

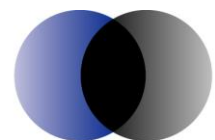


# The economic impact of Christmas Island Phosphates

The impact of Christmas Island  
Phosphates on the economy of  
Christmas Island

Prepared for Christmas Island Phosphates

**March 2009**



**ACIL Tasman**

Economics Policy Strategy

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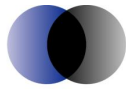


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## Executive summary

Phosphate mining and directly dependent businesses such as stevedoring and contractor activity account for approximately half the Gross Product of Christmas Island.

The likely direct and indirect job losses following the closure of the mine are around 280 full-time equivalent jobs. This represents approximately 40 percent of the current total island labour force. Job losses of this scale will place great strains on the Christmas Island community.

Access to additional lease areas will extend the mine life for a further 10 years, and allow annual average sales of around 650,000 tonnes of material over this period. In a typical year of operation phosphate mining will make substantial contributions in terms of tax payments, royalty payments, and community contributions. Additionally, CIP employees pay substantial income tax.

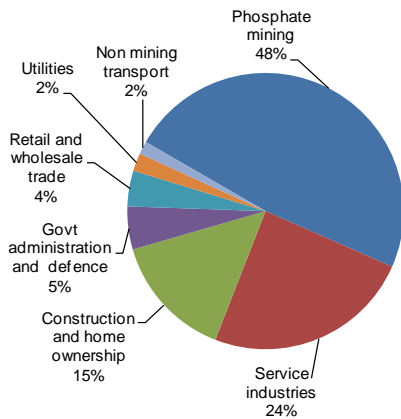
In summary, the total annual value of the various contributions will be around \$27M, and assuming a discount rate of six percent the net present value of these payments over ten years will be \$211M. The specific annual and NPV amounts are shown in Table ES 1.

Table ES 1 Value of extending the mine life by ten years

Details	Annual value	Net Present Value
	(\$) '000	(\$) '000
Sales revenue	115,700	902,656
<b>Contributions</b>		
Company tax	16,934	132,111
Income tax on employee wages and bonuses	4,925	38,423
Phosphate royalties	3,250	25,355
Rehabilitation levy	1,280	9,990
Fringe benefits tax	260	2,028
Community donations and sponsorship	220	1,716
Local government rates	140	1,092
Mine lease rental	24	187
<b>Total contributions</b>	<b>27,034</b>	<b>210,904</b>

Given the current level of planning and investment, five years is too short a time frame for tourism to develop as an alternative industry that could support a replacement level of employment. Extension of the mine life will allow greater time for tourism planning and development.

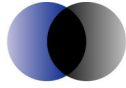
### Economic importance of various sectors on Christmas Island



Phosphate mining supports approximately 40 percent of total island employment

Annual value of tax and community contributions is \$27M

Net Present value of tax and community contributions over ten years is \$211M



## Report summary

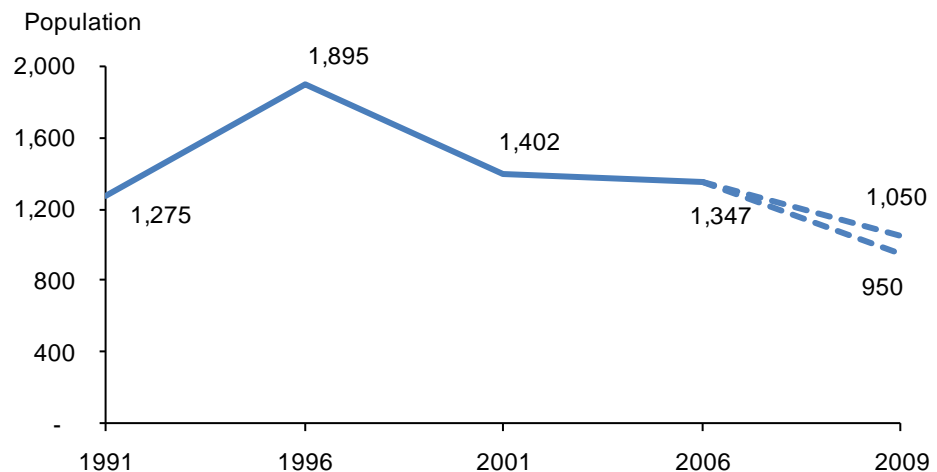
The biggest employer on Christmas Island is Christmas Island Phosphates (CIP), and closure of the business will be a significant economic shock for the Christmas Island economy. The following report provides baseline economic and social data for Christmas Island, and reports modelling results that describe the importance of phosphate mining on Christmas Island to the local economy. Details on the taxes paid and other contributions by CIP and CIP employees are also reported.

## Population summary

Christmas Island is an Australian non-self governing external territory located in the Indian Ocean approximately 360 km south of Java and 2,600 km northwest of Perth. The island has an area of 135 km<sup>2</sup> with approximately 80 km of coastline. The 2006 Census recorded a population of 1,348 which includes people of Chinese, Malay, and European extraction.

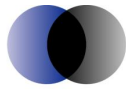
Anecdotal evidence indicates that the Christmas Island population has fallen since the census due to the reduction in economic activity following the completion of the immigration detention centre at northwest point, and the uncertainty regarding the future economic prospects for the island post-phosphate mining. It is possible that the current population is as low as 1,000 residents. Population details for Christmas Island are shown below in Figure ES 1.

Figure ES 1 **Christmas Island population**



Note: The usual resident population statistics exclude the effect of fly-in fly-out workers.

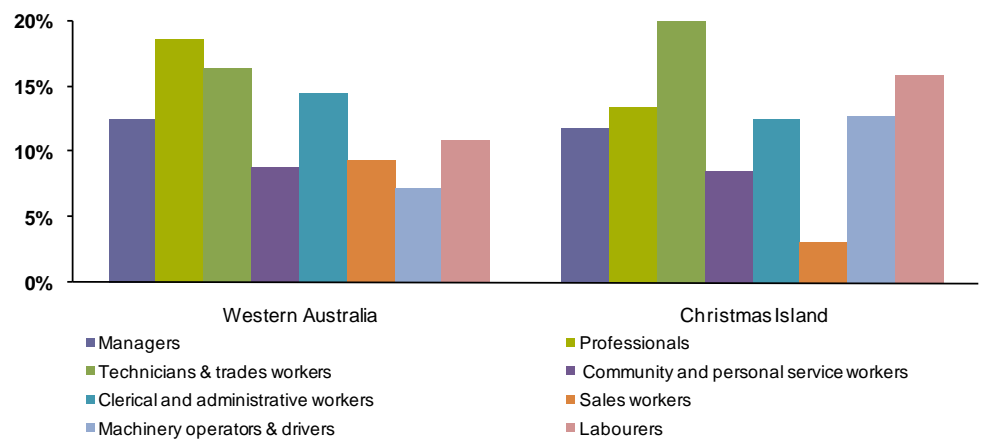
Data source: For period 1991 to 2006 AGCGC (2007, p. 7), estimate from 2006 onwards ACIL Tasman



### Income summary

Relative to Western Australia, incomes on Christmas Island are relatively high, with 28 percent of the population earning in excess of \$1,000 per week compared to 20 percent in Western Australia. This reflects the high level of employment in the Construction and Mining industries, the very high rate of full time employment (75 percent) on the island, and the relatively low level of overall unemployment. Income details are shown in Figure ES 2.

Figure ES 2 **Incomes on Christmas Island**



Note: Count of employed persons aged 15 years and over. It was not possible to compare data with the 2001 Census as the classification by which data is collected has changed.

Data source: 2006 Australian Bureau of Statistics Census

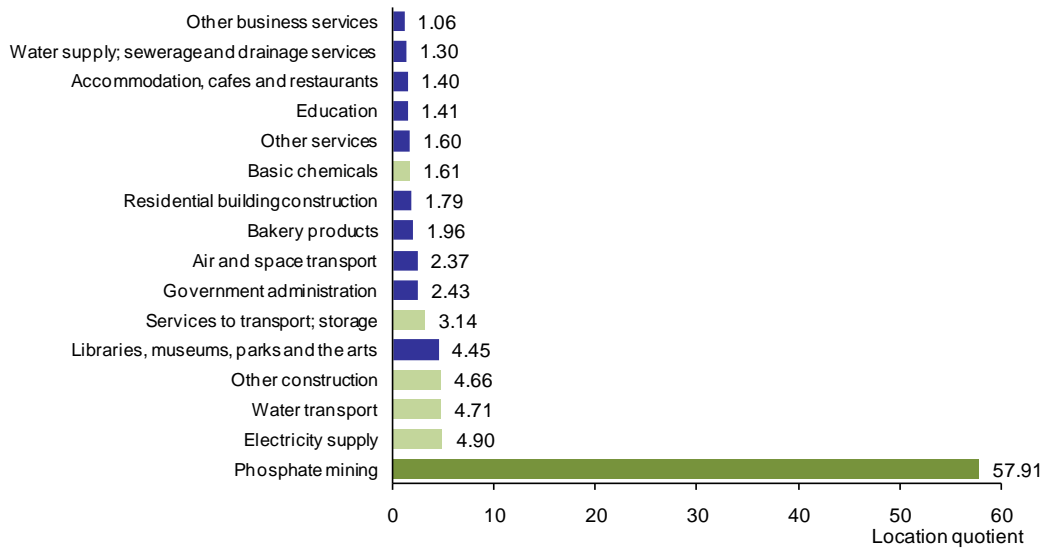
### Key industry sectors

A location quotient greater than unity for an industry indicates that the share of employment in that industry on Christmas Island is greater than the share of employment in the same industry for Western Australia as a whole. One interpretation of a number greater than unity is that the local economy has chosen to specialise in this activity. In some senses it therefore captures the areas that the local economy has a comparative advantage in. A location quotient less than unity but greater than zero is considered as indicating an under-represented industry, meaning that while the industry exists in that economy it is not likely that it is sufficient to drive the economy. Industries with location quotients of zero are not represented in the economy under consideration.

As can be seen from Figure ES 3, phosphate mining is overwhelmingly the most important industry on Christmas Island. Further, closure of the mine would see not only an end to the phosphate mining industry, but would also see a substantial contraction in four of the next five most important industry sectors. These other industries that are directly related to phosphate mining are indicted in pale green in Figure ES 3.



Figure ES 3 **Industry concentration on Christmas Island**

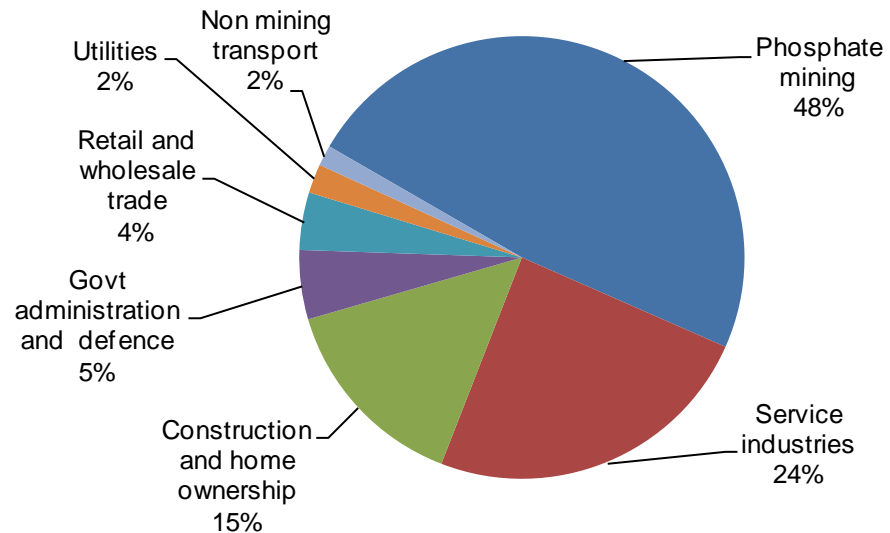


Note: calculations performed by ACIL Tasman. The label phosphate mining is used for the more general ABS category Other mining.  
Data source: 2006 Australian Bureau of Statistics Census

### Size of the Christmas Island economy

An Input Output table was developed for Christmas Island using 2006 data from the Australian Bureau of Statistics. The table was used to estimate the size of the Christmas Island economy. Based on the 2006 Census data, the estimated Gross Product of Christmas Island in 2005-06 was \$71M, and phosphate mining -- plus directly related contracting and stevedoring activity -- account for approximately half of all economic activity on Christmas Island. The relative importance of the different industry sectors is shown in Figure ES 4.

Figure ES 4 **Key industry sectors on Christmas Island**



*Note:* Phosphate mining category includes a share of stevedoring and road transport activity plus a share of construction activity. These changes have been made so as to better reflect the total dependence of some sectors on their relationship with the mine.

*Data source:* ACIL Tasman

### Industry linkages

The following multipliers were estimated for Christmas Island:

- Output – the total value of output generated by all industries in the economy
- Income – the total increase in compensation of employees by all industries
- Employment – the impact on full time equivalent employment
- Value added – the sum of wages, profits and indirect taxes.

The multipliers estimated for Christmas Island have been calculated to measure the impact of an extra \$1M of output. *Simple multipliers* capture the primary direct effect of an economic shock and the impact of industry expenditure. *Total multipliers* capture all the impact that the simple multiplier captures, but additionally capture the impact of the additional consumer spending from those employed in the industries that expand.

As a practical matter the simple multiplier estimates might be thought of as providing a lower bound estimate of impact and the total multiplier estimates might be thought of as providing an upper bound estimate. The multiplier estimates are shown in Table ES 2. The total employment multiplier for phosphate mining is four. The highest employment multipliers are for relatively low wage labour intensive industries.



Table ES 2 **Multipliers for Christmas Island (2005-06)**

	Output		Income		Gross Product		Employment	
	Simple multiplier	Total multiplier	Simple multiplier	Total multiplier	Simple multiplier	Total multiplier	Simple multiplier	Total multiplier
Other mining	1.24	1.45	0.31	0.36	0.53	0.65	2.95	4.01
Bakery products	1.18	1.40	0.32	0.37	0.46	0.59	7.63	8.72
Basic chemicals	1.41	1.54	0.19	0.22	0.35	0.43	2.82	3.47
Electricity supply	1.18	1.26	0.11	0.13	0.37	0.42	5.92	6.29
Water supply; sewer & drain services	1.19	1.34	0.22	0.25	0.67	0.76	3.28	4.02
Residential building construction	1.45	1.61	0.22	0.25	0.36	0.44	5.74	6.48
Other construction	1.35	1.46	0.15	0.18	0.41	0.47	4.69	5.21
Construction trade services	1.45	1.65	0.29	0.34	0.59	0.71	8.75	9.74
Wholesale trade and wholesale repairs	1.40	1.63	0.34	0.39	0.55	0.68	5.25	6.40
Retail trade and retail repairs	1.27	1.53	0.36	0.42	0.56	0.70	10.81	12.05
Accommodation, cafes and restaurants	1.18	1.40	0.30	0.35	0.46	0.58	7.83	8.86
Road transport	1.33	1.53	0.29	0.34	0.51	0.63	7.93	8.94
Water transport	1.46	1.62	0.23	0.27	0.39	0.48	4.57	5.36
Air and space transport	1.23	1.39	0.23	0.26	0.36	0.45	3.69	4.46
Services to transport; storage	1.40	1.61	0.29	0.34	0.56	0.68	4.22	5.21
Communication services	1.30	1.46	0.23	0.27	0.62	0.71	4.43	5.22
Banking	1.06	1.31	0.35	0.41	0.78	0.92	3.47	4.68
Ownership of dwellings	1.08	1.10	0.02	0.02	0.82	0.83	0.37	0.44
Other property services	1.54	1.68	0.21	0.24	0.65	0.74	3.40	4.11
Scientific research, tech & comp. serv.	1.37	1.75	0.54	0.63	0.63	0.84	7.53	9.38
Other business services	1.32	1.59	0.39	0.45	0.63	0.78	8.47	9.79
Government administration	1.31	1.68	0.51	0.60	0.63	0.83	12.10	13.85
Defence	1.25	1.51	0.37	0.43	0.52	0.67	5.94	7.20
Education	1.14	1.64	0.70	0.82	0.80	1.09	10.88	13.29
Health services	1.11	1.61	0.70	0.81	0.83	1.11	9.98	12.38
Community services	1.13	1.47	0.47	0.55	0.80	0.99	17.57	19.19
Libraries, museums, parks and the arts	1.28	1.60	0.46	0.53	0.52	0.70	15.53	17.10
Sport, gambling & recreational services	1.45	1.66	0.30	0.35	0.44	0.56	7.62	8.65
Personal services	1.28	1.54	0.37	0.43	0.63	0.78	18.41	19.69
Other services	1.17	1.65	0.68	0.79	0.73	1.00	9.30	11.62

Data source: ACIL Tasman 2005-06 Input Output Table for Christmas Island

### Impact of not obtaining access to additional leases

The mine directly employs around 170 people, with significant additional employment in stevedoring and contracting activity directly dependent on the mine. Access to additional lease areas will extend the mine life for a further 10 years, and allow annual average sales of around 650,000 tonnes of material over this period.



The Input Output tables and industry multipliers were used to estimate the impact of mine closure. There is some uncertainty regarding the future price of phosphate, but assuming:

- the average US dollar price for phosphate price is \$125
- the average Australian dollar US dollar exchange rate is \$.70
- that 650,000 tonnes of phosphate are shipped, and
- that 22 percent of the company is owned by on island residents,

the likely direct and indirect job losses following the closure of the mine are around 280 full-time equivalent jobs. This represents approximately 40 percent of the current total island labour force.

### Annual company and employee contributions

In a typical year of operation phosphate mining is expected to generate around \$116M in export or import replacement revenue and make substantial contributions in terms of tax and royalty payments. Additionally, CIP employees pay income tax. In summary, the total annual value of the various contributions will be around \$27M, comprised of:

- Company tax \$17.0M
- Income tax paid on employee wages and bonuses \$4.9M
- Phosphate royalties \$3.2M
- Rehabilitation levy \$1.3M
- Fringe benefits tax \$260,000
- Local government rates \$140,000
- Mining lease rental \$24,000

Additionally, CIP provides between \$200,000 and \$250,000 in community donations and sponsorships each year, and CIP employees contribute to the local community through service to:

- State Emergency Service (10 staff)
- Fire brigade (9 staff)
- Ambulance Service (3 staff), and
- Local government, by way of shire councillors (3 staff).

### Net present value of contributions

Access to the new lease areas would extend the mine life by ten years. Using a discount rate of six percent, the net present value of export or import replacement revenue over the life of the mine would be around \$903M. The NPV of the additional taxes, royalty payments, and community contributions would be \$211M, comprised of:



- Company tax \$132M
- Income tax paid on employee wages and bonuses \$38.4M
- Phosphate royalties \$25.4M
- Rehabilitation levy \$9.99M
- Fringe benefits tax \$2.03M
- Community donations and sponsorship \$1.72M
- Local government rates \$1.09M
- Mining lease rental \$.19M.

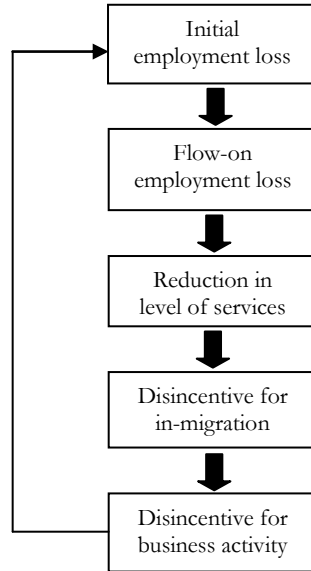
### Social impact

Social cohesion is a measure of how a community interacts. The Christmas Island community supports a diverse mix of people from all ages and ethnic backgrounds. The closure of the mine will see a large loss of population, and there will be significant social impacts from the change to the ethnic and age balance including a loss of students from schools, loss of community volunteers and leaders, loss of employment aspirations as young people's expectations of careers on the island are diminished, increases in unemployment, and possible long term unemployment due to lack of alternative employers.

In many communities this loss of social cohesion following the closure of a major employer is temporary as employees are eventually absorbed into other employment. However, in the case of Christmas Island, the current lack of economic diversification means that there is very little opportunity for residents to find alternative social and economic opportunities. Furthermore, there is little opportunity for the island to attract new residents given its isolation and lack of social and economic enticements. It is likely that without substantial and sustained government spending the community will enter an unrelenting downward spiral of the kind identified by Beer and Keane (2000), and illustrated in Figure ES 5.



Figure ES 5 **Services, employment, and population loss spiral**



Data source: Adapted from Beer and Keane (2000).

### Regional implications

In some areas Christmas Island serves as a regional hub for the Indian Ocean Territories more generally. The economic linkages between the Christmas Island economy and the Cocos (Keeling) Islands economy are not extensive, but occur in some critical areas. The most important economic linkage relates to air and sea transport. A significant reduction in economic activity on Christmas Island would have implications for the cost of service delivery on the Cocos (Keeling) Islands, especially in the area of transport costs.

The other critical area of interaction relates to health services. A reduction in health and related services on Christmas Island will impact upon the Cocos (Keeling) Islands in areas where the service is also provided to the Cocos (Keeling) Islands from staff based on Christmas Island. One example is that the resident pharmacist on Christmas Island also services the Cocos (Keeling) Islands. With a reduction in economic activity on Christmas Island it is likely that a greater number of health services would need to be provided to the Cocos (Keeling) Islands on a fly-in basis.

### Future prospects

Phosphate mining on Christmas Island will, at some point cease. If access to the requested lease areas is granted mining will cease in approximately 15 years. Without access to new areas mining will cease in approximately five years.



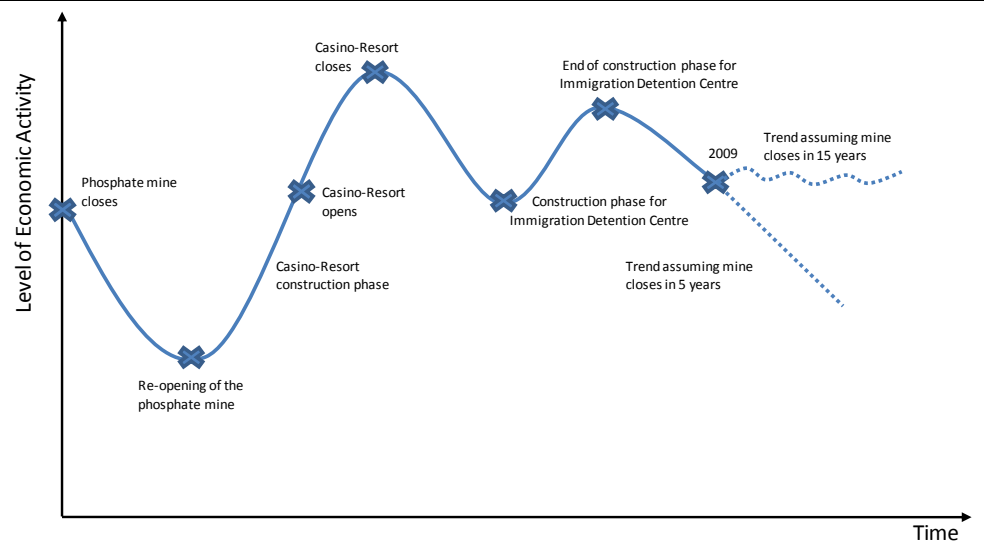
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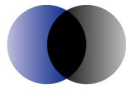
It will not be possible to establish a replacement economic base on Christmas Island within five years, and given the current state of planning for a post-mine economic future closure of the mine will see an economic collapse on Christmas Island. For example, for tourism to generate comparable replacement employment would require approximately 15,500 additional tourists to visit Christmas Island each year; a number that is many times greater than the current island tourism capacity.

An additional barrier to development is the lack of a comprehensive land use plan for Christmas Island. Investment in all substantial development projects, including tourism related projects, is unlikely to take place before a comprehensive land use plan is adopted. Adoption of such a plan is several years away.

With a planning horizon of 15 years, the medium term economic future of the island would be secure. Further, with a planning horizon of 15 years it is possible to imagine that sufficient planning and investment could be undertaken to build a sustainable post-phosphate mining future for Christmas Island. Indicative paths for economic life on Christmas Island with mining ceasing in both 5 years and 15 years are shown in Figure ES 6.

Figure ES 6 **Stylised paths for economic activity of Christmas Island**





# 1 Introduction

Christmas Island is an Australian non-self governing external territory located in the Indian Ocean approximately 360 km south of Java and 2,600 km northwest of Perth. The island has an area of 135 km<sup>2</sup> with approximately 80 km of coastline. The 2006 Census recorded a population of 1,348 which includes people of Chinese, Malay, and European extraction.

Due to the number of endemic bird, crab, and plant species found on Christmas Island, it is considered to have high conservation value. Reflecting the conservation value of the island, approximately 63 percent of Christmas Island is National Park. There are also large areas of unalienated or unallocated crown land on the island.

ACIL Tasman was engaged in February 2009 to undertake a study to determine the economic impact of phosphate mining to the Christmas Island economy, and determine the value of granting access to additional lease areas that would extend the mine life by ten years. The following report documents the study findings.

## 1.1 Methodology

To develop an economic profile of Christmas Island initial data was sourced from the Australian Bureau of Statistics. This detail was then refined using information gathered through consultation with representatives of Christmas Island Phosphates (CIP), residents, and desktop research. To represent the economic linkages on Christmas Island an Input Output table was then prepared.

To model the economic impact of the closure of the mine ACIL Tasman worked with representatives of CIP and consulted with IOT business operators. The process allowed a comprehensive description of the underlying economic structure of the IOT to be developed. The accurate description of the economy in turn allowed the impact of mine closure to be modelled in detail.

All data from the Australian Bureau of Statistics is based on place of usual residence data from the 2001 and 2006 Censuses.

## 1.2 Outline of the report

The remainder of the report is structured as follows. A base line description of the Christmas Island economy is provided in Chapter 2 and Chapter 3. Specifically, Chapter 2 provides a demographic profile of the island and



**ACIL Tasman**

Economics Policy Strategy

## **The economic impact of Christmas Island Phosphates**

Chapter 3 provides an economic profile. Government expenses and revenue associated with Christmas Island are reported in Chapter 4, and the contribution of Christmas Island Phosphates is described in Chapter 5. Modelling results that make use of the Christmas Island Input Output tables and associated multipliers to determine the economic impact of mine closure are presented in Chapter 6. The social impacts of mine closure are described in Chapter 7, and indicative calculations for the extent of growth required in tourism before it can generate sufficient replacement employment for mining are presented in Chapter 8. Concluding comments are made in Chapter 9.

## 2 Demographic profile

The demographic profile reports information on the population, including the ethnic mix of the island and the age and gender mix of the island, and also reports details relating to accommodation.

### 2.1 Population

The resident population of Christmas Island was 1,348 persons at the 2006 Census, which is slightly lower than the 2001 Census when 1,404 persons were counted.

Anecdotal evidence indicates that the Christmas Island population has fallen further since 2006. The main reasons for the reduction in population are the reduction in economic activity following the completion of the immigration detention centre at northwest point which provided a large number of construction jobs, and the uncertainty regarding the future economic prospects for Christmas Island in the event that phosphate mining ceases. It is possible that the current population is as low as 1,000 residents. Evidence for the fall in population can be seen in the school enrolment numbers shown in Table 1.

Table 1 **Christmas Island District High School enrolments: 2004-08**

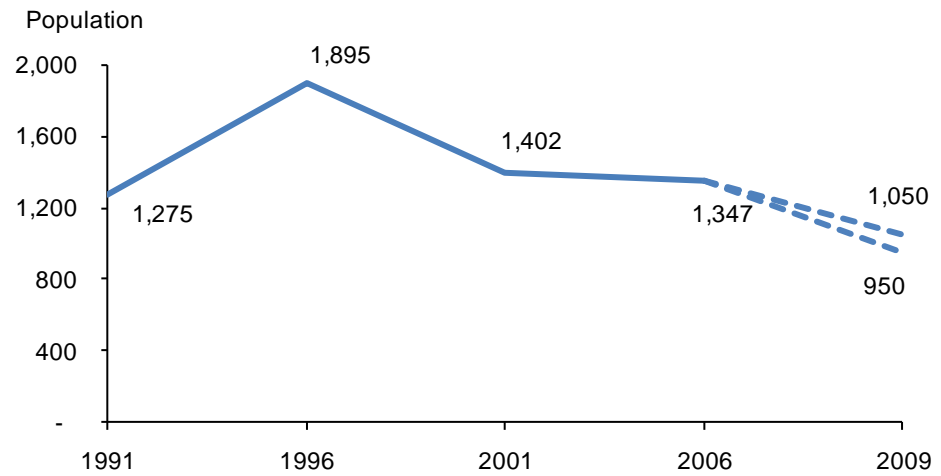
School bracket	2004	2005	2006	2007	2008
	No.	No.	No.	No.	No.
Primary	197	188	167	147	130
Lower secondary	100	103	90	76	73
Upper Secondary	30	40	37	26	24
<i>Total</i>	<i>327</i>	<i>331</i>	<i>294</i>	<i>249</i>	<i>227</i>

*Note:* Enrolment statistics are for semester one in the respective years. Data for 2009 is not yet available.  
*Data source:* [www2.eddept.wa.edu.au](http://www2.eddept.wa.edu.au) [accessed 11 August 2008].

Christmas Island population details based on census data, plus additional details for what is thought to be the range of values the current Island population lies within are shown in Figure 1.



Figure 1 **Christmas Island population**



*Note:* The usual resident population statistics exclude the effect of fly-in fly-out workers.

*Data source:* For period 1991 to 2006 AGCGC (2007, p. 7), estimate from 2006 onwards ACIL Tasman

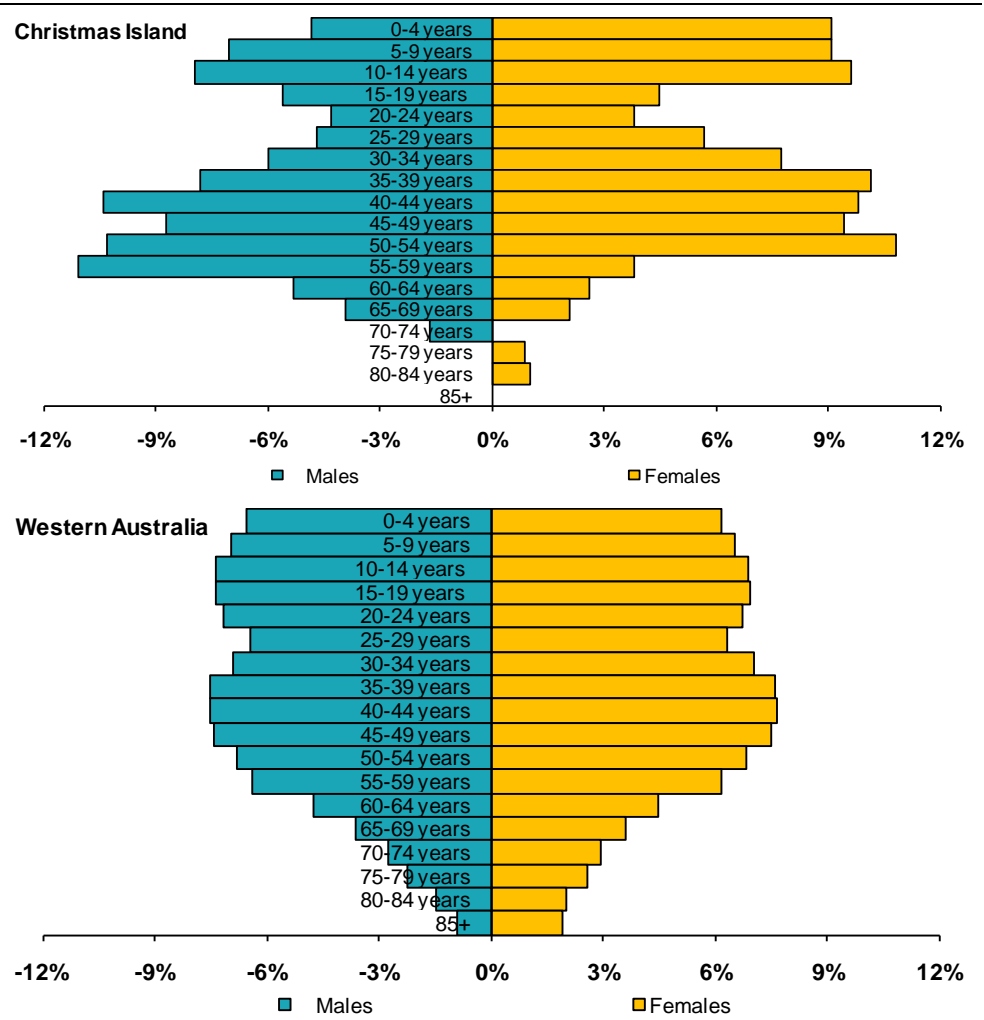
## 2.2 Age and gender structure

Christmas Island has an age and gender profile not dissimilar to other small and isolated communities in Western Australia. There is a lack of young people of school age as well as a lack of people in their twenties. This absence of population is normally a function of school aged children leaving an area to pursue their education elsewhere, and of younger people seeking alternative employment and life experiences away from home.

Figure 2 shows the age and gender profile for Christmas Island compared to Western Australia and highlights these features.



Figure 2 **Age and gender structure: Christmas Island and Western Australia (2006) (%)**



Data source: 2006 Australian Bureau of Statistics Census

### 2.3 Ethnicity

The majority of residents on Christmas Island have Chinese ancestry, but there is also a significant ethnic Malay population, and a significant population that has European ancestry. An indication of the relative importance of each group can be established from the nominated religious affiliation of Christmas Island residents. Figure 3 compares the religious affiliation of Christmas Island residents to Western Australia for 2001 and 2006. Unlike Western Australia where the majority of the population identifies with the Christian tradition, Figure 3 shows that most common religious affiliation on the island is Buddhism (30 percent), followed by Christianity (25 percent) and then Islam (20 percent).

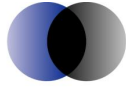
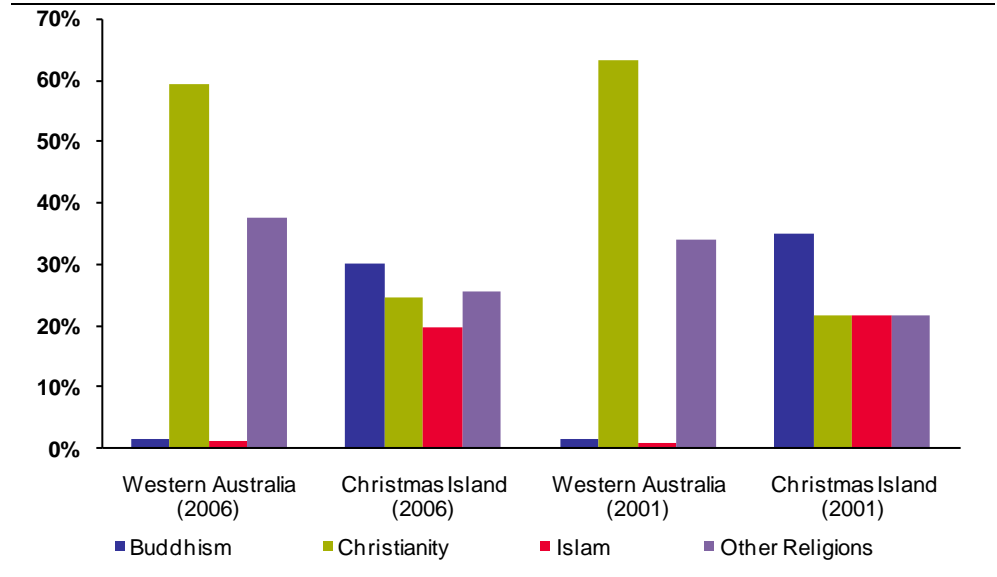


Figure 3 **Religious affiliation: Christmas Island and Western Australia (2006)**



Data source: 2001 and 2006 Australian Bureau of Statistics Census

## 2.4 Dwelling information

There is a high rate of rental accommodation on Christmas Island and a high proportion of government rental housing when compared to Western Australia (see Table 2). Out of a total housing stock of 481 households, 48 percent are rented compared to only 27 percent of households in Western Australia. Furthermore, 43 percent of rented households are for government provided accommodation, compared to only 15 percent in Western Australia. This is a function of the high level of people employed by the government sector on the island.

Table 2 **Rental housing: Christmas Island and Western Australia (2006)**

	Western Australia	Christmas Island
Total households	703,165	481
Percent households rented	27%	48%
Percent government provided rental housing	15%	43%
Median rent per week	\$170	\$92

Note: Count of occupied private dwellings being rented.

Data source: 2006 Australian Bureau of Statistics Census

The median weekly rent on Christmas Island is \$92 per week, which is low compared to Western Australia and is a result of the higher level of government rental accommodation. It is understood that government rental accommodation is priced according to the Tenant Rent Setting Framework that applies a substantial discount to market rents.



## 3 Economic profile

This chapter describes the economic output of the island, discusses the employment and income profile of residents, details the key industries, and describes the economic linkages on the island by way of Input Output table derived measures.

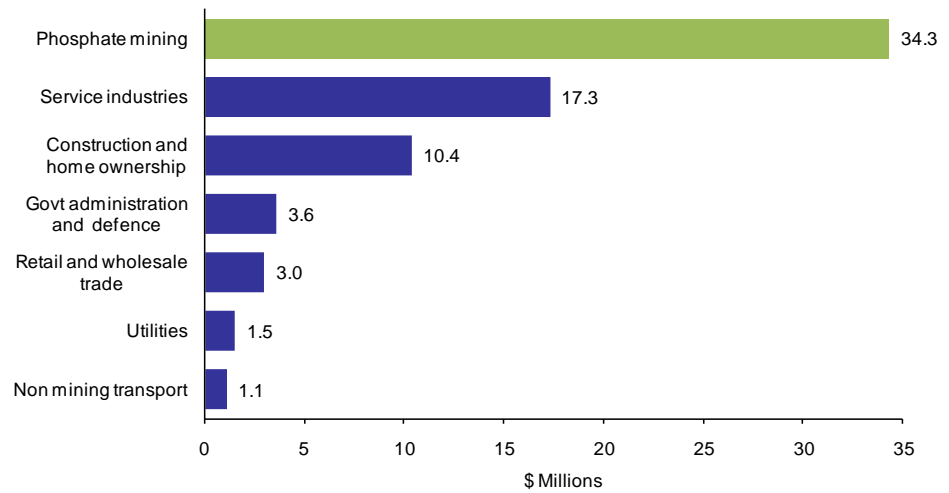
### 3.1 Economic output

To measure the size of the economy a Christmas Island specific Input Output table was developed. An Input Output table provides a summary, or a “snapshot”, of the transactions occurring within an economy over a given period of time. The Australian Bureau of Statistics (ABS) produces Input Output tables at the national level, and these tables show the consumption and sales patterns of over 100 industries. Input Output tables show, for a given industry, which other industries it purchases from and to which other industries it sells. The national Input Output tables also show the use of industry production in private and government consumption, the use in public and private investment, and sales to foreigners (exports). The Input Output table for Christmas Island was derived using the distributive commodity balance (DCB) method. The DCB approach takes a base Input Output table and uses industry shares to generate the regional table.

As the ultimate base table is produced by the ABS, the reference year for the analysis is determined by the ABS table produced for 2005-06. The estimated gross product of Christmas Island in 2005-06, derived from the Christmas Island Input Output table, was \$71M, and the industries that comprise the \$71M are detailed in Figure 4. Accounting for approximately half of total gross product, phosphate mining, including directly related service activity such as stevedoring, is the most significant economic activity on the island.

While this measure gives a reasonable indication of the direct importance of phosphate mining to the island, the measure understates the importance of phosphate mining to the Christmas Island economy as there are a range of indirectly related industries that exist only because of phosphate mining. Many of the non directly related service industries, such as banking services, would not exist if mining was not present on the island.

Figure 4 **Christmas Island Gross Product (\$M) 2005-06**

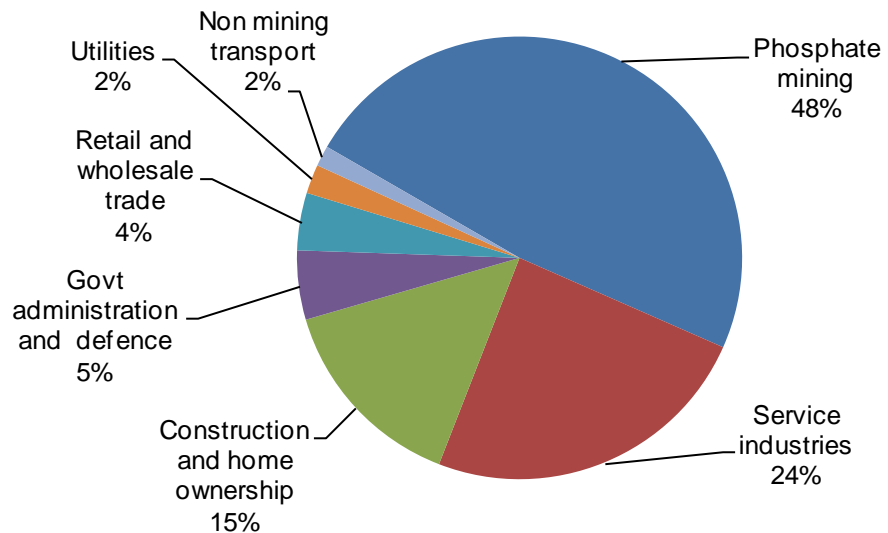


*Note:* Phosphate mining category includes a share of stevedoring and road transport activity plus a share of construction activity. These changes have been made so as to better reflect the total dependence of some sectors on their relationship with the mine.

*Data source:* ACIL Tasman

The relative industry shares, expressed in percentage terms are shown in Figure 5. The figure demonstrates the importance of phosphate mining to the Christmas Island economy.

Figure 5 **Relative importance to Christmas Island Gross Product: 2005-06**



*Note:* Phosphate mining category includes a share of stevedoring and road transport activity plus a share of construction activity. These changes have been made so as to better reflect the total dependence of some sectors on their relationship with the mine.

*Data source:* ACIL Tasman



## 3.2 Industry employment and importance

Employment on Christmas Island is dominated by a handful of industries with the main industries of employment in 2006 being Construction (15 percent), Mining (14 percent), and Public Administration and Safety (14 percent). Note that the large number of people employed in the Construction industry is a result of the Census data capturing some employment associated with the construction of the DIAC northwest point immigration facility and the associated housing infrastructure built on Christmas Island. It is likely that the share of employment in this industry has fallen since. All mining employment is at the Christmas Island phosphate mine and CIP is the largest employer on Christmas Island.

It is also notable that some of the employment in construction and stevedoring is employment directly attributable to the operation of the mine so that direct mining related employment is substantially greater than the value captured by the census classification groupings.

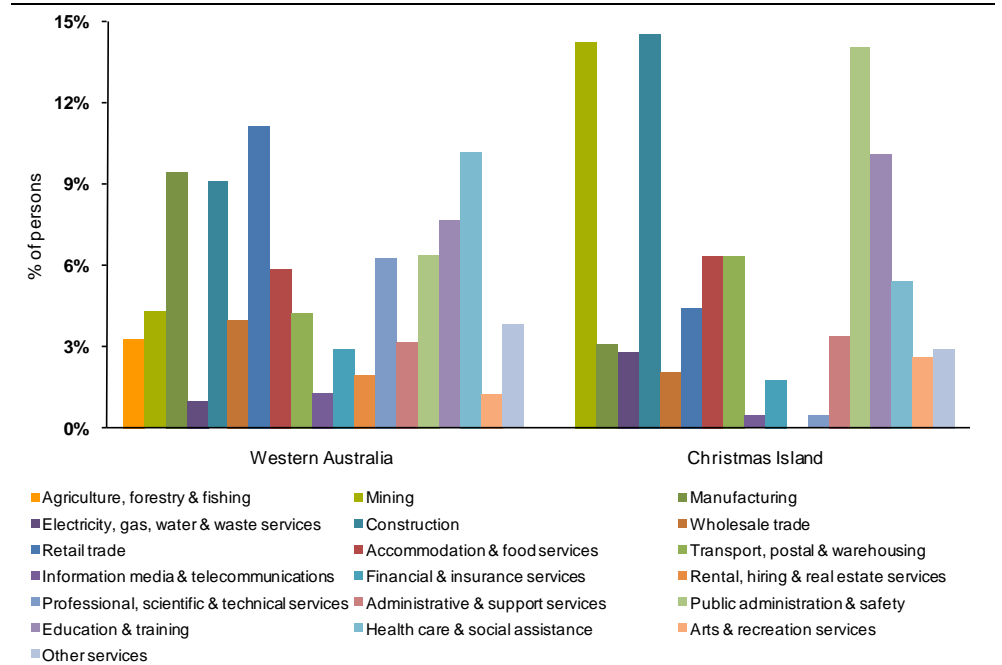
The government sector is a major employer accounting for 30 percent of the workforce. Employment primarily consists of employees of Parks Australia which administers the Christmas Island National Park, the Australian Federal Police, the Christmas Island District High School, and the Attorney-General's Department.

The Australian Bureau of Statistics have changed the industry categories they use to measure employment so it is not possible to directly compare data between the 2001 and 2006 Censuses. However, in 2001, the major industries of employment on Christmas Island were broadly consistent with the 2006 Census, namely: Mining (19 percent), Education (13 percent) and Government Administration and Defence (11 percent).

In Western Australia, the employment profile is more evenly spread with the major industries of employment in 2006 being Retail trade (11 percent), Health care and social assistance (10 percent), Construction (9 percent) and Manufacturing (9 percent). The employment profile of Western Australia as a whole is contrasted to that of Christmas Island in Figure 6.



Figure 6 **Employment by industry: Christmas Island and Western Australia (2006)**

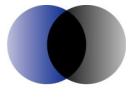


Note: Count of employed persons aged 15 years and over.  
Data source: 2006 Australian Bureau of Statistics Census

### 3.2.1 Location quotients

One method that can be employed to determine industry concentration on Christmas Island is to calculate location quotients for each industry on the island. Location quotients compare the share of employment in a region with the share of employment in another region. In this case, ACIL Tasman has compared the share of employment on Christmas Island with the share of employment in Western Australia as a whole. Details of the formula used to calculate each location quotient are provided in Box 1.

Location quotients were initially developed as a method of determining whether a regional industry should be classified as importing, exporting, or local. The logic being that an industry with a location quotient of unity is able to meet the needs of the local economy, while a location quotient of greater than unity indicates that the industry is capable of supplying product to customers outside of the region. A location quotient of less than unity indicates that imports may be required to meet the needs of the local economy.



Box 1 **Location quotient formula**

Location quotients ( $LQ_i$ ) are calculated using the following formula:

$$LQ_i = \frac{N_i^r / N^r}{N_i / N}$$

Where:

- $N_i^r$  represents employment in regional industry  $i$ ;
- $N^r$  represents total employment in the region;
- $N_i$  represents employment in the state's industry  $i$ ; and
- $N$  represents total state employment.

Data source: ACIL Tasman

For the purposes of the current study, a location quotient greater than unity for an industry indicates that the share of employment on Christmas Island in that industry is greater than the share of employment in the same industry for Western Australia as a whole. One interpretation of a number greater than unity is that the local economy has chosen to specialise in this activity. In some senses it therefore captures the areas that the local economy has a comparative advantage in. A location quotient less than unity but greater than zero is considered as indicating an under-represented industry, meaning that while the industry exists in that economy it is not likely that it is sufficient to drive the economy. Industries with location quotients of zero are not represented in the economy under consideration. It should be noted that with such analysis it is not possible to capture details for very small or niche industries.

A summary of the location quotients that are greater than unity is shown in Figure 7. From the figure it can be seen that using the location quotient measure there are only a handful of industries on Christmas Island that can be considered significant economic drivers. Figure 7 also confirms the dominance of the phosphate mining industry on Christmas Island as the major driver of the economy. Specifically, the location quotient for mining is 58, and the next most significant industry is electricity supply, with a location quotient of 5.

Although the formula for calculating location quotients is provided in Box 1, it is worth presenting details for a specific numerical example. By way of illustration let us consider the details for the location quotient on Christmas Island for libraries, museums, parks, and the arts. The 2006 Census indicated that there were 13 people employed in the libraries, museums, parks, and the arts industry on Christmas Island at a time when total employment on the island was 678. The percentage of the workforce employed in this industry grouping was therefore  $(13 \div 678) \times 100 = 1.91$  percent.



In Western Australia as a whole, out of a total employed workforce of 891,253 people, some 3,822 were employed in the libraries, museums, parks, and the arts industry grouping. As such the percent of the Western Australian population employed in this industry was  $(3,822 \div 891,253) \times 100 = 0.47$  percent.

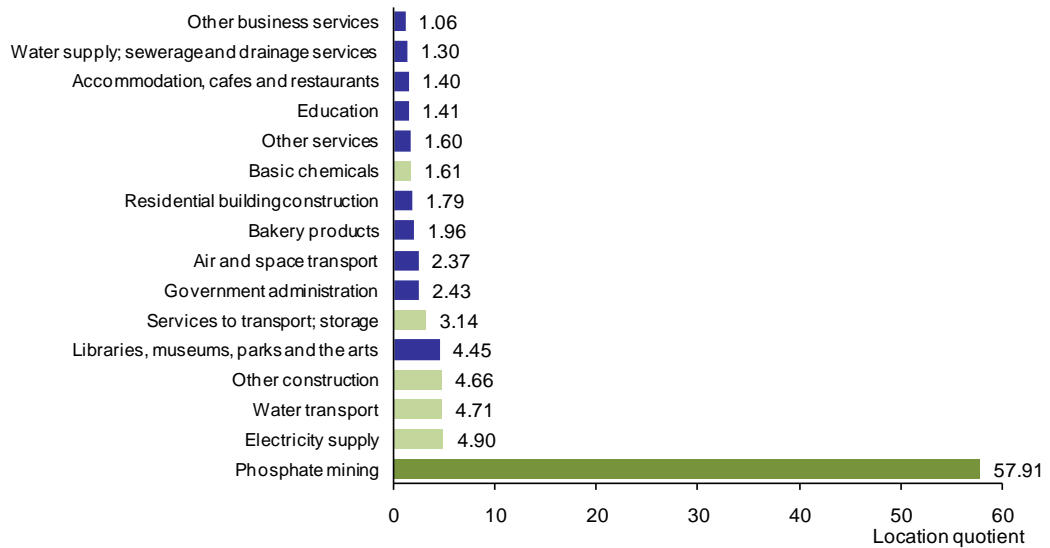
The location quotient is then found as the ratio of the Christmas Island industry workforce percentage and the Western Australian industry workforce percentage. Specifically, the location quotient for the libraries, museums, parks, and the arts industry on Christmas Island is found as  $1.91 \div 0.47 = 4.45$ , which is the value reported in the relevant row of Figure 7.

With regard to location quotient values for very small areas it is also important to recognise the importance of minimum scale of operation effects. Consider, for example, the case of bakery products on Christmas Island. The Census reported that three people were involved in this industry. It is likely that this is the minimum number of people required to operate a bakery. Due to the low number of people employed on Christmas Island, if a bakery exists on Christmas Island the location quotient ends up being above unity; and if it does not exist the location quotient ends up zero. For very small regions a location quotient value above unity does not always indicate an area of comparative advantage. It is therefore important to interpret the location quotient numbers in light of minimum scale of operation effects.

While Figure 7 demonstrates the overwhelming importance of phosphate mining to the local economy, in reality, the phosphate mining row understates the importance of phosphate mining. This is because there are a range of other economic activities that are directly related to phosphate mining but are classified separately to the activities of the mine. These activities relate to things such as stevedoring and pilot services, power generation, transport services, and construction contractors that work exclusively for the mine. These directly related industries are indicated with pale green in Figure 7. The closure of the mine would see not only an end to the phosphate mining industry -- overwhelmingly the most important industry on the island -- but it would also see a substantial contraction in four of the next five most important industry sectors.



Figure 7 **Location quotient analysis: Christmas Island**



Note: calculations performed by ACIL Tasman. The label phosphate mining is used for the more general ABS category Other mining.  
Data source: 2006 Australian Bureau of Statistics Census

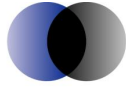
### 3.3 Economic linkages

The links between the different industries on Christmas Island can be understood by considering output multiplier estimates and the extent of expenditure captured on island.

Multiplier estimates have been derived from the Christmas Island Input Output table developed using 2006 data from the Australian Bureau of Statistics. The various multiplier values capture the direct and indirect effects of an economic stimulus on a region in terms of output, income, employment, and value added. The following multipliers were estimated for Christmas Island:

- Output multiplier – measures the total value of output generated by all industries in the economy
- Income multiplier – measures the total increase in compensation of employees by all industries
- Employment multiplier – measures the impact on full time equivalent employment
- Value added multiplier – measures the sum of wages, profits and indirect taxes and is used to measure the size of an economy in terms of Gross Product<sup>1</sup>.

<sup>1</sup> As several forms of indirect taxation are not payable on Christmas Island, taxes have been omitted from this calculation.



The multiplier values reported for Christmas Island have been calculated to measure the impact of an extra \$1M of output. For example, if the economy increased by \$1M across all industries, then the multipliers measure the impact of that increase in terms of output, income, full time equivalent jobs, and gross product.

### 3.3.1 Types of multipliers

The total economic impact identified by use of Input Output multipliers includes the direct effect of the initial increase in demand and the indirect (or “flow-on”) effects. The flow-on effects result from the linkages between industries in the regional economy. For example, accommodation providers on Christmas Island purchase inputs from other local industries. When demand for their output increases, the accommodation providers will increase their purchases from other local businesses, who themselves must increase their consumption, some of which will be from other local firms, and so on.

The simple multiplier estimates capture the primary direct effect of an economic shock and the impact of industry expenditure. The total multiplier estimates capture all the impact that the simple multiplier captures, but additionally capture the impact of the additional consumer spending from those employed in the industries that expand.

### 3.3.2 Assumptions and limitation of the approach

It is important to be clear about the assumptions made in the development of an Input Output table. The Input Output table analysis technique assumes:

- constant prices
- fixed technology
- fixed import shares
- unlimited supplies of all resources, including labour and capital
- a fixed relationship between income and private consumption.

As a result of these assumptions, any calculations making use of Input Output multipliers do not allow for substitution between goods and services or between capital and labour in the production process; or between goods and services in consumption. For these reasons the results generated from Input Output total multipliers are generally considered to be upper bound estimates of the likely economic impact. It is because the technique results in upper bound estimates that it is worthwhile to also report the simple multiplier results.

As the simple multiplier estimates capture direct effects and industry effects only, they underestimate the impact and so can be interpreted as representing



lower bound estimates. Reporting a range of values also helps convey the uncertainty involved when modelling.

### 3.3.3 Christmas Island multipliers

Table 3 contains simple and total multipliers for output, income, value added, and employment. Simple output multipliers measure the effects, both direct and indirect, on the output from all industries due to an initial one dollar change in a given industry. Total output multipliers are larger than simple multipliers because they also include the additional stimulus to output arising from the additional private consumption that occurs as a result of payments made to employees in the production process.

Income multipliers differ from output multipliers in that they are a measure of the increased private income arising from an additional one dollar increase in the output of a given industry.

Value added is defined as the sum of payments to labour and payments to capital. Value added multipliers therefore measure the impact of increased production on value added in the economy.

Output, income and value added are all measured in dollar terms. The multipliers for these are therefore in the units of dollar per dollar. For example, the total Output multiplier for phosphate mining on Christmas Island is 1.45. This means that for a \$1M increase in output from phosphate mining an additional \$450,000 in output will be generated. Multipliers therefore recognise the initial outlay in addition to the flow on impact.

Employment is measured in full time equivalent (FTE) jobs. Employment multipliers are measured in terms of (FTE) jobs created as a result of an initial \$1M increase in the output of a given industry. In the case of the phosphate mining industry on Christmas Island, the total Employment multiplier is 4.01. This means that for a \$1M increase in output there will be an increase in employment of 4.01 FTE jobs. Care should be taken when reviewing employment multiplier numbers as high numbers can reflect a high labour share relative to capital, a low average industry wage, or a combination of both factors.



Table 3 **Multipliers for Christmas Island (2005-06)**

	Output		Income		Value added fc		Employment	
	Simple multiplier	Total multiplier	Simple multiplier	Total multiplier	Simple multiplier	Total multiplier	Simple multiplier	Total multiplier
Phosphate mining	1.24	1.45	0.31	0.36	0.53	0.65	2.95	4.01
Bakery products	1.18	1.40	0.32	0.37	0.46	0.59	7.63	8.72
Basic chemicals	1.41	1.54	0.19	0.22	0.35	0.43	2.82	3.47
Electricity supply	1.18	1.26	0.11	0.13	0.37	0.42	5.92	6.29
Water supply; sewer & drain services	1.19	1.34	0.22	0.25	0.67	0.76	3.28	4.02
Residential building construction	1.45	1.61	0.22	0.25	0.36	0.44	5.74	6.48
Other construction	1.35	1.46	0.15	0.18	0.41	0.47	4.69	5.21
Construction trade services	1.45	1.65	0.29	0.34	0.59	0.71	8.75	9.74
Wholesale trade and wholesale repairs	1.40	1.63	0.34	0.39	0.55	0.68	5.25	6.40
Retail trade and retail repairs	1.27	1.53	0.36	0.42	0.56	0.70	10.81	12.05
Accommodation, cafes and restaurants	1.18	1.40	0.30	0.35	0.46	0.58	7.83	8.86
Road transport	1.33	1.53	0.29	0.34	0.51	0.63	7.93	8.94
Water transport	1.46	1.62	0.23	0.27	0.39	0.48	4.57	5.36
Air and space transport	1.23	1.39	0.23	0.26	0.36	0.45	3.69	4.46
Services to transport; storage	1.40	1.61	0.29	0.34	0.56	0.68	4.22	5.21
Communication services	1.30	1.46	0.23	0.27	0.62	0.71	4.43	5.22
Banking	1.06	1.31	0.35	0.41	0.78	0.92	3.47	4.68
Ownership of dwellings	1.08	1.10	0.02	0.02	0.82	0.83	0.37	0.44
Other property services	1.54	1.68	0.21	0.24	0.65	0.74	3.40	4.11
Scientific research, tech & comp servs	1.37	1.75	0.54	0.63	0.63	0.84	7.53	9.38
Other business services	1.32	1.59	0.39	0.45	0.63	0.78	8.47	9.79
Government administration	1.31	1.68	0.51	0.60	0.63	0.83	12.10	13.85
Defence	1.25	1.51	0.37	0.43	0.52	0.67	5.94	7.20
Education	1.14	1.64	0.70	0.82	0.80	1.09	10.88	13.29
Health services	1.11	1.61	0.70	0.81	0.83	1.11	9.98	12.38
Community services	1.13	1.47	0.47	0.55	0.80	0.99	17.57	19.19
Libraries, museums, parks and the arts	1.28	1.60	0.46	0.53	0.52	0.70	15.53	17.10
Sport, gambling & recreational servs	1.45	1.66	0.30	0.35	0.44	0.56	7.62	8.65
Personal services	1.28	1.54	0.37	0.43	0.63	0.78	18.41	19.69
Other services	1.17	1.65	0.68	0.79	0.73	1.00	9.30	11.62

Data source: ACIL Tasman 2005-06 Input Output Table for Christmas Island

### 3.3.4 Spending captured

Linkages between industries on Christmas Island can also be estimated by examining the purchases of industries located on Christmas Island from other businesses located the island. Table 4 shows total spending, spending by private (non business) consumers, and government spending that is captured on island. For comparison purposes details are also shown for Western Australia.

By reading down the total intermediate consumption column it can be seen that 41 percent of business purchases made on Christmas Island are from businesses located on the island, whereas an estimated 77 percent of purchases made by industry in Western Australia are from businesses located in the State.

Table 4 **Local share of spending estimate (2005-06) (%): Christmas Island and Western Australia**

Region	Total intermediate consumption	Private consumption	Government consumption
Christmas Island	41.0	56.4	74.7
Western Australia	76.8	84.5	95.5

*Data source: ACIL Tasman 2005-06 Input-Output Tables for Christmas Island and the Cocos (Keeling) Islands*

In Western Australia 84 percent of purchases by individuals are from Western Australia while the comparative figure for Christmas Island is 56 percent. Nearly all government spending in Western Australia (96 percent) is estimated to be made within the State. The respective figure for Christmas Island is 75 percent.

These figures indicate that much of the spending by government, businesses, and individuals on Christmas Island flows out of the Christmas Island economy. This is not surprising given the narrow base of the economy.

### 3.4 Economic summary

The economic history of Christmas Island is largely the history of phosphate mining. Were it not for phosphate deposits, and assuming only economic assessment criteria were used, the island would in all probability not have been settled. With respect to phosphate mining, apart from relatively brief periods during the Second World War and a period of closure between 1988 and 1991, phosphate has been mined on the island since 1889.

The economic base of the island is narrow and in recent decades economic progress on the island has followed a boom-bust economic cycle. As the island population is relatively small, the start of any large scale enterprise will lead to a boom, and the closure of any significant enterprise will lead to a noticeable economic contraction. A stylised representation showing the boom-bust nature of economic growth on Christmas Island since the late 1980s through to the current period, and some potential future economic growth paths, is shown in Figure 8.

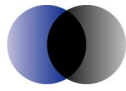
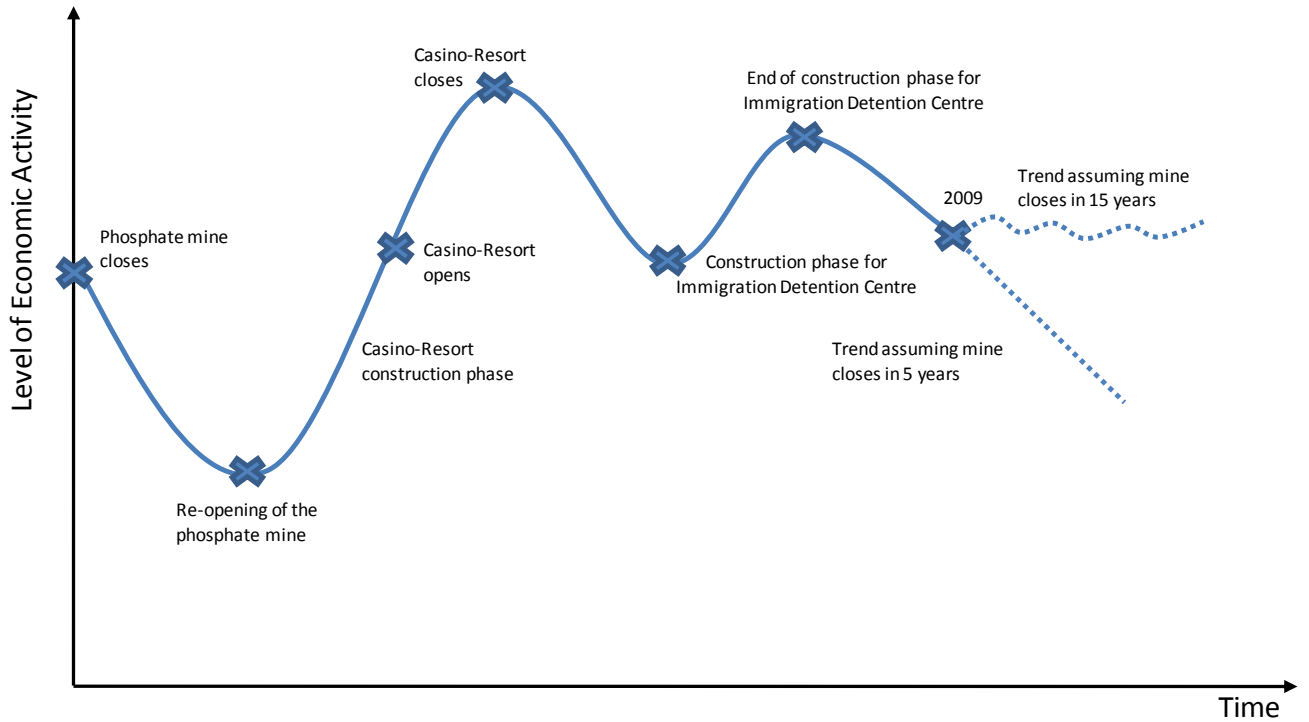


Figure 8 The economic cycle on Christmas Island over the past 20 years and into the future



Note: The figure is representative of the general boom-bust nature of economic development on the Island only.

Today economic activity on Christmas Island is largely dependent on the operation of the phosphate mine, with additional contributions from the government sector, general construction, and a small tourism sector.

Looking forward, given the current state of planning for a post-mining future on Christmas Island, with a mine life of only another five years it is likely that there will be continued gradual disinvestment on Christmas Island and economic decline. With a mine life of another 15 years the immediate economic future of the island would be secure, and there would be sufficient time to plan and develop the required infrastructure to develop replacement economic activity.

### 3.5 Qualifications

The Christmas Island workforce is relatively well skilled, and as can be seen from Figure 9, the most common qualification is a Certificate qualification at Certificate level III or IV. The share of qualified people holding a Certificate qualification is 37 percent on Christmas Island and 33 percent in Western Australia. This is a reflection of the importance of the mining and construction industries in both Christmas Island and Western Australia more generally.

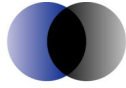
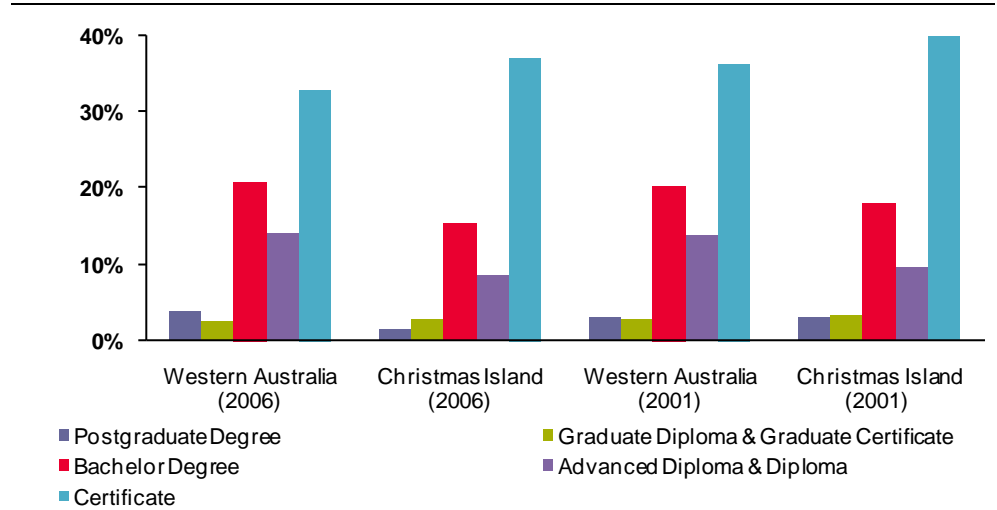


Figure 9 **Level of qualification: Christmas Island and Western Australia (2001 and 2006) (%)**



Note: Count of persons aged 15 years and over with a qualification.

Data source: 2006 Australian Bureau of Statistics Census

### 3.6 Occupation

Reflecting the needs of the mining and construction industries the most common occupations of employed persons on Christmas Island are Technician and Trades workers (20 percent) and Labourers (16 percent). Figure 10 shows the occupation of employed persons on Christmas Island and in Western Australia. The figure shows that the most significant difference in occupations relates to sales type occupations, with significantly fewer people employed in this occupation on Christmas Island compared to Western Australia. It can also be seen in the figure that in Western Australia as a whole the most common occupation is that of a Professional (19 percent), whereas this is the third most common occupation on Christmas Island (13 percent).

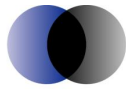


Figure 10 Occupation: Christmas Island and Western Australia (2006)



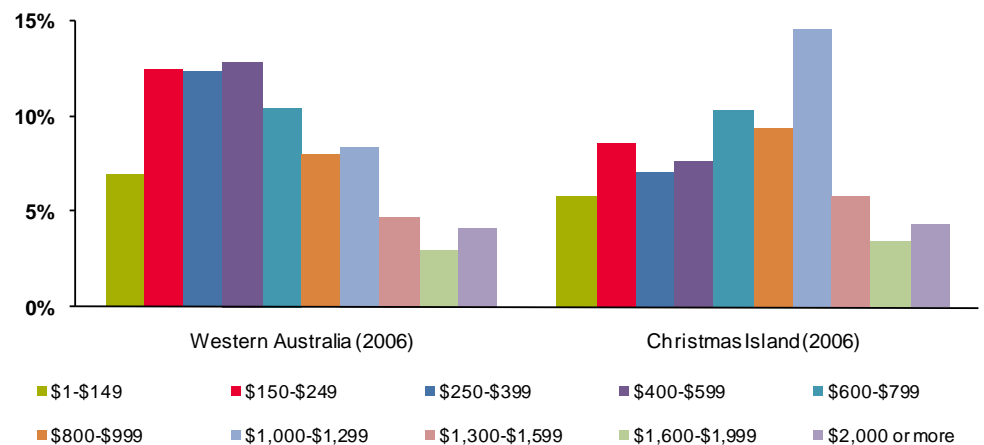
Note: Count of employed persons aged 15 years and over. It was not possible to compare data with the 2001 Census as the classification by which data is collected has changed.

Data source: 2006 Australian Bureau of Statistics Census

### 3.7 Income

Weekly individual incomes on Christmas Island are relatively high, with 28 percent of the population earning in excess of \$1,000 per week compared to 20 percent in Western Australia. This reflects the high level of employment in the Construction and Mining industries, and the very high rate of full time employment (75 percent) on Christmas Island.

Figure 11 Weekly individual incomes: Christmas Island and Western Australia (2006) (%)



Note: Count of persons aged 15 years and over.

Data source: 2006 Australian Bureau of Statistics Census

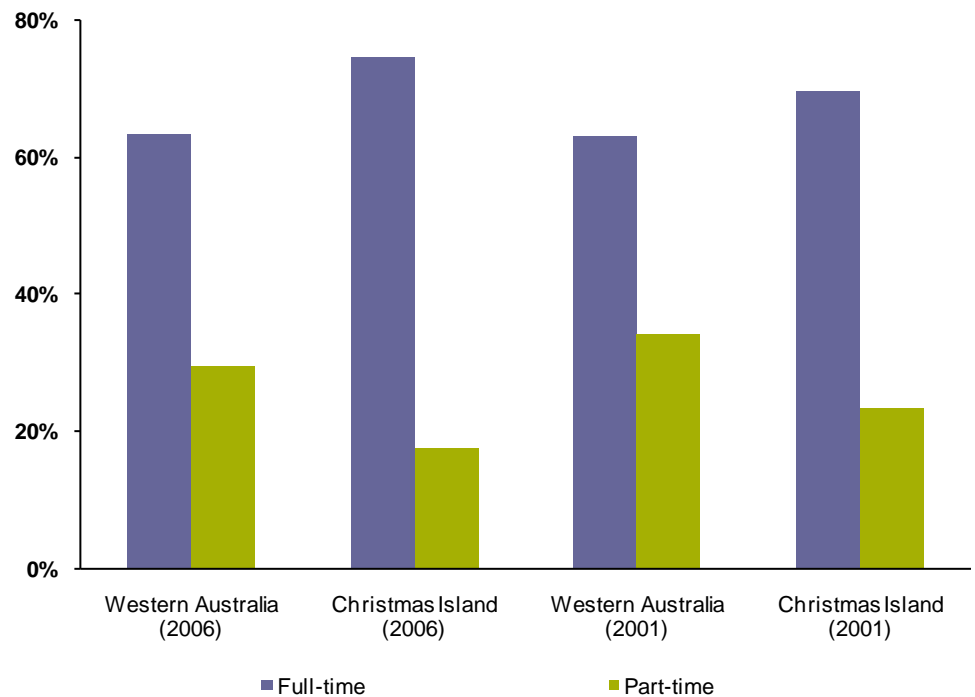
### 3.8 Employment profile

Christmas Island has a high rate of full-time employment compared to Western Australia. At the time of the 2006 Census, 75 percent of the working



population were employed on a full-time basis compared to only 63 percent of the Western Australian working population. Details on part-time and full-time employment for Christmas Island and Western Australia are shown in Figure 12.

Figure 12 **Full and part-time employment: Christmas Island and Western Australia (2001 and 2006) (%)**

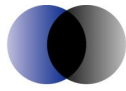


Note: Count of persons aged 15 years and over.

Data source: 2006 Australian Bureau of Statistics Census

### 3.9 Unemployment

At the 2006 Census, Christmas Island had a total workforce of 714 people, of which 34 were unemployed and seeking part or full-time work. The corresponding unemployment rate is therefore 4.8 percent, which is similar to that of Western Australia for the same time period. Both for Western Australia as a whole and Christmas Island the unemployment rate in 2006 was significantly lower than it was at the time of the 2001 census.



## **4 Government expenditure and revenue on Christmas Island**

The Commonwealth Grants Commission undertook a comprehensive study into the cost of service delivery for State type services in the Indian Ocean Territories for the reference year 2005-06 (AGCGC 2007). The following chapter provides summary details on the cost of service provision on Christmas Island based largely on the detail contained in that report.

### **4.1 Expenses**

It has been possible to identify not only State type expenses but also some of the additional expenses incurred in relation to Christmas Island. These other expenses are discussed separately.

#### **4.1.1 State service related expenses**

State type services on Christmas Island are largely delivered via service delivery agreements with the relevant Western Australian government agency. The cost of delivering State type service on Christmas Island for the three years 2004-05 through to 2006-07 is detailed in Table 5. The most significant costs incurred with relation to State type services relate to asset depreciation, the cost of providing electricity and gas, and education expenditure.

Table 5 **Expenses for State type services**

State type expenses	2004-05	2005-06	2006-07
	\$ '000	\$ '000	\$ '000
School education	6,561	6,669	6,496
Post school education	811	539	709
Health	7,111	7,280	6,753
Welfare	466	586	609
Housing	483	962	1,054
Police	1,382	1,455	1,428
Administration of Justice	390	330	332
Corrective services	104	118	142
Public safety	721	352	345
Culture and recreation	463	504	644
Electricity and gas	6,598	8,328	10,014
Water, sanitation, environment	2,087	1,957	1,722
Transport	1,808	2,506	2,457
Roads	1,390	917	1,023
Services to industry	432	415	654
General public service	6,218	5,176	5,497
Depreciation	7,155	8,604	13,428
<b>Total</b>	<b>44,182</b>	<b>46,699</b>	<b>53,310</b>

Data source: AGCGC (2007, p. 74)

The depreciation charge for Christmas Island is high because there are substantial government owned assets on the island. The main assets held that contribute to the charge relate to: port facilities, the airport, water and sewerage infrastructure, power generation and distribution assets, and commercial real estate. To put some context around how different this charge is compared to the rest of Australia, Table 6 expresses the depreciation charge on a per capita basis for Christmas Island, Western Australia, the Northern Territory, and Australia.

The significant depreciation charge is a reminder of the extent of government investment on the island, an investment that would be substantially underutilised should there be a collapse in the local economy.

Table 6 **Depreciation expense comparison**

	Christmas Island	Western Australia	Northern Territory	Australia
	\$ pc	\$ pc	\$ pc	\$ pc
Gross expense	6,095	216	472	210

Data source: AGCGC (2007, p.137)

Diesel generators are used to supply power on Christmas Island, and in 2005-06 operating costs were 32 cents per kilowatt hour, and this cost is consistent with the cost of power generation in remote communities that rely on diesel power generation technology.

#### 4.1.2 Other expenses

With respect to other costs incurred by government, most (around 75 percent) relate to local government grants and the cost of the airport. The local government grant is made up of the local government equalisation grant, the local government roads grant, and a grant equivalent to what would be received from the State government road funding programme.

The Christmas Island airport is an asset of the Commonwealth Government, and is operated under contract with Emerald Oak Pty Ltd, trading as Forte Airport Management.

Table 7 Other expenses incurred relating to Christmas Island

Commonwealth type expenses	2004-05	2005-06	2006-07
	\$ '000	\$ '000	\$ '000
Grants to the shire	2,266	2,172	2,287
Airport	1,249	897	1,129
Culture and recreation	289	855	930
Broadcasting	110	79	47
Australian Quarantine Inspection Service	79	78	78
Regional development grants	-	49	72
<b>Total</b>	<b>3,993</b>	<b>4,121</b>	<b>4,543</b>

Data source: AGCGC (2007, p. 64; 74)

#### 4.1.3 Expenditure not captured

It was not possible to obtain details for expenses related to transfer payments for pensions, unemployment benefits, and the like. For unemployment benefit expenses, as the unemployment benefit in early 2006 was \$205.10 per week for singles and \$222.10 for singles with a child, and the number of unemployed at the time of the Census was 34, it is possible to arrive at some reasonable estimates for unemployment benefit expenses, but not other transfer payments.

For example, let the lower bound estimate for the average number of unemployed people on the island for 2005-06 be 31 people. Assuming all these people were single, unemployment benefits paid would be  $\$205.10 \times 31 \times 52 = \$330,621$ . Similarly, take 37 as a reasonable upper bound estimate of the average number of people unemployed during 2005-06. Assuming all of

these people had a dependent the unemployment benefits paid would have been  $\$222.10 \times 37 \times 52 = \$427,320$ . It could therefore be argued that the likely range for unemployment benefit payments to residents of Christmas Island during 2005-06 was \$330,000 to \$430,000.

The final area of government expenditure not discussed, but known to be substantial, is the expenditure associated with maintenance of immigration detention facilities on Christmas Island. Given the scale of infrastructure installed, annual maintenance expenses are likely to be around \$25M to \$30M.

## 4.2 Revenue

The main sources of government revenue are local government rates, State type taxes, and Commonwealth type taxes.

### 4.2.1 State type tax revenue

The largest sources of State tax type revenue are mining royalties and payroll taxes. Given mining royalties are paid by CIP and given CIP is the largest employer on Christmas Island, the majority of State type taxes are paid by CIP.

Table 8 **State tax revenue**

State type revenue	2004-05	2005-06	2006-07
	\$ '000	\$ '000	\$ '000
Land tax	49	33	13
Stamp duty	112	163	132
Payroll tax	615	954	1,248
Debits tax	49	5	0
Mining royalties	751	1,869	1,443
Motor vehicle taxes	344	369	382
Gambling taxes	78	101	122
<b>Total</b>	<b>2,298</b>	<b>3,494</b>	<b>3,342</b>

Data source: AGCGC (2007, p. 76)

### 4.2.2 User charge type revenue

The largest source of revenue from user charges is for power. However, as Western Australia applies a uniform electricity tariff, revenue from electricity generation is substantially less than the cost of generation.

Table 9 **User charge revenue**

Other revenue	2004-05	2005-06	2006-07
	\$ '000	\$ '000	\$ '000
Health	126	164	240
Housing	604	536	539
Employee housing	886	841	844
Marine/Port	741	705	702
Power	2,799	3,177	3,343
Water	601	1018	753
Commercial rental	264	391	394
Other revenue	1,317	1,180	1,255
<b>Total user charge revenue</b>	<b>7,340</b>	<b>8,013</b>	<b>8,070</b>

Data source: AGCGC (2007, p. 76)

### 4.2.3 Other tax revenue

Details were not available for income taxes and company taxes paid by residents and island based companies. Although, given the estimate for 2005-06 for Gross Product on Christmas Island was \$71M, it can be expected that income tax and company tax paid would represent around 25 percent of this value, or something like \$17.25M to \$18.25M.

Actual rate income for the Shire of Christmas Island for the period 2004-05 to 2006-07 is shown in Table 10.

Table 10 **Shire of Christmas Island rate income**

	2004-05	2005-06	2006-07
	\$	\$	\$
Shire rate income	564,644	621,742	628,835

Data source: Various Shire of Christmas Island Budget Reports

## 5 Christmas Island Phosphates

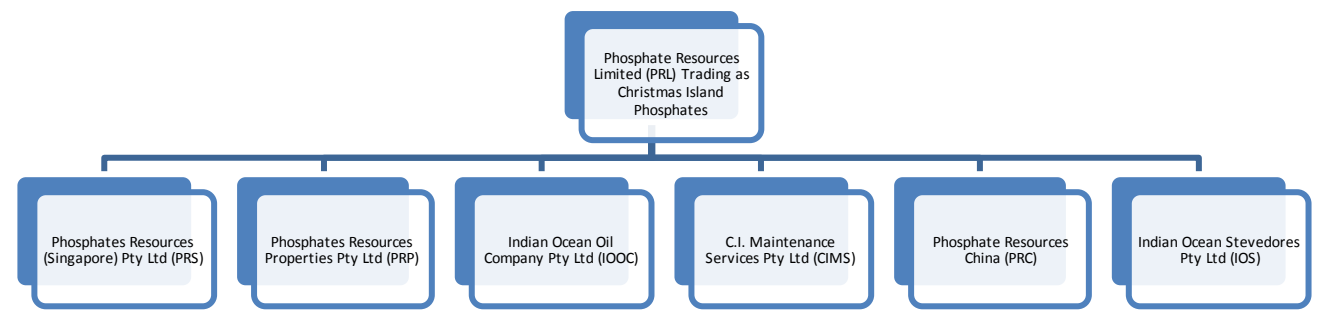
This chapter describes, in broad terms, the contribution to the local and national economy made by the Christmas Island Phosphate company, and company employees.

### 5.1 Business overview

CIP owns the Christmas Island phosphate mine, where it has mined and subsequently exported phosphate since 1990. The world phosphate price has risen substantially in recent years and in response to this price signal mine output has also risen substantially. CIP currently exports between 600,000 and 700,000 tonnes of phosphate product per year.

The destinations for phosphate product from the island are mainland Australia, Indonesia, Malaysia, New Zealand, and Thailand.

Figure 13 **Ownership structure: Christmas Island phosphate mine**



In addition to its phosphate mining operations, CIP has several wholly owned subsidiaries involved in various activities. Some subsidiaries are concerned with on island activities and others are concerned with off island activities. Details of the various subsidiaries are shown in Figure 13. The Indian Ocean Oil Company is responsible for the provision of used oil derived burner fuel for the burners that dry the phosphate and the diesel used by the mine fleet of vehicles. CI Maintenance Services has contracts relating to immigration facilities and so is not focused on directly servicing the mine. Indian Ocean Stevedores provide shipping pilot services.

### 5.2 Contribution to the economy

Phosphate mining on Christmas Island makes a substantial contribution in a number of areas.



### 5.2.1 Value of mining

In a typical year of operation, and in current dollar terms, phosphate mining on Christmas Island will generate around \$116M in sales revenue, and CIP and CIP employees will contribute around \$27M in taxes and royalty payments to the government. In summary, the annual values for the various contributions are approximately as follows:

- Company tax \$17.0M
- Income tax paid on employee wages and bonuses \$4.9M
- Phosphate royalties \$3.2M
- Rehabilitation levy \$1.3M
- Fringe benefits tax \$260,000
- Local government rates \$140,000
- Mining lease rental \$24,000

### 5.2.2 Community contributions

Cash payments and sponsorship payments represent a clear contribution to the community and CIP typically makes annual payments of between \$200,000 and \$250,000 each year.

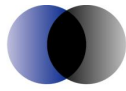
Additional to the cash contributions made by the company, CIP employees give their time to a range of voluntary organisations, including the:

- State Emergency Service (10 staff)
- Fire brigade (9 staff)
- Ambulance Service (3 staff), and
- Local government, by way of shire councillors (3 staff).

In recognition of the value such contributions make to the community, for any employee engaged in volunteer activity for the above organisations, CIP allows 38 hours per year of paid leave to attend any meetings or training sessions that are required.

### 5.2.3 Employment and training

CIP is the largest employer on the island. In total CIP employees 181 people, of which 167 are employed in mining related activity. Currently there are six apprentices working at the mine and five trainees. The traineeships and apprenticeships are for the trades of: Heavy duty diesel mechanic, Mechanical fitter, Boiler maker, and Electrician.



#### 5.2.4 Dependent business

As discussed previously, there is a range of business activity that is directly supported by the mine. The most obvious is the stevedoring activity, but there are also a number of contractors that work almost exclusively for the mine.

#### 5.2.5 Burner fuel market

Australia signed the *Basel Convention on the Control of the Transboundary Movements of Hazardous Waste and their Disposal* (Convention) in 1989, and it came into force in May 1992.

Under the terms of the Convention, Australia is required to:

- minimise the generation of hazardous waste
- ensure adequate disposal facilities are available
- control and reduce international movements of hazardous waste
- ensure environmentally sound management of wastes and
- prevent and punish illegal traffic<sup>2</sup>.

Paragraph 1(a) of Article 1 to the Convention defines waste to include those items listed in Annex I to the Convention that additionally contain one of the properties listed in Annex III to the Convention. Annex I includes:

- Waste mineral oils unfit for their originally intended use
- Waste oils/water, hydrocarbons/water mixtures, emulsions,

which meet the further test of also having a property from Annex III, the list of Hazardous Characteristics, namely flammability.

The legislation Australia operates under to meet the requirements of the convention is the *Hazardous Waste (Regulation of Exports and Imports) Act 1989*. The legislation defines hazardous waste to include anything classified as hazardous waste under the Convention. As such, used lube oil is defined as a hazardous waste.

While it is possible to apply for a permit to export hazardous waste from Australia the process is long, and there is considerable doubt as to whether an export permit would be granted. To date no permits have been granted to export used lube oil from Western Australia.

Domestic demand for used lube oil has fallen dramatically in recent years following the conversion of several Kimberly power stations to LNG, and the closure of both the Loongana Lime kiln facility in Kalgoorlie 2006 and Austral

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<sup>2</sup> DEWHA website [www.environment.gov.au/settlements/chemicals/hazardous-waste/conventions.html](http://www.environment.gov.au/settlements/chemicals/hazardous-waste/conventions.html) [accessed 6 November 2008]



**ACIL Tasman**

Economics Policy Strategy

## **The economic impact of Christmas Island Phosphates**

bricks in Bunbury 2008. There are now only three substantial Australian customers for used lube oil from Western Australia, and CIP is the largest customer.

It is notable that the closure of the Loongana Lime kiln facility in Kalgoorlie 2006 causes a crisis in respect of used oil collections in Western Australia as collections ceased and stockpiles began to accumulate across the State. A key plank in resolving the crisis was the establishment of the Christmas Island market for used lube oil, and it is possible that closure of this market could again cause a used oil storage crisis in Western Australia.



## 6 Economic impact of mine closure on the Christmas Island economy

CIP is seeking access to eight leases where the land covered by the leases contains over eight million tonnes of commercial grade phosphate. Of the eight million tonnes approximately 40 percent is of a grade suitable for Australian consumption. Without access to the additional leases phosphate mining on Christmas Island will cease in approximately five years. Access to the additional leases will add approximately ten years to the operating life of the mine.

The economic importance of the mine to Christmas Island is determined by the:

- spending of mine workers on other services on Christmas Island
- direct purchases of the mine from local providers of goods and services, and
- on island spending associated with dividend income that flows to resident shareholders.

To model the impacts of the mine closure a Christmas Island specific Input Output table was prepared. Details relating to the expenditure of the mine, and the sales volumes for product were then established through consultation with CIP. A particular issue with respect to the modelling process relates to what is assumed about the likely price of phosphate in the future.

Changes in the price of phosphate change overall mine profitability. For example, higher prices raise mine profitability, which in turn results in higher dividend payments to shareholders and higher bonus payments to mine employees. As Christmas Island residents hold a substantial proportion of CIP shares, increases in dividend payments have a substantial impact on overall income to Christmas Island residents. Assuming the additional dividend income is spent and saved in the same proportion as other income, the additional income implies substantial additional spending on Christmas Island.

### 6.1 Modelling assumptions and limitations

It is important to be clear about what insights Input Output table analysis can provide; what the limitations of such an approach are; and the additional adjustments to raw modelling results that may be required. The Input Output table analysis technique is based on certain restrictive assumptions. As a result of these assumptions, any calculations making use of Input Output multipliers do not allow for substitution between goods and services or between capital and labour in the production process, or between goods and services in



consumption. For these reasons the results generated from Input Output total multipliers are generally considered to be upper bound estimates of the likely economic impact. It is because the technique results in upper bound estimates that it is worthwhile to also report the simple multiplier results.

As the simple multiplier estimates capture direct effects and industry effects only, they could be interpreted as representing lower bound estimates. Reporting a range of values also helps convey the uncertainty involved when modelling. We believe modelling results provide general representative information that can be used to assist with policy formation. Presenting a single point estimate may convey a level of precision that simply does not exist with respect to economic modelling using Input Output tables.

A further complication with Input Output analysis arises in very small economies. When we consider large regions where there are many individual firms operating in any given industry, the assumption that employment reductions in each industry can occur in a smooth continuous fashion is an appropriate assumption. Marginal firms enter and leave the industry and individual firms add or reduce staff so that for a large economy aggregate industry level employment movements approximate a continuous function.

In very small economies where total industry employment can be represented by a single firm, the assumption sometimes needs to be revised. In particular, the marginal reduction in employment and output described by the Input Output analysis may result in a firm becoming economically unviable and so shutting down. The modelling approach cannot capture such step changes in employment conditions. A relevant example in the current context could be financial services. CIP purchases banking services directly from Westpac, and CIP workers are also significant users of the financial services provided by Westpac. Assuming a representative consumption pattern, modelling is likely to suggest the closure of the mine would result in a reduction of financial services income of several hundred thousand dollars, and a reduction in employment of two to three people. Such a reduction in bank revenue could result in the bank branch becoming uneconomic. The actual job losses in such a situation would therefore be higher than the numbers generated by the modelling.

The appropriate approach to such issues is to note the existence of the problem in advance, and discuss the potential for such effects where they are thought to exist. Where there is the potential for a step change in employment following the closure of a business we have sought further specific information from business operators. For a variety of reasons not all business operators were in a position to provide this detail.

### 6.1.1 Assumption regarding the price

When considering commodity markets it is usually the case that activity takes place in discrete time periods rather than in continuous time. For most commodities it is not possible, for example, to adjust output in continuous time to changes in market prices. We have most recently seen this in the case of coal and iron ore where producers were unable to expand output in response to higher prices. Before output can expand exploration must take place, mine campsite and infrastructure have to be built, and port capacity may need to be expanded. All of this can take several years.

In commodity markets where there are long lags between when a commitment to increase supply takes place and when the increase in supply becomes available for sale, we would expect to see an oscillating price path where prices rise and remain high for several years then begin to fall and stay low for several years, before rising again. In sharp contrast to much standard economic theory, commodity markets can be characterised by periods of shortage and high prices followed by periods of surplus and low prices.

Those firms operating in the commodity sector are of course aware of the cyclical nature of the business. That is why firms often wait some time before expanding production in response to a price rise. It is also why firms will for periods of time continue to operate mines while making a loss.

The final complication relates to the assumption about the value of the Australian dollar. As phosphate contracts are signed in US dollars, a fall in the value of the Australian dollar relative to the US dollar increases firm profitability and an increase in the Australian dollar relative to the US dollar decreases firm profitability.

Given the uncertainty about the future price path for both phosphate and the Australian dollar the value of phosphate mining to the Christmas Island economy has been modelled under three different scenarios. The base case scenario represents what are thought to be the most reasonable assumptions regarding average phosphate and Australian dollar prices going forward. The low case scenario considers a high Australian dollar and a low US dollar phosphate price and a high case scenario considers a high US dollar phosphate price and a low Australian dollar.

The key assumptions for the three cases considered are shown in Table 11. Additionally, it is assumed that all employees leave the island following closure of the mine<sup>3</sup>.

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<sup>3</sup> As when mining ceases workers are entitled to three weeks pay for each year of service, plus four weeks pay if they are over 45; a one-way air ticket for travel off Christmas Island for

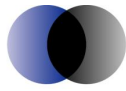


Table 11 **Modelling assumptions**

	Low case	Most likely	High case
Phosphate price	115	125	135
Exchange rate	.75	.70	.65
Volumes	650,000	650,000	650,000

## 6.2 Modelling results

Summary modelling results for the three scenarios are reported in Table 12, but the remainder of the discussion will be based on the results for the most likely scenario results.

In Table 12 the income effect columns of the table describe the estimated upper and lower bounds for on island wage income attributable to the mine. The value added effect columns represent the value of the mine in terms of wages and profit generated on the island. That these wages and profits are generated on the island does not mean that they necessarily stay on the island. The employment effect columns describe the number of full-time equivalent jobs that mine activity supports.

The consumption row of the table describes the impact attributable to the spending of mine employees and shareholders. The direct purchases column describes the effect attributable to the on island operating expenditure of the mine.

By reading across the total row of Table 12 to the employment columns it can be seen that under the most likely scenario assumptions between 265 and 281 direct and indirect jobs would be lost to the island following the closure of the mine.

The job losses likely following closure of the mine are significant. Given a workforce on the island of 714 people (as of the 2006 Census) the results suggest a loss of workforce of between 37 percent and 40 percent. Note that this loss in terms of the percent of the workforce could be higher as the workforce numbers are based on the 2006 Census when construction activity on the island was high.

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employees and dependents; and payment for the cost of shipping one sea container worth of goods from Christmas Island to their new destination, the assumption about employees leaving is reasonable.

Table 12 **Impact of ceasing mining operations: scenario estimates**

	Income effect		Value added effect		Employment effect	
	Simple (\$M)	Total (\$M)	Simple (\$M)	Total (\$M)	Simple (No.)	Total (No.)
<b>Most likely estimates</b>						
Consumption impact	23.3	23.8	87.3	88.5	227.2	237.2
Direct purchases	1.9	2.3	4.4	5.2	37.6	43.8
<i>Total</i>	<i>25.3</i>	<i>26.1</i>	<i>91.7</i>	<i>93.7</i>	<i>264.8</i>	<i>281.0</i>
<b>Low case estimates</b>						
Consumption impact	23.2	23.6	70.5	71.6	223.9	233.3
Direct purchases	1.9	2.3	4.4	5.2	37.6	43.8
<i>Total</i>	<i>25.1</i>	<i>25.9</i>	<i>74.9</i>	<i>76.8</i>	<i>261.5</i>	<i>277.2</i>
<b>High case estimates</b>						
Consumption impact	24.0	24.6	107.9	109.4	241.8	254.2
Direct purchases	1.9	2.3	4.4	5.2	37.6	43.8
<i>Total</i>	<i>26.0</i>	<i>26.9</i>	<i>112.4</i>	<i>114.6</i>	<i>279.4</i>	<i>298.0</i>

Data source: ACIL Tasman

### 6.2.1 Scenario adjustments

The modelling results provide a reasonably good indication of the order of magnitude of the economic shock the closure of the mine will have on Christmas Island. There are however a few specific areas of possible adjustment and other matters that can be considered.

#### Stevedoring

The modelling results indicate that up to 9.5 full-time jobs would be lost in stevedoring on Christmas Island following the closure of the mine. The assumptions used to inform the development of the Christmas Island Input Output table are based on the national productivity level for different industries. In the case of Christmas Island where the port is not operational all year, the model assumes a higher level of productivity for the port than can actually be achieved. As such, the actual job losses in stevedoring will be higher than the numbers generated by the model. On Christmas Island there are 15 people employed full-time in stevedoring and a further six employed on a permanent casual basis.

Without the mine traffic to the port stevedoring would not be a viable standalone business.

#### Financial services

CIP and its employees purchase significant banking services from Westpac. The modelling suggests that between 2.8 and 3.8 jobs would be lost in the



banking sector following the closure of the mine. Total employment in banking at the time of the Census was six persons. All banks, including Westpac, are sensitive to questions about their intent to close regional bank branches. As such it has not been possible to clarify Westpac's intentions following the closure of the mine.

It is understood that there are around 290 family members related to CIP employees on Christmas Island. Assuming the majority of CIP workers and their families leave the island following the closure of the mine it is difficult to see how the provision of a full service retail bank branch on Christmas Island could be justified on pure economic grounds.

### **Conservation and rehabilitation works**

The funds from the mine rehabilitation levy provide for five full-time Parks Australia jobs. Immediately following the closure of the mine funding would still be available for these positions. Over the medium term the funds that provide for these positions will exhaust, and so without intervention these positions will also be lost to the Christmas Island economy.

### **Education sector effects**

A substantial reduction in the population of Christmas Island that saw enrolments in year 11 and year 12 drop below the level required to support offering these final two years may result in additional employment losses in the education sector not captured in the modelling.

### **Wealth effects**

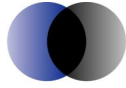
Property prices on Christmas Island have fluctuated with the level of economic activity. The end of mining on the island and subsequent reduction in people living on the island, *ceteris paribus*, will depress property prices. The marginal propensity to spend from wealth is generally thought to be small but is nevertheless real.

Falling property prices will have an additional negative impact on spending, employment, and jobs on Christmas Island.

## **6.2.2 Summary of modelling results**

There is some uncertainty regarding the future price of phosphate, but assuming:

- the average US dollar price for phosphate price is \$125
- the average Australian dollar US dollar exchange rate is \$.70
- that 650,000 tonnes of phosphate are shipped, and



– that 22 percent of the company is owned by on island residents, and making adjustments for some of the modelling approach limitations, the likely job losses following the closure of the mine are around 280 jobs.

### 6.3 Value of the life of the mine extension

Access to new mining lease areas will extend the mine life by approximately ten years. As part of the internal mining process material from the new leases can be combined with existing lower grade ores so that a blended export quality product can be produced. It is therefore possible that the total volume of material exported during this additional ten year period would be more than the total amount of phosphate recovered from the specific lease areas. Here it is assumed that each year 650,000 tonnes is exported for each year the mine is open.

As noted above, the average annual value of the various contributions from phosphate mining are:

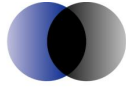
- Sales revenue \$116M
- Company tax \$17.0M
- Income tax paid on employee wages and bonuses \$4.9M
- Phosphate royalties \$3.2M
- Rehabilitation levy \$1.3M
- Fringe benefits tax \$260,000
- Community donations and sponsorship \$240,000
- Local government rates \$140,000
- Mining lease rental \$24,000

To generate a value for the contributions from extending the mine life by ten years it is necessary to discount future values. It is thought that the most appropriate discount rate to apply is six percent, but the net present value of contributions has also been calculated using a discount rate of three percent, and a discount rate of nine percent. As shown in Table 13, based on a discount rate of six percent, the NPV of ten years worth of phosphate sales is \$903M, and the NPV of taxes, royalties and community contributions is \$211M.



Table 13 **NPV of extending the mine life by ten year: various discount rates**

Details	6 percent	9 percent	3 percent
	(\$) '000	(\$) '000	(\$) '000
Sales revenue	902,656	809,350	1,016,553
<b>Contributions</b>			
Company tax	132,111	118,455	148,781
Income tax on employee wages and bonuses	38,423	34,452	43,272
Phosphate royalties	25,355	22,735	28,555
Rehabilitation levy	9,990	8,957	11,251
Fringe benefits tax	2,028	1,819	2,284
Community donations and sponsorship	1,716	1,539	1,933
Local government rates	1,092	979	1,230
Mine lease rental	187	168	211
Total contributions	210,904	189,104	237,516



## 7 Social impact of mine closure on the Christmas Island economy

The potential closure of the Christmas Island Phosphate mine will have a social impact. This impact is measured by changes in the social well being of Christmas Island residents as a result of closure compared to the current situation. Christmas Island currently supports a small but viable population with a diverse ethnic makeup.

CIP is the largest employer on the island and it also supports a range of businesses and their employees. The closure of the mine would therefore have a significant impact on employment on the island with economic modelling suggesting a loss of employment equal to around 40 percent of the labour force. This loss would have significant social implications which are discussed in the following sections.

### 7.1 Population

The current population of Christmas Island is thought to be lower than 1,348 people recorded at the time of the 2006 Census, with around 1,000 people a reasonable estimate. Considering a loss of total workforce on the island of 280 and a median household size of 2.6, closure of the mine will impact up to half the island population. Without alternative employment opportunities it is likely that many of these families will leave the island. The experience of the previous mine closure during the period 1989 to 1991 suggests that employees will tend to leave. Population losses approaching this order of magnitude will have a significant negative impact on the social cohesion of the island.

### 7.2 Social cohesion

Social cohesion is a measure of how a community interacts. The Christmas Island community supports a diverse mix of people from all ages and ethnic backgrounds. With such a large expected loss of population, there will be significant social impacts from the change to the ethnic and age balance including a loss of students from schools, loss of community volunteers and leaders, loss of employment aspirations as young people's expectations of careers on the island are diminished, increases in unemployment, and possible long term unemployment due to lack of alternative employers.

In many communities this loss of social cohesion following the closure of a major employer is temporary as employees are eventually absorbed into other employment. However, in the case of Christmas Island, the current lack of economic diversification means that there is very little opportunity for



residents to find alternative social and economic opportunities. Furthermore, there is little opportunity for the island to attract new residents given its isolation and lack of social and economic enticements.

### **7.3 Education and training**

CIP employs six apprentices and five trainees. Often the people who take up these opportunities are young which assists the island in attracting and retaining young people, and assists in balancing the demographic profile. It is unlikely that these apprentices and trainees would find alternative opportunities elsewhere on Christmas Island.

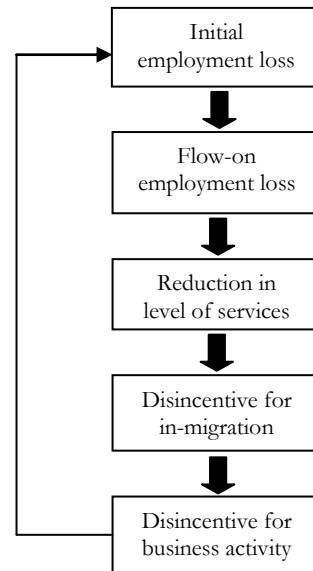
### **7.4 Community leaders and volunteers**

Employees of CIP provide an important contribution to their community as volunteers and community representatives. Out of the current CIP workforce, 21 are employed as volunteers with key community organisations including the SES, fire brigade, and ambulance services. In addition, three CIP employees currently hold positions as counsellors on the Christmas Island Local Government Authority.

## 8 Further matters for consideration

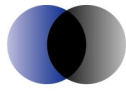
As a general matter mine closure in remote regional locations, without central intervention, will lead to a fall in both employment and the resident population of a town. This in turn results in a reduction in overall service provision and expectations, which precipitates an unrelenting downward spiral. This point was highlighted by Beer and Keane (2000) in the context of their study of rural and remote regions in northern South Australia. The authors explain that once small towns and regions are in decline they can face an ever increasing deterioration in employment outcomes and a reduction in services.

Figure 14 **Services, employment, and population loss spiral**



*Data source: Beer and Keane (2000).*

Phosphate mining on Christmas Island will, at some point cease. If access to the lease areas is granted mining will cease in approximately 15 years. Without access to new areas mining will cease in approximately five years. A relevant question is, therefore, how much time will planning for a post-mine economy take. Tourism is likely to feature in any future planning for Christmas Island. As such, by considering the scale of tourism on Christmas Island today and the scale of tourism required to generate enough employment to replace phosphate mining it is possible to establish some idea of the scale of the planning and development task required.



## 8.1 Tourism today

Tourism on Christmas Island is marketed by the Christmas Island Tourism Association. The Association operates a Visitor Information Centre and booking office in the Settlement area.

### Attractions

The main visitor attractions on Christmas Island are centred on nature based activities, including the annual Red Crab migration. The island's heritage, including cultural heritage, are also tourist attractions.

Nature based activities include two commercial boat tour operators (diving and fishing), fishing tours, and a land based company that offers sightseeing and bird watching tours. Some off island commercial businesses also bring tours to the island. A number of visitor sites, walking tracks, and driving tracks have been developed which provide opportunities for visitors to self cater. There are hire car (two and four wheel drive) and bus charter facilities on the island. Christmas Island National Park has viewing platforms, boardwalks, walking tracks, and camping sites, although the quality of facilities is not as high as in some other Australian National Parks.

### Accommodation

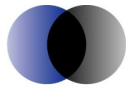
The current accommodation capacity on the island is approximately 150 rooms, with most of the accommodation located in Settlement. Accommodation is predominantly at the 2 or 3 star level, with limited self catering options.

Of the available stock of accommodation it is understood that up to 50 beds are on permanent standby for DIAC and are not available for tourism purposes.

### Visitors

In 2007 one third of all visitors to Christmas Island travelled for holiday or leisure purposes, 49 percent for business or work reasons, and 14 percent were visiting friends and relatives. The vast majority of visitors (91 percent) were from Australia with the remainder from the UK (3.6 percent) Germany (1.2 percent), Canada (1.2 percent), other (3 percent) (PFP, 2008, p. 3).

So despite proximity to large population centres to the north these locations do not currently provide any significant tourist visitors.



### Air services

The Perth-IOT National Jet flight uses a 56 seat plane. It is understood that between 30 and 40 seats are available for tourists to Christmas Island on each NJS flight (PFP, 2008, p. 3). The flight schedule has varied over the years but currently flights service the islands on Monday and Friday, with additional flights during peak periods such as during school holidays. The regular Monday flight departs Perth, refuels at Learmonth, lands at Christmas Island, and then heads across to West Island before returning to Perth. The regular Friday flight departs Perth, refuels at Learmonth, arrives at West Island, and then crosses to Christmas Island before returning to Perth.

The refuelling requirement and the circular nature of the route mean that depending on the day of travel and the final destination, passengers from Perth can be faced with a lengthy journey. The appropriateness of both the current flight path and the current plane type used for the service could be questioned.

Previous economic analysis undertaken for the AGD has indicated that an air service from Perth to the IOT represents a marginal business opportunity. The Perth-IOT air service is therefore underwritten by the Commonwealth and should passenger numbers fall below a threshold level the Commonwealth pays a top up fee to the service provider<sup>4</sup>. The actual air service subsidy paid to NJS by the Commonwealth in 2006-07 was \$113,000 (AGCGC, 2007, p. 18).

The twice weekly NJS flight is not the only regular air service to Christmas Island. Additional air services to Christmas Island have typically been provided appropriate to the level of economic activity at the time. Currently Australia Indian Ocean Territories Airline (AIO TA) flies to Christmas Island from Kuala Lumpur on Mondays using a Malaysia Airlines 737-400. A typical seat configuration on a 737-400 might be something like 126 economy seats and 16 business class seats.

Future air service arrangements for Christmas Island are unknown. The NJS contract ends on 3 April 2009 and NJS did not retender for the contract. SkyAirWorld, the company that was awarded the contract starting 3 April 2009 was placed into receivership on 13 March 2009, and the Embraer jets that were to service the Christmas Island and the Cocos (Keeling) Islands have been repossessed.

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<sup>4</sup> It is understood that a new air services contract has been let, but contract details are not known at this stage.



### Airport facilities

The Christmas Island airport comprises a single runway that is 2,100 metres long and caters for both freight and passenger traffic. Although the airport operates as an international airport the facilities are not dissimilar to the services and facilities available at small regional airports in Western Australia. There is a small bar/kiosk facility, and due to its tax status, a small duty free store. The passenger processing areas are not air-conditioned and passengers collect their luggage directly from a luggage trailer.

Due to the low quality of the internet links to the airport, passengers arriving on Christmas Island face passport processing delays. Although passport control delays have been common across all airports with international flight arrivals since 2001, queuing for passport control (and quarantine) in a non-air-conditioned building in a tropical environment represents a less than ideal first experience for many visitors.

The airport has access to a 1,000L fire truck that is manned by volunteers. If an airline has a requirement for a fire service to be located and manned at the airport during landing and take-off, commercial arrangements can be entered into to ensure that such a service is available.

## 8.2 Scale of replacement tourism

Regarding the development of tourism on Christmas Island as a replacement industry for phosphate mining the multiplier calculations can be used to provide some indicative figures on the scale of development required. These calculations draw on the multipliers calculated to assess the impact of mine closure.

### Tourism multiplier

To calculate a tourism employment multiplier it is first necessary to make some assumptions about how the average tourist allocates their expenditure to different activities. Assume the average visitor spends \$250 per day, and so that it is possible to keep the example tractable, but still representative, assume this expenditure is allocated across three industry groups only: accommodation, restaurants, and cafes (\$150), retail trade (\$50), and sport and recreational services (\$50). To estimate the lower bound for the number of jobs created let us further use the simple multiplier values, and to represent the upper bound let us use the total multiplier values. The respective simple multiplier values are: accommodation, cafes and restaurants (10.81), retail trade (7.83), and sport and recreational services (7.62). The implied simple tourism employment multiplier is therefore  $(.60 \times 10.81 + .20 \times 7.83 + .20 \times 7.62) = 9.58$ , and \$1M worth of tourism expenditure generates 9.78 jobs. The implied

total tourism employment multiplier value is  $(60 \times 12.05 + .20 \times 8.86 + .20 \times 8.65) = 10.73$  and indicates that \$1M worth of tourism expenditure generates 10.73 jobs.

### **Estimated additional visitor spend required**

Assuming the target total level of job replacement is 280 full-time jobs the simple multiplier values indicate that tourism spending of \$29.2M would be required and the total multiplier values indicate that \$26.1M in tourism expenditure would be required. Given average daily expenditure per tourist of \$250 this implies between 116,934 and 104,360 additional visitor days would be required to generate 280 full-time jobs.

The PFP (2008) report found that 11 percent of visitors to Christmas stayed for 1 to 3 days, 52 percent stayed for 4 to 7 days, 14 percent stayed 8 to 12 days, 12 percent stayed 13 to 30 days, and 11 percent stayed more than 30 days. Assuming the average tourist stay is 7 days, this implies additional tourist numbers of between 16,705 and 14,909, or an additional 321 to 286 tourists each and every week.

Table 14 **Tourism generated employment summary statistics**

Multiplier	Spending required	Visitor Days	Annual visitors	Weekly visitors
	(\$)	No.	No.	No.
Simple multiplier	29,233,660	116,934	16,705	321
Total multiplier	26,090,198	104,360	14,909	286

*Note:* Assume the average visitor spends \$250 per day and that expenditure is allocated across accommodation, restaurants, and cafes (\$150), retail trade (\$50), and sport and recreational services (\$50).

*Data source:* ACIL Tasman 2005-06 Input Output tables for Christmas Island.

Tourism is a seasonal business rather than one that operates with steady arrivals each week. If we assume a very efficient industry with an average occupancy rate of around 70 percent, these additional visitors would require somewhere between 410 and 460 beds. If we recall that current available tourism bed numbers are around 100 the scale of the required expansion of the tourist industry becomes apparent.

To provide some indication of the magnitude of capital investment required to construct this amount of accommodation it can be noted that the average per lettable unit cost for tourism developments in the Northwest of WA completed in the first half of 2008 was \$174,510 (Tourism WA 2008). It is also understood that a detailed capital budget has been developed for an 80 bed three star eco-tourism resort on the Cocos (Keeling) Islands and that this project will cost around \$11M. Total capital spending to build just the required

accommodation to house the extra tourists would therefore be in the order of \$65 to \$75M.

This, of course, assumes that it is possible to obtain access to suitable land for the accommodation to be built on. Land use planning on Christmas Island is such that it will be a minimum of several years before a comprehensive land use planning document will be adopted. As a practical matter it will not be until a land use plan has been finalised and adopted that any significant investment will be undertaken by any prospective developers.

### 8.3 Christmas Island resort complex

A discussion of tourism and Christmas Island invites consideration of the Christmas Island Resort. The Christmas Island Resort complex included a small casino that targeted high rollers. It was estimated that when the casino-resort was operating the annual contribution it made to the local economy in terms of wages, rates and taxes, and community benefit fund contributions was approximately \$11M. While there continues to be substantial interest in re-establishing a casino on Christmas Island, it is worth noting that the consolidated accounts for the resort show that while the casino made a profit, the complex as a whole generally made a loss (JSCNCET, 2001, p. 21).

As shown in Table 15, visitor numbers to the island were substantially greater than they are today during the period the casino was operational.

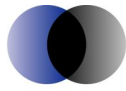
Table 15 **Comparison of visitors to Christmas Island**

	1994*	1995*	1996*	1997*	1998*	2007
Domestic	4,236	5,883	5,720	6,443	4,272	1,920
International	5,557	13,494	11,816	3,326	2,463	278
<i>Total</i>	<i>9,793</i>	<i>19,377</i>	<i>17,536</i>	<i>9,769</i>	<i>6,735</i>	<i>2,198</i>

Note: \* indicates financial year

Data source: Risky Business (2001) and 2007 numbers provided by CITA

Despite commercial interest in re-establishing a casino on Christmas Island it must be noted that the casino market has evolved substantially since the Christmas Island facility closed in 1998. There has been a substantial expansion and upgrading of facilities in Macau. Both the Sands and the Venetian have opened casinos on Macau, and the former monopoly supplier of gaming services on Macau has also added a new casino, the Grand Lisboa. Crown Macau, the first of two casinos owned by Melco Crown Entertainment (MCE) is also operational, and the second MCE casino, the much larger City of Dreams, is set to open in June 2009. The Sands is also developing a multi-billion dollar casino site in Singapore.



The issues relating to a casino resort development have been well canvassed and are known to interested parties. As such they are not canvassed here. Rather it is simply noted that:

- When the facility closed there was every expectation it would reopen
- There are several credible parties interested in re-establishing the facility
- A small scale casino could form part of a larger tourism development in a post-mining economy
- There would be a substantial increase in employment, but not necessarily in the employment prospects for those already on the island
- Allowing remote locations that have struggled with development to provide gaming services has occurred in other countries
- The facility previously struggled to be profitability even with a relatively low gaming tax rate
- Special visa processes would be required for high rollers from Indonesia
- Substantial legislative change would be required for an operation to be possible
- The existing owner of the site is not in a position to develop the site and has previously refused reasonable offers for the site
- As a general principle it is not clear that the provision of special or monopoly type rights for a particular industry is an appropriate regional development strategy.

## 8.4 Tourism prospects summary

The tourism product available on Christmas Island is limited by:

- the availability of flights
- consistency of flight schedule and service provider
- the availability of suitable accommodation and airport services
- the lack of a comprehensive land use plan for the island
- a general lack of a service culture, and
- a lack of tourism activities.

With the exception of some specialist interest groups, such as bird watchers, current tourists to Christmas Island are unlikely to be repeat visitors.

To develop tourism as a viable industry that can support a population approaching the current level will take time. It is possible that tourism may never grow to a size that can support a significant level of employment. It is however certain that in the next five years tourism cannot grow to the point that it is a substantial replacement industry.

## 9 Summary and conclusions

Phosphate mining and directly dependent businesses such as stevedoring account for approximately half the Gross Product of Christmas Island.

The likely direct and indirect job losses following the closure of the mine are around 280 full-time equivalent jobs. This represents approximately 40 percent of the current total island labour force. Job losses of this scale will place great strains on the Christmas Island community.

Access to additional lease areas will extend the mine life for a further 10 years, and allow annual average sales of around 650,000 tonnes of material over this period. In a typical year of operation phosphate mining will make substantial contributions in terms of tax payments, royalty payments, and community contributions. Additionally, CIP employees pay substantial income tax.

In summary, the total annual value of the various contributions will be around \$27M, and assuming a discount rate of six percent the net present value of these payments over ten years will be \$211M. The specific annual and NPV amounts are shown in Table 16.

Table 16 **Value of extending the mine life by ten years**

Details	Annual value	Net Present Value
	(\$) '000	(\$) '000
Sales revenue	115,700	902,656
<b>Contributions</b>		
Company tax	16,934	132,111
Income tax on employee wages and bonuses	4,925	38,423
Phosphate royalties	3,250	25,355
Rehabilitation levy	1,280	9,990
Fringe benefits tax	260	2,028
Community donations and sponsorship	220	1,716
Local government rates	140	1,092
Mine lease rental	24	187
<b>Total contributions</b>	<b>27,034</b>	<b>210,904</b>

Given the current level of planning and investment, five years is too short a time frame for tourism to develop as an alternative industry that could support a replacement level of employment. Extension of the mine life will allow greater time for tourism planning and development.



## A Input Output modelling

The Input Output table for Christmas Island was derived using the distributive commodity balance (DCB) method. The DCB takes a base Input Output table and uses industry shares to generate the regional table.

The original base table is an Australian Input Output table for 2005-06 published by the Australian Bureau of Statistics. From this table an Input Output table for Western Australia was derived and then used to generate an Input Output table for Christmas Island. In the description of the DCB method to follow, it is assumed that the Western Australian Input Output table is the base table.

The DCB method requires the share of a regional industry in the base economy be estimated. In most instances employment shares are used to accomplish this as this is the most readily available data. The 2006 census provided the data used to estimate Christmas Island industry shares in the Western Australian economy. Using these shares the base economy is essentially scaled down to the size of the regional economy.

The DCB method is well suited to the incorporation of additional regional data were available. For Christmas Island, data on the consumption of local goods and services by the phosphate mine was made available. These data were included in the Christmas Island table and have significantly improved its quality.

Table 17 contains the Input Output table for Christmas Island. The rows of the Input Output tables show the sales from each industry in terms of \$M while the columns show the purchases made by each industry in terms of \$M.

Consider the Accommodation, cafes and restaurants industry row for Christmas Island in Table 17 which reflects a large portion (but not all) of the tourism sector. The row shows that this industry sells little of its output to other local industries with most values being less than \$1M. The sum of all these sales comes to only \$0.4 million as shown in the Total intermediate usage column. The table also shows that an estimated \$1.9 million from the Accommodation, cafes and restaurants industry on Christmas Island is sold to Private final consumption which reflects purchases made by local people from this industry. An additional \$2.4 million is sold as exports which reflect sales to visitors to the Island.

Total sales are measured by the sum of sales to industry, government, private consumers, capital expenditure and exports and are represented by Total



supply in the tables. For the Accommodation, cafes and restaurants industry on Christmas Island total sales are an estimated \$4.8 million.

Reading down the Accommodation, cafes and restaurants industry column in Table 17 shows that the industry consumes or purchases \$0.7 million worth of local (from Christmas Island) goods and services, as represented by Total intermediate usage. The column also shows that the industry uses or purchases \$1.2 million in local labour, makes a profit (representing payments for the use of capital) of \$0.6 million, pays taxes on certain inputs and uses imports valued at \$2.0 million.

Total purchases made by an industry are the sum of the cost of all inputs (labour, profits, taxes, purchases and imports and is represented by the Production row. For the Accommodation, cafes and restaurants industry on Christmas Island, total purchases are \$4.8 million.

Table 17 Input Output Table: Christmas Island (2006)

	Other mining	Bakery products	Basic chemicals	Electricity supply	Water supply, sewerage & drainage	Residential building	Other constr	Constr trade servs	Wholesale trade & repairs	Retail trade & repairs	Accomm, cafes & restaurants	Road transp	Water transp	Air & space transp	Servs to transp, storage	Communication servs	Banking	Ownership of dwellings	Other property servs	Scientific research, tech & comp servs	Other business servs	Government administration	Defence	Education	Health servs	Community servs	Libraries, museums, parks & arts	Sport, gambling & recreat servs	Personal servs	Other servs	Total intermediate usage	Private final consumption expenditure	Government final consumption	Capital expenditure	Exports	Total final demand	Total supply	
Other mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	54	<b>54</b>	<b>54</b>	
Bakery prods	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	<b>1</b>	<b>1</b>
Basic chems	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.3	0	0	0	0	1	<b>1</b>	<b>3</b>	
Electricity supply	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.2	1	0	0	0	0	<b>1</b>	<b>3</b>	
Water supply; sewerage & drainage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	1	0	0	0	0	<b>1</b>	<b>1</b>	
Residential building constr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	4	0	0	<b>4</b>	<b>4</b>	
Other constr	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.3	0	0	24	1	<b>25</b>	<b>28</b>		
Constr trade servs	0	0	0	0	0	1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.6	0	0	0	0	0	<b>0</b>	<b>7</b>	
Wholesale trade & repairs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.9	1	0	0	0	0	<b>1</b>	<b>3</b>	
Retail trade & repairs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	2	0	0	0	0	<b>2</b>	<b>3</b>	
Accomm, cafes etc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	2	0	0	2	0	<b>4</b>	<b>5</b>	

	Other mining	Bakery products	Basic chemicals	Electricity supply	Water supply, sewerage & drainage	Residential building	Other constr	Constr trade servs	Wholesale trade & repairs	Retail trade & repairs	Accomm, cafes & restaurants	Road transp	Water transp	Air & space transp	Servs to transp, storage	Communication servs	Banking	Ownership of dwellings	Other property servs	Scientific research, tech & comp servs	Other business servs	Government administration	Defence	Education	Health servs	Community servs	Libraries, museums, parks & arts	Sport, gambling & recreat servs	Personal servs	Other servs	Total intermediate usage	Private final consumption expenditure	Government final consumption	Capital expenditure	Exports	Total final demand	Total supply	
Road transp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	0	0	0	0	0	1	2
Water transp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	1	1	2	
Air & space transp	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	0	0	0	1	1	2		
Servs to transp; storage	2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.8	0	0	0	4	4	9	
Comm servs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.3	1	0	0	0	1	3	
Banking	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0	1	0	0	0	1	2	
Ownership dwellings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	6	0	0	0	6	6	
Other property servs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7	0	0	0	0	0	2	
Scientific research, tech & comp servs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0	1	
Other business servs	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.3	0	0	0	0	0	1	3	
Govt admin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2	0	5	0	0	0	5	7	
Defence	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	1	0	0	0	1	1	
Education	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	3	3	0	0	0	6	6	
Health servs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	1	2	0	0	0	3	3	



	Other mining	Bakery products	Basic chemicals	Electricity supply	Water supply, sewerage & drainage	Residential building	Other constr	Constr trade servs	Wholesale trade & repairs	Retail trade & repairs	Accomm, cafes & restaurants	Road transp	Water transp	Air & space transp	Servs to transp, storage	Communication servs	Banking	Ownership of dwellings	Other property servs	Scientific research, tech & comp servs	Other business servs	Government administration	Defence	Education	Health servs	Community servs	Libraries, museums, parks & arts	Sport, gambling & recreat servs	Personal servs	Other servs	Total intermediate usage	Private final consumption expenditure	Government final consumption	Capital expenditure	Exports	Total final demand	Total supply		
less subsidies on production																																							
Imports cif	12	0	2	1	0	2	14	2	1	1	2	1	1	1	3	1	0	1	0	0	1	2	0	1	0	0	0	0	0	0	0	0	50	14	4	6	0	23	73
Production	54	1	3	3	1	4	28	7	3	3	5	2	2	2	9	3	2	6	2	1	3	7	1	6	3	1	1	1	0	3	167	37	18	35	68	159	325		
Total use of goods & servs in production	22	0	3	2	0	4	21	4	2	2	3	1	1	1	5	1	0	1	1	0	1	3	0	2	1	0	1	0	0	1	85	34	18	34	68	155	240		

Data source: ACIL Tasman Note: all values in this table are greater than zero. Any industry with a zero value has been omitted.

## B Bibliography

- AGCGC (Australian Government Commonwealth Grants Commission) (2007), *Report on Indian Ocean Territories 2007*, Canberra.
- Beer, A and Keane, R (2000) “Population Decline and Service Provision in Regional Australia: A South Australian Case Study” *People and Place*, Vol. 8, No. 2, pp. pp. 69-76.
- DEWR (Department of Employment and Workplace Relations) (2006) *Small Area Labour Markets: March Quarter 2006*, Canberra.
- FDI (Future Directions International) (2008) *Australia’s External Territories: The Forgotten Frontiers, Occasional Paper 1*, Perth.
- Haney, M and Shkaratan, M (2003) “Mine Closure and Its Impact on the Community: Five Years After Mine Closure in Romania, Russia and Ukraine”, *Policy Research Working Paper; The World Bank*, Infrastructure and Energy Services Department.
- O’Faircheallaigh, C (1992) “Mine Closures in Remote Regions: Policy Options and Implications”, in Neil, C et al. (eds), *Coping With Closure: An International Comparison of Mine Town Experiences*, London, pp. 347-368.
- Tourism WA (2008) *Tourism Accommodation Development Register June 2008*, Perth.
- Waters, L (1983) *The Union of Christmas Island Workers*, Allen & Unwin, Sydney.