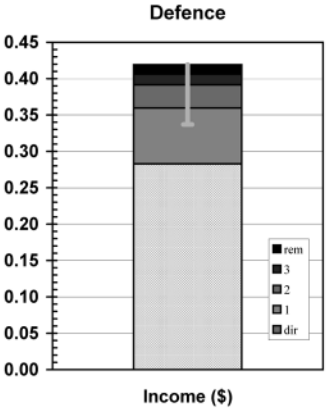

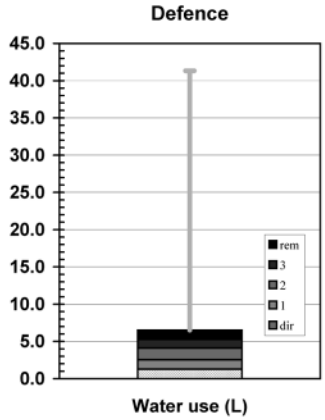

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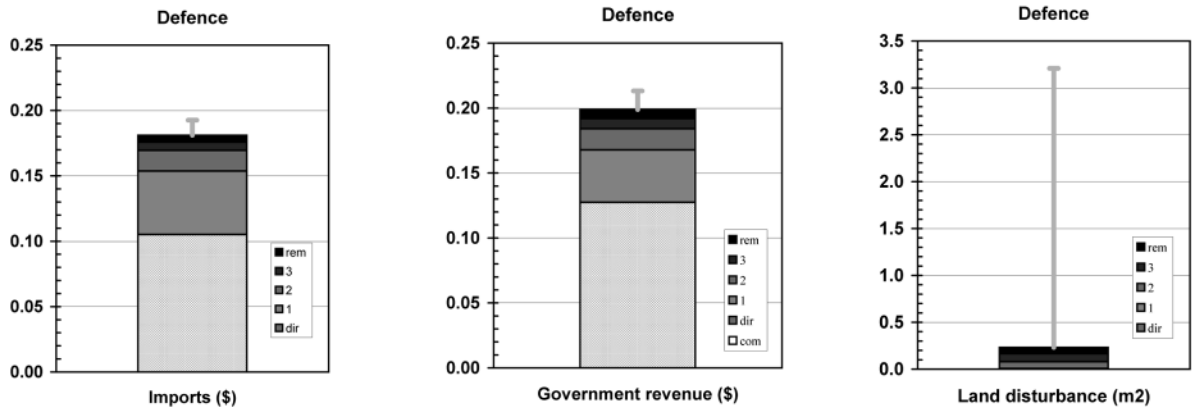


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 0.0		
Government final consumption	$m 8,880.0	(10.03% of total)	($m 8,880.0 domestically produced)
Gross fixed capital expenditure	$m 32.2	(0.03% of total)	($m 32.2 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 8,912.2**	**(1.94% of GNE)**	**($m 8,912.2 domestically produced)**
Exports	$m 143.3	(0.17% of total)	($m 143.3 domestically produced)
Final demand	**$m 9,055.5**	**(1.67% of GNT)**	**($m 9,055.5 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 2,594.8	(1.52% of total)	
Gross operating surplus	$m 669.0	(0.35% of total)	
Taxes less subsidies	$m 1,170.0	(1.37% of total)	
Sectoral GDP*	**$m 4,433.9**	**(0.99% of GDP)**	
Imports	$m 965.4	(0.99% of total)	
Primary inputs	**$m 5,399.3**	**(0.99% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 669.0	(0.35%)	$m 659.9	(0.34%)	$m 1,798.6	(0.94%)
Exports ($m)	$m 143.3	(0.17%)	$m 141.4	(0.17%)	$m 851.6	(1.02%)
Imports ($m)	$m 965.4	(0.99%)	$m 952.3	(0.98%)	$m 1,640.0	(1.68%)
Employment (e-y)	79,745 e-y	(1.12%)	78,666 e-y	(1.10%)	129,832 e-y	(1.82%)
Income ($m)*	$m 2,594.8	(1.52%)	$m 2,559.7	(1.50%)	$m 3,797.2	(2.22%)
Government revenue ($m)†	$m 1,170.0	(1.08%)	$m 1,154.2	(1.07%)	$m 1,800.9	(1.67%)
GHG emissions (kt CO_2-e)	1,417 kt	(0.27%)	1,398 kt	(0.27%)	4,178 kt	(0.81%)
Water use (ML)	11,651 ML	(0.06%)	11,494 ML	(0.05%)	58,916 ML	(0.28%)
Land disturbance (kha)	0 kha	(0.00%)	0 kha	(0.00%)	211 kha	(0.13%)
Primary energy (TJ)	20,590 TJ	(0.53%)	20,312 TJ	(0.52%)	48,190 TJ	(1.24%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.07	0.20	0.38
Exports ($)	0.02	0.09	0.16
Imports ($)	0.11	0.18	0.19
Employment (min)	1.08	1.79	1.75
Income ($)	0.28	0.42	0.34
Government revenue ($)	0.13	0.20	0.21
GHG emissions (kg CO_2-e)	0.15	0.46	1.02
Water use (L)	1.27	6.51	41.32
Land disturbance (m^2)	0.00	0.23	3.21
Primary energy (MJ)	2.24	5.32	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Df	0.0729	(0; 37.%)	Df	1.08	(0; 61.%)	Df	0.154	(0; 33.%)
Nb Df	0.00984	(1; 5.%)	Nb Df	0.1	(1; 5.6%)	El Df	0.0329	(1; 7.1%)
St Df	0.0068	(1; 3.4%)	Fa Df	0.0536	(1; 3.%)	Is Sb Df	0.0107	(2; 2.3%)
Wt Df	0.00494	(1; 2.5%)	Wt Df	0.0356	(1; 2.%)	At Df	0.00954	(1; 2.1%)
Sb Df	0.00353	(1; 1.8%)	Ps Df	0.0208	(1; 1.2%)	Fo Df	0.00651	(1; 1.4%)
Ms Df	0.00202	(1; 1.%)	Sb Df	0.0176	(1; 0.99%)	Nb Df	0.00576	(1; 1.2%)
Lg Df	0.002	(1; 1.%)	Pr Df	0.0145	(1; 0.81%)	Wt Df	0.00493	(1; 1.1%)
Pr Df	0.00174	(1; 0.87%)	St Df	0.0111	(1; 0.62%)	Lg Df	0.00475	(1; 1.%)
Rd Df	0.00161	(1; 0.81%)	Gv Df	0.0107	(1; 0.6%)	El Sb Df	0.00378	(2; 0.82%)
Cm Df	0.00149	(1; 0.75%)	Rd Df	0.00946	(1; 0.53%)	Is Df	0.00372	(1; 0.81%)
Ru Df	0.00148	(1; 0.75%)	Ms Df	0.00905	(1; 0.51%)	Bc Mp Df	0.0035	(2; 0.76%)
Ps Df	0.00146	(1; 0.74%)	Ru Df	0.00862	(1; 0.48%)	El St Df	0.00283	(2; 0.61%)
El Df	0.00133	(1; 0.67%)	Fu Df	0.0084	(1; 0.47%)	Rd Df	0.00256	(1; 0.55%)
Is Sb Df	0.00124	(2; 0.62%)	Ho Df	0.00621	(1; 0.35%)	Oi Fo Df	0.00196	(2; 0.42%)
Oc Df	0.0011	(1; 0.55%)	Eq Df	0.006	(1; 0.34%)	Ch Df	0.00192	(1; 0.42%)
Bk Df	0.00109	(1; 0.55%)	Fm Sb Df	0.0059	(2; 0.33%)	Sb Df	0.00188	(1; 0.41%)
Pd Df	0.00105	(1; 0.53%)	Oe Df	0.00559	(1; 0.31%)	El Ru Df	0.0018	(2; 0.39%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Df	0.0156	(0; 17.%)	Df	0.283	(0; 67.%)	Df	1.27	(0; 20.%)
Sb Df	0.0151	(1; 16.%)	Nb Df	0.015	(1; 3.6%)	Wa Df	0.518	(1; 8.%)
Wt Df	0.00404	(1; 4.3%)	Sb Df	0.01	(1; 2.4%)	Sc Cg Df	0.228	(2; 3.5%)
At Df	0.00304	(1; 3.2%)	Wt Df	0.00763	(1; 1.8%)	El Df	0.182	(1; 2.8%)
Lg Df	0.00233	(1; 2.5%)	Pr Df	0.00291	(1; 0.69%)	Su Fd Df	0.0968	(2; 1.5%)
Ai Df	0.00226	(1; 2.4%)	St Df	0.00283	(1; 0.68%)	Bc Mp Df	0.0923	(2; 1.4%)
Oe Df	0.00203	(1; 2.2%)	Gv Df	0.0027	(1; 0.64%)	Ri Fc Bp Df	0.0856	(3; 1.3%)
Oe Sb Df	0.00184	(2; 2.%)	Ru Df	0.00218	(1; 0.52%)	Vf Df	0.0771	(1; 1.2%)
St Df	0.00168	(1; 1.8%)	Ms Df	0.0021	(1; 0.5%)	Wa Ms Df	0.0519	(2; 0.8%)
Eq Df	0.00107	(1; 1.1%)	Ai Df	0.0019	(1; 0.45%)	Wo Tx Df	0.0471	(2; 0.72%)
Nf Sb Df	0.00106	(2; 1.1%)	At Df	0.00169	(1; 0.4%)	Ws Ho Df	0.0452	(2; 0.7%)
En Df	0.000999	(1; 1.1%)	Ps Df	0.00166	(1; 0.4%)	Ws Df	0.0411	(1; 0.63%)
Oc Df	0.00098	(1; 1.%)	Rd Df	0.00163	(1; 0.39%)	Pp Pr Df	0.0364	(2; 0.56%)
Is Sb Df	0.000944	(2; 1.%)	Oe Df	0.00128	(1; 0.31%)	Ri Fc Df	0.0362	(2; 0.56%)
Ru Df	0.000834	(1; 0.89%)	Oe Sb Df	0.00116	(2; 0.28%)	Su Bv Df	0.0359	(2; 0.55%)
Oi Fo Df	0.000632	(2; 0.67%)	Ed Df	0.00109	(1; 0.26%)	Bc Mp Ho Df	0.0325	(3; 0.5%)
Rd Df	0.00056	(1; 0.6%)	Bk Df	0.00107	(1; 0.26%)	Dc Dp Df	0.0324	(2; 0.5%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Df	0.105	(0; 58.%)	Df	0.127	(0; 64.%)	Wo Tx Df	0.0349	(2; 15.%)
Sb Df	0.0159	(1; 8.8%)	Sb Df	0.00809	(1; 4.1%)	Bc Mp Df	0.0254	(2; 11.%)
Nb Df	0.00334	(1; 1.8%)	Nb Df	0.00631	(1; 3.2%)	Wo Tx Cl Df	0.0181	(3; 7.8%)
Ai Df	0.00288	(1; 1.6%)	Wt Df	0.00357	(1; 1.8%)	Bc Mp Ho Df	0.00895	(3; 3.8%)
Ru Df	0.00287	(1; 1.6%)	St Df	0.00151	(1; 0.76%)	Wo Tx Tp Df	0.00844	(3; 3.6%)
Pr Df	0.0026	(1; 1.4%)	Pr Df	0.00141	(1; 0.71%)	Wo Tx Fu Df	0.00636	(3; 2.7%)
Fo Df	0.00213	(1; 1.2%)	At Df	0.00136	(1; 0.68%)	Bc Mp Bp Df	0.00416	(3; 1.8%)
Oc Df	0.00152	(1; 0.84%)	Ai Df	0.00135	(1; 0.68%)	Wo Tx Ru Df	0.00403	(3; 1.7%)
Oe Df	0.00124	(1; 0.68%)	Rd Df	0.00115	(1; 0.58%)	Wo Mp Df	0.00287	(2; 1.2%)
En Df	0.00116	(1; 0.64%)	Ru Df	0.00115	(1; 0.58%)	Bc Mp Fd Df	0.00174	(3; 0.75%)
Wt Df	0.00115	(1; 0.63%)	Ms Df	0.000999	(1; 0.5%)	Wo Tx Wt Df	0.00127	(3; 0.54%)
Oe Sb Df	0.00112	(2; 0.62%)	Gv Df	0.00094	(1; 0.47%)	Sw Pp Pr Df	0.00117	(3; 0.5%)
At Df	0.000905	(1; 0.5%)	Oe Df	0.000633	(1; 0.32%)	At Df	0.00104	(1; 0.44%)
Eq Df	0.000707	(1; 0.39%)	Pd Df	0.000623	(1; 0.31%)	Wo Mp Ho Df	0.00101	(3; 0.43%)
En Nb Df	0.000642	(2; 0.35%)	Bk Df	0.000592	(1; 0.3%)	Ba Bm Df	0.000975	(2; 0.42%)
St Df	0.000616	(1; 0.34%)	Oe Sb Df	0.000575	(2; 0.29%)	Bc Mp Oc Df	0.000823	(3; 0.35%)
Cl Df	0.000573	(1; 0.32%)	Ps Df	0.000525	(1; 0.26%)	Bc Mp De Df	0.000796	(3; 0.34%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.880 ±0.012	(±1.3%)
Downstream	0.016 ±0.001	(±5.9%)

Sector 8401: Education (Ed)

School, post-school and other educational services

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of greenhouse emissions, water use and land disturbance are respectively 80%, 90% and 95% below the economy wide averages. The social indicators of employment generation and income are 40% and 80% above average emphasising that expenditure in education delivers direct social returns, while the government revenue indicator is 10% above average. The financial indicators reflect the issue of who pays for education, with an operating surplus 70% below average, an export propensity 55% below average and an import penetration 80% below average. The export indicator will improve over time since tertiary education is growing rapidly to become one of the nation's leading services exports. Under base case population scenarios, the domestic requirements for education places are more or less stable as moderating birthrates and population ageing interact. There are however cyclical trends with higher levels every 30 years due to echoes of past baby booms. The innovation expectations are uncertain due to developing tensions between education costs (how much and who pays), methods (people and machines) and outcomes (jobs and the ability to think widely).

Sector Description

The education sector includes primary and secondary schooling, technical colleges, universities and a range of special education providers. In physical terms there are 9 600 schools, 87 technical colleges and 47 universities. There are 3.3 million school students and 700 000 higher education students. In the year 2003, about $40 billion was spent on educational activities with three quarters of this being by government, and the rest private expenditure. There are 150 000 overseas students in higher education in Australia bringing in $4 billion in export income.

Place of Industry in the Economy

The education sector is an important part of value adding in Australia ranking 4th out of 135 sectors and contributing 4.9% of GDP in this analysis. Other industries of similar value adding are health services and retail trade. The industry is a large employer with a direct requirement of 438 000 employment years and a further 38 000 years in the upstream suppliers giving a total of 476 000 or 6.7% of national total. The sector also supplies another 33 000 employment years to downstream industries. The industry is responsible for around one percent of energy use and greenhouse emissions and less than one half of one percent of water use and land disturbance. Imports are one half of exports in financial flow terms.

Strategic Overview

The integrated overview provided in the spider diagram shows a major service sector with polarised outcomes. This sector shows some of the best outcomes in the analysis with high employment and income, low environmental requirements and low imports. However operating surplus and export propensity are significantly below the economy wide average. The two outliers reflect the special status of the education sector in economy and society, rather than being measures of poor performance. Recent information on exports will show an improved indicator. Government revenue and operating surplus might not improve as education, health, and community services are perceived as investment into a civil society and evidence of national progress, rather than simply an expense in the national accounts. In a broader sense, taxes such as the excise on alcohol, tobacco and gambling could be seen as contributing to the societal investment into health and education.

TBL Account #1

The financial indicator of operating surplus is 70% below the economy wide average reflecting the government's role in investing in national human capital. Government is responsible for at least three quarters of the sector's funding. About two thirds of the effect is direct with the rest due to a range of first order effects including electricity generation, books, wholesale trade, communications and banking. The social indicator of employment generation is 40% greater than average and most of this is a direct effect. Expenditure on education services therefore shows an immediate social return in jobs. Greenhouse emissions are 80% below average and most of this in first order suppliers such as electricity generation (58%), black coal mining for electricity (2%), airline travel (1%) and wholesale trade (1%).

TBL Accounts #2 and #3

The second TBL account shows export propensity 50% below average, income 80% above average (perhaps due to the tertiary sector rather than the primary and secondary sectors) and water use 90% below average. The third TBL account shows import penetration 80% below average, government revenue 10% above average and negligible land disturbance.

Structural Path Analysis and Linkages

While the greenhouse indicator is below the economy wide average, it is nevertheless instructive to note that electricity production through various supply chains is responsible for over 60% of the sector's emissions. This suggests low carbon electricity may be a first choice mitigation strategy. In addition there are many behavioural and retrofitting options for helping the education sector reduce greenhouse emissions further.

Increases in consumer demand for education services provide very weak stimuli to upstream sectors such as books and periodicals, electricity, wholesale trade, communications and legal and accounting services. Decisions to invest into the sector show extremely weak downstream linkages as most of the effect is dissipated to private consumption.

Future Trends in Sector

Under the base case scenario in the *Future Dilemmas* study with 25 million people by 2050, the number of students is similar to today because of the balancing demographic forces of declining births and population ageing. However the educational requirements are expected to grow in some regions and decline in others due to patterns of internal migration. Most noticeable in the more populated states is the oscillating student numbers over 30 year intervals caused by echoes of the first baby booms in the 1940s. Uncertainties do cloud the future however and changes in birth rate, immigration rate and participation rate, particularly in the tertiary sector, could cause radical shifts in these outcomes.

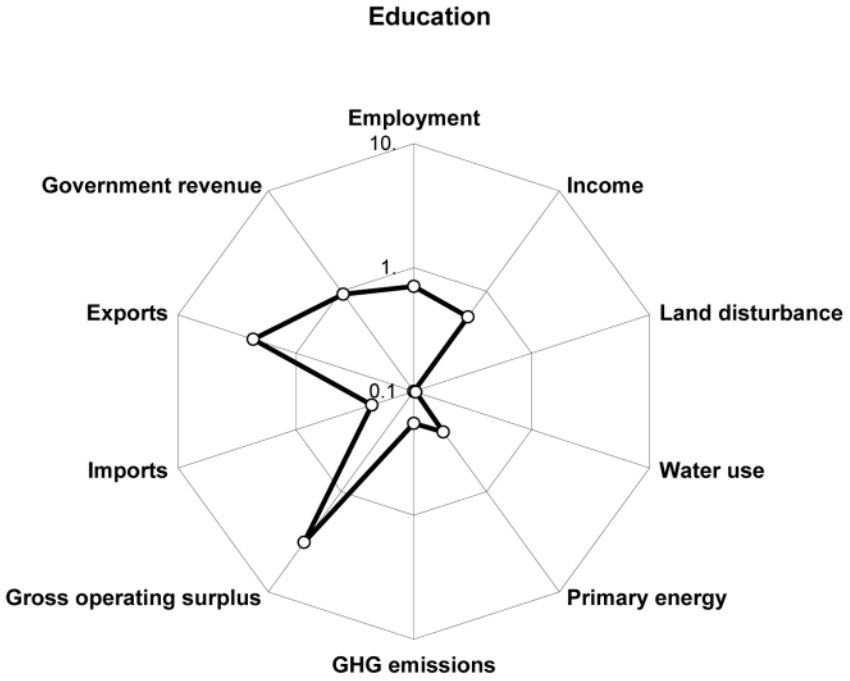
Innovation and Technical Opportunities

Many of the sector's future possibilities appear to be constrained by the tension between cost (how much and who should pay), educational methods (delivering online or through people) and the quality of learning engendered (job tickets or ability to think). The most challenging tasks of this century appear to be at the meeting place of many disciplines where issues of creativity, synthesis and ethical dimensions abound. Faced with many of these issues, the literature in medical education is calling for the development of polymaths and Renaissance doctors that are technologically and philosophically literate while understanding patients as people. Many disciplines are making similar calls. Internet based delivery of education products may meet the information delivery requirements, but may not catalyse the educational outcome required in a complex and fast moving world.

Sector Education (Ed)

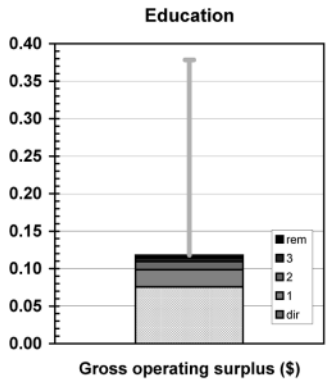
School, post-school and other educational sevices

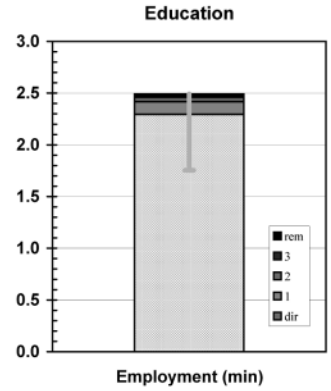
Spider diagram

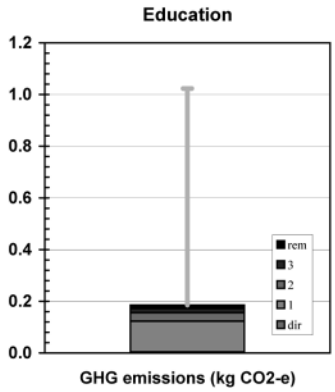


Bar graphs

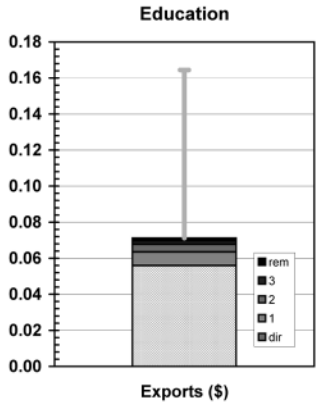
Account #1

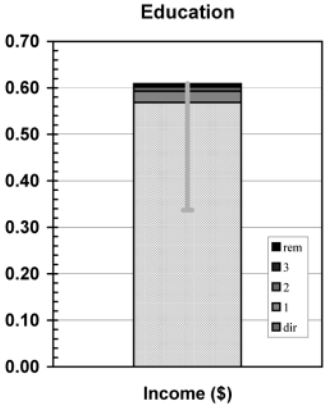


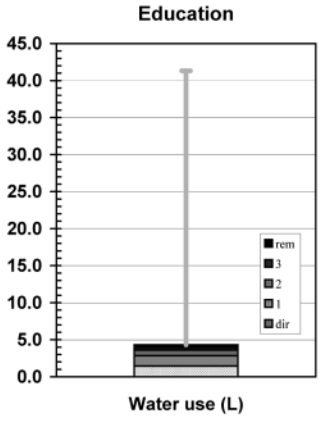




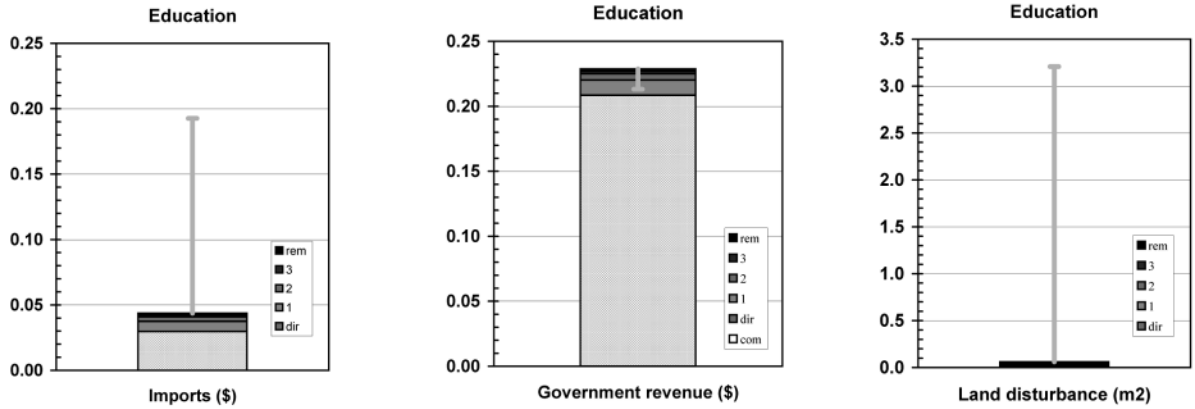
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 5,579.8	(2.11% of total)	($m 5,283.9 domestically produced)
Government final consumption	$m 16,987.9	(19.19% of total)	($m 16,987.9 domestically produced)
Gross fixed capital expenditure	$m 113.1	(0.11% of total)	($m 113.1 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 22,680.8**	**(4.94% of GNE)**	**($m 22,384.9 domestically produced)**
Exports	$m 1,431.9	(1.72% of total)	($m 1,431.9 domestically produced)
Final demand	**$m 24,112.7**	**(4.44% of GNT)**	**($m 23,816.8 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 14,545.8	(8.51% of total)	
Gross operating surplus	$m 1,933.6	(1.01% of total)	
Taxes less subsidies	$m 5,334.6	(6.24% of total)	
Sectoral GDP*	**$m 21,814.1**	**(4.87% of GDP)**	
Imports	$m 759.0	(0.78% of total)	
Primary inputs	**$m 22,573.1**	**(4.14% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 1,933.6	(1.01%)	$m 1,799.5	(0.94%)	$m 2,807.5	(1.46%)
Exports ($m)	$m 1,431.9	(1.72%)	$m 1,332.5	(1.60%)	$m 1,696.7	(2.04%)
Imports ($m)	$m 759.0	(0.78%)	$m 706.4	(0.72%)	$m 1,042.2	(1.07%)
Employment (e-y)	470,700 e-y	(6.60%)	438,050 e-y	(6.15%)	475,725 e-y	(6.67%)
Income ($m)*	$m 14,545.8	(8.51%)	$m 13,536.8	(7.92%)	$m 14,508.8	(8.49%)
Government revenue ($m)†	$m 5,334.6	(4.94%)	$m 4,964.6	(4.59%)	$m 5,447.5	(5.04%)
GHG emissions (kt CO_2-e)	88 kt	(0.02%)	82 kt	(0.02%)	4,411 kt	(0.85%)
Water use (ML)	36,989 ML	(0.18%)	34,423 ML	(0.16%)	102,548 ML	(0.49%)
Land disturbance (kha)	4 kha	(0.00%)	3 kha	(0.00%)	145 kha	(0.09%)
Primary energy (TJ)	1,554 TJ	(0.04%)	1,446 TJ	(0.04%)	46,298 TJ	(1.19%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.08	0.12	0.38
Exports ($)	0.06	0.07	0.16
Imports ($)	0.03	0.04	0.19
Employment (min)	2.30	2.49	1.75
Income ($)	0.57	0.61	0.34
Government revenue ($)	0.21	0.23	0.21
GHG emissions (kg CO_2-e)	0.00	0.19	1.02
Water use (L)	1.45	4.31	41.32
Land disturbance (m^2)	0.00	0.06	3.21
Primary energy (MJ)	0.06	1.94	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Ed	0.0756	(0; 64.%)	Ed	2.3	(0; 92.%)	El Ed	0.107	(1; 58.%)
El Ed	0.00434	(1; 3.7%)	Wt Ed	0.0184	(1; 0.74%)	Ed	0.00344	(0; 1.9%)
Ne Ed	0.00261	(1; 2.2%)	Ne Ed	0.00883	(1; 0.35%)	Bl El Ed	0.00271	(2; 1.5%)
Wt Ed	0.00256	(1; 2.2%)	Gv Ed	0.00848	(1; 0.34%)	At Ed	0.00265	(1; 1.4%)
Cm Ed	0.00217	(1; 1.8%)	Ps Ed	0.00847	(1; 0.34%)	Wt Ed	0.00256	(1; 1.4%)
Bk Ed	0.00142	(1; 1.2%)	Cm Ed	0.00599	(1; 0.24%)	El En Ed	0.00106	(2; 0.57%)
Ms Ed	0.000907	(1; 0.77%)	Bk Ed	0.00563	(1; 0.23%)	Bc Mp Ed	0.00104	(2; 0.56%)
Wa Ed	0.000828	(1; 0.7%)	El Ed	0.00483	(1; 0.19%)	Ne Ed	0.000951	(1; 0.51%)
Bl El Ed	0.000692	(2; 0.59%)	Ms Ed	0.00407	(1; 0.16%)	Is Sm Ed	0.000862	(2; 0.47%)
Sf Ed	0.000646	(1; 0.55%)	Bs Ed	0.00389	(1; 0.16%)	El Wt Ed	0.000769	(2; 0.42%)
St Ed	0.000608	(1; 0.52%)	Cu Ed	0.00368	(1; 0.15%)	Dc Dp Ed	0.000754	(2; 0.41%)
Ps Ed	0.000597	(1; 0.51%)	Fa Ed	0.00333	(1; 0.13%)	Sw Pp Ne Ed	0.000698	(3; 0.38%)
Ts Ed	0.000546	(1; 0.46%)	Ho Ed	0.00325	(1; 0.13%)	Pp Ne Ed	0.000682	(2; 0.37%)
Sf Bk Ed	0.000496	(2; 0.42%)	Sm Ed	0.00265	(1; 0.11%)	Ga Ed	0.000652	(1; 0.35%)
St Wt Ed	0.000489	(2; 0.41%)	Ts Ed	0.00246	(1; 0.099%)	Bc Mp Ho Ed	0.000645	(3; 0.35%)
Bs Ed	0.000394	(1; 0.33%)	Rd Ed	0.0023	(1; 0.092%)	Rd Ed	0.000621	(1; 0.34%)
Rd Ed	0.000391	(1; 0.33%)	Pr Ed	0.0022	(1; 0.088%)	El Gv Ed	0.000569	(2; 0.31%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Ed	0.0559	(0; 79.%)	Ed	0.568	(0; 93.%)	Ed	1.45	(0; 34.%)
Wt Ed	0.00209	(1; 2.9%)	Wt Ed	0.00396	(1; 0.65%)	Wa Ed	0.608	(1; 14.%)
Bl El Ed	0.00105	(2; 1.5%)	Gv Ed	0.00213	(1; 0.35%)	El Ed	0.594	(1; 14.%)
En Ed	0.000994	(1; 1.4%)	Ne Ed	0.00202	(1; 0.33%)	Dc Dp Ed	0.304	(2; 7.1%)
At Ed	0.000842	(1; 1.2%)	Bk Ed	0.00139	(1; 0.23%)	Cu Ed	0.0508	(1; 1.2%)
Ne Ed	0.00038	(1; 0.53%)	Cm Ed	0.00136	(1; 0.22%)	Wa El Ed	0.0343	(2; 0.8%)
Cm Ed	0.000289	(1; 0.41%)	El Ed	0.00131	(1; 0.21%)	Bc Mp Ed	0.0275	(2; 0.64%)
Oe Ed	0.000203	(1; 0.28%)	Ms Ed	0.000946	(1; 0.16%)	Ws Ho Ed	0.0237	(2; 0.55%)
Rf Ed	0.000189	(1; 0.27%)	Ps Ed	0.000678	(1; 0.11%)	Wa Ms Ed	0.0233	(2; 0.54%)
Ho Ed	0.000181	(1; 0.25%)	Cu Ed	0.000676	(1; 0.11%)	Su Bv Ed	0.0211	(2; 0.49%)
Om Ed	0.00016	(1; 0.22%)	Ts Ed	0.000576	(1; 0.095%)	Pp Ne Ed	0.0171	(2; 0.4%)
St Ed	0.000151	(1; 0.21%)	Bs Ed	0.000477	(1; 0.078%)	Bc Mp Ho Ed	0.017	(3; 0.39%)
Ms Ed	0.00014	(1; 0.2%)	Ho Ed	0.000474	(1; 0.078%)	Sm Ed	0.0168	(1; 0.39%)
Dp Ed	0.000139	(1; 0.2%)	En Ed	0.000471	(1; 0.077%)	Dc Dp Ho Ed	0.0141	(3; 0.33%)
Rd Ed	0.000136	(1; 0.19%)	At Ed	0.000469	(1; 0.077%)	Bl El Ed	0.014	(2; 0.33%)
St Wt Ed	0.000121	(2; 0.17%)	Sm Ed	0.000457	(1; 0.075%)	Vf Ed	0.0127	(1; 0.3%)
Bk Ed	0.00011	(1; 0.16%)	Pr Ed	0.000441	(1; 0.072%)	Wp Ed	0.0126	(1; 0.29%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Ed	0.0297	(0; 68.%)	Ed	0.208	(0; 91.%)	Bc Mp Ed	0.00758	(2; 12.%)
Ne Ed	0.00126	(1; 2.9%)	Wt Ed	0.00185	(1; 0.81%)	Wo Tx Ed	0.00568	(2; 9.3%)
En Ed	0.00115	(1; 2.6%)	Ne Ed	0.00101	(1; 0.44%)	Bc Mp Ho Ed	0.00469	(3; 7.7%)
Wt Ed	0.000595	(1; 1.4%)	El Ed	0.000814	(1; 0.36%)	Wo Tx Tp Ed	0.00392	(3; 6.4%)
Pr Ed	0.000394	(1; 0.9%)	Bk Ed	0.000768	(1; 0.34%)	El Ed	0.00173	(1; 2.8%)
Cm Ed	0.000371	(1; 0.85%)	Gv Ed	0.000742	(1; 0.32%)	Dc Dp Ed	0.00157	(2; 2.6%)
El Ed	0.000301	(1; 0.69%)	Cm Ed	0.00065	(1; 0.28%)	Ed	0.00146	(0; 2.4%)
At Ed	0.000251	(1; 0.57%)	Ms Ed	0.000449	(1; 0.2%)	Wo Tx Cl Ed	0.00136	(3; 2.2%)
Gv Ed	0.000221	(1; 0.5%)	At Ed	0.000377	(1; 0.16%)	Wo Mp Ed	0.000856	(2; 1.4%)
Sm Ed	0.000217	(1; 0.5%)	En Ed	0.000287	(1; 0.13%)	Wo Tx Fu Ed	0.000708	(3; 1.2%)
Ps Ed	0.000213	(1; 0.49%)	Ts Ed	0.000284	(1; 0.12%)	Wo Tx Wt Ed	0.000657	(3; 1.1%)
Ms Ed	0.000206	(1; 0.47%)	Rd Ed	0.00028	(1; 0.12%)	Sw Pp Ne Ed	0.00055	(3; 0.9%)
Cu Ed	0.000175	(1; 0.4%)	Cu Ed	0.00025	(1; 0.11%)	Bc Mp Bp Ed	0.000546	(3; 0.9%)
Ts Ed	0.000157	(1; 0.36%)	Ho Ed	0.00025	(1; 0.11%)	Wo Mp Ho Ed	0.000529	(3; 0.87%)
Wp Ed	0.000151	(1; 0.34%)	Ps Ed	0.000215	(1; 0.094%)	Ba Bm Ho Ed	0.000383	(3; 0.63%)
Pa Ed	0.000141	(1; 0.32%)	Pr Ed	0.000213	(1; 0.093%)	Bc Mp Ho Wt	0.000379	(4; 0.62%)
Bk Ed	0.000137	(1; 0.31%)	Os Ed	0.000203	(1; 0.089%)	Bc Mp Ho Ne	0.000357	(4; 0.59%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.241 ±0.003	(±1.4%)
Downstream	0.135 ±0.002	(±1.4%)

Sector 8601: Health Services (Hs)

Hospital, nursing home, medical, dental, optometry, ambulance, community health, veterinary and other health services

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of greenhouse emissions, water use and land disturbance are respectively 85%, 80% and 95% below the economy wide averages. The social indicators of employment generation and income are 25% and 55% above average while government revenue is equal to average. The financial indicators of operating surplus and export propensity are 50% and 80% below average while import penetration is 75% below average. Nevertheless in absolute financial terms, imports are three times the size of exports. Key policy challenges include meeting the rising costs of health care as the population ages and the workforce declines, the rising use and cost of pharmaceuticals and the expected increase in other government expenditures such as superannuation. The technological future for health services is vast and uncertain. Four tensions are identified in the literature: facilitating life long wellness, balancing specialists with generalists, containing the medical technology avalanche and introducing cross compliance measures that reward people who embrace and live healthy lifestyles.

Sector Description

In the sector's total financial expenditure of $60 billion per year, the health services sector is composed of hospitals (53%), medical services (13%), dental services (8%), optometry, physiotherapy etc. (5%), ambulance (2%), community health (13%), and veterinary services (2%). There are 749 public and 516 private hospitals (total 1 265) with a total of nearly 80 000 beds. There are 6.3 million patient transactions per year representing nearly 23 million patient days in total. There are 48 000 doctors, 7 500 dentists, 2 700 optometrists, 5 700 physiotherapists and 4 800 veterinarians. The pharmaceutical benefits scheme funds over 150 million prescriptions per year (eight prescriptions per capita), at a total cost of $5 billion, representing a doubling of cost per item over the last decade.

Place of Industry in the Economy

The health services sector is one of the biggest in terms of value adding in the economy, ranking 3rd out of 135 and contributing 5.4% of GDP in this analysis. By way of comparison it is similar in value adding to wholesale trade and education. It is a major contributor to national employment with 445 000 employment years directly required and an additional 64 000 embodied in the upstream suppliers to the sector. The total employment of 509 000 employment years represents over 7% of national employment generation and the sector also contributes 13 000 employment years to downstream industries. Its requirement for national energy use and subsequent emissions is around one percent of national total and it is responsible for one half of one percent of water use and land disturbance. In financial flow terms, imports are three times the size of exports.

Strategic Overview

The integrated overview in the spider diagram portrays two outliers for operating surplus and export propensity. Subsequent analyses may show an improvement in the export indicator as recent government press releases quote health exports of $2 billion per annum. The operating surplus indicator may be difficult to improve as universal heath care at an affordable cost remains part of national expectations. Excise taxes on sectors such as gambling, tobacco and alcohol directly contribute to the health sector and help balance the negative aspects derived from their use.

TBL Account #1

The financial indicator of operating surplus is 50% below the economy wide average and most of this is a direct effect. The social indicator of employment generation is 25% above average and nine tenths of this is a direct effect reflecting the strong linkage between expenditure in this sector and direct employment generation. The greenhouse emissions indicator is 85% below average and only one sixth of this is a direct effect. The remainder is located in the production chain of the sector's suppliers and includes electricity production (15%), basic chemicals (4%) wholesale trade (2%) and gas production and distribution (1%).

TBL Accounts #2 and #3

The second TBL account shows export propensity is 80% below average although new data may improve this result. The income indicator is 55% above average reflecting the high skill levels in the sector. Water use is 80% below average. The third TBL account shows import penetration 75% below average, government revenue equal to average and negligible land disturbance.

Structural Path Analysis and Linkages

The export propensity indicator is 80% below average. An examination of the structural path shows that the direct effect is 41% with contributions from wholesale trade (7%), medical equipment (7%) and basic chemicals (2%) providing significant first order additions to the export indicator. Business sources report that medical equipment manufacturers have a turnover of about $1 billion per year and are gaining in export competence but the limited scale of expertise in Australia would not permit domestic manufacturers to supply the full range of equipment required by this sector.

Increases in consumer demand for health services provide small and weak stimuli to a number of upstream suppliers such as wholesale trade, property development, legal and accounting services, and other business management. Expanding the domestic health sector shows negligible downstream effects on other industries as the sector is essentially self supporting and most of the effect is dissipated by private consumption of health services.

Future Trends in Sector

The Federal Government's *Intergenerational Report* released in 2002 charts a prospective future for the health services sector where costs double to 8% of GDP by 2040 and where the pharmaceuticals component increases by a factor of six. Commonwealth spending has increased from 1.5% of GDP in 1971 to 4% currently and it is projected that health issues associated with population ageing and a number of other whole economy issues such as superannuation obligations could steadily increase fiscal pressure in 15 years time when spending might start to exceed revenue. None of these expectations are certain. Aboriginal health and new health issues driven by global climate change, each pose health delivery challenges that lie outside the current conventional wisdom.

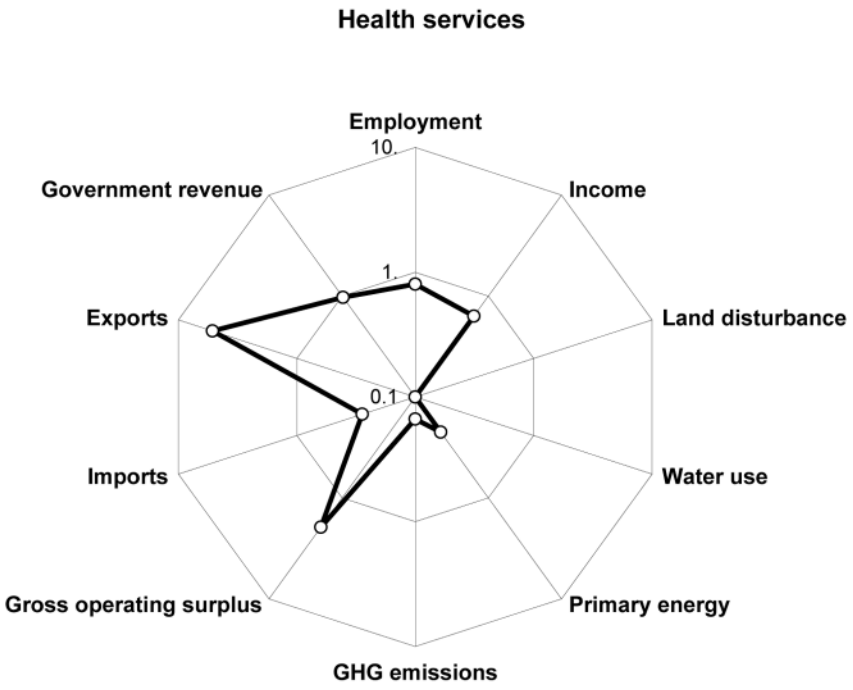
Innovation and Technical Opportunities

In the technologically rich field of human health, and with demographic ageing trends well underway in most affluent countries, the future of this sector is highly uncertain. Nevertheless the literature reveals four tensions that must be resolved to balance rising costs and increasing expectations of service. First is the transition from disease curing to life long wellness and disease prevention. Second is balancing the trend to increased specialisation with the broad requirement for well trained and empathetic generalists. The third is containing the proliferation of medical technology by choosing societal health outcomes with the least ethical flaws. Lastly, difficult areas of cross compliance need to be addressed, whereby those who avoid the health problems of affluence and lifestyle, are rewarded by enhanced access and lower health insurance premiums.

Sector **Health services** **(Hs)**

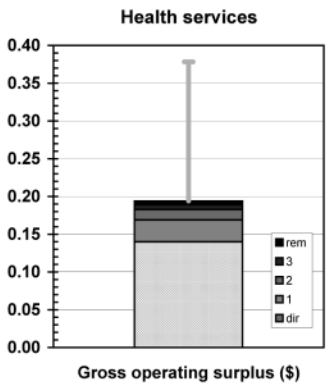
Hospital, nursing home, medical, dental, optometry, ambulance, community health, veterinary and other health services

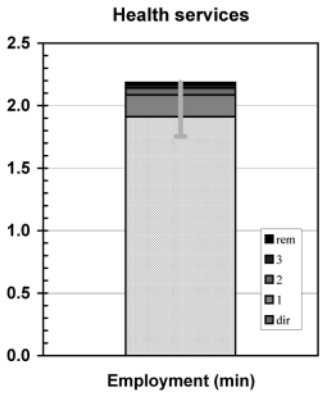
Spider diagram

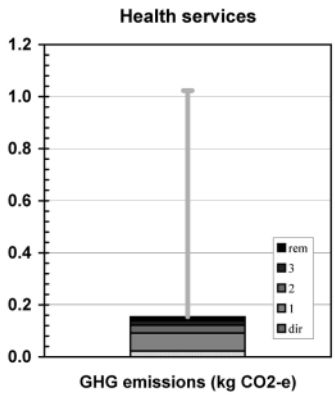


Bar graphs

Account #1







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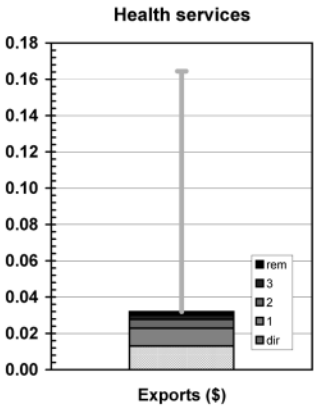

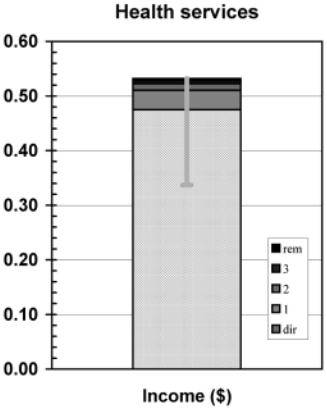

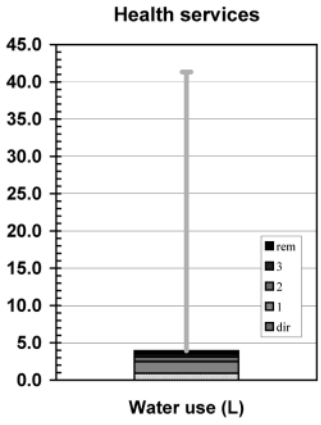

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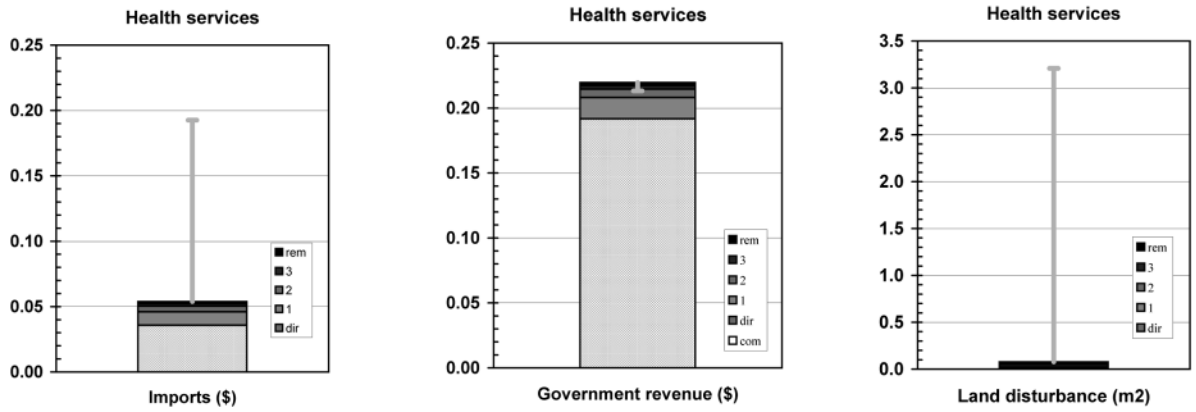


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 8,874.9	(3.36% of total)	($m 8,635.0 domestically produced)
Government final consumption	$m 20,011.8	(22.61% of total)	($m 20,011.8 domestically produced)
Gross fixed capital expenditure	$m 24.3	(0.02% of total)	($m 24.3 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 28,911.1**	**(6.29% of GNE)**	**($m 28,671.2 domestically produced)**
Exports	$m 390.0	(0.47% of total)	($m 390.0 domestically produced)
Final demand	**$m 29,301.1**	**(5.40% of GNT)**	**($m 29,061.2 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 14,205.1	(8.31% of total)	
Gross operating surplus	$m 4,181.2	(2.18% of total)	
Taxes less subsidies	$m 5,734.9	(6.71% of total)	
Sectoral GDP*	**$m 24,121.2**	**(5.38% of GDP)**	
Imports	$m 1,070.4	(1.10% of total)	
Primary inputs	**$m 25,191.6**	**(4.62% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 4,181.2	(2.18%)	$m 4,062.1	(2.12%)	$m 5,634.4	(2.94%)
Exports ($m)	$m 390.0	(0.47%)	$m 378.9	(0.45%)	$m 927.9	(1.11%)
Imports ($m)	$m 1,070.4	(1.10%)	$m 1,039.9	(1.06%)	$m 1,565.8	(1.60%)
Employment (e-y)	458,125 e-y	(6.43%)	445,079 e-y	(6.24%)	508,873 e-y	(7.14%)
Income ($m)*	$m 14,205.1	(8.31%)	$m 13,800.6	(8.08%)	$m 15,467.2	(9.05%)
Government revenue ($m)†	$m 5,734.9	(5.31%)	$m 5,571.6	(5.15%)	$m 6,381.5	(5.90%)
GHG emissions (kt CO_2-e)	676 kt	(0.13%)	657 kt	(0.13%)	4,463 kt	(0.86%)
Water use (ML)	27,078 ML	(0.13%)	26,307 ML	(0.13%)	114,037 ML	(0.54%)
Land disturbance (kha)	22 kha	(0.01%)	22 kha	(0.01%)	225 kha	(0.14%)
Primary energy (TJ)	10,300 TJ	(0.27%)	10,007 TJ	(0.26%)	49,669 TJ	(1.28%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.14	0.19	0.38
Exports ($)	0.01	0.03	0.16
Imports ($)	0.04	0.05	0.19
Employment (min)	1.91	2.19	1.75
Income ($)	0.47	0.53	0.34
Government revenue ($)	0.19	0.22	0.21
GHG emissions (kg CO_2-e)	0.02	0.15	1.02
Water use (L)	0.91	3.92	41.32
Land disturbance (m^2)	0.01	0.08	3.21
Primary energy (MJ)	0.34	1.71	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Hs	0.14	(0; 72.%)	Hs	1.91	(0; 87.%)	El Hs	0.0494	(1; 32.%)
Cm Hs	0.00278	(1; 1.4%)	Bs Hs	0.0239	(1; 1.1%)	Hs	0.0226	(0; 15.%)
Wt Hs	0.00267	(1; 1.4%)	Wt Hs	0.0193	(1; 0.88%)	Ch Hs	0.00564	(1; 3.7%)
Bs Hs	0.00242	(1; 1.2%)	Ps Hs	0.0109	(1; 0.5%)	Wt Hs	0.00267	(1; 1.7%)
Bk Hs	0.00234	(1; 1.2%)	Bk Hs	0.00928	(1; 0.42%)	Ga Hs	0.00157	(1; 1.%)
El Hs	0.002	(1; 1.%)	Ms Hs	0.00886	(1; 0.41%)	El Bs Hs	0.00148	(2; 0.96%)
Ms Hs	0.00198	(1; 1.%)	Cm Hs	0.00769	(1; 0.35%)	Ng Hs	0.00131	(1; 0.85%)
Wa Hs	0.00148	(1; 0.76%)	Oe Hs	0.00602	(1; 0.28%)	Bl El Hs	0.00124	(2; 0.81%)
Pd Hs	0.00137	(1; 0.71%)	Gv Hs	0.00405	(1; 0.19%)	At Hs	0.00116	(1; 0.76%)
St Hs	0.000844	(1; 0.44%)	Ts Hs	0.00372	(1; 0.17%)	El Ch Hs	0.00085	(2; 0.55%)
Ts Hs	0.000825	(1; 0.43%)	Pd Hs	0.0033	(1; 0.15%)	El Ms Hs	0.000827	(2; 0.54%)
Sf Bk Hs	0.000817	(2; 0.42%)	Rd Hs	0.00295	(1; 0.14%)	El Wt Hs	0.000803	(2; 0.52%)
Ps Hs	0.000769	(1; 0.4%)	El Hs	0.00222	(1; 0.1%)	Rd Hs	0.000797	(1; 0.52%)
Sf Hs	0.0006	(1; 0.31%)	Ed Hs	0.00205	(1; 0.094%)	Ap Hs	0.000705	(1; 0.46%)
Oe Hs	0.000552	(1; 0.28%)	Wa Hs	0.00188	(1; 0.086%)	El Pd Hs	0.000654	(2; 0.43%)
St Wt Hs	0.00051	(2; 0.26%)	Fa Hs	0.00178	(1; 0.082%)	El Ps Hs	0.000549	(2; 0.36%)
Rd Hs	0.000502	(1; 0.26%)	Ms Wt Hs	0.00174	(2; 0.08%)	El Bk Hs	0.000539	(2; 0.35%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Hs	0.013	(0; 41.%)	Hs	0.475	(0; 89.%)	Wa Hs	1.08	(1; 28.%)
Wt Hs	0.00219	(1; 6.9%)	Wt Hs	0.00413	(1; 0.78%)	Hs	0.905	(0; 23.%)
Oe Hs	0.00218	(1; 6.8%)	Bs Hs	0.00293	(1; 0.55%)	El Hs	0.273	(1; 7.%)
Ch Hs	0.000656	(1; 2.1%)	Bk Hs	0.00229	(1; 0.43%)	Dc Dp Hs	0.0974	(2; 2.5%)
Bl El Hs	0.000483	(2; 1.5%)	Ms Hs	0.00206	(1; 0.39%)	Wa Bs Hs	0.0731	(2; 1.9%)
Bs Hs	0.000449	(1; 1.4%)	Cm Hs	0.00175	(1; 0.33%)	Ws Hs	0.0538	(1; 1.4%)
Cm Hs	0.000371	(1; 1.2%)	Oe Hs	0.00138	(1; 0.26%)	Wa Ms Hs	0.0508	(2; 1.3%)
At Hs	0.00037	(1; 1.2%)	Pd Hs	0.00124	(1; 0.23%)	Wa Pd Hs	0.0375	(2; 0.96%)
Ph Hs	0.000332	(1; 1.%)	Gv Hs	0.00102	(1; 0.19%)	Vf Hs	0.0247	(1; 0.63%)
Ms Hs	0.000306	(1; 0.96%)	Ps Hs	0.000873	(1; 0.16%)	Ch Hs	0.0172	(1; 0.44%)
Lg Hs	0.000222	(1; 0.69%)	Ts Hs	0.00087	(1; 0.16%)	Wa El Hs	0.0158	(2; 0.4%)
St Hs	0.000209	(1; 0.66%)	El Hs	0.000601	(1; 0.11%)	Ps Hs	0.0149	(1; 0.38%)
Bk Hs	0.000182	(1; 0.57%)	Rd Hs	0.000508	(1; 0.095%)	Ri Ws Hs	0.012	(2; 0.31%)
Rd Hs	0.000175	(1; 0.55%)	Ed Hs	0.000507	(1; 0.095%)	Wa Ts Hs	0.0111	(2; 0.28%)
Ts Hs	0.000131	(1; 0.41%)	Os Hs	0.000486	(1; 0.091%)	Vf Ws Hs	0.0109	(2; 0.28%)
St Wt Hs	0.000126	(2; 0.4%)	Wa Hs	0.000424	(1; 0.08%)	Wt Hs	0.0108	(1; 0.27%)
Tp Hs	0.000122	(1; 0.38%)	Ms Wt Hs	0.000404	(2; 0.076%)	Wa Ms Wt Hs	0.00997	(3; 0.25%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Hs	0.0358	(0; 66.%)	Hs	0.192	(0; 87.%)	Wo Tx Tp Hs	0.00866	(3; 11.%)
Oe Hs	0.00133	(1; 2.5%)	Wt Hs	0.00193	(1; 0.88%)	Hs	0.00745	(0; 9.6%)
Ch Hs	0.000657	(1; 1.2%)	Bk Hs	0.00127	(1; 0.58%)	Wo Tx Cl Hs	0.00568	(3; 7.3%)
Wt Hs	0.000622	(1; 1.2%)	Ms Hs	0.000979	(1; 0.45%)	Wo Tx Hs	0.00291	(2; 3.8%)
Bs Hs	0.000481	(1; 0.89%)	Bs Hs	0.000869	(1; 0.4%)	Bc Mp Hs	0.00267	(2; 3.4%)
Cm Hs	0.000476	(1; 0.88%)	Cm Hs	0.000834	(1; 0.38%)	Bc Mp Ch Hs	0.00224	(3; 2.9%)
Ph Hs	0.000463	(1; 0.86%)	Pd Hs	0.000811	(1; 0.37%)	Wo Tx Kn Hs	0.00157	(3; 2.%)
Ms Hs	0.000449	(1; 0.83%)	Oe Hs	0.00068	(1; 0.31%)	Bc Ch Hs	0.00113	(2; 1.5%)
Ap Hs	0.000397	(1; 0.74%)	Ts Hs	0.000429	(1; 0.2%)	Bc Mp Ho Hs	0.000829	(3; 1.1%)
Ac Hs	0.000318	(1; 0.59%)	El Hs	0.000374	(1; 0.17%)	El Hs	0.000797	(1; 1.%)
Tp Hs	0.000278	(1; 0.52%)	Rd Hs	0.00036	(1; 0.16%)	Wh Ph Hs	0.000704	(2; 0.91%)
Ps Hs	0.000274	(1; 0.51%)	Gv Hs	0.000354	(1; 0.16%)	Wo Tx Wt Hs	0.000686	(3; 0.89%)
Ts Hs	0.000237	(1; 0.44%)	Wa Hs	0.000319	(1; 0.15%)	Bc Mp Lp Fw I	0.000661	(4; 0.85%)
Bk Hs	0.000226	(1; 0.42%)	In Hs	0.000305	(1; 0.14%)	Bc Mp De Hs	0.000598	(3; 0.77%)
Pr Hs	0.000226	(1; 0.42%)	Ps Hs	0.000276	(1; 0.13%)	Wa Hs	0.000537	(1; 0.69%)
Wa Hs	0.000224	(1; 0.42%)	Sf Bk Hs	0.000229	(2; 0.1%)	Bc Mp Ho Bs I	0.000513	(4; 0.66%)
Pl Hs	0.00022	(1; 0.41%)	Os Hs	0.000225	(1; 0.1%)	Dc Dp Hs	0.000505	(2; 0.65%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.320 ±0.005	(±1.5%)
Downstream	0.036 ±0.002	(±4.9%)

Sector 8701: Community Care (Cs)

Child care and other community care services

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of greenhouse emissions, water use and land disturbance are 15%, 55% and 75% below the economy wide averages respectively. Two of the social indicators, employment generation and income are 80% and 30% higher than average while government revenue is 20% below average. The financial indicators of operating surplus and exports are 35% and 55% below average respectively. While the import penetration indicator is 20% below average this is still relatively high for a domestically based service sector and may reflect the repatriation of disability pensions to overseas countries or licensing fees sent offshore. Key future issues for the sector are the ageing realities of Australia's population and the intergenerational waves of childbirths based on echoes from the early baby booms. While many innovations in medical and caring technologies are expected, social innovation should focus on integrating all ages into functional communities and ensuring that home and suburban infrastructure facilitates community care of children, the aged and the infirm.

Sector Description

The community care sector includes residential care for aged and infirm persons, social support and childcare which respectively contribute 60%, 20% and 11% of the $11 billion in annual expenditure (which grew 25% over the last five years). There is a strong trend towards privatisation of service delivery which is still funded in the main by government. Over 1 500 000 children under the age of 12 years access either formal or informal childcare services each week and the trend has been increasing since the early 1990s reflecting changing patterns of work and carer responsibility. There is also a strong ethos of unaccounted volunteer work alongside the formally accounted sector, with over four million people working without pay for three or more hours per week.

Place of Industry in the Economy

The sector ranks 36th out of 135 in terms of value adding in the economy and contributes 0.59% of GDP in this analysis. By way of comparison, it is similar in size to the sugar refining, beef cattle and money market sectors. The sector is a relatively large employer with 119 000 employment years used directly or 1.7% of national total. In addition, 47 000 years are required in upstream suppliers giving total of 166 000 employment years. The sector also contributes 4 000 employment years to downstream industries. The sector has moderate resource requirements with over one percent of energy use and greenhouse emissions and one half of one percent of water use and land disturbance.

Strategic Overview

The strategic overview portrayed in the spider diagram shows a sector with excellent outcomes in the social indicators of employment generation and income, and two of the four environmental indicators of water use and land disturbance. The energy use and greenhouse emissions are near average which is surprising for a service sector but may be due to the sector's provision of care, comfort and meal service, all of which have a relatively high embodied content of electricity. Two indicators lie well outside the average: operating surplus and export propensity. By its nature and function, the sector traditionally has a high proportion of not-for-profit organisations providing services, although the aged care and childcare components are increasingly being serviced by private firms and publicly listed companies. Future analyses may see a change in the surplus and government revenue indicators because of privatisation and the trend towards user pays.

TBL Account #1

The financial surplus for the community care sector is 35% below economy wide average and only one fifth of this is a direct effect with first order effects such as communications, electricity generation, business services and wholesale trade making substantial contributions. The employment generation indicator is one of the highest in this analysis being 80% greater than average and three quarters of this is a direct effect. For a service sector the greenhouse emissions are surprisingly high, being 15% below average. About one tenth of this is a direct effect with the remainder in the chain of suppliers. The lower than average financial surplus could be characterised as being symptomatic of a dependent nation. However in the alternative, it could be seen as a strength which generates high levels of employment in support of a civil society.

TBL Accounts #2 and #3

The second TBL account shows the financial indicator of export propensity as 55% below average, the social indicator of income 30% above average and water use 55% below average. The third TBL account shows that import penetration is 25% below average, government revenue is 20% below average and land disturbance is 75% below average.

Structural Path Analysis and Linkages

The energy use and greenhouse emission indicators are high for a service sector (although still near average). An examination of the structural pathway for emissions shows that electricity generation (32%) is the largest component and that 13% is due to direct within sector use, mostly from vehicle use. The emissions indicator could be improved through choosing lower carbon electricity from gas turbine generators, hydro or distributed fuel cells. A range of first order effects is also important such as gas production and distribution (10%), lime and cement (3%) and garbage disposal (2%).

Increased consumer demand for the sector's services provide a stronger than average stimulus to its upstream suppliers, such as electricity generation, wholesale trade, communications, property development, legal and marketing, and business services. Decisions to invest into the sector show extremely weak downstream linkages as most of the effect is dissipated to private consumption.

Future Trends in Sector

The most obvious domestic issue for the sector is the interaction of the key demographic variables with requirement for services. Although birth rates are declining, there will still be intergenerational peaks and troughs of childcare requirements caused by declining echoes of the baby-boom years and the demographic characteristics of the mothers. The ageing population will require increased levels of care, but better health, self funded retirement and a preference to stay at home might radically change the nature of the service provision. Issues such as depression and dementia provide large uncertainties which may be ameliorated by medical technologies or societal innovations.

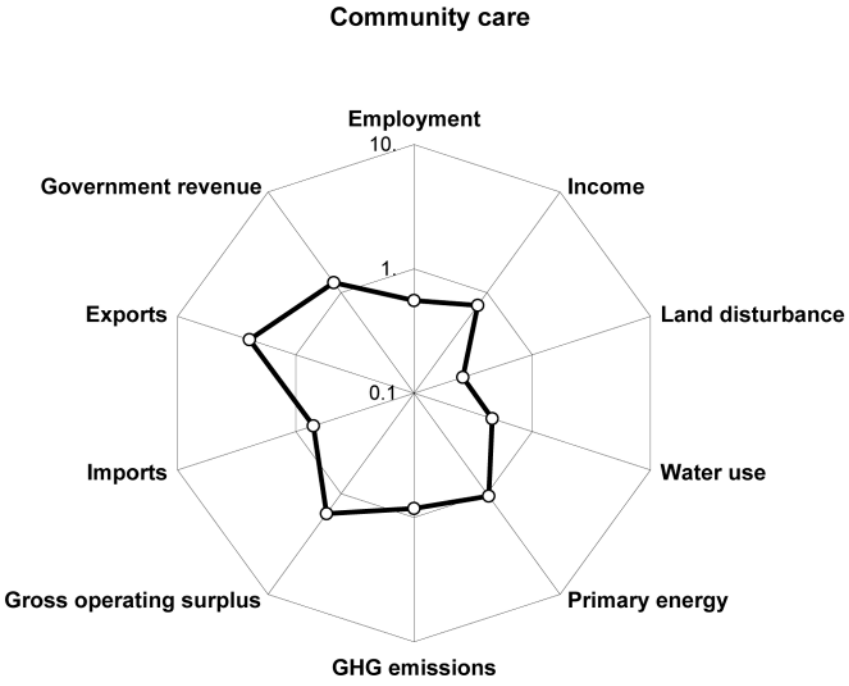
Innovation and Technical Opportunities

This sector faces open ended expectations of the amount and diversity of the services it provides. Innovations must be generated at a more systemic whole economy level if significant long term impacts on the size of the caring task and its quality are to happen. Some studies suggest that all ages be fully integrated into community life and that community care set the current and future framework for suburban function, rather than the real estate development focus of suburban planning today. Upstream innovations need to improve the suitability of the caring infrastructure and the occupational health and safety of the caring workforce. Inevitably most of these issues can be solved by an increased societal emphasis on, and investment into community caring. However the balance between societal self help and helplessness is a difficult one to manage.

Sector **Community care** **(Cs)**

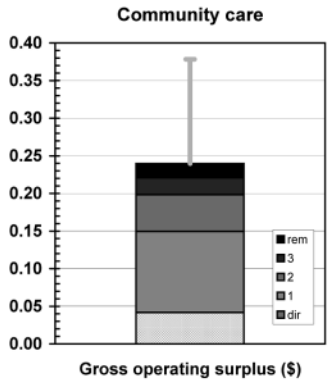
Child care and other community care services

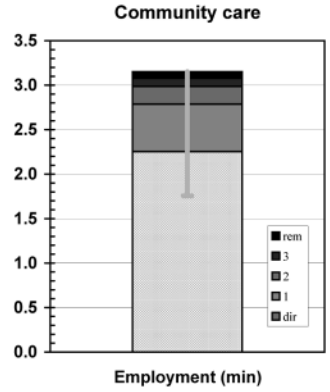
Spider diagram

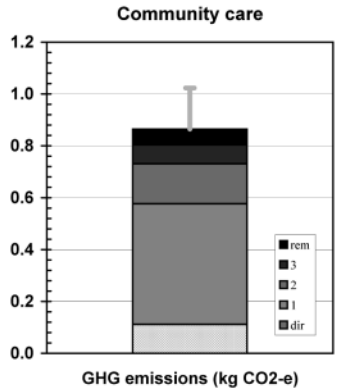


Bar graphs

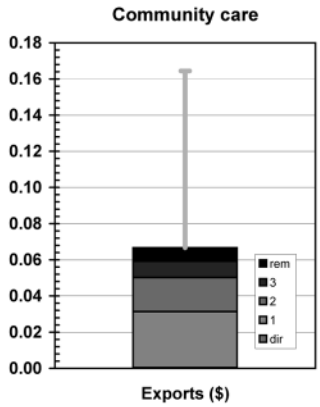
Account #1

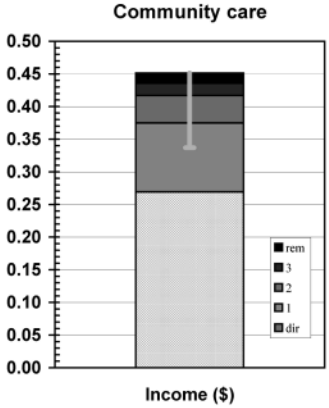


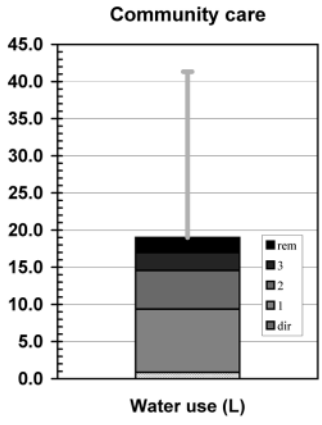




Account #2







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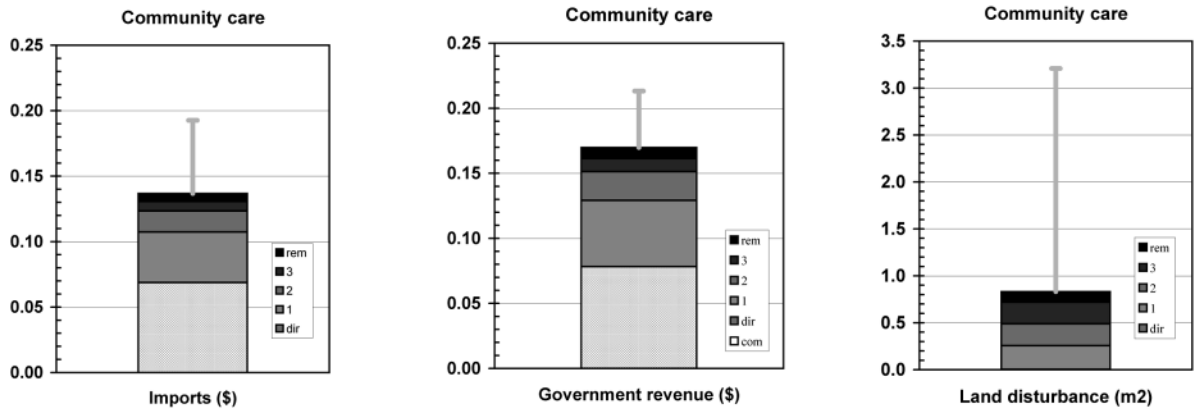


National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 4,932.7	(1.87% of total)	($m 4,932.3 domestically produced)
Government final consumption	$m 1,656.0	(1.87% of total)	($m 1,656.0 domestically produced)
Gross fixed capital expenditure	$m 4.3	(0.00% of total)	($m 4.3 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 6,592.9**	**(1.44% of GNE)**	**($m 6,592.5 domestically produced)**
Exports	$m 2.1	(0.00% of total)	($m 2.1 domestically produced)
Final demand	**$m 6,595.0**	**(1.22% of GNT)**	**($m 6,594.6 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 1,837.3	(1.08% of total)	
Gross operating surplus	$m 285.0	(0.15% of total)	
Taxes less subsidies	$m 533.6	(0.62% of total)	
Sectoral GDP*	**$m 2,655.8**	**(0.59% of GDP)**	
Imports	$m 469.1	(0.48% of total)	
Primary inputs	**$m 3,124.9**	**(0.57% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 285.0	(0.15%)	$m 275.4	(0.14%)	$m 1,581.2	(0.82%)
Exports ($m)	$m 2.1	(0.00%)	$m 2.0	(0.00%)	$m 439.7	(0.53%)
Imports ($m)	$m 469.1	(0.48%)	$m 453.2	(0.46%)	$m 901.8	(0.92%)
Employment (e-y)	123,200 e-y	(1.73%)	119,034 e-y	(1.67%)	166,534 e-y	(2.34%)
Income ($m)*	$m 1,837.3	(1.08%)	$m 1,775.1	(1.04%)	$m 2,977.4	(1.74%)
Government revenue ($m)†	$m 533.6	(0.49%)	$m 515.5	(0.48%)	$m 1,119.5	(1.04%)
GHG emissions (kt CO_2-e)	763 kt	(0.15%)	737 kt	(0.14%)	5,702 kt	(1.10%)
Water use (ML)	5,837 ML	(0.03%)	5,640 ML	(0.03%)	125,244 ML	(0.60%)
Land disturbance (kha)	3 kha	(0.00%)	3 kha	(0.00%)	549 kha	(0.34%)
Primary energy (TJ)	13,057 TJ	(0.34%)	12,616 TJ	(0.33%)	53,212 TJ	(1.37%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.04	0.24	0.38
Exports ($)	0.00	0.07	0.16
Imports ($)	0.07	0.14	0.19
Employment (min)	2.25	3.15	1.75
Income ($)	0.27	0.45	0.34
Government revenue ($)	0.08	0.17	0.21
GHG emissions (kg CO_2-e)	0.11	0.86	1.02
Water use (L)	0.86	18.99	41.32
Land disturbance (m^2)	0.00	0.83	3.21
Primary energy (MJ)	1.91	8.07	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Cs	0.0418	(0; 17.%)	Cs	2.25	(0; 71.%)	El Cs	0.273	(1; 32.%)
Cm Cs	0.014	(1; 5.8%)	Bs Cs	0.0932	(1; 3.%)	Cs	0.112	(0; 13.%)
El Cs	0.011	(1; 4.6%)	Cm Cs	0.0386	(1; 1.2%)	Gd Cs	0.0683	(1; 7.9%)
Bs Cs	0.00944	(1; 3.9%)	Wt Cs	0.0367	(1; 1.2%)	Bc Mp Cs	0.0199	(2; 2.3%)
Wa Cs	0.00774	(1; 3.2%)	Gd Cs	0.027	(1; 0.86%)	Ga Cs	0.0193	(1; 2.2%)
Wt Cs	0.0051	(1; 2.1%)	Ho Cs	0.0245	(1; 0.78%)	Ng Cs	0.0145	(1; 1.7%)
Ms Cs	0.00487	(1; 2.%)	Ms Cs	0.0218	(1; 0.69%)	Lm Cs	0.0136	(1; 1.6%)
Ts Cs	0.00484	(1; 2.%)	Ts Cs	0.0218	(1; 0.69%)	Ce Cs	0.0128	(1; 1.5%)
Pd Cs	0.0047	(1; 2.%)	Rd Cs	0.0183	(1; 0.58%)	Wo Cs	0.00959	(1; 1.1%)
Ng Cs	0.0032	(1; 1.3%)	Cl Cs	0.0174	(1; 0.55%)	Bl El Cs	0.00687	(2; 0.8%)
Rd Cs	0.00311	(1; 1.3%)	Gv Cs	0.0169	(1; 0.54%)	At Cs	0.00604	(1; 0.7%)
Ga Cs	0.00282	(1; 1.2%)	Ed Cs	0.0167	(1; 0.53%)	El Bs Cs	0.00575	(2; 0.67%)
Rh Cs	0.00273	(1; 1.1%)	Rh Cs	0.0167	(1; 0.53%)	Wt Cs	0.00509	(1; 0.59%)
St Cs	0.00248	(1; 1.%)	El Cs	0.0123	(1; 0.39%)	Rd Cs	0.00494	(1; 0.57%)
Ne Cs	0.00226	(1; 0.94%)	Pd Cs	0.0113	(1; 0.36%)	Bc Mp Ho Cs	0.00486	(3; 0.56%)
Ho Cs	0.00195	(1; 0.81%)	Wa Cs	0.00986	(1; 0.31%)	Wo Tx Cl Cs	0.00425	(3; 0.49%)
Bl El Cs	0.00176	(2; 0.73%)	Pr Cs	0.00896	(1; 0.28%)	Ch Cs	0.00361	(1; 0.42%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Wt Cs	0.00417	(1; 6.3%)	Cs	0.269	(0; 60.%)	Wa Cs	5.69	(1; 30.%)
Bl El Cs	0.00267	(2; 4.%)	Bs Cs	0.0114	(1; 2.5%)	El Cs	1.51	(1; 7.9%)
At Cs	0.00192	(1; 2.9%)	Cm Cs	0.00876	(1; 1.9%)	Dc Dp Cs	1.28	(2; 6.8%)
Cm Cs	0.00186	(1; 2.8%)	Wt Cs	0.00788	(1; 1.7%)	Cs	0.855	(0; 4.5%)
Bs Cs	0.00175	(1; 2.6%)	Gd Cs	0.00757	(1; 1.7%)	Ri Fc Cs	0.526	(2; 2.8%)
Cl Cs	0.00163	(1; 2.4%)	Ts Cs	0.0051	(1; 1.1%)	Bc Mp Cs	0.525	(2; 2.8%)
Ho Cs	0.00136	(1; 2.%)	Ms Cs	0.00508	(1; 1.1%)	Sc Cg Cs	0.412	(2; 2.2%)
Lg Cs	0.00118	(1; 1.8%)	Gv Cs	0.00424	(1; 0.94%)	Vf Cs	0.311	(1; 1.6%)
Rd Cs	0.00108	(1; 1.6%)	Pd Cs	0.00424	(1; 0.94%)	Wo Cs	0.31	(1; 1.6%)
En Cs	0.000903	(1; 1.4%)	Ed Cs	0.00414	(1; 0.92%)	Wa Bs Cs	0.285	(2; 1.5%)
Ac Cs	0.000876	(1; 1.3%)	Ho Cs	0.00358	(1; 0.79%)	Ws Ho Cs	0.179	(2; 0.94%)
Wo Cs	0.00085	(1; 1.3%)	El Cs	0.00332	(1; 0.74%)	Wa Pd Cs	0.128	(2; 0.68%)
Sg Cs	0.000818	(1; 1.2%)	Rd Cs	0.00314	(1; 0.7%)	Bc Mp Ho Cs	0.128	(3; 0.68%)
Mp Cs	0.000775	(1; 1.2%)	Wa Cs	0.00223	(1; 0.49%)	Cl Cs	0.126	(1; 0.66%)
Ts Cs	0.000768	(1; 1.2%)	Os Cs	0.00221	(1; 0.49%)	Wa Ms Cs	0.125	(2; 0.66%)
Ms Cs	0.000754	(1; 1.1%)	Cl Cs	0.00198	(1; 0.44%)	Su Fd Cs	0.119	(2; 0.63%)
Tx Cl Cs	0.000653	(2; 0.98%)	Hs Cs	0.00189	(1; 0.42%)	Dc Dp Ho Cs	0.106	(3; 0.56%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Cs	0.0687	(0; 50.%)	Cs	0.0782	(0; 46.%)	Wo Cs	0.23	(1; 28.%)
Cl Cs	0.00323	(1; 2.4%)	Cm Cs	0.00418	(1; 2.5%)	Bc Mp Cs	0.145	(2; 17.%)
Cm Cs	0.00239	(1; 1.7%)	Wt Cs	0.00368	(1; 2.2%)	Wo Tx Cl Cs	0.102	(3; 12.%)
Ac Cs	0.00235	(1; 1.7%)	Gd Cs	0.00351	(1; 2.1%)	Wo Tx Cs	0.0371	(2; 4.5%)
Bs Cs	0.00188	(1; 1.4%)	Bs Cs	0.00339	(1; 2.%)	Bc Mp Ho Cs	0.0354	(3; 4.3%)
Pr Cs	0.0016	(1; 1.2%)	Pd Cs	0.00278	(1; 1.6%)	Wo Tx Tp Cs	0.0195	(3; 2.3%)
Rh Cs	0.00141	(1; 1.%)	Ts Cs	0.00251	(1; 1.5%)	Wo Mp Cs	0.0164	(2; 2.%)
Ts Cs	0.00139	(1; 1.%)	Ms Cs	0.00241	(1; 1.4%)	Dc Dp Cs	0.00665	(2; 0.8%)
Wt Cs	0.00118	(1; 0.87%)	Rd Cs	0.00223	(1; 1.3%)	Gd Cs	0.00642	(1; 0.77%)
Wa Cs	0.00118	(1; 0.86%)	El Cs	0.00207	(1; 1.2%)	Wh Fc Cs	0.00455	(2; 0.55%)
Ms Cs	0.00111	(1; 0.81%)	Ho Cs	0.00188	(1; 1.1%)	El Cs	0.00441	(1; 0.53%)
Fo Cs	0.0011	(1; 0.81%)	Wa Cs	0.00167	(1; 0.98%)	Bc Mp Of Cs	0.00405	(3; 0.49%)
Ne Cs	0.00109	(1; 0.8%)	Ed Cs	0.00152	(1; 0.89%)	Wo Mp Ho Cs	0.00399	(3; 0.48%)
En Cs	0.00105	(1; 0.77%)	Gv Cs	0.00148	(1; 0.87%)	Cs	0.0038	(0; 0.46%)
Ap Cs	0.001	(1; 0.73%)	In Cs	0.00136	(1; 0.8%)	Bc Mp Cl Cs	0.00361	(3; 0.43%)
Ho Cs	0.000909	(1; 0.66%)	Os Cs	0.00102	(1; 0.6%)	Wh Ac Cs	0.00358	(2; 0.43%)
Rd Cs	0.000788	(1; 0.58%)	Bk Cs	0.000912	(1; 0.54%)	Bc Mp De Cs	0.00319	(3; 0.38%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	1.127 ±0.015	(±1.3%)
Downstream	0.061 ±0.001	(±2.2%)

Sector 9101: Motion Picture, Radio and Television (Et)

Motion picture, film hiring, radio and television services

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of greenhouse emissions, water use and land disturbance are 70% to 95% below economy wide averages. The social indicator of employment generation is 5% below average, income is 10% below average and government revenue is 35% below average. The financial indicators reveal that operating surplus is 10% below average, export propensity is 50% below average and import penetration is equal to average. In absolute financial terms, the sector's imports are four times its exports. The future of the sector seems dependent upon the convergence of a range of communication technologies and the transfer from analogue to digital transmission methods. The internet in particular may challenge television as the primary conduit for societal norms and future outcomes of the competition between these two are uncertain. Some bleak views of full technological integration suggest it could lead to societal failure brought on by a combination of energy shocks, societal vandalism and consumer saturation, which lead to less tractable governance where diversity of information provision ceases.

Sector Description

Traditional television and radio production and transmission dominate this sector. There are 48 private sector free-to-air television stations, seven pay television stations and two public television stations. There are 261 radio broadcasters comprising 103 commercial companies, 121 community broadcasters and 37 other types. For film and video production there are over 2 000 businesses making television programs, commercials, supplying production services and undertaking post production and film laboratory services. There are 58 businesses engaged in film and video distribution. There are over 1 500 cinema screens in Australia and each year there are over 80 million paid admissions to view films. All broadcasters in Australia adhere to domestic content quotas of more than 55% between 6.00 a.m. and midnight.

Place of Industry in the Economy

The sector is a moderate sized one in terms of value adding within the economy ranking 42nd out of 135 sectors and generating 0.47% of GDP in this analysis. It is a relatively small sector in employment generation terms with 11 000 employment years directly involved in the sector, and another 7 000 years in the sector's upstream suppliers giving a total of 19 000 years. It also supplies 26 000 employment years to downstream sectors such as wholesale and retail trade, property development, marketing and sport and recreation. It has small resource requirements with less than one tenth of one percent of water use, land disturbance, energy use and greenhouse emissions.

Strategic Overview

The integrated overview in the spider diagram shows the mixed TBL performance of this sector with below average performance for the financial indicators of export propensity and import penetration, and the social indicator of government revenue. For this sector, these indicators are closely linked because of the globalised nature of media and entertainment, particularly in motion pictures and television. The domestic market and locally produced content lacks the market scale to compete against the marginal programming costs of imported films and shows. Television has content rules to help balance the competition between the domestic minnows and the global giants.

TBL Account #1

The financial indicator of surplus is 10% below average and the sector itself is directly responsible for two thirds of the effect with the sports, marketing and communications sectors contributing 6% in first order effects. The social indicator of employment generation is 5% below average with a composition of effect similar to the surplus. The environmental indicator of greenhouse emissions is 75% below average with a direct effect of 5% and a range of first order to third order effects responsible for most of the indicator. The largest are electricity production (25%), a range of food production effects (6%) and airline travel (2%). Greenhouse performance could be improved by sourcing electricity directly from low-emission sources.

TBL Accounts #2 and #3

In the second TBL account, the export indicator is 50% below average, the income indicator 10% below average and the water indicator is 70% below average. For the third TBL account, imports are equal to average, government revenue is 35% below average and land disturbance is 95% below average. The export propensity and import penetration indicators may require further attention.

Structural Path Analysis and Linkages

The below average import and export indicators, and the dominance of imports over exports, warrant further inspection. Three quarters of the import indicator is a direct effect and presumably reflects the imports of overseas programming content and various licensing fees. The rest of the import chain is a long list of minor contributions from sectors such as sport, marketing, camera and electronic equipment and recorded media. Exports are similar with a direct effect of 44% presumably derived from domestically produced programs and films. First order effects that could help increase the export indicator include wholesale trade, airline travel, sport and marketing.

Increases in consumer demand provide weak upstream effects to the sector's suppliers as it is essentially a self supplying sector. However there is some stimulus for wholesale trade, property development, marketing and sport and recreation. Decisions to invest into the sector show strong downstream linkages and require that wholesale and retail trade, property development, computer services, marketing, and sport and recreation also increase to dissipate the effect of the investment.

Future Trends in Sector

The entertainment requirements for the older and relatively affluent demographic are relatively under-researched currently and have important implications for this sector. Under the base scenario in the *Future Dilemmas* study, the domestic population will grow to 25 million (+25%) people by 2050 and most of this growth will occur within, or on the edge of current cities. Most importantly over one quarter of these people will be over 65 years of age (13% currently), while the number of younger people will be less but remain relatively stable.

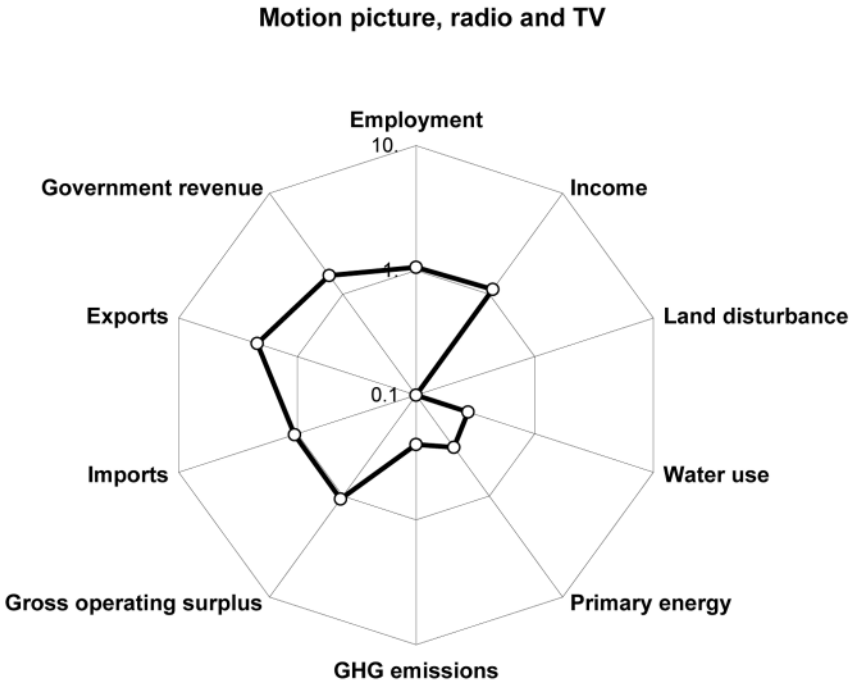
Innovation and Technical Opportunities

The future of television is seen to be governed by the current cohort of young people, who on average spend eight hours daily involved with media devices (television, video, games, music CDs, internet) in the US, and five hours in Australia. While the technological future seems destined to embrace a full integration of all communication devices, there are concerns that this could lead to catastrophic societal failure if energy systems become fragile and erratic. The internet is seen by many media specialists as reducing television's pre-eminence as the mirror of societal norms and could transfer power to different parts of society with uncertain positive and negative outcomes. Changes in the nature of work and leisure could drive substantial but unpredictable change and increasing technological sophistication may not ensure the future of the status quo.

Sector **Motion picture, radio and TV** **(Et)**

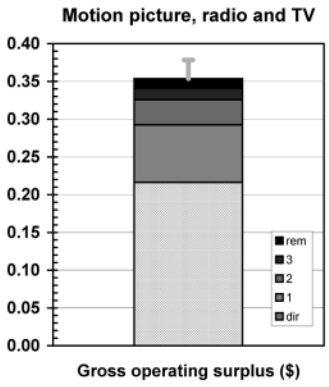
Motion picture, film hiring, radio and television services

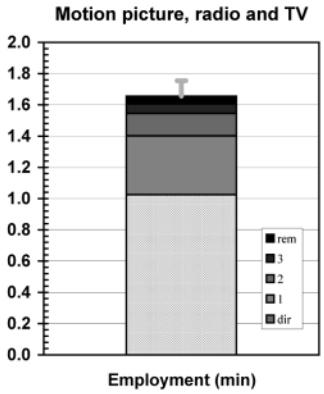
Spider diagram

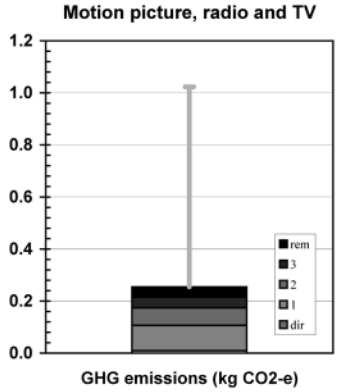


Bar graphs

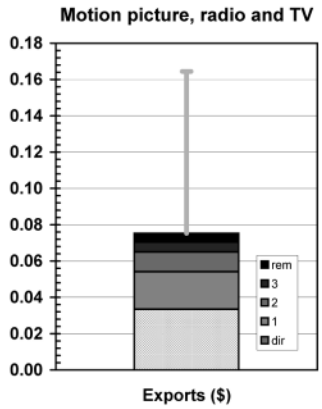
Account #1

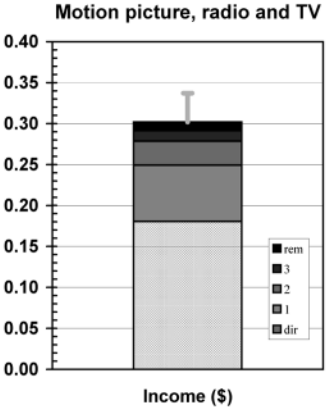


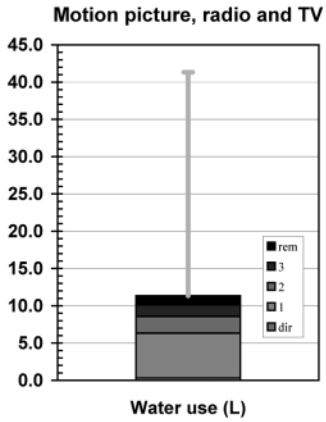




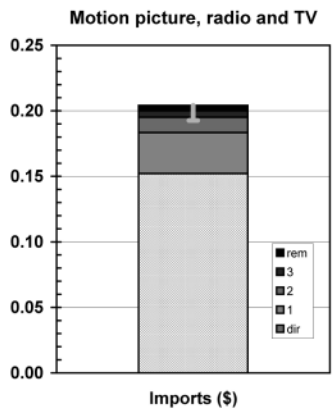
Account #2

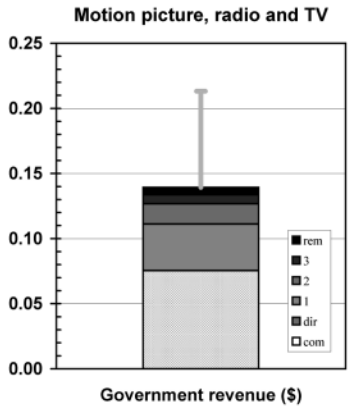


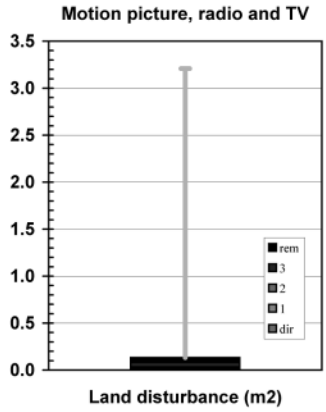




Account #3







National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 472.8	(0.18% of total)	($m 446.5 domestically produced)
Government final consumption	$m 530.0	(0.60% of total)	($m 530.0 domestically produced)
Gross fixed capital expenditure	$m 203.4	(0.19% of total)	($m 203.4 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 1,206.2**	**(0.26% of GNE)**	**($m 1,179.9 domestically produced)**
Exports	$m 149.8	(0.18% of total)	($m 149.8 domestically produced)
Final demand	**$m 1,356.0**	**(0.25% of GNT)**	**($m 1,329.6 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 807.8	(0.47% of total)	
Gross operating surplus	$m 967.4	(0.50% of total)	
Taxes less subsidies	$m 337.6	(0.40% of total)	
Sectoral GDP*	**$m 2,112.8**	**(0.47% of GDP)**	
Imports	$m 680.9	(0.70% of total)	
Primary inputs	**$m 2,793.7**	**(0.51% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 967.4	(0.50%)	$m 287.4	(0.15%)	$m 470.1	(0.25%)
Exports ($m)	$m 149.8	(0.18%)	$m 44.5	(0.05%)	$m 100.1	(0.12%)
Imports ($m)	$m 680.9	(0.70%)	$m 202.3	(0.21%)	$m 271.4	(0.28%)
Employment (e-y)	36,775 e-y	(0.52%)	10,928 e-y	(0.15%)	17,643 e-y	(0.25%)
Income ($m)*	$m 807.8	(0.47%)	$m 240.0	(0.14%)	$m 401.3	(0.23%)
Government revenue ($m)†	$m 337.6	(0.31%)	$m 100.3	(0.09%)	$m 185.2	(0.17%)
GHG emissions (kt CO_2-e)	41 kt	(0.01%)	12 kt	(0.00%)	338 kt	(0.07%)
Water use (ML)	1,296 ML	(0.01%)	385 ML	(0.00%)	15,079 ML	(0.07%)
Land disturbance (kha)	1 kha	(0.00%)	0 kha	(0.00%)	18 kha	(0.01%)
Primary energy (TJ)	591 TJ	(0.02%)	176 TJ	(0.00%)	3,349 TJ	(0.09%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.22	0.35	0.38
Exports ($)	0.03	0.08	0.16
Imports ($)	0.15	0.20	0.19
Employment (min)	1.03	1.66	1.75
Income ($)	0.18	0.30	0.34
Government revenue ($)	0.08	0.14	0.21
GHG emissions (kg CO_2-e)	0.01	0.25	1.02
Water use (L)	0.29	11.34	41.32
Land disturbance (m^2)	0.00	0.13	3.21
Primary energy (MJ)	0.13	2.52	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Et	0.216	(0; 61.%)	Et	1.03	(0; 62.%)	El Et	0.063	(1; 25.%)
Rs Et	0.00841	(1; 2.4%)	Rs Et	0.0393	(1; 2.4%)	Et	0.00919	(0; 3.6%)
Ms Et	0.00697	(1; 2.%)	Ms Et	0.0313	(1; 1.9%)	Vf Et	0.00782	(1; 3.1%)
Cm Et	0.00433	(1; 1.2%)	Wt Et	0.0235	(1; 1.4%)	At Et	0.00508	(1; 2.%)
Vf Et	0.00404	(1; 1.1%)	Vf Et	0.02	(1; 1.2%)	Fr Vf Et	0.00467	(2; 1.8%)
Wt Et	0.00326	(1; 0.92%)	Bs Et	0.0183	(1; 1.1%)	El Rs Et	0.00338	(2; 1.3%)
Pd Et	0.00305	(1; 0.86%)	Ps Et	0.0137	(1; 0.82%)	Wt Et	0.00325	(1; 1.3%)
El Et	0.00255	(1; 0.72%)	Cu Et	0.0128	(1; 0.77%)	Rd Et	0.00325	(1; 1.3%)
Sg Et	0.00239	(1; 0.68%)	Ho Et	0.0124	(1; 0.75%)	El Ms Et	0.00292	(2; 1.1%)
Bk Et	0.00237	(1; 0.67%)	Rd Et	0.012	(1; 0.73%)	Bc Mp Ho Et	0.00246	(3; 0.97%)
Ne Et	0.00222	(1; 0.63%)	Cm Et	0.012	(1; 0.72%)	Sg Et	0.00188	(1; 0.74%)
Rd Et	0.00204	(1; 0.58%)	Bk Et	0.0094	(1; 0.57%)	El Ho Et	0.00162	(2; 0.64%)
Bs Et	0.00185	(1; 0.52%)	Fm Et	0.00869	(1; 0.52%)	Bl El Et	0.00159	(2; 0.62%)
Rv Et	0.00131	(1; 0.37%)	Ne Et	0.00752	(1; 0.45%)	El Pd Et	0.00145	(2; 0.57%)
Cu Et	0.00123	(1; 0.35%)	Pd Et	0.00732	(1; 0.44%)	Is Fm Et	0.00126	(2; 0.5%)
Wa Et	0.00118	(1; 0.33%)	Rh Et	0.00604	(1; 0.36%)	Fr Et	0.00113	(1; 0.44%)
Fn Et	0.00106	(1; 0.3%)	Pr Et	0.00506	(1; 0.31%)	El Bs Et	0.00113	(2; 0.44%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Et	0.0335	(0; 44.%)	Et	0.181	(0; 60.%)	Vf Et	4.18	(1; 37.%)
Wt Et	0.00267	(1; 3.5%)	Ms Et	0.00727	(1; 2.4%)	Wa Et	0.864	(1; 7.6%)
At Et	0.00162	(1; 2.1%)	Rs Et	0.00525	(1; 1.7%)	Sc Cg Vf Et	0.434	(3; 3.8%)
Rs Et	0.00148	(1; 2.%)	Wt Et	0.00504	(1; 1.7%)	Vf Rs Et	0.352	(2; 3.1%)
Vf Et	0.00122	(1; 1.6%)	Pd Et	0.00275	(1; 0.91%)	El Et	0.348	(1; 3.1%)
Sg Et	0.00119	(1; 1.6%)	Cm Et	0.00272	(1; 0.9%)	Et	0.29	(0; 2.6%)
Ms Et	0.00108	(1; 1.4%)	Cu Et	0.00235	(1; 0.78%)	Wa Ms Et	0.179	(2; 1.6%)
En Et	0.000983	(1; 1.3%)	Bk Et	0.00232	(1; 0.77%)	Cu Et	0.177	(1; 1.6%)
Oe Et	0.000728	(1; 0.97%)	Bs Et	0.00224	(1; 0.74%)	Rs Et	0.172	(1; 1.5%)
Rd Et	0.000711	(1; 0.94%)	Rd Et	0.00207	(1; 0.68%)	Su Fd Et	0.101	(2; 0.89%)
Ho Et	0.000689	(1; 0.91%)	Ho Et	0.00181	(1; 0.6%)	Ws Ho Et	0.0902	(2; 0.8%)
Bl El Et	0.000616	(2; 0.82%)	Ne Et	0.00172	(1; 0.57%)	Wa Pd Et	0.0834	(2; 0.74%)
Cm Et	0.000578	(1; 0.77%)	Vf Et	0.00165	(1; 0.55%)	Bc Mp Ho Et	0.0647	(3; 0.57%)
Ee Et	0.000527	(1; 0.7%)	Fm Et	0.00136	(1; 0.45%)	Sg Et	0.0606	(1; 0.53%)
Fm Et	0.000448	(1; 0.59%)	In Et	0.00116	(1; 0.38%)	Wa Bs Et	0.0559	(2; 0.49%)
Bs Et	0.000343	(1; 0.46%)	Ps Et	0.00109	(1; 0.36%)	Dc Dp Ho Et	0.0537	(3; 0.47%)
Ne Et	0.000324	(1; 0.43%)	Hs Et	0.00106	(1; 0.35%)	Wa Rs Et	0.0484	(2; 0.43%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Et	0.152	(0; 75.%)	Et	0.0754	(0; 54.%)	Bc Mp Ho Et	0.0179	(3; 13.%)
Rs Et	0.00232	(1; 1.1%)	Rs Et	0.00456	(1; 3.3%)	Rs Et	0.0048	(1; 3.6%)
Ms Et	0.00159	(1; 0.78%)	Ms Et	0.00345	(1; 2.5%)	Vf Et	0.00394	(1; 3.%)
En Et	0.00114	(1; 0.56%)	Wt Et	0.00236	(1; 1.7%)	Bc Mp Et	0.00341	(2; 2.6%)
Ne Et	0.00107	(1; 0.52%)	Pd Et	0.0018	(1; 1.3%)	Wo Tx Et	0.00284	(2; 2.1%)
Vf Et	0.000995	(1; 0.49%)	Rd Et	0.00147	(1; 1.1%)	Wo Tx Tp Et	0.00239	(3; 1.8%)
Pr Et	0.000906	(1; 0.44%)	Cm Et	0.0013	(1; 0.93%)	Wo Tx Cl Et	0.0023	(3; 1.7%)
Wt Et	0.000758	(1; 0.37%)	Bk Et	0.00128	(1; 0.92%)	Wo Mp Ho Et	0.00202	(3; 1.5%)
Sg Et	0.000749	(1; 0.37%)	In Et	0.00124	(1; 0.89%)	Bc Mp Fd Et	0.00182	(3; 1.4%)
Cm Et	0.000741	(1; 0.36%)	Vf Et	0.00101	(1; 0.73%)	Bc Mp Ho Ms	0.00169	(4; 1.3%)
Cu Et	0.00061	(1; 0.3%)	Ho Et	0.000951	(1; 0.68%)	Et	0.00158	(0; 1.2%)
Fm Et	0.000588	(1; 0.29%)	Cu Et	0.000871	(1; 0.63%)	Fr Vf Et	0.0015	(2; 1.1%)
Pt Et	0.000519	(1; 0.25%)	Ne Et	0.000864	(1; 0.62%)	Ba Bm Ho Et	0.00146	(3; 1.1%)
Rd Et	0.000518	(1; 0.25%)	At Et	0.000724	(1; 0.52%)	Wh Vf Et	0.0012	(2; 0.91%)
Ee Et	0.000514	(1; 0.25%)	Bs Et	0.000664	(1; 0.48%)	El Et	0.00102	(1; 0.77%)
Rh Et	0.00051	(1; 0.25%)	Pr Et	0.00049	(1; 0.35%)	Wo Tx Wt Et	0.000836	(3; 0.63%)
At Et	0.000482	(1; 0.24%)	El Et	0.000478	(1; 0.34%)	Wh Fd Et	0.000794	(2; 0.6%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.773 ±0.012	(±1.5%)
Downstream	1.467 ±0.028	(±1.9%)

Sector 9201: Libraries, Museums and Arts (Cu)

Libraries, zoological and botanical gardens, recreational parks, museums, art galleries, creative arts, sound recording, performing arts, news reporting

Short Summary

Against the metric of one dollar of final demand, the environmental indicators of greenhouse emissions, water use and land disturbance are respectively 85%, 25% and 95% below economy wide average. Most of the greenhouse emissions and land disturbance effect are indirect while water use is mostly direct and a function of water used in botanical gardens, recreational parks and zoos. The social indicators of employment generation and income are 30% and 25% above average respectively. The employment indicator reflects the sector's labour intensive nature while the income indicator reflects the skill levels required. However there is also a high level of volunteer and unpaid work that is not included in the national accounts. The third social indicator of government revenue is 20% below average reflecting the sector's position as a social investment which helps underpin a civil society, rather than being a for-profit business. Two financial indicators of operating surplus and export propensity are below average but the requirement for imports is low. There are two key issues for the future. Firstly, the degree to which Australia's ageing population stays interested in the performing arts is important since 25% or more of the population may be over 65 years of age by 2050. Secondly, technology is a double-edged sword that may make the arts more accessible, or saturate patrons with digital overload. Counter intuitively, there could be a swing back to live performance with real people and original material.

Sector Description

This is a broadly based cultural sector encompassing the performing and natural arts. There are nearly 1 500 organisations in performing arts and the total income is derived almost equally from box office sales and government funding. There are 2 000 museums, 1 500 libraries, 600 commercial art galleries, 190 sound recording studios and 123 botanic gardens. Yearly patronage is difficult to ascertain in total, but museums have 28 million admissions, botanic gardens have 12 million visits, and libraries have 100 million visits to access the 55 million items they hold in stock.

Place of Industry in the Economy

The sector is in the top half of value adding sectors in the economy ranking 47th out of 135 sectors and contributing 0.41% of GDP in this analysis. It is similar in value adding to iron ores, meat products and sheep and shorn wool. It is a moderate generator of employment with 34 000 employment years directly embodied in sector operations and is responsible for a further 7 000 employment years in upstream supplying sectors. It contributes 9 000 employment years to downstream sectors. The sector has a small requirement for resources being responsible for less than one tenth of one percent of land disturbance, energy use and greenhouse emissions. Its water requirements are a little higher, at three tenths of one percent of national water use.

Strategic Overview

The spider diagram portrays good outcomes for all environmental variables and two social indicators of employment generation and income. There are three outliers of government revenue, export propensity and operating surplus. There is a case for grouping the sector with education, health and community care and viewing it as an investment into a civil society rather than a cost.

TBL Account #1

The financial indicator of operating surplus is 25% below economy wide average and two thirds of this is a direct sector effect. The rest resides in first order suppliers such as banking (6%), communications (1%), financial market providers (1%), printed and recorded media (1%) and marketing (1%). The social indicator of employment generation is 30% greater than average. The environmental indicator of greenhouse emissions is 85% below average and most of the effect is located in suppliers such as electricity production, airlines, road transport, and wholesale trade.

TBL Accounts #2 and #3

The second TBL account shows export propensity 60% below average, income 25% above average and water use 25% below average. The third TBL account shows import penetration 35% below average, government revenue 20% below average and negligible land disturbance.

Structural Path Analysis and Linkages

The sector's high visibility gives it a large potential to encourage change in urban society. While water use is below average, an examination of the structural path shows that 85% of the water is used directly, presumably within sub-sectors such as zoos, botanical gardens, and recreational parks. It is now commonplace for much of this amenity water to be recycled in the case of zoos, or mined from urban sewage in the case of gardens and parks and these uses can showcase the technologies. Below average exports is an accounting anomaly driven by a general freeloading tendency where travel, transportation and accommodation benefit from, but do not transact with the cultural sector.

Increases in consumer demand show relatively weak upstream effects as most of the stimulus is captured by the performing arts industry itself. However there are specific stimuli for the banking, property development and marketing sectors. Decisions to invest into the sector show relatively weak downstream linkages with most of the effect dissipated to private consumption. However accommodation, printed and recorded media, and marketing need to expand to dissipate the effect.

Future Trends in Sector

While the *Future Dilemmas* study did not specifically model the cultural sectors, the infrastructure class of 'institutions' was simulated to double in size out to 2050 due to both population growth (+25%) and per capita demand (+30%), the latter being highly uncertain. There is more certainty around population ageing with at least one quarter of the population being over 65 years of age in 2050. For households in the period 2020 to 2050, there will be relative stability in the numbers of young, medium young and mature households, while older households will triple in number over this period. The participation in cultural pursuits by the older households will depend on their discretionary spending power, and the extent to which their situation, health, and perceptions of personal security will allow them out of the house to attend performances and exhibitions.

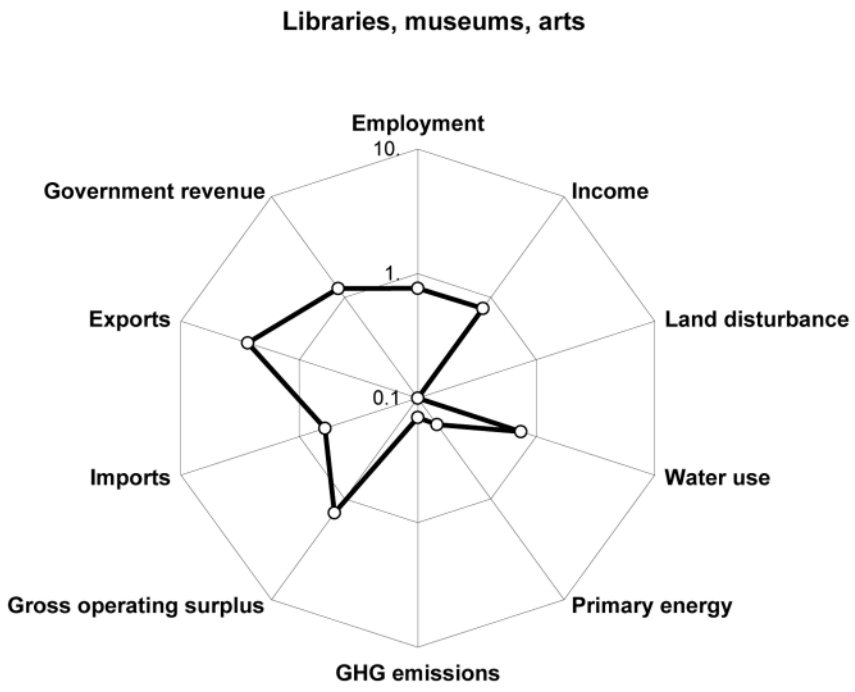
Innovation and Technical Opportunities

This sector occupies the ground between technological progress and personal and cultural awareness. As lifestyle enabling technologies become more pervasive, service markets may shift from the 'functional and technological' to 'aesthetic and cultural' to 'authentic and original'. The cultural performance market could become a rapidly changing and continuously regrouping element requiring a mixture of trade, gastronomy, services and entertainment. Technical opportunities may saturate when painting, music, theatre shows or zoos can all be digitally accessed in the living room. Technology may improve the curatorial and educational task of libraries, museums and art galleries. Zoos and botanical gardens may buffer the world against species extinctions but face risks from novel diseases. Future music appreciation may be live and original, rather than digital and perfect.

Sector **Libraries, museums, arts** **(Cu)**

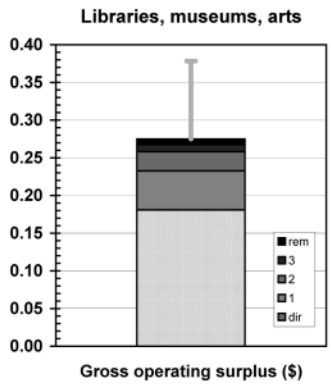
Libraries, zoological and botanical gardens, recreational parks, museums, art galleries, creative arts, sound recording, performing arts, news reporting

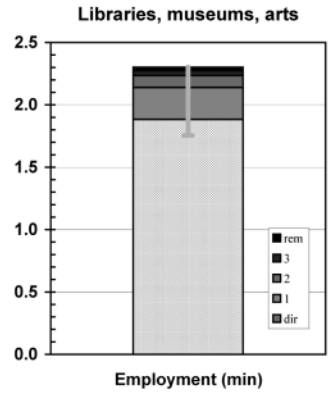
Spider diagram

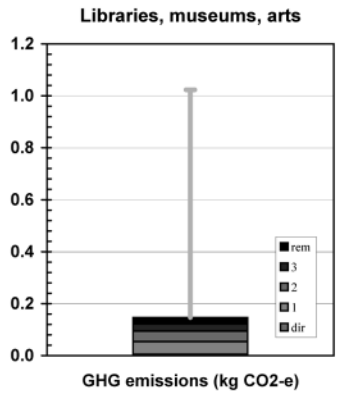


Bar graphs

Account #1







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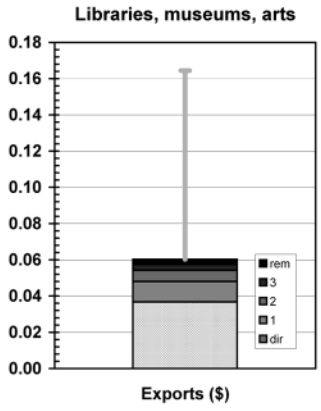

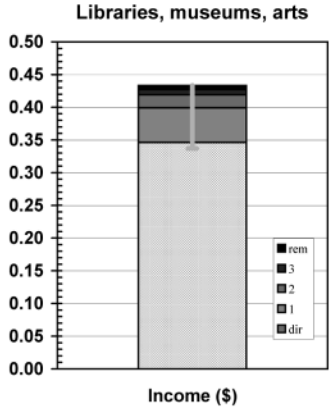

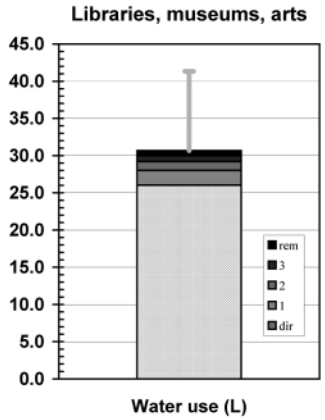

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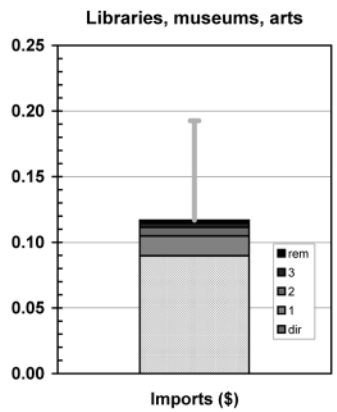
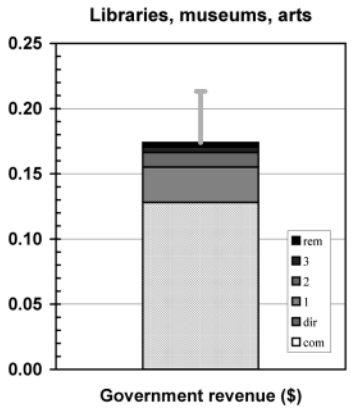
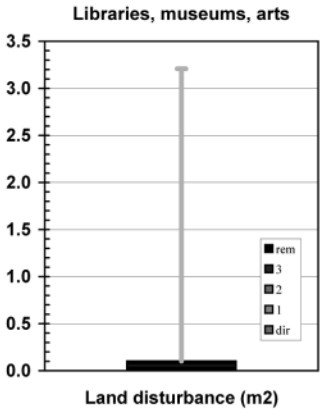






National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 1,129.2	(0.43% of total)	($m 1,085.3 domestically produced)
Government final consumption	$m 988.6	(1.12% of total)	($m 988.6 domestically produced)
Gross fixed capital expenditure	$m 42.8	(0.04% of total)	($m 39.5 domestically produced)
Net changes in stocks	$m 4.5	(0.26% of total)	($m 4.2 domestically produced)
Sectoral GNE	**$m 2,165.2**	**(0.47% of GNE)**	**($m 2,117.5 domestically produced)**
Exports	$m 103.0	(0.12% of total)	($m 103.0 domestically produced)
Final demand	**$m 2,268.1**	**(0.42% of GNT)**	**($m 2,220.5 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 970.5	(0.57% of total)	
Gross operating surplus	$m 507.2	(0.26% of total)	
Taxes less subsidies	$m 359.0	(0.42% of total)	
Sectoral GDP*	**$m 1,836.8**	**(0.41% of GDP)**	
Imports	$m 251.6	(0.26% of total)	
Primary inputs	**$m 2,088.4**	**(0.38% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 507.2	(0.26%)	$m 401.7	(0.21%)	$m 610.7	(0.32%)
Exports ($m)	$m 103.0	(0.12%)	$m 81.5	(0.10%)	$m 133.8	(0.16%)
Imports ($m)	$m 251.6	(0.26%)	$m 199.3	(0.20%)	$m 259.4	(0.27%)
Employment (e-y)	42,300 e-y	(0.59%)	33,497 e-y	(0.47%)	40,961 e-y	(0.57%)
Income ($m)*	$m 970.5	(0.57%)	$m 768.5	(0.45%)	$m 962.3	(0.56%)
Government revenue ($m)†	$m 359.0	(0.33%)	$m 284.3	(0.26%)	$m 386.3	(0.36%)
GHG emissions (kt CO_2-e)	13 kt	(0.00%)	11 kt	(0.00%)	325 kt	(0.06%)
Water use (ML)	72,971 ML	(0.35%)	57,785 ML	(0.28%)	68,091 ML	(0.33%)
Land disturbance (kha)	5 kha	(0.00%)	4 kha	(0.00%)	23 kha	(0.01%)
Primary energy (TJ)	196 TJ	(0.01%)	155 TJ	(0.00%)	3,108 TJ	(0.08%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.18	0.28	0.38
Exports ($)	0.04	0.06	0.16
Imports ($)	0.09	0.12	0.19
Employment (min)	1.88	2.30	1.75
Income ($)	0.35	0.43	0.34
Government revenue ($)	0.13	0.17	0.21
GHG emissions (kg CO_2-e)	0.00	0.15	1.02
Water use (L)	26.02	30.66	41.32
Land disturbance (m^2)	0.02	0.10	3.21
Primary energy (MJ)	0.07	1.40	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Cu	0.181	(0; 66.%)	Cu	1.88	(0; 82.%)	El Cu	0.0304	(1; 21.%)
Bk Cu	0.0125	(1; 4.5%)	Bk Cu	0.0495	(1; 2.2%)	Cu	0.00479	(0; 3.3%)
Sf Bk Cu	0.00436	(2; 1.6%)	Bs Cu	0.024	(1; 1.%)	El Bk Cu	0.00287	(2; 2.%)
Cm Cu	0.00351	(1; 1.3%)	Ms Cu	0.0149	(1; 0.65%)	At Cu	0.00246	(1; 1.7%)
Fn Cu	0.00341	(1; 1.2%)	Fn Cu	0.0136	(1; 0.59%)	Rd Cu	0.00159	(1; 1.1%)
Ne Cu	0.00339	(1; 1.2%)	Ne Cu	0.0115	(1; 0.5%)	Vf Cu	0.00153	(1; 1.%)
Ms Cu	0.00332	(1; 1.2%)	Wt Cu	0.011	(1; 0.48%)	Wt Cu	0.00152	(1; 1.%)
Bs Cu	0.00244	(1; 0.89%)	Et Cu	0.00994	(1; 0.43%)	El Bs Cu	0.00148	(2; 1.%)
Et Cu	0.0021	(1; 0.76%)	Cm Cu	0.00971	(1; 0.42%)	Fd Cu	0.00144	(1; 0.98%)
Ts Cu	0.00178	(1; 0.65%)	Ed Cu	0.0091	(1; 0.4%)	El Ms Cu	0.00139	(2; 0.95%)
Pd Cu	0.00163	(1; 0.59%)	Pr Cu	0.00806	(1; 0.35%)	El Rf Cu	0.00134	(2; 0.92%)
Wt Cu	0.00152	(1; 0.55%)	Ts Cu	0.00801	(1; 0.35%)	Rf Cu	0.00133	(1; 0.91%)
Sf Fn Cu	0.00136	(2; 0.49%)	Rh Cu	0.00696	(1; 0.3%)	Bc Mp Ho Cu	0.00131	(3; 0.89%)
El Cu	0.00123	(1; 0.45%)	Ho Cu	0.0066	(1; 0.29%)	Ne Cu	0.00124	(1; 0.85%)
Rh Cu	0.00114	(1; 0.41%)	Rd Cu	0.00588	(1; 0.26%)	Sw Pp Cu	0.000994	(2; 0.68%)
Rd Cu	0.001	(1; 0.36%)	Sf Bk Cu	0.00566	(2; 0.25%)	Pp Cu	0.00097	(1; 0.66%)
Pr Cu	0.000962	(1; 0.35%)	Ps Cu	0.00476	(1; 0.21%)	Fr Vf Cu	0.000914	(2; 0.62%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Cu	0.0367	(0; 61.%)	Cu	0.346	(0; 80.%)	Cu	26.0	(0; 85.%)
Wt Cu	0.00124	(1; 2.1%)	Bk Cu	0.0122	(1; 2.8%)	Vf Cu	0.817	(1; 2.7%)
Bk Cu	0.000971	(1; 1.6%)	Ms Cu	0.00346	(1; 0.8%)	Wa Cu	0.622	(1; 2.%)
At Cu	0.000784	(1; 1.3%)	Bs Cu	0.00295	(1; 0.68%)	Su Fd Cu	0.174	(2; 0.57%)
Rf Cu	0.000754	(1; 1.3%)	Ne Cu	0.00264	(1; 0.61%)	El Cu	0.168	(1; 0.55%)
Ms Cu	0.000514	(1; 0.85%)	Fn Cu	0.00255	(1; 0.59%)	Dc Dp Cu	0.0885	(2; 0.29%)
Ne Cu	0.000495	(1; 0.82%)	Wt Cu	0.00235	(1; 0.54%)	Wa Ms Cu	0.0854	(2; 0.28%)
Cm Cu	0.000469	(1; 0.78%)	Ed Cu	0.00225	(1; 0.52%)	Sc Cg Vf Cu	0.0848	(3; 0.28%)
Bs Cu	0.000451	(1; 0.75%)	Cm Cu	0.00221	(1; 0.51%)	Wa Bs Cu	0.0736	(2; 0.24%)
Sg Cu	0.000412	(1; 0.68%)	Ts Cu	0.00187	(1; 0.43%)	Ws Ho Cu	0.0481	(2; 0.16%)
Fd Cu	0.000395	(1; 0.65%)	In Cu	0.00179	(1; 0.41%)	Wa Pd Cu	0.0447	(2; 0.15%)
Ho Cu	0.000367	(1; 0.61%)	Et Cu	0.00175	(1; 0.4%)	Vf Et Cu	0.0405	(2; 0.13%)
Rd Cu	0.000348	(1; 0.58%)	Pr Cu	0.00161	(1; 0.37%)	Vf Rs Cu	0.0401	(2; 0.13%)
In Cu	0.000347	(1; 0.58%)	Pd Cu	0.00147	(1; 0.34%)	Bc Mp Ho Cu	0.0345	(3; 0.11%)
Et Cu	0.000324	(1; 0.54%)	Sf Bk Cu	0.0014	(2; 0.32%)	Dc Dp Ho Cu	0.0286	(3; 0.093%)
Bl El Cu	0.000297	(2; 0.49%)	Gv Cu	0.00105	(1; 0.24%)	Pp Cu	0.0243	(1; 0.079%)
Ts Cu	0.000282	(1; 0.47%)	Rf Cu	0.00103	(1; 0.24%)	Wa Ts Cu	0.024	(2; 0.078%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Cu	0.0897	(0; 77.%)	Cu	0.128	(0; 74.%)	Cu	0.0161	(0; 16.%)
Ne Cu	0.00163	(1; 1.4%)	Bk Cu	0.00675	(1; 3.9%)	Bc Mp Ho Cu	0.00952	(3; 9.2%)
Et Cu	0.00147	(1; 1.3%)	In Cu	0.00193	(1; 1.1%)	Wo Tx Cu	0.00434	(2; 4.2%)
Pr Cu	0.00144	(1; 1.2%)	Ms Cu	0.00164	(1; 0.95%)	Bc Mp Cu	0.00383	(2; 3.7%)
Bk Cu	0.00121	(1; 1.%)	Ne Cu	0.00132	(1; 0.76%)	Bc Mp Fd Cu	0.00312	(3; 3.%)
Ms Cu	0.000755	(1; 0.65%)	Fn Cu	0.00125	(1; 0.72%)	Wo Tx Tp Cu	0.00195	(3; 1.9%)
Cm Cu	0.000601	(1; 0.51%)	Sf Bk Cu	0.00122	(2; 0.7%)	Bc Mp Ho Bk (	0.00181	(4; 1.8%)
Rh Cu	0.000588	(1; 0.5%)	Wt Cu	0.0011	(1; 0.63%)	Wh Fd Cu	0.00136	(2; 1.3%)
Ts Cu	0.00051	(1; 0.44%)	Cm Cu	0.00105	(1; 0.61%)	Wo Mp Ho Cu	0.00107	(3; 1.%)
Bs Cu	0.000484	(1; 0.41%)	Pd Cu	0.000965	(1; 0.55%)	Bc Mp Bk Cu	0.00107	(3; 1.%)
Wt Cu	0.000353	(1; 0.3%)	Ts Cu	0.000924	(1; 0.53%)	Bc Mp Ho Ms	0.000805	(4; 0.78%)
En Cu	0.000282	(1; 0.24%)	Bs Cu	0.000874	(1; 0.5%)	Sw Pp Cu	0.000782	(2; 0.76%)
Rs Cu	0.000264	(1; 0.23%)	Ed Cu	0.000826	(1; 0.47%)	Ba Bm Ho Cu	0.000777	(3; 0.75%)
Sg Cu	0.000259	(1; 0.22%)	Pr Cu	0.00078	(1; 0.45%)	Vf Cu	0.000771	(1; 0.75%)
Rd Cu	0.000254	(1; 0.22%)	Et Cu	0.000731	(1; 0.42%)	Sw Pp Ne Cu	0.000715	(3; 0.69%)
Fn Cu	0.000246	(1; 0.21%)	Rd Cu	0.000718	(1; 0.41%)	Sw Pp Pr Cu	0.000651	(3; 0.63%)
Ho Cu	0.000245	(1; 0.21%)	Rs Cu	0.00052	(1; 0.3%)	Wo Cu	0.000584	(1; 0.57%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.510 ±0.008	(±1.5%)
Downstream	0.398 ±0.008	(±2.0%)

Sector 9301: Sport and Recreation (Rs)

Sport, skiing, lottery, gambling, racing and other recreational services

Short Summary

Against the metric of one dollar of final consumption, the environmental indicators provide excellent outcomes that are 65%, 40% and 90% below economy wide averages for greenhouse emissions, water use and land disturbance respectively. For the social indicators the government revenue indicator is notable at 75% above average, due mainly to gaming taxes which supplement state government revenue. Employment generation is equal to average but income is 20% below average due possibly to the high proportion of part time staff with short term contracts. The financial indicators show an above average outcome for operating surplus, while export propensity and import penetration are 45% and 35% below average respectively. Overall the sector provides an excellent TBL account but the societal impacts of the gambling industry are not included in this analysis. Demographic and societal trends, especially population ageing, are important to both the gambling and sports components of this sector. A bleak prognosis could see Australia with an ageing population of stay at home gamblers, while an optimistic prognosis might balance active risk taking in sport participation with sedentary risk taking in gambling.

Sector Description

The sector is a diverse one and includes traditional sporting activities, dog and horse racing, snow skiing, casinos and various forms of gambling. As well as the relatively positive outcomes reported here the sector gives rise to a number of social issues such as problem gambling. Total receipts from gambling in 2001 were $14 billion or $700 per capita, a one quarter increase since 1998. The source of gambling revenue was poker machines (63%), lotto (13%), TAB (12%) and casinos (11%). For sporting activities there are over 7 000 organisations nationally of which 51% are ‘for profit’, 40% at ‘not for profit’ and 9% are government. Sports activity is relatively high with over 50% of people (7.5 million) over the age of 18 years participating and this is split about equally between club and informal activities. The horse racing industry has over 32 000 horses racing at 400 tracks in 21 000 races with 205 000 starting horses coached by 4 200 trainers and ridden by 1 500 jockeys.

Place of Industry in the Economy

The sport and recreation sector is in the top quartile of value adding in the economy ranking 25th out of 135 sectors and contributing 0.96% of GDP in this analysis. It is similar in value adding to the defence, air transport and motor vehicle industries. It is directly responsible for 69 000 employment years within the sector and stimulates 44 000 employment years in upstream supplying sectors and also contributes 6 000 employment years to downstream industries. It has relatively moderate resource requirements with one percent of national water use and around one half of one percent of land disturbance, primary energy and greenhouse emissions.

Strategic Overview

The strategic overview provided by the spider diagram portrays very positive outcomes for TBL indicator set used in this analysis. Sport and recreation is reasonably unique as a service sector in its government revenue performance with gaming levies yielding 17 cents for every dollar consumed. The environmental indicators are all well below economy wide average perhaps reflecting the relatively low physical requirements for the gaming industry, where much of the turnover is concentrated in shops, clubs and casinos. If energy intensive motor sports such as Formula One racing dominated the sector, the environmental indicators could reveal a different story.

TBL Account #1

The financial indicator of operating surplus is 5% greater than average. Two thirds of this is a direct sector effect and the remainder due to first order (20%), second order (10%) and third order effects (10%). The social indicator of employment generation is equal to average and two thirds of this is also a direct effect, with a supplier makeup similar to the operating surplus. The environmental indicator of greenhouse emissions is 65% below average with more than 95% of this due to indirect effects. The first TBL account reports relatively positive outcomes for the sector.

TBL Accounts #2 and #3

In the second TBL account, exports are 45% below average, income is 20% below average and water use is 40% below average. In the third TBL account, there is a lower requirement for imports (30% below average), government revenue is notable in being 75% above average and land disturbance is 90% below average. The financial and social indicators have a high direct content, while most of the environmental effect is indirect and held within the sector's supply chain.

Structural Path Analysis and Linkages

The export indicator is below average and would have to double to bring it to the economy wide average. An examination of its structural path reveals that 44% of the current effect is direct. Opportunities for improvement could include attracting more foreign high rollers to Australian casinos (their potential losses are classified as an export), successful sporting teams (who bring their winnings home), major sporting events (the Olympic Games generated exports of $600 million) and franchising Australian sporting concepts overseas (provided that profits are repatriated). Another 17% of the indicator is in first order effects from sectors such as wholesale trade, airlines and gaming machines.

Increases in consumer demand for sport and recreation provides an average stimulus for upstream suppliers such as wholesale trade, property development, marketing and the sector itself. Decisions to invest into the sector provide extremely weak downstream linkages as most of the effects are dissipated by private consumption. There is a small effect on the television sector for live coverage.

Future Trends in Sector

This sector provides a window into the complex interplays at work in a modern economy and society. Against a background of a growing but ageing population, gambling activities could increase appreciably especially if discretionary income is maintained in post-work population cohorts. Increased commercialisation of sport and an inclination towards passive recreation (eg internet) could reduce sports participation perhaps with long term healthcare implications. However none of this is certain, and society and its leaders could use incentives and taxes to encourage a transition to a less gambling orientated lifestyle and to a more active, sports oriented lifestyle across all generations. The winter usefulness of Australian ski fields may decline if temperature and climate change begin to impact significantly past 2025.

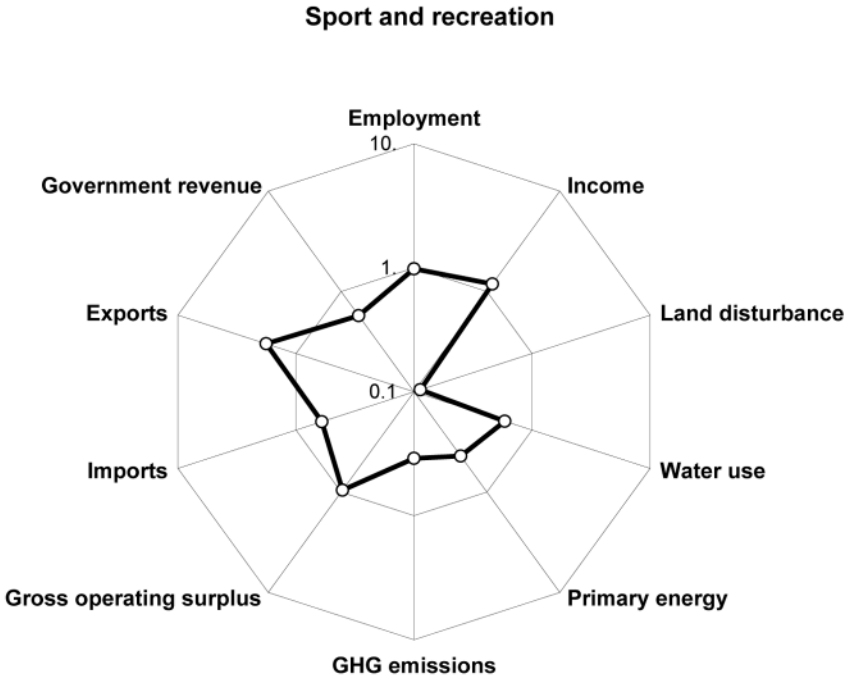
Innovation and Technical Opportunities

Sophisticated methods are being used to manage, improve and promote activities in this sector. As well as the frequent news of drugs in sport, there is a real possibility of genetic manipulation to enhance sporting excellence at national and team levels. While performance enhancing drugs are actively managed against, the ethical dimensions of breeding elite athletes for genetic fitness presents another level of philosophical complexity. It is now possible to actively monitor many facets of the overall health of an athlete (or a horse) during training and performance and use this to predict and optimise immediate performance, as well as avoid the risks of injury and burnout.

Sector **Sport and recreation** **(Rs)**

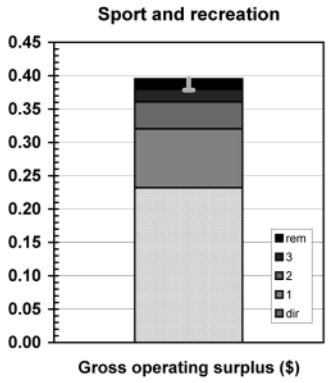
Sport, skiing, lottery, gambling, racing and other recreational services

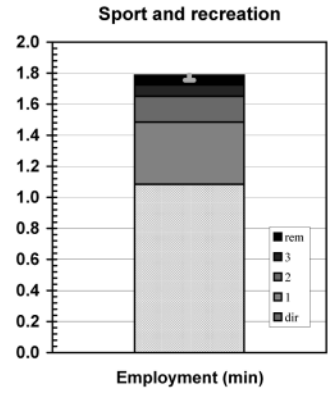
Spider diagram

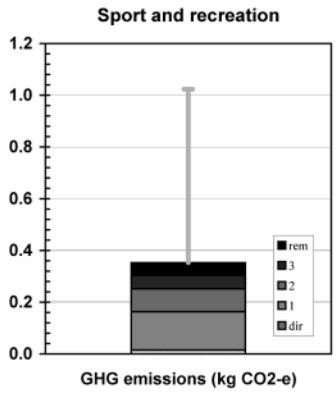


Bar graphs

Account #1







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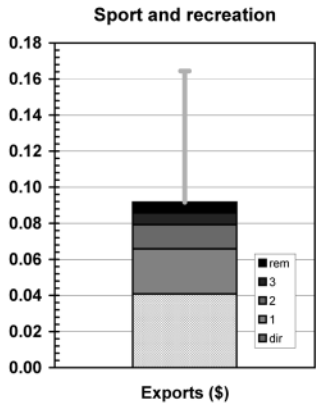
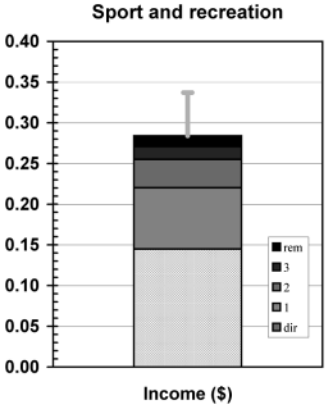
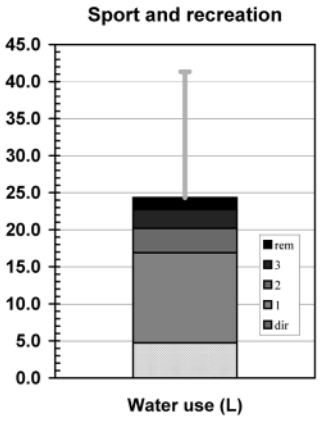
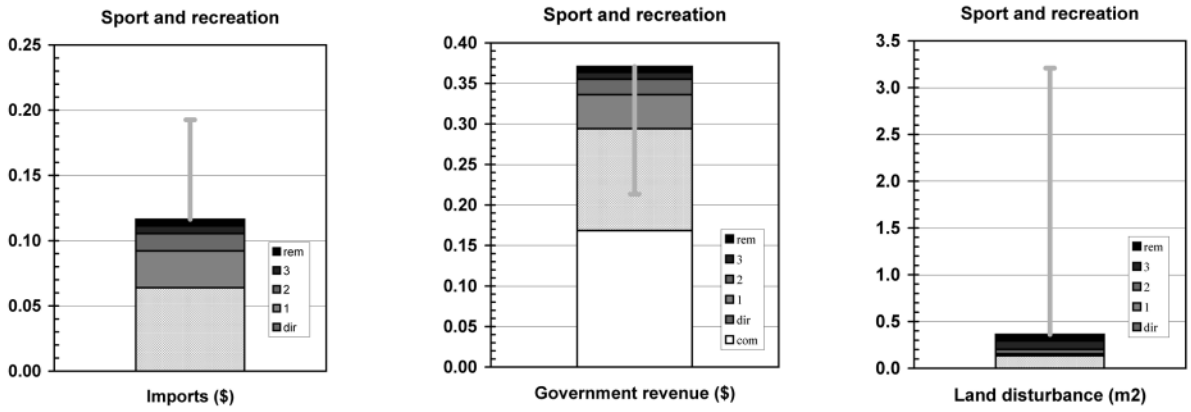






Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 7,289.6	(2.76% of total)	($m 7,064.9 domestically produced)
Government final consumption	$m 495.6	(0.56% of total)	($m 495.6 domestically produced)
Gross fixed capital expenditure	$m 8.1	(0.01% of total)	($m 8.1 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 7,793.3**	**(1.70% of GNE)**	**($m 7,568.5 domestically produced)**
Exports	$m 349.8	(0.42% of total)	($m 349.8 domestically produced)
Final demand	**$m 8,143.1**	**(1.50% of GNT)**	**($m 7,918.4 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 1,243.0	(0.73% of total)	
Gross operating surplus	$m 1,990.3	(1.04% of total)	
Taxes less subsidies	$m 1,079.9	(1.26% of total)	
Sectoral GDP*	**$m 4,313.2**	**(0.96% of GDP)**	
Imports	$m 548.0	(0.56% of total)	
Primary inputs	**$m 4,861.2**	**(0.89% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 1,990.3	(1.04%)	$m 1,836.8	(0.96%)	$m 3,130.7	(1.63%)
Exports ($m)	$m 349.8	(0.42%)	$m 322.8	(0.39%)	$m 725.7	(0.87%)
Imports ($m)	$m 548.0	(0.56%)	$m 505.7	(0.52%)	$m 921.3	(0.94%)
Employment (e-y)	74,513 e-y	(1.05%)	68,765 e-y	(0.96%)	113,366 e-y	(1.59%)
Income ($m)*	$m 1,243.0	(0.73%)	$m 1,147.2	(0.67%)	$m 2,248.7	(1.32%)
Government revenue ($m)†	$m 2,412.4	(2.23%)	$m 2,329.1	(2.15%)	$m 2,935.9	(2.72%)
GHG emissions (kt CO_2-e)	124 kt	(0.02%)	114 kt	(0.02%)	2,790 kt	(0.54%)
Water use (ML)	40,603 ML	(0.19%)	37,471 ML	(0.18%)	192,632 ML	(0.92%)
Land disturbance (kha)	114 kha	(0.07%)	105 kha	(0.06%)	287 kha	(0.18%)
Primary energy (TJ)	1,804 TJ	(0.05%)	1,664 TJ	(0.04%)	26,504 TJ	(0.68%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.23	0.40	0.38
Exports ($)	0.04	0.09	0.16
Imports ($)	0.06	0.12	0.19
Employment (min)	1.08	1.79	1.75
Income ($)	0.14	0.28	0.34
Government revenue ($)	0.29	0.37	0.21
GHG emissions (kg CO_2-e)	0.01	0.35	1.02
Water use (L)	4.73	24.33	41.32
Land disturbance (m^2)	0.13	0.36	3.21
Primary energy (MJ)	0.21	3.35	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Rs	0.232	(0; 59.%)	Rs	1.08	(0; 61.%)	El Rs	0.0933	(1; 26.%)
Vf Rs	0.00938	(1; 2.4%)	Vf Rs	0.0465	(1; 2.6%)	Vf Rs	0.0182	(1; 5.2%)
Pd Rs	0.00861	(1; 2.2%)	Ms Rs	0.0316	(1; 1.8%)	Rs	0.0144	(0; 4.1%)
Ms Rs	0.00705	(1; 1.8%)	Wt Rs	0.0275	(1; 1.5%)	Fr Vf Rs	0.0109	(2; 3.1%)
Cm Rs	0.00693	(1; 1.8%)	Et Rs	0.0216	(1; 1.2%)	At Rs	0.00778	(1; 2.2%)
Bk Rs	0.0051	(1; 1.3%)	Pd Rs	0.0207	(1; 1.2%)	Fd Rs	0.00495	(1; 1.4%)
Et Rs	0.00456	(1; 1.2%)	Bk Rs	0.0202	(1; 1.1%)	Rd Rs	0.00453	(1; 1.3%)
Wt Rs	0.00381	(1; 0.96%)	Cm Rs	0.0192	(1; 1.1%)	El Pd Rs	0.0041	(2; 1.2%)
El Rs	0.00377	(1; 0.95%)	Bs Rs	0.0188	(1; 1.1%)	Wt Rs	0.00381	(1; 1.1%)
Rd Rs	0.00285	(1; 0.72%)	Rd Rs	0.0168	(1; 0.94%)	El Ms Rs	0.00295	(2; 0.84%)
Sg Rs	0.00244	(1; 0.62%)	Ho Rs	0.0138	(1; 0.77%)	Bc Mp Ho Rs	0.00274	(3; 0.78%)
Rv Rs	0.00236	(1; 0.6%)	Fm Rs	0.009	(1; 0.5%)	Bc Mp Lp Rs	0.00247	(3; 0.7%)
Ne Rs	0.00203	(1; 0.51%)	Rh Rs	0.00833	(1; 0.47%)	Bl El Rs	0.00235	(2; 0.67%)
Bs Rs	0.0019	(1; 0.48%)	Cu Rs	0.00755	(1; 0.42%)	El Vf Rs	0.00233	(2; 0.66%)
Wa Rs	0.00182	(1; 0.46%)	Pr Rs	0.0073	(1; 0.41%)	Bc Mp Rs	0.00202	(2; 0.57%)
Sf Bk Rs	0.00178	(2; 0.45%)	Ne Rs	0.00688	(1; 0.39%)	Sg Rs	0.00193	(1; 0.55%)
Fn Rs	0.00166	(1; 0.42%)	Fn Rs	0.00662	(1; 0.37%)	El Ho Rs	0.00181	(2; 0.51%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Rs	0.0408	(0; 44.%)	Rs	0.145	(0; 51.%)	Vf Rs	9.7	(1; 40.%)
Wt Rs	0.00312	(1; 3.4%)	Pd Rs	0.00777	(1; 2.7%)	Rs	4.73	(0; 19.%)
Vf Rs	0.00283	(1; 3.1%)	Ms Rs	0.00736	(1; 2.6%)	Wa Rs	1.33	(1; 5.5%)
At Rs	0.00247	(1; 2.7%)	Wt Rs	0.0059	(1; 2.1%)	Sc Cg Vf Rs	1.01	(3; 4.1%)
Fd Rs	0.00136	(1; 1.5%)	Bk Rs	0.005	(1; 1.8%)	Su Fd Rs	0.598	(2; 2.5%)
En Rs	0.00126	(1; 1.4%)	Cm Rs	0.00435	(1; 1.5%)	El Rs	0.516	(1; 2.1%)
Sg Rs	0.00122	(1; 1.3%)	Vf Rs	0.00383	(1; 1.3%)	Wa Pd Rs	0.236	(2; 0.97%)
Ms Rs	0.00109	(1; 1.2%)	Et Rs	0.00381	(1; 1.3%)	Wa Ms Rs	0.181	(2; 0.75%)
Rd Rs	0.000993	(1; 1.1%)	Rd Rs	0.00288	(1; 1.%)	Dc Dp Rs	0.126	(2; 0.52%)
Cm Rs	0.000925	(1; 1.%)	Bs Rs	0.00231	(1; 0.81%)	Cu Rs	0.104	(1; 0.43%)
Bl El Rs	0.000913	(2; 1.%)	Ho Rs	0.00202	(1; 0.71%)	Ws Ho Rs	0.101	(2; 0.41%)
Ho Rs	0.000768	(1; 0.84%)	Hs Rs	0.00161	(1; 0.57%)	Vf Et Rs	0.0882	(2; 0.36%)
Lp Rs	0.000753	(1; 0.82%)	Ne Rs	0.00158	(1; 0.56%)	Bc Mp Ho Rs	0.0722	(3; 0.3%)
Et Rs	0.000706	(1; 0.77%)	Pr Rs	0.00146	(1; 0.52%)	Sg Rs	0.062	(1; 0.25%)
Ee Rs	0.000552	(1; 0.6%)	Fm Rs	0.00141	(1; 0.5%)	Dc Dp Ho Rs	0.0599	(3; 0.25%)
Cg Vf Rs	0.000469	(2; 0.51%)	Cu Rs	0.00139	(1; 0.49%)	Wa Vf Rs	0.0583	(2; 0.24%)
Fm Rs	0.000464	(1; 0.51%)	At Rs	0.00138	(1; 0.49%)	Wa Bs Rs	0.0575	(2; 0.24%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Rs	0.0639	(0; 55.%)	Rs	0.126	(0; 62.%)	Rs	0.133	(0; 37.%)
Et Rs	0.00321	(1; 2.8%)	Pd Rs	0.00509	(1; 2.5%)	Bc Mp Ho Rs	0.0199	(3; 5.5%)
Vf Rs	0.00231	(1; 2.%)	Ms Rs	0.00349	(1; 1.7%)	Bc Mp Lp Rs	0.0179	(3; 4.9%)
Ms Rs	0.0016	(1; 1.4%)	Bk Rs	0.00276	(1; 1.4%)	Bc Mp Rs	0.0147	(2; 4.1%)
En Rs	0.00147	(1; 1.3%)	Wt Rs	0.00276	(1; 1.4%)	Bc Mp Fd Rs	0.0107	(3; 3.%)
Pr Rs	0.00131	(1; 1.1%)	Vf Rs	0.00235	(1; 1.2%)	Wo Lp Rs	0.0093	(2; 2.6%)
Pd Rs	0.00124	(1; 1.1%)	Cm Rs	0.00208	(1; 1.%)	Vf Rs	0.00915	(1; 2.5%)
Cm Rs	0.00119	(1; 1.%)	Rd Rs	0.00205	(1; 1.%)	Wh Fd Rs	0.00469	(2; 1.3%)
Ne Rs	0.000979	(1; 0.84%)	Et Rs	0.00159	(1; 0.79%)	Fr Vf Rs	0.00349	(2; 0.96%)
Wt Rs	0.000886	(1; 0.76%)	In Rs	0.00143	(1; 0.71%)	Wo Tx Rs	0.00298	(2; 0.82%)
Sg Rs	0.000765	(1; 0.66%)	At Rs	0.00111	(1; 0.55%)	Wh Vf Rs	0.0028	(2; 0.77%)
At Rs	0.000738	(1; 0.63%)	Ho Rs	0.00106	(1; 0.52%)	Wo Mp Ho Rs	0.00225	(3; 0.62%)
Rd Rs	0.000723	(1; 0.62%)	Ne Rs	0.000791	(1; 0.39%)	Wo Mp Lp Rs	0.00202	(3; 0.56%)
Rh Rs	0.000703	(1; 0.6%)	El Rs	0.000708	(1; 0.35%)	Bc Mp Ho Ms	0.00171	(4; 0.47%)
Fm Rs	0.000609	(1; 0.52%)	Pr Rs	0.000707	(1; 0.35%)	Wo Mp Rs	0.00166	(2; 0.46%)
Ee Rs	0.000539	(1; 0.46%)	Bs Rs	0.000683	(1; 0.34%)	Ba Bm Ho Rs	0.00163	(3; 0.45%)
Ho Rs	0.000512	(1; 0.44%)	Hs Rs	0.00065	(1; 0.32%)	El Rs	0.00151	(1; 0.42%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.918 ±0.014	(±1.6%)
Downstream	0.121 ±0.004	(±3.6%)

Sector 9501: Personal Services (Ps)

Hairdressing, TV and video hiring, personal and household goods hiring, funerals, film processing, laundry, dry-cleaning and other personal services, private household employees

Short Summary

Against the metric of a dollar of final demand, the environmental indicators of the personal services sector portray excellent outcomes with greenhouse emissions, water use and land disturbance being respectively 50%, 70% and 90% below economy wide averages. The social indicator of employment generation is twice the economy wide average while income is 10% greater than average and government revenue is 30% below average. The financial indicators of surplus, export propensity and import penetration are all below average by 10%, 55% and 30% respectively. The ageing population has mixed implications for the future of the sector. Annual deaths will double by 2060 providing an assured future for funeral and cemetery services. The ageing demographic may require increased home help, but the degree to which other service requirements are retained or grow, will depend on retirement income and whether service industries match expectations of a relatively un-researched demographic. Technological innovations may improve service delivery in some parts of the sector, but others such as video hire and film processing may disappear.

Sector Description

The sector includes a wide range of services such as video hire, photography, funerals, hairdressing and domestic help. Hairdressing and paid domestic help are the largest categories in financial terms with 30% and 20% of the total respectively. In such a diverse sector it is difficult to obtain comprehensive information on activity but some examples will suffice. Video hiring is sourced from 1 600 outlets nationwide with annual hires of 152 million or 8 per capita per year. Home and personal hiring works from 600 business locations, there are 13 500 hairdressing salons and over 1 100 funeral directors and/or crematoria.

Place of Industry in the Economy

The sector is moderate in terms of value adding in the economy and ranks 35th out of 135 sectors, contributing 0.63% of GDP in this analysis. It is a relatively large employer with 132 000 employment years or nearly 2% of the workforce. Of these worker years, 104 000 are employed directly within the sector and 28 000 in upstream suppliers that supply this sector's goods and services. In addition, the sector contributes 24 000 employment years to the output of downstream sectors. It has a moderate requirement for resources with less than one half of one percent of water, land, energy and greenhouse emissions.

Strategic Overview

The integrated overview provided by the spider diagram shows a typical service sector with excellent outcomes for all indicators with the exception of government revenue and export propensity. The social indicators of employment generation and income are both greater than economy wide averages while all environmental indicators reveal below average outcomes. It may be difficult to improve the government revenue and export indicators since this is essentially a local, domestically orientated industry. However it is possible that by using domestic activity as a foundation, a number of first order suppliers could improve their own performance. The export supplier chain includes physically obvious sectors such as cosmetics, photographic equipment, basic chemicals and air transport. Government revenue includes wholesale trade, road transport, publications and communications.

TBL Account #1

For the first TBL account, the financial indicator of operating surplus is 10% below the economy wide average, employment generation is twice the average and greenhouse gas emissions are one half of the economy wide average. For the financial and social indicators there are large direct effects of one half and four fifths respectively showing that expenditure in this sector has immediate business and social implications. For greenhouse gases only one tenth of the effect is direct and the majority is derived from first order suppliers. Electricity generation (29%) is the largest greenhouse contributor so mitigation efforts should consider purchasing low-carbon electricity or green power. This will become easier over time as in ten years, fuels cells run by natural gas or methanol will allow low carbon electricity to be delivered locally to domestic households or commercial buildings.

TBL Accounts #2 and #3

In the second TBL account, the financial indicator of export propensity is 55% below average, the social indicator of income is 10% above average and the environmental indicator of water use is 70% below average. In the third TBL account, the financial indicator of import penetration is 30% below average, government revenue is 30% below average and land disturbance is 90% below average. For the environmental indicators, most of the effect is indirect and the within sector effect is typically less than one quarter. For the financial and social indicators, about one half of the effect is direct and the remainder lies in the production chain.

Structural Path Analysis and Linkages

This service sector may wish to promote its environmental credentials as part of its image making in similar ways to the personal cosmetics manufacturer ‘The Body Shop’. As discussed above, greenhouse emissions could be reduced by sourcing low carbon electricity. Addition contributions to emissions include basic chemicals (3%), cement (2%), wholesale trade (2%), abrasive materials (2%), airline and road transport (2%). The water chain shows that direct use is 29% thus giving options for improvement within the sector. Additional contributions for water use come from vegetable and fruit growing (11%), domestic water supply (8%), electricity production (6%) and water for business support services (1%).

Increased consumer demand for the products and services in the sector provide an average stimulus for the upstream suppliers such as wholesale trade, communications, property development and business management services. Decisions to invest in the sector provide only weak downstream linkages with small effects shown in retail trade, business management and health services.

Future Trends in Sector

While the *Future Dilemmas* report did not model this sector in detail, it could be assumed that demand grows by at least 25% in line with population growth out to 2050. However, demographically dependent sectors such as funeral directing will double activity by 2060 as deaths double with population ageing. It could be expected that domestic services and hairdressing will also double provided that the ageing demographic retain their spending power through astute investment of retirement income, and provided that their health and mobility is retained.

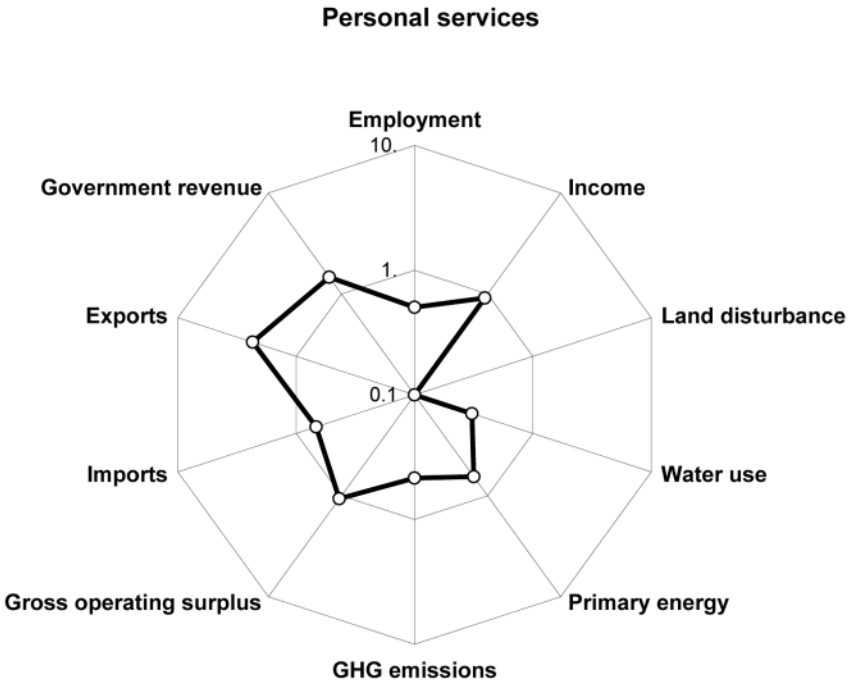
Innovation and Technical Opportunities

The key innovation for this service sector may lie in understanding the changing nature of services and their provision for an ageing population (home help, hair dressing, entertainment, special equipment). On past performance, a technological and economic approach will attempt to reduce the labour component of service provision, and replace it with machines, data linkages and remote control. This may be exactly the opposite of what the serviced consumers require or prefer.

Sector **Personal services** **(Ps)**

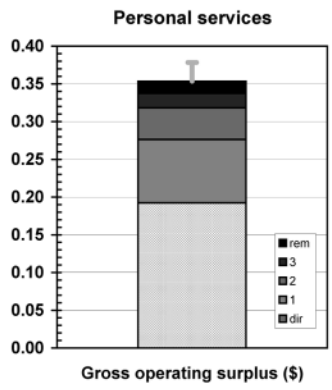
Hairdressing, TV and video hiring, personal and household goods hiring, funerals, film processing, laundry, dry-cleaning and other personal services, private household employees

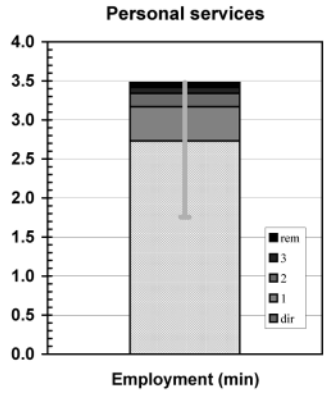
Spider diagram

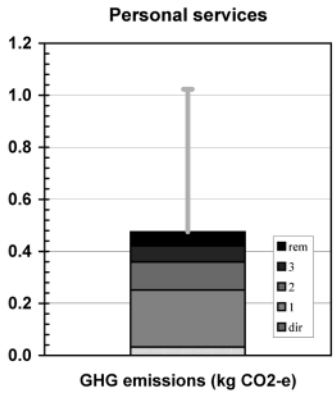


Bar graphs

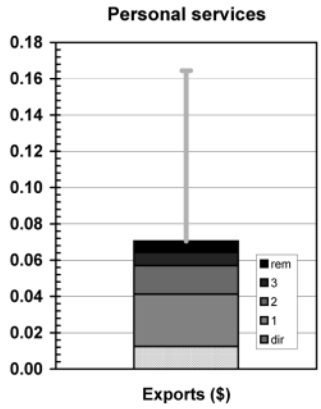
Account #1

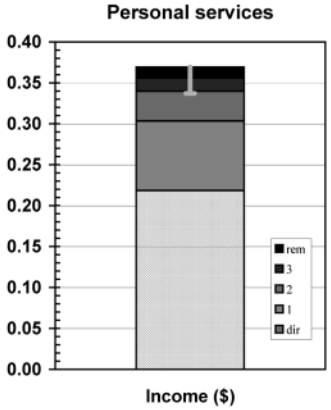


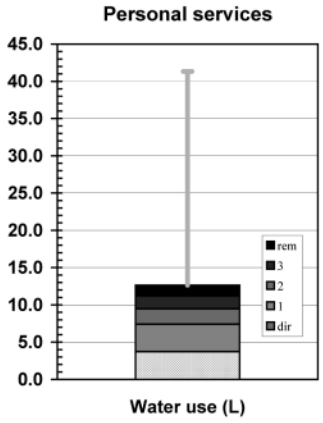




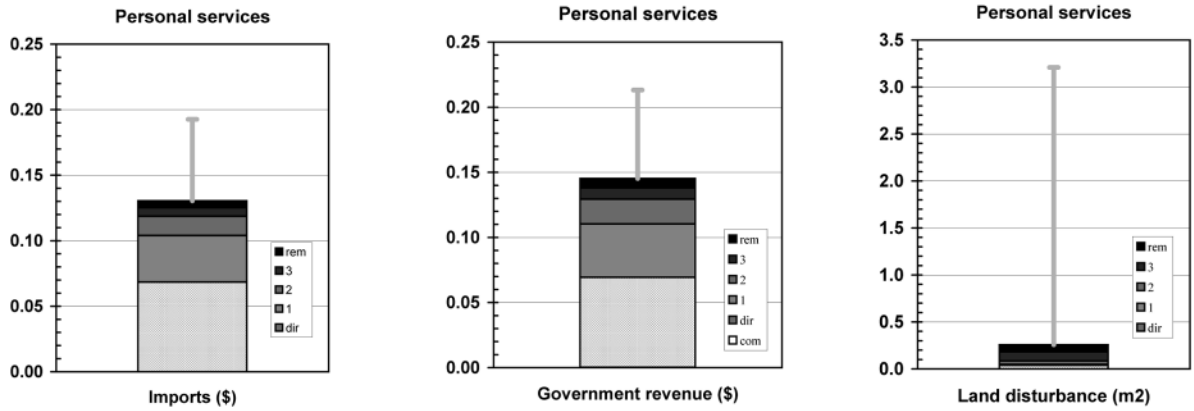
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 4,626.6	(1.75% of total)	($m 4,587.8 domestically produced)
Government final consumption	$m 83.8	(0.09% of total)	($m 83.8 domestically produced)
Gross fixed capital expenditure	$m 1.2	(0.00% of total)	($m 1.2 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 4,711.7**	**(1.03% of GNE)**	**($m 4,672.8 domestically produced)**
Exports	$m 72.8	(0.09% of total)	($m 72.8 domestically produced)
Final demand	**$m 4,784.5**	**(0.88% of GNT)**	**($m 4,745.6 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 1,276.8	(0.75% of total)	
Gross operating surplus	$m 1,124.6	(0.59% of total)	
Taxes less subsidies	$m 404.2	(0.47% of total)	
Sectoral GDP*	**$m 2,805.6**	**(0.63% of GDP)**	
Imports	$m 400.4	(0.41% of total)	
Primary inputs	**$m 3,206.0**	**(0.59% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 1,124.6	(0.59%)	$m 912.9	(0.48%)	$m 1,677.2	(0.87%)
Exports ($m)	$m 72.8	(0.09%)	$m 59.1	(0.07%)	$m 334.6	(0.40%)
Imports ($m)	$m 400.4	(0.41%)	$m 325.1	(0.33%)	$m 619.1	(0.63%)
Employment (e-y)	127,900 e-y	(1.79%)	103,826 e-y	(1.46%)	132,325 e-y	(1.86%)
Income ($m)*	$m 1,276.8	(0.75%)	$m 1,036.5	(0.61%)	$m 1,752.8	(1.03%)
Government revenue ($m)†	$m 405.5	(0.38%)	$m 329.4	(0.30%)	$m 689.2	(0.64%)
GHG emissions (kt CO_2-e)	186 kt	(0.04%)	151 kt	(0.03%)	2,255 kt	(0.43%)
Water use (ML)	21,757 ML	(0.10%)	17,662 ML	(0.08%)	59,964 ML	(0.29%)
Land disturbance (kha)	23 kha	(0.01%)	18 kha	(0.01%)	122 kha	(0.08%)
Primary energy (TJ)	2,797 TJ	(0.07%)	2,271 TJ	(0.06%)	23,527 TJ	(0.61%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.19	0.35	0.38
Exports ($)	0.01	0.07	0.16
Imports ($)	0.07	0.13	0.19
Employment (min)	2.73	3.48	1.75
Income ($)	0.22	0.37	0.34
Government revenue ($)	0.07	0.15	0.21
GHG emissions (kg CO_2-e)	0.03	0.48	1.02
Water use (L)	3.72	12.64	41.32
Land disturbance (m^2)	0.04	0.26	3.21
Primary energy (MJ)	0.48	4.96	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Ps	0.192	(0; 54.%)	Ps	2.73	(0; 78.%)	El Ps	0.137	(1; 29.%)
Cm Ps	0.00916	(1; 2.6%)	Wt Ps	0.0602	(1; 1.7%)	Ps	0.0318	(0; 6.7%)
Wt Ps	0.00836	(1; 2.4%)	Bs Ps	0.0521	(1; 1.5%)	Ch Ps	0.0149	(1; 3.1%)
Ms Ps	0.0071	(1; 2.%)	Ms Ps	0.0318	(1; 0.92%)	Ce Ps	0.00959	(1; 2.%)
Ne Ps	0.00618	(1; 1.7%)	Cm Ps	0.0253	(1; 0.73%)	Wt Ps	0.00834	(1; 1.8%)
El Ps	0.00555	(1; 1.6%)	Ne Ps	0.0209	(1; 0.6%)	Mi Ps	0.00693	(1; 1.5%)
Bs Ps	0.00528	(1; 1.5%)	Rh Ps	0.0181	(1; 0.52%)	At Ps	0.00468	(1; 0.98%)
Ct Ps	0.00425	(1; 1.2%)	Pr Ps	0.0164	(1; 0.47%)	Rd Ps	0.00372	(1; 0.78%)
Rh Ps	0.00296	(1; 0.84%)	Ct Ps	0.0152	(1; 0.44%)	Bl El Ps	0.00346	(2; 0.73%)
Pd Ps	0.00269	(1; 0.76%)	Ho Ps	0.0149	(1; 0.43%)	Fo Ps	0.00329	(1; 0.69%)
Bk Ps	0.00242	(1; 0.68%)	Rd Ps	0.0138	(1; 0.4%)	El Bs Ps	0.00322	(2; 0.68%)
Rd Ps	0.00234	(1; 0.66%)	Ed Ps	0.012	(1; 0.34%)	Ch Ct Ps	0.00317	(2; 0.67%)
Ts Ps	0.00223	(1; 0.63%)	Ts Ps	0.01	(1; 0.29%)	Gd Ps	0.00307	(1; 0.65%)
Pr Ps	0.00196	(1; 0.55%)	Bk Ps	0.00961	(1; 0.28%)	El Ms Ps	0.00297	(2; 0.63%)
St Wt Ps	0.0016	(2; 0.45%)	Gv Ps	0.00892	(1; 0.26%)	Bc Mp Ho Ps	0.00296	(3; 0.62%)
Mi Ps	0.00153	(1; 0.43%)	Vf Ps	0.00683	(1; 0.2%)	El Ct Ps	0.00268	(2; 0.56%)
Sf Ps	0.0015	(1; 0.42%)	Rt Ps	0.00666	(1; 0.19%)	Vf Ps	0.00267	(1; 0.56%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Ps	0.0125	(0; 18.%)	Ps	0.218	(0; 59.%)	Ps	3.72	(0; 29.%)
Wt Ps	0.00684	(1; 9.7%)	Wt Ps	0.0129	(1; 3.5%)	Vf Ps	1.42	(1; 11.%)
Ct Ps	0.00203	(1; 2.9%)	Ms Ps	0.00741	(1; 2.%)	Wa Ps	0.972	(1; 7.7%)
Oe Ps	0.00188	(1; 2.7%)	Bs Ps	0.0064	(1; 1.7%)	El Ps	0.759	(1; 6.%)
Ch Ps	0.00173	(1; 2.5%)	Cm Ps	0.00575	(1; 1.6%)	Wa Ms Ps	0.183	(2; 1.4%)
At Ps	0.00149	(1; 2.1%)	Ne Ps	0.0048	(1; 1.3%)	Sc Cg Ct Ps	0.175	(3; 1.4%)
Bl El Ps	0.00134	(2; 1.9%)	Ct Ps	0.00338	(1; 0.92%)	Wa Bs Ps	0.16	(2; 1.3%)
Cm Ps	0.00122	(1; 1.7%)	Pr Ps	0.00328	(1; 0.89%)	Sc Cg Vf Ps	0.148	(3; 1.2%)
Ms Ps	0.0011	(1; 1.6%)	Ed Ps	0.00297	(1; 0.8%)	Mi Ps	0.117	(1; 0.92%)
Bs Ps	0.00098	(1; 1.4%)	Pd Ps	0.00243	(1; 0.66%)	Sc Cg Ps	0.116	(2; 0.92%)
Ne Ps	0.000902	(1; 1.3%)	Bk Ps	0.00237	(1; 0.64%)	Ws Ho Ps	0.109	(2; 0.86%)
Ho Ps	0.00083	(1; 1.2%)	Rd Ps	0.00237	(1; 0.64%)	Dc Dp Ps	0.102	(2; 0.81%)
Rd Ps	0.000815	(1; 1.2%)	Ts Ps	0.00235	(1; 0.64%)	Bc Mp Ho Ps	0.0781	(3; 0.62%)
Mi Ps	0.000718	(1; 1.%)	Gv Ps	0.00224	(1; 0.61%)	Wa Pd Ps	0.0736	(2; 0.58%)
Nf Ps	0.000566	(1; 0.8%)	Ho Ps	0.00218	(1; 0.59%)	Su Fd Ps	0.0734	(2; 0.58%)
Eq Ps	0.000454	(1; 0.64%)	Rh Ps	0.00198	(1; 0.54%)	Dc Dp Ho Ps	0.0647	(3; 0.51%)
Lg Ps	0.000428	(1; 0.61%)	El Ps	0.00167	(1; 0.45%)	Wa Ct Ps	0.0564	(2; 0.45%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Ps	0.0685	(0; 53.%)	Ps	0.0691	(0; 48.%)	Ps	0.0387	(0; 15.%)
Ct Ps	0.0036	(1; 2.8%)	Wt Ps	0.00604	(1; 4.2%)	Bc Mp Ho Ps	0.0215	(3; 8.3%)
Ne Ps	0.00298	(1; 2.3%)	Ms Ps	0.00352	(1; 2.4%)	Wo Tx Tp Ps	0.0135	(3; 5.2%)
Pr Ps	0.00293	(1; 2.2%)	Cm Ps	0.00275	(1; 1.9%)	Wo Tx Ps	0.0116	(2; 4.5%)
Wt Ps	0.00194	(1; 1.5%)	Ne Ps	0.00241	(1; 1.7%)	Wo Tx Cl Ps	0.00875	(3; 3.4%)
Ch Ps	0.00173	(1; 1.3%)	Bs Ps	0.0019	(1; 1.3%)	Bc Mp Ps	0.0084	(2; 3.3%)
Ms Ps	0.00162	(1; 1.2%)	Rd Ps	0.00168	(1; 1.2%)	Bc Mp Ch Ps	0.00592	(3; 2.3%)
Cm Ps	0.00157	(1; 1.2%)	Pd Ps	0.00159	(1; 1.1%)	Bc Mp De Ps	0.00366	(3; 1.4%)
Rh Ps	0.00153	(1; 1.2%)	Pr Ps	0.00159	(1; 1.1%)	Bc Mp Rt Ps	0.00357	(3; 1.4%)
Oe Ps	0.00115	(1; 0.88%)	Ct Ps	0.00156	(1; 1.1%)	Bc Ch Ps	0.00298	(2; 1.2%)
Fo Ps	0.00108	(1; 0.83%)	Bk Ps	0.00131	(1; 0.9%)	Bc Mp Ct Ps	0.0025	(3; 0.97%)
Ap Ps	0.00106	(1; 0.81%)	Ts Ps	0.00116	(1; 0.8%)	Wo Mp Ho Ps	0.00243	(3; 0.94%)
Bs Ps	0.00105	(1; 0.81%)	Ho Ps	0.00115	(1; 0.79%)	El Ps	0.00222	(1; 0.86%)
Et Ps	0.000917	(1; 0.7%)	Ed Ps	0.00109	(1; 0.75%)	Wo Tx Fu Ps	0.00218	(3; 0.85%)
Pl Ps	0.000811	(1; 0.62%)	In Ps	0.00108	(1; 0.75%)	Wo Tx Wt Ps	0.00214	(3; 0.83%)
Ts Ps	0.000639	(1; 0.49%)	El Ps	0.00104	(1; 0.72%)	Ba Bm Ho Ps	0.00176	(3; 0.68%)
De Ps	0.000621	(1; 0.48%)	Rh Ps	0.000909	(1; 0.63%)	Bc Mp Ho Ms	0.00172	(4; 0.67%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.951 ±0.013	(±1.4%)
Downstream	0.324 ±0.005	(±1.4%)

Sector 96340010: Sanitary and Garbage Disposal (Gd)

Sanitary and garbage disposal services

Short Summary

Against the metric of one dollar of final demand, the environmental indicator of greenhouse gas emissions is over four times the economy wide average while water use and land disturbance are 85% and 75% below average respectively. The social indicator of employment generation is 15% above average while and income and government revenue are 55% and 20% above average respectively. The financial indicator of operating surplus is 60% below average, export propensity is 80% below average and import penetration is 60% below average. Efforts to improve outcomes could focus on tiered levies for specific waste streams within regulatory frameworks that avoid perverse outcomes such as waste dumping. In the longer term, waste minimisation activities must focus on per capita consumption which is the primary driver. In the interim, direct energy production from a sorted waste stream can short circuit a host of waste treatment complexities provided that toxics can be neutralised, and recycling markets maintained rather than undermined.

Sector Description

At an individual level, each Australian generates on average 1.1 tonnes of solid waste per year putting Australia close to the top of waste producers in the OECD. Thus this sector currently processes around 22 million tonnes of solid waste per year. The composition of the waste stream is classified as municipal (40%), commercial and industrial (23%) and construction and demolition (37%). Recycling of waste reveals an emerging success story with 50% for paper, 44% for glass, 44% for HDPE plastics and 34% for PET plastics. This sector also includes sewage collection and disposal. By way of example, Sydney Water's infrastructure includes 40 000 km of pipes, 654 sewage pumping stations and 30 sewage treatment plants. It processes 1.5 GL of sewage effluent daily and produces yearly 160 000 tonnes of bio-solids used in agriculture or disposal.

Place of Industry in the Economy

While sanitary and garbage disposal is a key sector underpinning health, lifestyle and economic productivity, it represents a relatively small part of Australia's value adding, ranking 80th out of 135 sectors and contributing 0.18% of GDP in this analysis. The industry in total is a small employer with a total requirement of 3 000 employment years. In addition it contributes 14 000 employment years to the output of downstream sectors. Its requirements for water, land and primary energy are less than one tenth of one percent of national totals. Greenhouse gas emissions are less than two tenths of one percent of the national total, attributable mostly to methane generated in landfill.

Strategic Overview

The integrated overview provided in the spider diagram shows a signature, reasonably typical of a service sector with significant outliers for greenhouse emissions, operating surplus and export propensity. The greenhouse indicator is due mostly to methane emissions from landfill (methane has a high global warming potential). Since the sector functions principally at a local government scale, the export propensity indicator is less important although successful waste management companies can diversify to overseas markets and repatriate profits. Improving the operating surplus may be possible by increasing disposal fees, particularly if focused on per capita waste reduction at the source or point of sale, rather than the post-consumption sink of disposal or recycling.

TBL Account #1

The financial indicator of surplus is 60% below the economy wide average and one half of this is a direct effect with first order effects such as communications, electricity production, scientific services and wholesale trade supplying relatively minor amounts. The employment indicator is 15% above average and most is a direct effect with the remainder due to first order effects similar to the operating surplus. The greenhouse emissions indicator is over four times the economy wide average and the majority of this is a direct within sector effect.

TBL Accounts #2 and #3

The second TBL account shows that exports are 80% below average and that most of this is due to first order effects of export industries where garbage disposal is embodied in the production chain. The social indicator of income is 55% above average, possibly reflecting the penalty rates and overtime used to attract and retain workers in the sector. The water use indicator is 85% below average. The third TBL account shows an import penetration indicator 60% below average, government revenue 20% above average and land disturbance 75% below average.

Structural Path Analysis and Linkages

The greenhouse gas structural pathway reveals that over 95% of the 4.5 kg CO2-e per dollar emitted is a direct effect with electricity generation contributing another 2%. Methane emissions from landfill make up 95% of the direct sector effect due mainly to methane's high global warming potential. New landfills are designed to capture methane for 'green power' electricity generation.

Increases in consumer demand for garbage disposal services show weak upstream effects across the whole economy but vegetable and fruit growing, services to agriculture, wholesale trade, road transport and accounting are notable. Downstream effects are very strong and require that meat products, retail trade, and accommodation and cafes also expand to dissipate the expansion effect.

Future Trends in Sector

The base case scenario in the *Future Dilemmas* study anticipates that total garbage for landfill could increase three fold by 2050 in the absence of major innovations in recycling and personal consumption. Part of the increase is due to population growth (+25%), affluence growth (+200%) and export growth in different sectors (up to +300%). This scenario seems unlikely due to waste reduction initiatives, increased recycling and environmental regulatory controls. However the potential of a three times increase in waste over 50 years highlights the latent waste potential of the Australian consumption ethos.

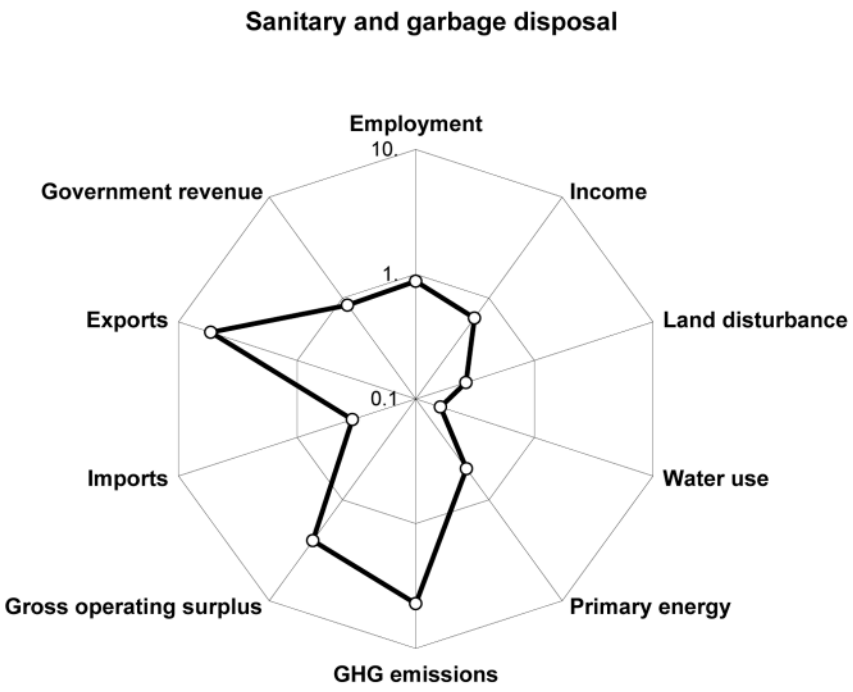
Innovation and Technical Opportunities

In intergenerational timeframes, reducing per capita resource consumption to one third of today's levels may be the only feasible way to constrain the full system implications of today's waste stream in developed economies. Before that goal is fully realised there are two interim ways ahead that may be applied differentially in different regions and circumstances. The first, based on full waste sorting at the household or factory origin is to recycle energy intensive products such as aluminium and use the remainder to produce electricity, heat and petroleum replacing liquid fuels. The second is to take the 'industrial ecology' ideals of reuse, recycling and waste minimisation to their thermodynamic and social limits and ensure that local employment opportunities are maximised. Sewage treatment should aim to capture most methane for electricity production and recycle treated sludge back to agriculture and horticulture. Heavy metals, pharmaceutical by-products and persistent organic materials must be carefully managed to minimise risks to human health and ecosystem function. Ultimately, the material basis of many advanced economies may have to be completely redesigned.

Sector **Sanitary and garbage disposal** **(Gd)**

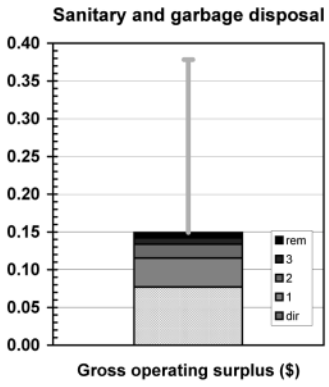
Sanitary and garbage disposal services

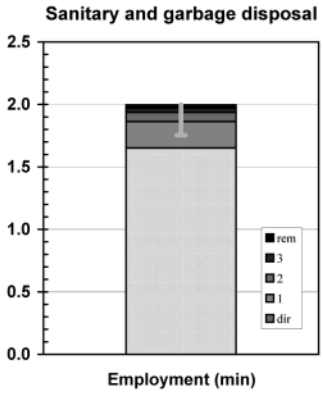
Spider diagram

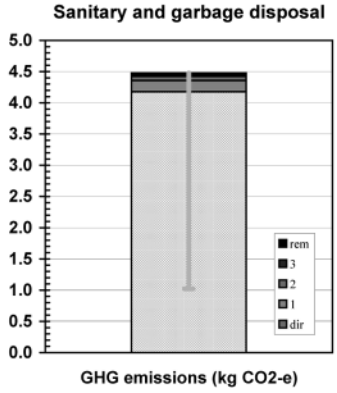


Bar graphs

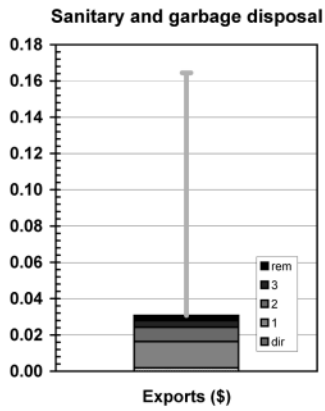
Account #1

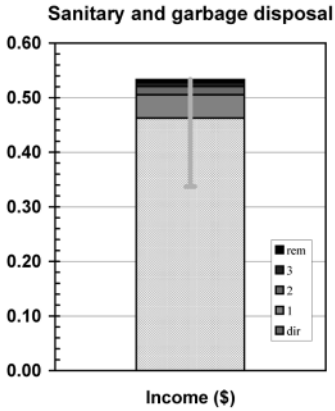


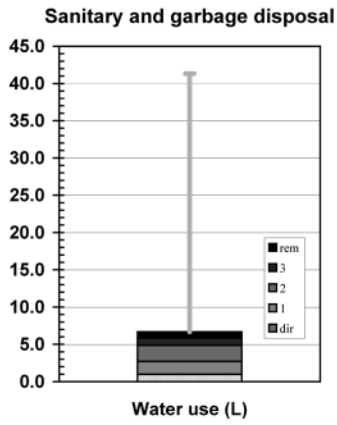




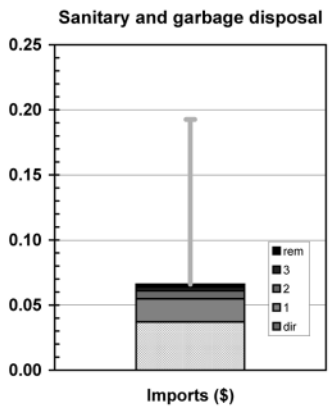
Account #2

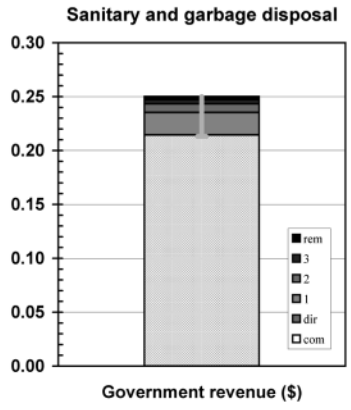


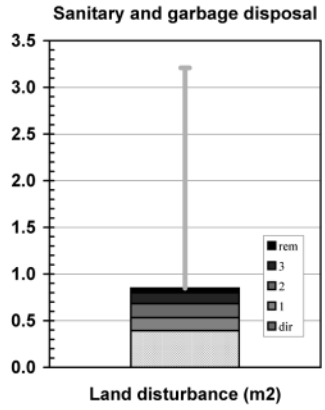




Account #3







National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 6.6	(0.00% of total)	($m 6.6 domestically produced)
Government final consumption	$m 175.1	(0.20% of total)	($m 175.1 domestically produced)
Gross fixed capital expenditure	$m 0.0		
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 181.7**	**(0.04% of GNE)**	**($m 181.7 domestically produced)**
Exports	$m 2.0	(0.00% of total)	($m 2.0 domestically produced)
Final demand	**$m 183.7**	**(0.03% of GNT)**	**($m 183.7 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 500.2	(0.29% of total)	
Gross operating surplus	$m 83.3	(0.04% of total)	
Taxes less subsidies	$m 232.0	(0.27% of total)	
Sectoral GDP*	**$m 815.6**	**(0.18% of GDP)**	
Imports	$m 40.1	(0.04% of total)	
Primary inputs	**$m 855.7**	**(0.16% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 83.3	(0.04%)	$m 14.2	(0.01%)	$m 27.4	(0.01%)
Exports ($m)	$m 2.0	(0.00%)	$m 0.3	(0.00%)	$m 5.6	(0.01%)
Imports ($m)	$m 40.1	(0.04%)	$m 6.8	(0.01%)	$m 12.1	(0.01%)
Employment (e-y)	14,311 e-y	(0.20%)	2,430 e-y	(0.03%)	2,940 e-y	(0.04%)
Income ($m)*	$m 500.2	(0.29%)	$m 84.9	(0.05%)	$m 98.0	(0.06%)
Government revenue ($m)†	$m 232.0	(0.21%)	$m 39.4	(0.04%)	$m 46.0	(0.04%)
GHG emissions (kt CO_2-e)	4,518 kt	(0.87%)	767 kt	(0.15%)	822 kt	(0.16%)
Water use (ML)	1,048 ML	(0.01%)	178 ML	(0.00%)	1,227 ML	(0.01%)
Land disturbance (kha)	42 kha	(0.03%)	7 kha	(0.00%)	16 kha	(0.01%)
Primary energy (TJ)	1,686 TJ	(0.04%)	286 TJ	(0.01%)	690 TJ	(0.02%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.08	0.15	0.38
Exports ($)	0.00	0.03	0.16
Imports ($)	0.04	0.07	0.19
Employment (min)	1.65	2.00	1.75
Income ($)	0.46	0.53	0.34
Government revenue ($)	0.21	0.25	0.21
GHG emissions (kg CO_2-e)	4.18	4.48	1.02
Water use (L)	0.97	6.68	41.32
Land disturbance (m^2)	0.39	0.85	3.21
Primary energy (MJ)	1.56	3.76	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Gd	0.077	(0; 52.%)	Gd	1.65	(0; 83.%)	Gd	4.18	(0; 93.%)
Cm Gd	0.00603	(1; 4.%)	Wt Gd	0.0209	(1; 1.%)	El Gd	0.0891	(1; 2.%)
El Gd	0.0036	(1; 2.4%)	Cm Gd	0.0167	(1; 0.83%)	Bc Mp Gd	0.0151	(2; 0.34%)
Ts Gd	0.00328	(1; 2.2%)	Ed Gd	0.0148	(1; 0.74%)	Lm Gd	0.00824	(1; 0.18%)
Wt Gd	0.00291	(1; 1.9%)	Ts Gd	0.0148	(1; 0.74%)	Wo Gd	0.00545	(1; 0.12%)
Ne Gd	0.00143	(1; 0.96%)	Bs Gd	0.0117	(1; 0.59%)	Wt Gd	0.0029	(1; 0.065%)
Ms Gd	0.00135	(1; 0.91%)	Cl Gd	0.00908	(1; 0.45%)	Fo Gd	0.0027	(1; 0.06%)
Rd Gd	0.00124	(1; 0.83%)	Ho Gd	0.00877	(1; 0.44%)	Bl El Gd	0.00225	(2; 0.05%)
Bs Gd	0.00119	(1; 0.79%)	Rd Gd	0.0073	(1; 0.37%)	Wo Tx Cl Gd	0.00222	(3; 0.049%)
Rh Gd	0.00114	(1; 0.76%)	Pr Gd	0.00729	(1; 0.36%)	Ap Gd	0.00211	(1; 0.047%)
Pd Gd	0.00114	(1; 0.76%)	Rh Gd	0.00697	(1; 0.35%)	At Gd	0.00209	(1; 0.047%)
Bk Gd	0.00105	(1; 0.7%)	Ms Gd	0.00606	(1; 0.3%)	Ce Gd	0.00206	(1; 0.046%)
St Gd	0.00103	(1; 0.69%)	Ne Gd	0.00486	(1; 0.24%)	Ch Gd	0.00201	(1; 0.045%)
Pr Gd	0.000871	(1; 0.58%)	Bk Gd	0.00418	(1; 0.21%)	Rd Gd	0.00197	(1; 0.044%)
Wa Gd	0.000842	(1; 0.56%)	Ps Gd	0.00416	(1; 0.21%)	Bc Mp Ho Gd	0.00174	(3; 0.039%)
Ho Gd	0.000699	(1; 0.47%)	Fm Gd	0.00405	(1; 0.2%)	Dc Dp Gd	0.00155	(2; 0.035%)
Rv Gd	0.000638	(1; 0.43%)	El Gd	0.004	(1; 0.2%)	Lg Gd	0.00142	(1; 0.032%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Wt Gd	0.00238	(1; 7.7%)	Gd	0.462	(0; 87.%)	Gd	0.969	(0; 15.%)
Gd	0.00185	(0; 6.%)	Wt Gd	0.00449	(1; 0.84%)	Dc Dp Gd	0.623	(2; 9.3%)
Bl El Gd	0.000871	(2; 2.8%)	Cm Gd	0.00378	(1; 0.71%)	Wa Gd	0.618	(1; 9.3%)
Cl Gd	0.000847	(1; 2.8%)	Ed Gd	0.00367	(1; 0.69%)	El Gd	0.493	(1; 7.4%)
Cm Gd	0.000804	(1; 2.6%)	Ts Gd	0.00346	(1; 0.65%)	Bc Mp Gd	0.399	(2; 6.%)
Lg Gd	0.000698	(1; 2.3%)	Pr Gd	0.00146	(1; 0.27%)	Sc Cg Gd	0.181	(2; 2.7%)
At Gd	0.000664	(1; 2.2%)	Bs Gd	0.00144	(1; 0.27%)	Wo Gd	0.176	(1; 2.6%)
Mp Gd	0.000588	(1; 1.9%)	Ms Gd	0.00141	(1; 0.26%)	Vf Gd	0.139	(1; 2.1%)
Ts Gd	0.000521	(1; 1.7%)	Ho Gd	0.00128	(1; 0.24%)	Ri Fc Gd	0.137	(2; 2.%)
Ho Gd	0.000488	(1; 1.6%)	Rd Gd	0.00126	(1; 0.24%)	Cl Gd	0.0658	(1; 0.98%)
En Gd	0.000488	(1; 1.6%)	Ne Gd	0.00111	(1; 0.21%)	Ws Ho Gd	0.0639	(2; 0.96%)
Wo Gd	0.000483	(1; 1.6%)	El Gd	0.00108	(1; 0.2%)	Su Fd Gd	0.0573	(2; 0.86%)
Rd Gd	0.000432	(1; 1.4%)	Cl Gd	0.00103	(1; 0.19%)	Bc Mp Ho Gd	0.0459	(3; 0.69%)
Ed Gd	0.000362	(1; 1.2%)	Bk Gd	0.00103	(1; 0.19%)	Wa Ts Gd	0.0443	(2; 0.66%)
Oi Ap Gd	0.000352	(2; 1.1%)	Pd Gd	0.00103	(1; 0.19%)	Dc Dp Ho Gd	0.038	(3; 0.57%)
Tx Cl Gd	0.00034	(2; 1.1%)	Rh Gd	0.000762	(1; 0.14%)	Wa Bs Gd	0.0358	(2; 0.54%)
Eq Gd	0.000305	(1; 0.99%)	Fm Gd	0.000635	(1; 0.12%)	Wa Ms Gd	0.0348	(2; 0.52%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Gd	0.0371	(0; 56.%)	Gd	0.214	(0; 86.%)	Gd	0.392	(0; 46.%)
Cl Gd	0.00169	(1; 2.6%)	Wt Gd	0.0021	(1; 0.84%)	Wo Gd	0.131	(1; 15.%)
Pr Gd	0.00131	(1; 2.%)	Cm Gd	0.00181	(1; 0.72%)	Bc Mp Gd	0.11	(2; 13.%)
Ap Gd	0.00119	(1; 1.8%)	Ts Gd	0.00171	(1; 0.68%)	Wo Tx Cl Gd	0.0532	(3; 6.3%)
Cm Gd	0.00103	(1; 1.6%)	Ed Gd	0.00135	(1; 0.54%)	Wo Tx Tp Gd	0.0184	(3; 2.2%)
Ts Gd	0.000942	(1; 1.4%)	Rd Gd	0.000891	(1; 0.36%)	Wo Tx Gd	0.0156	(2; 1.8%)
Fo Gd	0.000883	(1; 1.3%)	Pr Gd	0.000706	(1; 0.28%)	Bc Mp Ho Gd	0.0127	(3; 1.5%)
Ne Gd	0.000691	(1; 1.%)	El Gd	0.000676	(1; 0.27%)	Wo Mp Gd	0.0124	(2; 1.5%)
Wt Gd	0.000676	(1; 1.%)	Pd Gd	0.000674	(1; 0.27%)	Dc Dp Gd	0.00323	(2; 0.38%)
Tp Gd	0.000592	(1; 0.9%)	Ho Gd	0.000674	(1; 0.27%)	Wo Tx Fu Gd	0.00261	(3; 0.31%)
Rh Gd	0.000588	(1; 0.89%)	Ms Gd	0.000669	(1; 0.27%)	Bc Mp Bp Gd	0.00223	(3; 0.26%)
En Gd	0.000566	(1; 0.86%)	Bk Gd	0.00057	(1; 0.23%)	Bc Mp Cl Gd	0.00188	(3; 0.22%)
Ru Gd	0.000329	(1; 0.5%)	Ne Gd	0.000559	(1; 0.22%)	El Gd	0.00144	(1; 0.17%)
Ho Gd	0.000325	(1; 0.49%)	Bs Gd	0.000425	(1; 0.17%)	Wo Mp Ho Gd	0.00143	(3; 0.17%)
Rd Gd	0.000315	(1; 0.48%)	In Gd	0.000363	(1; 0.14%)	Wh Fc Gd	0.00118	(2; 0.14%)
Ms Gd	0.000307	(1; 0.47%)	Cl Gd	0.000351	(1; 0.14%)	Ba Bm Ho Gd	0.00103	(3; 0.12%)
Mv Gd	0.000289	(1; 0.44%)	Rh Gd	0.00035	(1; 0.14%)	Bc Mp Fd Gd	0.00103	(3; 0.12%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.427 ±0.005	(±1.3%)
Downstream	1.402 ±0.018	(±1.3%)

Sector 9601: Police and Other Services (Os)

Police, interest groups, religious organisations, student unions, fire brigade, corrective and other services

Short Summary

Against a metric of one dollar of final demand, the environmental indicators of greenhouse gas emissions, water use and land disturbance are all 65-85% below the economy wide average. Two of the social indicators, employment generation and income are respectively 15% and 55% higher than average. Most of the effect is direct showing that expenditure in this sector stimulates immediate social returns. Government revenue is 20% above average. The financial indicators of operating surplus and export propensity are 60% and 80% below average respectively, while import penetration is 65% below the average. The sector includes many professions and activities that ensure societal function continues and is safe. In line with other sectors such as community care, health and education, there are always calls for additional resources. Community policing and private security provide examples of a trend towards user pays, but there may be an ultimate limit.

Sector Description

This sector makes an important contribution to civil society and includes police, religious, fire, security and penal services as well as a wide range of voluntary organisations. Because of its diverse nature it is difficult to describe in quantitative terms but includes by way of example 42 000 police officers and 13 000 ministers of religion. Social and economic changes are increasing the need for volunteer services to shore up fragile parts of society and to supplement the services previously provided by government. At the same time, increased perceptions of insecurity are leading to more private security services, home alarm systems and the like. This dichotomy stimulates strong societal debate on the definition of progress and its enabling processes, and highlights the sector's importance in ensuring the smooth running of the nation's economic and physical structures.

Place of Industry in the Economy

As well as underpinning civil society this sector contributes a substantial part of value adding to the economy ranking 21st out of 135 sectors and contributing 1.51% of GDP in this analysis. It is an moderate employment generator requiring 95 000 direct employment years and another 20 000 years in the sector's suppliers giving a total of 115 000 employment years. It also supplies 14 000 employment years to downstream sectors. In absolute terms, it has small requirements for water and land resources, requiring about one fifth of one percent of national totals. It uses less than one percent of primary energy and generates one half of one percent of greenhouse gas emissions.

Strategic Overview

The profile of the spider diagram portrays a typical service sector which is principally funded by the different tiers of government. Two outliers of operating surplus and export propensity are well below average outcomes but it is difficult to suggest feasible routes to improve these results at an economy wide level since this sector contributes to the basis of a civil society. In general it produces limited exports, is a receiver of government revenue rather than a contributor, and aims to at best break even, rather than produce a financial surplus. However all four environmental indicators are better than average, it is a good generator of employment and income and its services require below average imports.

TBL Account #1

The financial indicator of surplus is 60% below the economy wide average with one half a direct effect due to the sector, and the remainder due to small contributions from communications, electricity production, computer services and wholesale trade. The employment generation in this sector is 15% higher than average with four fifths of the effect a direct one and the remainder due to small contributions from wholesale trade, communications, education, and computer services. The greenhouse gas indicator is 65% below average with a direct effect of one third (mostly vehicles) and notable indirect effects from electricity generation (25%) and beef consumption (4%).

TBL Accounts #2 and #3

The second TBL account shows an export propensity 80% below average, income 55% above average and water use 85% below average. The two social indicators of employment generation and income are both well above average and show that expenditures made within this sector give direct social returns. The water small indicator is typical of a service sector. The third TBL account shows that the sector's requirement for imports is 65% below the economy wide average and land disturbance is 85% below average. The government revenue indicator is 20% above average.

Structural Path Analysis and Linkages

While the greenhouse indicator is well below average, there may still be scope for improvement. An examination of the structural pathway for emissions shows that 30% are direct within sector effects, 25% are from electricity generation with smaller contributions from beef products (4%), lime (2%), wool (2%), wholesale trade (1%) and diesel refining (1%). This suggests energy efficiency measures within the sector and sourcing lower carbon electricity are the primary ways ahead for tackling greenhouse issues.

For both upstream and downstream effects, the sector shows linkages that are relatively weak and operate at about half of the economy wide average. The sector is relatively self supporting and shows only minor upstream effects for the sector's suppliers notably wholesale trade, communications, property development and computer services. The downstream linkages to wholesale and retail trade, property development, legal services and government administration are relatively small specifically as most of the downstream effect is dissipated to private consumption.

Future Trends in Sector

While the *Future Dilemmas* report does not specifically model this sector, a generalised service sector covering this area expands by 40% over the next 50 years in line with population growth and further development of the service economy. However if policing is used as an example, the social, political and technical aspects of policing will change substantially over the next twenty years. Population ageing, racial mix, government investment, unemployment, family breakdown, income equality and technological development make the future quite uncertain. Personal freedom and privacy may decrease with the widespread deployment of surveillance technologies. The increased sophistication and integration of both private (eg credit card activity) and government databases (eg health, taxation and employment) will require increased complexity of regulation and oversight.

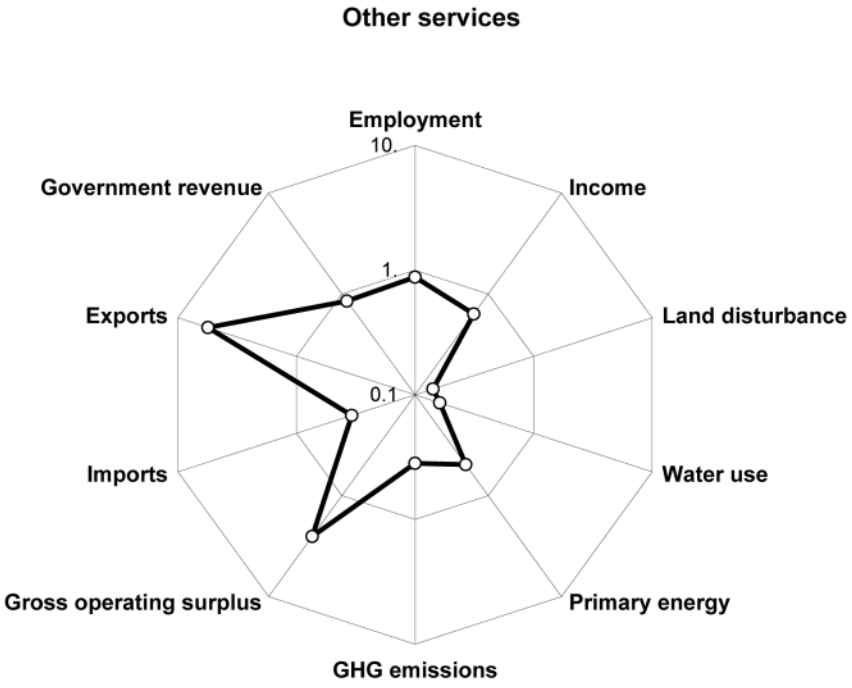
Innovation and Technical Opportunities

Using policing as an example, the literature reports on technical issues such as street lighting and surveillance cameras as crime prevention mechanisms. However at a societal level it is widely acknowledged that tensions between full equality and full freedom are difficult to reconcile. Thus the degree of top down regulation required is strongly debated at both public and private levels. For example, reducing fire risk is leading to strong planning controls of the suburban-bush interface.

Sector **Other services** **(Os)**

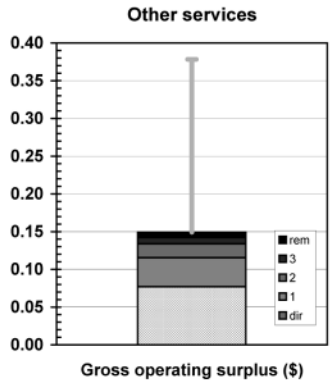
Police, interest groups, religious organisations, student unions, fire brigade, corrective and other services

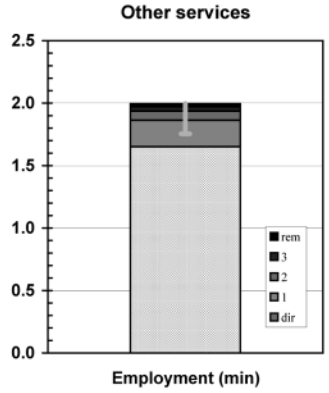
Spider diagram

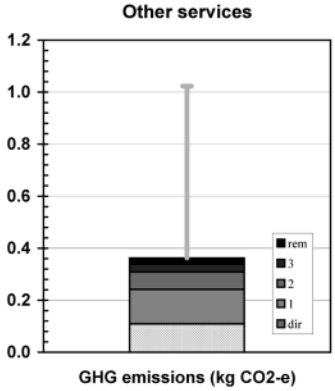


Bar graphs

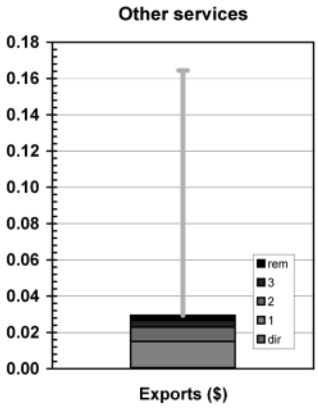
Account #1

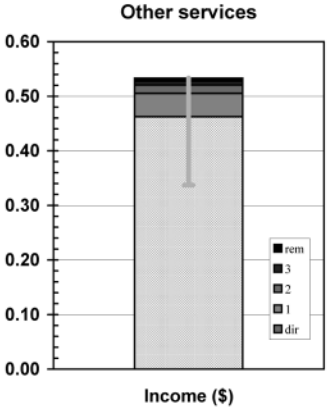


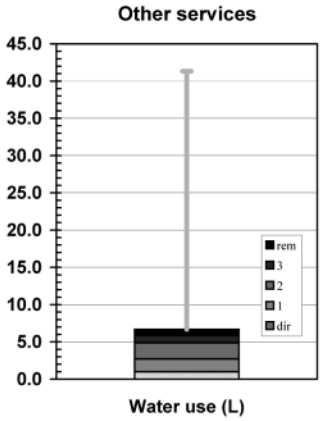




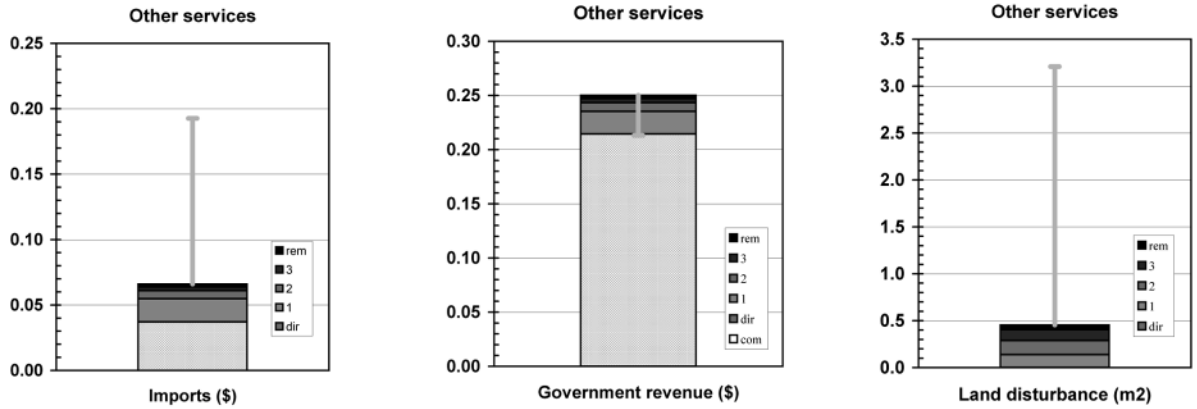
Account #2







Account #3



National Accounts extracts			
Receipts: GNT(E) - commodities			
Private final consumption	$m 1,995.8	(0.76% of total)	($m 1,995.1 domestically produced)
Government final consumption	$m 5,150.4	(5.82% of total)	($m 5,150.4 domestically produced)
Gross fixed capital expenditure	$m 23.2	(0.02% of total)	($m 23.2 domestically produced)
Net changes in stocks	$m 0.0		
Sectoral GNE	**$m 7,169.5**	**(1.56% of GNE)**	**($m 7,168.7 domestically produced)**
Exports	$m 4.9	(0.01% of total)	($m 4.9 domestically produced)
Final demand	**$m 7,174.3**	**(1.32% of GNT)**	**($m 7,173.6 domestically produced)**
Costs: GNT(I) - industries			
Wages and salaries	$m 4,151.7	(2.43% of total)	
Gross operating surplus	$m 691.7	(0.36% of total)	
Taxes less subsidies	$m 1,925.7	(2.25% of total)	
Sectoral GDP*	**$m 6,769.1**	**(1.51% of GDP)**	
Imports	$m 333.0	(0.34% of total)	
Primary inputs	**$m 7,102.1**	**(1.30% of GNT)**	

* Sectoral gross value added + net taxes on products

TBL factors	in supplying industry		embodied in commodity GNT			
		(% of national)	direct	(% of national)	total	(% of national)
Gross operating surplus ($m)	$m 691.7	(0.36%)	$m 552.7	(0.29%)	$m 1,070.9	(0.56%)
Exports ($m)	$m 4.9	(0.01%)	$m 3.9	(0.00%)	$m 211.1	(0.25%)
Imports ($m)	$m 333.0	(0.34%)	$m 266.0	(0.27%)	$m 473.7	(0.49%)
Employment (e-y)	118,776 e-y	(1.67%)	94,908 e-y	(1.33%)	114,809 e-y	(1.61%)
Income ($m)*	$m 4,151.7	(2.43%)	$m 3,317.4	(1.94%)	$m 3,826.8	(2.24%)
Government revenue ($m)†	$m 1,925.7	(1.78%)	$m 1,538.7	(1.42%)	$m 1,794.7	(1.66%)
GHG emissions (kt CO_2-e)	978 kt	(0.19%)	781 kt	(0.15%)	2,599 kt	(0.50%)
Water use (ML)	8,699 ML	(0.04%)	6,951 ML	(0.03%)	47,908 ML	(0.23%)
Land disturbance (kha)	2 kha	(0.00%)	2 kha	(0.00%)	326 kha	(0.20%)
Primary energy (TJ)	13,990 TJ	(0.36%)	11,178 TJ	(0.29%)	26,953 TJ	(0.69%)

*excludes income tax † includes net commodity taxes on final demand and income tax

TBL multipliers - commodities	per $ of GNE/GNT*		Nation-wide average
	direct	total	total
Gross operating surplus ($)	0.08	0.15	0.38
Exports ($)	0.00	0.03	0.16
Imports ($)	0.04	0.07	0.19
Employment (min)	1.65	2.00	1.75
Income ($)	0.46	0.53	0.34
Government revenue ($)	0.21	0.25	0.21
GHG emissions (kg CO_2-e)	0.11	0.36	1.02
Water use (L)	0.97	6.68	41.32
Land disturbance (m^2)	0.00	0.45	3.21
Primary energy (MJ)	1.56	3.76	7.65

*refers to GNE/GNT produced in the actual year, excludes decreases in stocks

Structural Paths (intensities - commodities)

Gross operating surplus ($/$)			Employment (min/$)			GHG emissions (kg CO_2-e/$)		
Os	0.077	(0; 52.%)	Os	1.65	(0; 83.%)	Os	0.109	(0; 30.%)
Cm Os	0.00603	(1; 4.%)	Wt Os	0.0209	(1; 1.%)	El Os	0.0891	(1; 25.%)
El Os	0.0036	(1; 2.4%)	Cm Os	0.0167	(1; 0.83%)	Bc Mp Os	0.0151	(2; 4.2%)
Ts Os	0.00328	(1; 2.2%)	Ed Os	0.0148	(1; 0.74%)	Lm Os	0.00824	(1; 2.3%)
Wt Os	0.00291	(1; 1.9%)	Ts Os	0.0148	(1; 0.74%)	Wo Os	0.00545	(1; 1.5%)
Ne Os	0.00143	(1; 0.96%)	Bs Os	0.0117	(1; 0.59%)	Wt Os	0.0029	(1; 0.8%)
Ms Os	0.00135	(1; 0.91%)	Cl Os	0.00908	(1; 0.45%)	Fo Os	0.0027	(1; 0.74%)
Rd Os	0.00124	(1; 0.83%)	Ho Os	0.00877	(1; 0.44%)	Bl El Os	0.00225	(2; 0.62%)
Bs Os	0.00119	(1; 0.79%)	Rd Os	0.0073	(1; 0.37%)	Wo Tx Cl Os	0.00222	(3; 0.61%)
Rh Os	0.00114	(1; 0.76%)	Pr Os	0.00729	(1; 0.36%)	Ap Os	0.00211	(1; 0.58%)
Pd Os	0.00114	(1; 0.76%)	Rh Os	0.00697	(1; 0.35%)	At Os	0.00209	(1; 0.58%)
Bk Os	0.00105	(1; 0.7%)	Ms Os	0.00606	(1; 0.3%)	Ce Os	0.00206	(1; 0.57%)
St Os	0.00103	(1; 0.69%)	Ne Os	0.00486	(1; 0.24%)	Ch Os	0.00201	(1; 0.56%)
Pr Os	0.000871	(1; 0.58%)	Bk Os	0.00418	(1; 0.21%)	Rd Os	0.00197	(1; 0.54%)
Wa Os	0.000842	(1; 0.56%)	Ps Os	0.00416	(1; 0.21%)	Bc Mp Ho Os	0.00174	(3; 0.48%)
Ho Os	0.000699	(1; 0.47%)	Fm Os	0.00405	(1; 0.2%)	Dc Dp Os	0.00155	(2; 0.43%)
Rv Os	0.000638	(1; 0.43%)	El Os	0.004	(1; 0.2%)	Lg Os	0.00142	(1; 0.39%)

Exports ($/$)			Income ($/$)			Water use (L/$)		
Wt Os	0.00238	(1; 8.1%)	Os	0.462	(0; 87.%)	Os	0.969	(0; 15.%)
Bl El Os	0.000871	(2; 3.%)	Wt Os	0.00449	(1; 0.84%)	Dc Dp Os	0.623	(2; 9.3%)
Cl Os	0.000847	(1; 2.9%)	Cm Os	0.00378	(1; 0.71%)	Wa Os	0.618	(1; 9.3%)
Cm Os	0.000804	(1; 2.7%)	Ed Os	0.00367	(1; 0.69%)	El Os	0.493	(1; 7.4%)
Lg Os	0.000698	(1; 2.4%)	Ts Os	0.00346	(1; 0.65%)	Bc Mp Os	0.399	(2; 6.%)
At Os	0.000664	(1; 2.3%)	Pr Os	0.00146	(1; 0.27%)	Sc Cg Os	0.181	(2; 2.7%)
Mp Os	0.000588	(1; 2.%)	Bs Os	0.00144	(1; 0.27%)	Wo Os	0.176	(1; 2.6%)
Os	0.000543	(0; 1.8%)	Ms Os	0.00141	(1; 0.26%)	Vf Os	0.139	(1; 2.1%)
Ts Os	0.000521	(1; 1.8%)	Ho Os	0.00128	(1; 0.24%)	Ri Fc Os	0.137	(2; 2.%)
Ho Os	0.000488	(1; 1.7%)	Rd Os	0.00126	(1; 0.24%)	Cl Os	0.0658	(1; 0.98%)
En Os	0.000488	(1; 1.7%)	Ne Os	0.00111	(1; 0.21%)	Ws Ho Os	0.0639	(2; 0.96%)
Wo Os	0.000483	(1; 1.6%)	El Os	0.00108	(1; 0.2%)	Su Fd Os	0.0573	(2; 0.86%)
Rd Os	0.000432	(1; 1.5%)	Cl Os	0.00103	(1; 0.19%)	Bc Mp Ho Os	0.0459	(3; 0.69%)
Ed Os	0.000362	(1; 1.2%)	Bk Os	0.00103	(1; 0.19%)	Wa Ts Os	0.0443	(2; 0.66%)
Oi Ap Os	0.000352	(2; 1.2%)	Pd Os	0.00103	(1; 0.19%)	Dc Dp Ho Os	0.038	(3; 0.57%)
Tx Cl Os	0.00034	(2; 1.2%)	Rh Os	0.000762	(1; 0.14%)	Wa Bs Os	0.0358	(2; 0.54%)
Eq Os	0.000305	(1; 1.%)	Fm Os	0.000635	(1; 0.12%)	Wa Ms Os	0.0348	(2; 0.52%)

Imports ($/$)			Government revenue ($/$)			Land disturbance (m^2/$)		
Os	0.0371	(0; 56.%)	Os	0.214	(0; 86.%)	Wo Os	0.131	(1; 29.%)
Cl Os	0.00169	(1; 2.6%)	Wt Os	0.0021	(1; 0.84%)	Bc Mp Os	0.11	(2; 24.%)
Pr Os	0.00131	(1; 2.%)	Cm Os	0.00181	(1; 0.72%)	Wo Tx Cl Os	0.0532	(3; 12.%)
Ap Os	0.00119	(1; 1.8%)	Ts Os	0.00171	(1; 0.68%)	Wo Tx Tp Os	0.0184	(3; 4.%)
Cm Os	0.00103	(1; 1.6%)	Ed Os	0.00135	(1; 0.54%)	Wo Tx Os	0.0156	(2; 3.4%)
Ts Os	0.000942	(1; 1.4%)	Rd Os	0.000891	(1; 0.36%)	Bc Mp Ho Os	0.0127	(3; 2.8%)
Fo Os	0.000883	(1; 1.3%)	Pr Os	0.000706	(1; 0.28%)	Wo Mp Os	0.0124	(2; 2.7%)
Ne Os	0.000691	(1; 1.%)	El Os	0.000676	(1; 0.27%)	Dc Dp Os	0.00323	(2; 0.71%)
Wt Os	0.000676	(1; 1.%)	Pd Os	0.000674	(1; 0.27%)	Wo Tx Fu Os	0.00261	(3; 0.57%)
Tp Os	0.000592	(1; 0.9%)	Ho Os	0.000674	(1; 0.27%)	Os	0.00229	(0; 0.5%)
Rh Os	0.000588	(1; 0.89%)	Ms Os	0.000669	(1; 0.27%)	Bc Mp Bp Os	0.00223	(3; 0.49%)
En Os	0.000566	(1; 0.86%)	Bk Os	0.00057	(1; 0.23%)	Bc Mp Cl Os	0.00188	(3; 0.41%)
Ru Os	0.000329	(1; 0.5%)	Ne Os	0.000559	(1; 0.22%)	El Os	0.00144	(1; 0.32%)
Ho Os	0.000325	(1; 0.49%)	Bs Os	0.000425	(1; 0.17%)	Wo Mp Ho Os	0.00143	(3; 0.31%)
Rd Os	0.000315	(1; 0.48%)	In Os	0.000363	(1; 0.14%)	Wh Fc Os	0.00118	(2; 0.26%)
Ms Os	0.000307	(1; 0.47%)	Cl Os	0.000351	(1; 0.14%)	Ba Bm Ho Os	0.00103	(3; 0.23%)
Mv Os	0.000289	(1; 0.44%)	Rh Os	0.00035	(1; 0.14%)	Bc Mp Fd Os	0.00103	(3; 0.23%)

Linkages (average = 1)

	Value	C.o.V.
Upstream	0.427 ±0.005	(±1.3%)
Downstream	0.421 ±0.005	(±1.3%)