

# THE WAIKATO REGIONAL ECONOMY

REPORT FOR

**Katohyst**   
group

BY

**DR WARREN R. HUGHES**

**DEPARTMENT OF ECONOMICS  
THE UNIVERSITY OF WAIKATO  
HAMILTON NEW ZEALAND**

# EXECUTIVE SUMMARY

This report analyses the performance and structure of the Waikato Regional Council economy (Waikato RC) for the year ended December 2006.

In addition, results are presented for the Core Waikato economy (defined as Hamilton City Council plus Waikato District Council and Waipa District Council). Main results from the analysis include:

- The Waikato RC economy comprises 9.5% of NZ's population and 9% of retail sales and gross domestic product (GDP) for the year ended December 2006.
- The Core Waikato economy comprises 56% of Waikato RC population and 57% of its gross regional product (GRP).
- The real annual growth rate for GDP and GRP over recent years (since March 2003) was 3% for the NZ economy and 5.8% for the Waikato RC economy reflecting a dramatic recovery in the Waikato region's performance since 2004.
- Corroborating the above result, annual growth in employment for the 2.75 years to December 2006 was 1.6% for NZ and 7.0% for Waikato RC. Waikato's employment growth rate over this period far outpaced NZ, Auckland (1.8%) and Bay of Plenty (1.4%).
- Value Added - or GDP/GRP per employee - for the December 2006 year was \$86,791 for NZ and \$90,789 for Waikato RC. This reflects the large capital intensive, exporting sectors located in the Waikato region.
- The most profitable sectors in the Waikato region with large workforces include *Electricity, Dairy Farming* and *Coal Mining*.
- The largest exporters in the Waikato region include *Dairy Processing, Electronic Manufacturing, Basic Metal Products* and *Agricultural Machinery*.
- The most profitable and largest exporting sectors for the Core Waikato economy are the same as for the Waikato RC economy.
- After accounting for all linkages from initiating activity, the greatest percentage of employment and value added activity in the Waikato RC economy stems from *Dairy Farming & Processing, Education & Scientific Research* and *Sheep Beef Deer Farming & Processing*.
- The most important activity in the Waikato region is still *Dairy Farming & Processing* which, after accounting for all backward and forward linkages, accounts for 17% of Waikato RC employment and 24% of its GRP.
- Productivity per worker has increased significantly for all major sectors of the Waikato economy with the exception of *Dairy Processing* and *Tourism*.
- *Water Supply* and *Electricity* are the most valuable resources in the Waikato economy with total multipliers of 5.51 and 4.73 respectively.
- The Agri-Manufacturing Group comprising *Plastics, Fabricated Metal Products, Electronic Manufacturing, Agricultural Machinery* and *Industrial Machinery* accounts for 9.2% of employment and 8.1% of Waikato region GDP.
- Hamilton City accounts for 46% and 76% of employment in the Waikato RC and Core Waikato economies respectively.
- A detailed analysis of employment trends suggests that the Waikato is gaining productive capacity faster than the Auckland, Bay of Plenty and Northland regions and may increase its percentage of the NZ economy above its current 9% share. These gains may come at the expense of the Auckland region as logistics in that increasingly congested region become a major reason to locate elsewhere.

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## INTRODUCTION

The analysis in this report is based on three 112-sector economic models of the NZ, Waikato Regional Council and Core Waikato economies. The Waikato Regional Council (R. C.) economy is the usual regional economy for the Waikato region based on the 9 District Council (Thames-Coromandel to Waitomo & Taupo) regions surrounding and including Hamilton City. Note that individual sectors in the 112-sector models of the NZ, Waikato and Core economies such as *Retail Trade*, *Accommodation* etc are *italicised* for easy identification.

**TABLE 1: WAIKATO'S PLACE IN THE NEW ZEALAND ECONOMY YEAR ENDED DECEMBER 2006**

<b>Economic Measure</b>	<b>Waikato RC</b>	<b>New Zealand</b>	<b>Percent</b>
Gross Regional or Domestic Product \$ b	14.355	160.152	9.0%
Full-time Equivalent Employment Feb '06	158,113	1,845,255	8.6%
Value Added per Employee \$	\$90,789	\$86,791	104.6%
Employment Count December 2006 '000	196.5	2114.0	9.3%
Population 2006 Census #	390,100	4,116,900	9.5%
Retail Sales \$ b	5.535	61.271	9.0%

The conclusion from the above is that:

**...the Waikato Regional Council economy is approximately 9% of the NZ economy, a slight increase over recent years.**

Note that Waikato value added (or GDP or GRP gross regional product) per employee is about 4.6% higher than the national average. GRP is the regional equivalent of NZ's GDP.

The impact of the Core Waikato districts (Hamilton City Council, Waikato D C and Waipa D C) on the greater Waikato Regional Council economy is summarised in the table below.

**TABLE 2: CORE WAIKATO AND THE WAIKATO REGIONAL COUNCIL ECONOMY DEC 2006 YEAR**

<b>Economic Measure</b>	<b>Waikato RC</b>	<b>Core Waikato</b>	<b>Percent</b>
Gross Regional or Domestic Product \$ b	14.355	8.166	56.9%
Full-time Equivalent Employment Feb '06	158,113	97,614	61.7%
Value Added per Employee \$	\$90,789	\$83,656	92.1%
Population 2006 Census	390,100	217,600	55.8%

The figures in the table show the core districts to be 55% to 62% of the total Waikato regional economy depending on the measure used.

While value added per employee is about 8% lower than the Waikato average, it should be noted that some large Waikato exporting sectors (dairying, forestry, etc) are located outside the core districts.

Furthermore, some of Waikato's largest-employing but lowest-paid sectors such as *Retail Trade*, *Accommodation*, *Cafes & Restaurants* are concentrated in the Core districts.

## RECENT GROWTH PERFORMANCE OF THE NZ AND WAIKATO ECONOMIES

The table below summarises the GDP or GRP performance for the NZ and Waikato RC economies in recent years.

**TABLE 3: NZ AND WAIKATO RC GROWTH PERFORMANCE 2000 – 2006**

Economy	GDP or GRP in \$ billions for years ended March				Year Ended
	2000	2001	2002	2003	Dec 2006 \$ b
New Zealand	109.7	115.9	124.6	130.7	160.2
% gain over previous year		5.7%	7.5%	4.9%	
Waikato R. C.	8.9	10.1	11.1	10.6	14.4
% gain over previous year		13.5%	11.0%	-4.5%	

The statistics for the March years 2000 to 2003 are recently published **Statistics NZ** data for the NZ and regional economies. Currently, these data for regional economies like Waikato RC do not extend past the year ended March 2003. Consequently to compare more recent trends for the NZ and Waikato economies we need to convert the above data to equivalent annual growth rates as shown in the following table.

**TABLE 4: NOMINAL AND REAL GROWTH RATES FOR THE NZ AND WAIKATO RC ECONOMIES**

Economy	Equivalent Annual Growth Rate for the period March 200 – March 2003	Equivalent Annual Growth Rate for the period March 2003 – December 2006
New Zealand	6.0%	5.6% (3.0% real)
Waikato R C	5.6%	8.4% (5.8% real)

As noted in the previous report for the then Waikato Economic Development Agency (WED), the Waikato economy was performing very badly around 2003/2004 with a shrinking labour force. This is evidenced by the negative 4.5% nominal growth for the March 2003 year for the Waikato R. C. economy shown in Table 3. This sub-par performance continued on into 2004. As a result, Waikato's nominal growth rate at 5.6% was below the NZ average over the period 2000 - 2003.

However, over the latest period to the December 2006 year, **the Waikato economy has significantly outperformed the NZ economy with a 5.8% real growth rate compared to 3% for the NZ economy.**

Note that CPI inflation averaged 2.6% annually over the 2003 - 2006 period allowing us to derive approximate real growth rates as shown in the last column of Table 4 in brackets. The employment growth rates over recent years corroborate these relative GDP growth rates. From December 2004 to December 2006, the annual employment growth rate for the Waikato RC economy was 7.0% compared to 1.6% for NZ as a whole.

The latest Waikato real growth rate for GRP/GDP is almost double the NZ rate and reflects the good performance in the meat and dairy sectors that are so important to the region. Furthermore, construction in the Hamilton-Cambridge-Te Awamutu triangle has been strong and this always underpins growth in the consumer spending sectors.

## PROFITABILITY AND EXPORTING PERFORMANCE OF MAJOR WAIKATO SECTORS

In what follows, we utilise the measure Value Added per employee for profitability where employment is now measured as Employment Count (head count) or EC. This is the best measure of regional profitability of a business unit or sector. Value Added is the dollar measure of an activity captured by regional business units and employees. The activity can be a business operation such as *Dairy Farming* or an event such as *Balloons Over Waikato*. Value Added includes the following:

- Net wages and salaries to regional employees
- Net operating profits or surplus of business units after tax but before dividends and interest paid
- Capital replacement or depreciation incurred in current operations of all business units
- All PAYE, income, company, GST, customs and excise taxes, road user charges etc. paid to government

**The total of value added aggregated across all 112 sectors in the regional economy equates to regional GDP or GRP, currently \$14.355 billion for the Waikato region (Table 1).**

High value added in a sector or business unit allows for high wages to employees, high rates of return on capital by business units, replacement of capital equipment in business units using the latest technology to sustain state-of-the-art production in important exporting sectors, taxation for government to facilitate maintenance of public goods such as education, medical services, roading,

justice and public order. Profitability for all 112 sectors in the Waikato RC economy is detailed in the Appendix. The same data for the Core Waikato economy is also shown there.

Using results from the 112-sector model of the Waikato R. C. economy (reviewed in the Appendix) we can identify the most profitable sectors in the region using Value Added per Employment Count as the defining measure. The top 10 sectors are listed below. In this table VA stands for Value Added and EC for Employment Count. Sectors are ranked according to VA per EC.

**TABLE 5: MOST PROFITABLE SECTORS FOR WAIKATO REGION IN THE YEAR TO DECEMBER 2006**

Sector	Rank	Sales \$ m	VA \$ m	Jobs EC	VA per EC \$	Exports % Sales	Imports % Sales
Forestry	1	652.6	232.0	140	1,657,143	32.9	13.6
Gas Supply	2	169.6	58.0	110	527,273	50.1	32.1
Water Supply	3	70.2	23.3	45	517,778	7.1	5.0
Electricity Generation	4	629.4	365.1	790	462,152	77.0	33.2
Property Services	5	756.9	513.4	1295	396,448	11.6	10.1
Paper & Products	6	338.1	149.6	430	347,907	69.4	27.4
Casinos & Gaming	7	148.0	99.7	340	293,235	16.6	13.5
Dairy Farming	8	2,346.3	1,475.9	5790	254,905	30.5	11.8
Coal Mining	9	202.4	89.4	352	253,977	74.4	23.5
Soft Drink & Water	10	48.6	21.3	85	250,588	14.8	26.1

The top 10 exporting sectors in the Waikato region are listed below. Here we use the percentage of sales exported out of the region as the ranking measure. Some niche sectors such as *Footwear* with low employment have been excluded from the ranking. Note that exports here are defined by exports out of the Waikato region and may go to other NZ regions as well as overseas.

**TABLE 6: MAJOR EXPORTERS FOR WAIKATO REGION IN THE YEAR TO DECEMBER 2006**

Sector	Rank	Sales \$ m	VA \$ m	Jobs EC	VA per EC \$	Exports % Sales	Imports % Sales
Kiwifruit	1	42.0	24.3	200	121,500	93.8	10.7
Dairy Processing	2	2,153.1	328.8	2980	110,336	91.2	5.9
Electronic Manuf'ing	3	127.4	45.3	410	110,488	84.9	40.7
Basic Metal Products	4	258.5	82.8	560	147,857	84.3	30.1
Agricultural Machinery	5	124.7	51.9	610	85,082	76.7	32.2
Services to Mining	6	19.0	6.8	210	32,381	75.8	18.9
Fishing	7	80.0	26.6	190	140,000	74.6	31.9
Coal Mining	8	202.4	89.4	352	253,977	74.4	23.5
Ship & Boat	9	38.6	16.7	277	60,289	73.1	26.4
Industrial Chemicals	10	51.6	15.9	80	198,750	72.5	37.2
Scientific Research		118.9	82.7	1190	69,496	62.1	13.3

VA = Value Added EC = Employment Count

We also have included *Scientific Research* in the above table as it is a large employing sector which exports 62.1% of sales out of the region 60% of which would be overseas exports. Note that sales per employee for this sector are \$99,916. Statistics from this sector will be utilized to examine the performance of the Waikato Innovation Park since inception (see accompanying report).

Again, Export and Import percentages for all 112 sectors are included in the complete table in the Appendix.

The above analysis is replicated for the Core Waikato region as defined above.

**TABLE 7: MOST PROFITABLE SECTORS FOR CORE WAIKATO REGION IN THE YEAR TO DECEMBER 2006**

Sector	Rank	Sales \$ m	VA \$ m	Jobs EC	VA per EC \$	Exports % Sales	Imports % Sales
Gas Supply	1	61.7	21.1	40	527,500	30.6	32.1
Electricity Generation	2	767.7	258.9	560	462,321	20.4	8.2
Paper & Products	3	99.3	38.2	110	347,273	33.8	27.4
Property Services	4	441.9	299.8	756	396,561	10.7	10.0
Water Supply	5	70.2	23.3	69	337,681	27.6	5.0
Casinos & Gaming	6	143.2	96.4	329	293,009	49.9	13.5
Dairy Farming	7	916.0	439.7	1725	254,899	0.0	32.7
Coal Mining	8	103.5	45.7	180	253,889	68.9	23.5
Other Min & Quarrying	9	69.4	6.5	96	234,375	0.0	40.2
Publishing & Recording	10	140.8	69.1	340	203,235	40.3	26.7

VA = Value Added EC = Employment Count

In comparing Tables 5 and 7 we see both *Forestry* and *Soft Drink & Water* (large for Taupo DC and South Waikato DC) drop out of the top 10 for the Core Waikato region as expected. These sectors are replaced by *Other Mining & Quarrying* and *Publishing & Recording*. Note that all statistics in the above table are calculated for all 112 sectors and are included in the Appendix.

The top 10 exporting sectors in the Core Waikato region are listed below. Again we use the percentage of sales exported out of the region as the ranking measure. Statistics for all 112 sectors in the Core Waikato economy are included in the Appendix.

**TABLE 8: MAJOR EXPORTERS FOR CORE WAIKATO REGION IN THE YEAR TO DECEMBER 2006**

Sector	Rank	Sales \$ m	VA \$ m	Jobs EC	VA per EC \$	Exports % Sales	Imports % Sales
Dairy Processing	1	1242.8	189.8	1720	110,349	90.9	5.9
Services to Mining	2	18.1	6.5	200	32,500	90.1	18.8
Electronic Manuf'ing	3	115.6	41.1	372	110,484	90.0	40.7
Apples & Pears	4	17.8	8.6	100	86,000	88.2	13.5
Kiwifruit	5	7.3	4.2	35	120,000	87.7	11.0
Basic Metal Products	6	190.7	61.1	413	147,942	85.9	30.1
Agricultural Machinery	7	76.2	31.7	373	84,987	80.1	32.2
Scientific Research	8	114.5	79.6	1146	69,459	78.2	13.3
Textiles	9	23.6	8.1	107	75,701	77.5	28.0
Medicinal & Cosmetics	10	49.4	15.5	110	140,909	73.9	41.5

For the Core Waikato, *Scientific Research*, *Textiles* and *Medicinal & Cosmetics* move into the top 10 at the expense of *Gas Supply*, *Electricity Generation* and the mining sectors. With Hamilton City Council in the Core, major household servicing sectors such as *Retail Trade*, *Cafes & Restaurants* become important in percentage terms for employment etc. Table 9, however, shows that about 40% of the Core Waikato economy to be dependent on the agriculture and manufacturing sectors.

**TABLE 9: ANALYSIS OF CORE WAIKATO ECONOMY FOR YEAR ENDED DECEMBER 2006**

	Sales		Value Added or GRP		Employment	
	Value \$ m	% of Core	Value \$ m	% of Core	EC #	% of Core
Farming	1447.4	7.0%	670.5	8.2%	4,895	5.0%
Other Primary Industry	336.5	1.6%	102.3	1.3%	610	0.6%
Primary Processing	1769.0	8.6%	325.3	4.0%	3,490	3.6%
Manufacturing	2118.8	10.3%	774.3	9.5%	8,727	8.9%
Business Services	2597.1	12.6%	1536.0	18.8%	17,677	18.1%
<b>TOTALS</b>	<b>8268.8</b>	<b>40.3%</b>	<b>3408.4</b>	<b>41.7%</b>	<b>35,399</b>	<b>36.3%</b>

With Hamilton City as the major city in the region, it naturally is home to business units providing services to the primary business units located in the adjacent districts. Accordingly, business services such as *Communications*, *Legal Services* etc are a major segment of Core Waikato employment being on a par with the other four sectors combined in Table 9. However, for sales and GRP it is

outweighed by the primary producing and processing sectors in terms of sales or regional turnover and, with the addition of manufacturing, also outweighed in terms of value added or GRP.

## EMPLOYMENT IN THE WAIKATO RC ECONOMY

The following table shows the employment impact of some of the region's major industries. The direct impact shows the total employment in the originating sectors such as *Dairy Farming* and *Dairy Processing*. The linked sectors for these originating sectors would be *Electricity Generation* (a backward linked sector inputting energy into farms and factories) and *Retail Trade* (a forward linked sector selling milk, butter etc to consumers). The sum of the direct and linked employment is then the total employment impact on the Waikato RC economy. In total, these major sectors in the Waikato region directly and indirectly account for almost 60% of regional employment.

**TABLE 10: MAJOR WAIKATO RC EMPLOYMENT SECTORS**

ORIGINATING SECTORS	Sales for 2006 \$ billions	EMPLOYMENT COUNT			Percent of Waikato RC
		Direct EC	Linked EC	Total EC	
Dairy Farming & Processing	4.5	8,770	18,219	26,989	17.1%
Sheep Beef Deer Farming & Processing	1.6	5,880	13,532	19,412	12.3%
Forestry, Services & Logging	0.8	1,390	6,878	8,268	5.2%
Coal & Other & Services to Mining	0.5	1,130	3,126	4,256	2.7%
Electricity Generation	1.1	790	15,176	15,966	10.1%
Education & Scientific Research	0.9	12,500	7,287	19,787	12.5%
<b>TOTALS</b>				<b>94,678</b>	<b>59.9%</b>

For the December 2006 year, *Dairy Farming & Processing* now comprises 17% of Employment and 24% of GRP for the Waikato RC economy.

Employment levels and resulting growth rates since 2000 are shown for NZ and four regions since December 2000 in Table 11.

**TABLE 11: EMPLOYMENT AND GROWTH RATES FOR NZ & REGIONAL ECONOMIES – '000 DECEMBER YEARS**

Region	December Years '000					Annual Growth Rate Percent 2000 - 2004	Dec Yrs '000		Annual Growth Rate Percent 2004 – 2006
	2000	2001	2002	2003	2004		2005	2006	
New Zealand	1830	1877	1916	1972	2048	2.9%	2091	2114	1.6%
Waikato	173	173	181	179	172	-0.1%	182	196	6.7%
Auckland	561	585	588	606	631	3.0%	649	654	1.8%
Northland	54	57	59	60	65	4.7%	70	72	5.2%
Bay of Plenty	51	51	54	53	53	1.0%	55	61	3.6%

Note that these periods are slightly different from those used in previous employment analysis but the overall conclusions are unchanged. Over 2000 – 2004, the national and Auckland economies experienced satisfactory employment growth of around 3% annually. Regional economies such as the Waikato and Bay of Plenty experienced sub-par growth, although Northland performed best of all the regions.

However, over 2004 – 2006 the reverse is true with the Waikato economy showing an exceptional 6.7% growth rate close to the previously quoted 7% rate for the slightly different period March 2003 – December 2006. The Bay of Plenty has also outperformed the NZ average with 3.6% annual growth while Northland employment growth accelerated slightly.

Although recent growth rates for the Waikato and Bay of Plenty may in part reflect a “catch-up” from their previous sub-par performance, if these trends continue a significant realignment of NZ productive capacity away from Auckland to the adjacent regions

may be in the making. This analysis of employment lies behind the judgment that the Waikato economy may be increasing its percentage of the national cake above its current 9% share.

## REGIONAL ECONOMIC TRENDS FOR MAJOR INDUSTRY SECTORS

**TABLE 12: RECENT TRENDS IN OUTPUT FOR MAJOR SECTOR GROUPS IN THE WAIKATO ECONOMY**

MAJOR SECTOR	SALES REVENUE IN \$ MILLIONS			
	2001 Year	2006 Year	Increase	Growth Percent p.a.
Dairy Farming	1,508	2,346	838	9.2%
Dairy Processing	1,462	2,153	691	8.0%
Agricultural Manufacturing	575	976	401	11.2%
Sheep & Beef Farming	384	594	210	9.1%
Meat Processing	542	841	299	9.2%
Education & Scientific Research	597	907	310	8.7%
Electricity	591	1,083	492	12.9%
Retail & Wholesale Trade	2,074	3,098	1,024	8.4%
Tourism (Accommodation etc)	738	1,413	675	13.9%
Central Government	288	396	108	6.6%
Hospitals	309	510	201	10.5%
<b>TOTAL ABOVE SECTORS</b>	<b>9,068</b>	<b>14,317</b>	<b>5,249</b>	<b>9.6%</b>
<b>CPI Index as at December</b>	<b>886</b>	<b>1005</b>		<b>2.6%</b>
<b>Population</b>	<b>364,986</b>	<b>390,100</b>	<b>25,114</b>	<b>1.3%</b>
<b>Employment in FTEs</b>	<b>124,470</b>	<b>158,113</b>	<b>33,643</b>	<b>4.9%</b>

Note that the CPI index over the 2001/2006 period averaged 2.6% growth per year. This is a measure of inflation and an approximate real growth in sales revenue for *Dairy Farming* would be 9.2% less 2.6% or 6.6% per year. Real growth in aggregate sales for the sectors listed in Table 12 would be 7% per year, which is a healthy regional growth percentage.

The results in Table 12 can be reproduced for Employment. Comparison of the Employment growth rate with the real Output growth rate can be used to estimate productivity growth in these major sectors. To illustrate the logic we use the Education & Scientific Research grouping – what we might label the “knowledge economy”. Real output growth in this sector from Table 12 is 8.7% less 2.6% (the average inflation rate) or 6.1%.

However, as shown in Table 13 below, employment over this same period has grown at a 3.5% rate indicating significant productivity growth for the “knowledge economy” in the Waikato region of approximately 2.6% p.a. over five years. All major groups show productivity growth with the exception of *Dairy Processing* and *Meat Processing* (significantly negative) and *Tourism* (flat). Note that a high NZ dollar can negatively impact “productivity” in a major exporting sector such as *Dairy Processing* or *Meat Processing* as it reduces output value in NZ dollars compared to earlier years when the NZ dollar had a lower value.

**TABLE 13: RECENT TRENDS IN EMPLOYMENT FOR MAJOR SECTOR GROUPS IN THE WAIKATO ECONOMY**

MAJOR SECTOR GROUP	EMPLOYMENT IN FTEs (2001) AND EMPLOYMENT COUNT (2006)			
	2001 Year	2006 Year	Increase	Growth Percent p.a.
Dairy Farming	11,838	5,790	-6,048	-13.3%
Dairy Processing	1,529	2,980	1,451	14.3%
Sheep & Beef Farming	3,128	2,210	-918	-6.7%
Meat Processing	1,362	2,580	1,218	13.6%
Agricultural Manufacturing	3,622	5,020	1,398	6.7%
Education & Scientific Research	10,522	12,500	1,978	3.5%
Electricity	577	790	213	6.5%
Retail & Wholesale Trade	21,296	28,350	7,054	5.9%
Tourism (Accommodation etc)	10,862	18,610	7,748	11.4%
Central Government	2,382	2,040	-342	-3.1%
Hospitals	3,622	5,620	1,998	9.2%
<b>TOTAL ABOVE SECTORS</b>	<b>70,740</b>	<b>86,490</b>	<b>15,750</b>	<b>4.1%</b>
<b>Percent of Total Employment</b>	<b>56.8%</b>	<b>54.7%</b>		

Note that total employment in these major sector groups has fallen from 56.8% in 2001 to 54.7% in 2006. This indicates a diversification in employment in the Waikato region to other sectors in the economy. It should also be acknowledged that the *Dairy Farming* and *Sheep & Beef Farming* employment numbers in 2001 at 11,838 and 3,128 respectively are almost certainly too high.

Clearly there has been significant dairy farm consolidation in recent years but it is known that all agricultural employment data has been of questionable accuracy until recent years. This means that the annual losses in employment at 13.3% for *Dairy Farming* and 6.7% for *Sheep & Beef Farming* as shown in Table 13 are almost certainly significantly overstated.

However, the productivity gain in *Dairy Farming* over recent years has been well documented by other analysis due to the economies of scale realized with bigger herds etc, although perhaps not as spectacularly as the above figures suggest. That is, as follows:  $9.2 - 2.6 + 13.3$  or 19.9% annually!

## MAJOR INDUSTRY MULTIPLIERS

The importance of the major sector groupings in Tables 12 and 13 can also be demonstrated through so-called “multiplier” calculation. An industry multiplier shows the total impact on an economy (such as the Waikato RC economy) of a one dollar change in output in an initiating industry such as *Dairy Farming*.

Note that in the present analysis these multipliers will be simple averages of individual sectors in the group (nine sectors in the *Tourism* group). Multipliers need to account for both backward (into supplying sectors) and forward (into using sectors) linkages. These are shown separately in Table 14 for our major sector groupings. We show only the Output multipliers but Income, Employment and Value Added multipliers will be very similar.

**TABLE 14: OUTPUT MULTIPLIERS FOR BACKWARD AND FORWARD LINKAGES AND TOTAL IMPACT**

MAJOR SECTOR GROUP	OUTPUT MULTIPLIERS FOR WAIKATO RC ECONOMY		
	Backward/Supply Linkages	Forward/Using Linkages	Total Regional Multiplier
Dairy Farming	1.64	1.82	2.46
Dairy Processing	2.36	1.15	2.51
Sheep, Beef & Deer Farming	1.94	2.68	3.62
Meat Processing	2.44	1.54	2.98
Agricultural Manufacturing	1.71	1.39	2.10
Education & Scientific Research	1.81	1.62	2.43
Electricity	2.30	3.43	4.73
Retail & Wholesale Trade	1.80	2.47	3.27
Tourism (Accommodation etc)	1.89	2.29	3.18
Central Government	1.85	1.18	2.03

For *Meat Processing* we see that the backward linkage at 2.44 is the highest for all groups. This means that every dollar of *Meat Processing* output generates another \$1.44 in sectors that supply *Meat Processing*. Most obviously this is the *Sheep, Beef & Deer Farming* sector but also sectors such as *Electricity* that supply the energy for processing animals. Note that the forward linkage value for *Meat Processing* is relatively low at 1.54.

However, the forward linkage value for *Dairy Processing* is the lowest of all those listed in Table 14. Although some output from *Dairy Processing* links forward into *Retail Trade* as milk, dairy products etc, over 90% of output from Waikato *Dairy Processing* is exported out of the region and mainly overseas. It does not link into further production in the Waikato or NZ and thus results in the lowest forward linkage multiplier shown in Table 14.

On the other hand, the forward linkage from the Waikato’s *Electricity* sector is the highest of those shown in Table 14 since this service has obvious links to much other activity in the Waikato region driving dairy farming, manufacturing and home consumer use. The implication of the 3.43 forward multiplier value is that if Waikato *Electricity* output falls by \$1, another \$2.43 of regional output could be lost to the Waikato.

In practice, a shortfall in Waikato *Electricity* output may be compensated by increased imported electricity from say the South Island if it is available. The high forward linkage multiplier for *Electricity* in the Waikato region makes clear the risk to the region if this service cannot produce as normal or import from other NZ regions.

The total multiplier values show *Electricity* to be the most valuable sector of all the major sector groupings in the Waikato region. However, even *Electricity* is superseded by *Water Supply* whose forward linkage at 3.95 is the highest in the Waikato region. At 2.56. *Water Supply* also has the highest backward linkage in the region. *Non-Residential Building* at 2.44 is the next highest followed by *Dairy Processing* at 2.36. The total output multiplier for *Water Supply* at 5.51 shows this resource is extremely valuable for the Waikato regional economy.

## IMPORTANCE OF THE AGRI-MANUFACTURING GROUP FOR THE WAIKATO ECONOMY

Agri-Manufacturing is an important sector grouping for the Waikato RC economy and also the Core Waikato economy where much of this industry is located. The model sectors forming this group with their December 2006 year sales are as follows: *Plastics* (food containers, animal tags etc) \$173.3 m, *Fabricated Metal Products* \$474.5 m, *Electronic Manufacturing* (animal fencing and weighing machines etc) \$127.4 m, *Agricultural Machinery* \$124.7 m, and *Industrial Machinery* \$249.4 m.

Total annual sales for these sectors are \$1.1 b and total direct employment is 6,100 for the Waikato RC economy. For the Core Waikato economy, total sales are \$833 m and aggregate employment is 4,365 persons.

These sectors are major service industries for the agricultural sectors in the regional economy and major exporters of equipment, services etc overseas. The forward linkages shown in Table 15 are objective evidence of the importance of these sectors to the rural economy.

**TABLE 15: LINKAGE ANALYSIS FROM THE AGRI-MANUFACTURING GROUP TO THE WAIKATO ECONOMY**

<b>Expenditure Round</b>	<b>Sales Revenue \$ millions</b>	<b>Net Household Income \$ mill</b>	<b>Employment Persons</b>	<b>GRP or Value Added \$ millions</b>
First or direct expenditure round by group	1,149.3	247.1	6,100	460.4
Backward linkages to supplying sectors	820.9	153.5	4,628	393.5
Forward linkages to using sectors	693.5	78.4	3,784	306.5
<b>Total Impact for Waikato RC Economy</b>	<b>2,663.7</b>	<b>479.0</b>	<b>14,512</b>	<b>1,160.4</b>
Percent of Waikato RC Economy	7.4%	8.7%	9.2%	8.1%
Multiplier	2.32	1.94	2.38	2.52

Table 15 shows that the backward linkage flow-ons are not significantly greater than the forward linkage flow-ons apart from the Net Income measure. Major supplying sectors to the group aggregated under backward linkages are *Electricity*, *Road Freight* and *Communications*. Major using sectors aggregated under forward linkages are *Dairy Farming*, *Dairy Processing* and *Hospitals*.

While the using sectors could always import the group's goods and services from outside the region, it is obviously more cost-effective and efficient to have these suppliers located in the region. Taking all measures into account, the group constitutes about 9% of the Waikato RC economy.

## IMPORTANCE OF HAMILTON CITY TO THE WAIKATO RC & CORE WAIKATO ECONOMIES

As the major territorial authority in the Waikato RC region, Hamilton City has a major role in the future development of the region. In Table 16, the importance according to sales, income employment and value added is shown for both the Waikato RC and the Core Waikato economies.

**TABLE 16: HAMILTON CITY IN THE WAIKATO RC AND CORE WAIKATO ECONOMIES**

<b>ECONOMY</b>	<b>Sales or Revenue \$ millions</b>	<b>Gross Household Income \$ millions</b>	<b>Employment Persons</b>	<b>GRP or Value Added \$ millions</b>
Waikato RC Economy	35,842.8	7,865.6	158,113	14,355.3
Core Waikato Economy	22,089.9	4,705.0	97,614	8,166.1
Hamilton City	15,041.9	3,394.1	72,225	5,680.2
Percent of Waikato RC	42.0%	43.2%	45.7%	39.6%
Percent of Core Waikato	68.1%	72.1%	74.0%	69.6%

Using GRP as the definitive measure we see that Hamilton is respectively 40% and 70% of the two economies. However, on the employment measure this rises to 46% and 74% respectively. Of course, many of the part-time, lower paid jobs in the *Retail Trade* and *Tourism* sectors are concentrated in Hamilton City raising the employment percentage above the other measures.

## CONCLUSIONS

The Waikato RC economy has dramatically recovered from its slump over the 2003/2004 years evidenced at that time by a shrinking GRP and labour force. Although other adjacent regions such as Auckland, Northland and Bay of Plenty are major regional players in the NZ economy, the Waikato RC region at 9% of NZ's economy still maintains its high ranking and is showing evidence of increasing this share.

Waikato's annual employment growth rate over the 2.75 years since March 2003 to December 2006 was an astounding 7.0% which far outpaced that of NZ as whole at 1.6%, Auckland RC at 1.8% and Bay of Plenty RC at 1.4%. Northland's annual gain over this period was also significantly lower although still respectable at 4.9%

Recent analysis of NZ employment trends in Table 11 suggests that productive capacity as measured by employment is moving away from Auckland to the adjacent regions of Waikato, Bay of Plenty and Northland. Waikato's employment level is roughly 3 times that of its regional rivals Bay of Plenty and Northland and supports a more extensive productive infrastructure as a result. If logistics between the Waikato region and its two ports (Auckland and Tauranga) and its two airports (Auckland and Hamilton) can be still further improved, the region stands to gain more business units and associated employment at the expense of an increasingly congested Auckland region.

The above analysis can be used to determine the strategy for future development of the Waikato region. Sustainable long-run development will only be profitable if the competitive advantage of the region can be maintained against competitors in a globalised world. NZ has only a small domestic market and must rely on favourable commodity prices derived from large scale manufacturing in the primary industries and large export volumes to overseas countries.

While other sectors such as *Tourism* are becoming important for the NZ economy, large scale employment in high-paying jobs can only be sustainable if our major exporting sectors in the primary industries maintain their competitiveness. This focuses attention on agriculture sectors such as dairy, sheep, deer, fish etc, kiwifruit, citrus, apple etc as well as the follow-on processing sectors such as wine, food processing etc. Forestry will also continue to be important, particularly if sustainable forestry becomes a barrier for some major NZ competitors.

The Waikato region is a major player in these important export sectors. It follows that future developments must be undertaken with a view to building on these existing strengths. **Waikato Innovation Park (WIP)** is an outstanding example as to how research can leverage returns to our primary growing sectors.

For example, the Walton case study overseen by the **WIP** has lifted dairy profitability per hectare from around \$3,000 to \$4,000. Smaller dairy farms average around \$1,000. Although this is but one example of the productivity gains that are possible, it must be replicated in other areas if NZ is to maintain its leading role as a major exporter of commodities such as dairy ingredients.

Furthermore, NZ needs to achieve large scale production in value added areas such as food (e.g. organics), forest products as well as products related to animal and food production even if the manufacturing of these products is undertaken off-shore. That is, the R & D for many agricultural products and services can be undertaken in NZ's well-established agricultural research infrastructure, tested in the field as with the Walton case study with full-scale production of associated products etc undertaken overseas if necessary.

# **APPENDIX**

**REVIEW OF THE 112-SECTOR MODEL OF THE WAIKATO ECONOMY**

**ACTIVITIES IN THE 112 SECTORS OF THE WAIKATO ECONOMY**

**REGIONAL ECONOMIC MODELS SHOWING SECTOR SALES, EMPLOYMENT, EXPORTS & PROFITABILITY**

**WAIKATO RC MODEL**

**CORE WAIKATO MODEL – HAMILTON CITY COUNCIL + WAIKATO DC + WAIPA DC**

## REVIEW OF THE 112-SECTOR MODEL OF THE WAIKATO ECONOMY

This review provides a brief technical description of the 112-sector Input/Output Model used to generate the general equilibrium economic impact (resulting impacts after all reactions to initiating events, industry developments etc. are accounted for) on the Waikato Regional Council (RC) economy and the Core Waikato economy.

The economic models were constructed from data originating with *Statistics NZ*. The NZ and all regional economies were categorised into 112 sectors. These comprise the basic farming sectors such as *Dairy Farming*, *Sheep & Beef Farming* as well as *Other Horticulture*, *Mixed Cropping*, *Fruit Growing* and *Services to Agriculture* sectors. There are 18 such primary sectors in the model up to *Oil & Gas Exploration*. Related follow-on sectors from these primary producers that are important for regional rural economies are *Meat Processing*, *Fruit & Vegetable Processing* and 3 sectors related to wood processing.

Altogether there are 41 manufacturing sectors including the primary processing sectors above as well as *Agricultural Equipment*, *Other Chemical Products* etc. The 3 utility sectors for *Electricity*, *Gas* and *Water* include the production, distribution and supply of these goods and services. Construction is sub-divided into 4 sectors including *Ancillary Construction* (e.g. paving, swimming pools, roofing, electrical maintenance etc.).

The model then uses 46 sectors covering activities such as *Wholesale Trade*, *Retail Trade*, *Accommodation*, 4 transportation sectors, 16 finance and business service sectors, central and local government services as well as separate sectors for *Education*, *Hospitals*, *Aged Accommodation* and *Gaming*. Descriptions of the activities in each of the 112 sectors are listed below. Where a sector description is not obvious, some of the activities covered in that sector are listed in the right-most column.

This comprehensive economic model is one of a class of so-called *general equilibrium* models and is described as an Input/Output model. Each of the 112 sectors in the model quantifies the inputs it receives from all other sectors, such as *Gas*, in order to produce the goods or services sold in a given period (output level in dollars), usually a year.

Also quantified are the total inputs of labour and capital goods (depreciation or capital replacement) needed to produce at that output level. The models were constructed for the December 2006 year and can provide detailed information concerning:

- The structure of the Waikato RC and Core Waikato economies as to the most important sectors in terms of employment, profitability, exports out of region etc.
- The impact of a change originating in one sector (e.g. *Logging*) and its implications for other related sectors (*Paper & Products*) and the regional economy as a whole.
- Consequences for regional employment and income flowing from major changes to the economy as a result of government policy (e.g. lower taxes, tariffs, free trade agreements etc.)
- The implications for the regional environment of significant increases in the output level of any sector or group of sectors.

There are four economic impacts that can be analysed for the regional economy as follows:

- Total sales, revenue or output in dollars.
- Net household income after tax, superannuation and other saving in dollars.
- Value Added for the region (defined below) otherwise known as regional Gross Domestic Product (GDP) or Gross Regional Product (GRP).
- Employment in full-time equivalent persons (FTEs).

Although total sales or output best measures the dollar value of total economic activity in a region, it can be inflated by the value of large imports of products or services (e.g. sophisticated engineering design services) into a region like the Waikato from say Auckland or Rotterdam. While such sales figures measure total transaction value, the Value Added measure quantifies the economic value in dollars created within the Waikato region by the local workforce after allowing for any necessary imports of raw materials and other

goods and services from outside the region. This is the measure of the addition to gross regional product (GRP) for the Waikato and ultimately to NZ's GDP, and best reflects the true gain to the regional economy. Total Value Added includes:

- Net after-tax wages and salaries to employees.
- Net after-tax operating surplus but before dividends and interest of business units.
- Capital replacement of plant and equipment used up in current production.
- PAYE, company tax, GST, excise and customs taxes, road user charges and all other taxes paid to central government.

Net after-tax wages and salaries (or household income) is the best measure of available household purchasing power. Strong growth or impact for this measure in a region signals improved prospects for the *Wholesale* and *Retail Trade* sectors, *Ancillary Construction* (e.g. house additions or renovations) and similar sectors.

A wealthy region or country may show acceptable outcomes for the three dollar measures above but may lack the industrial capacity to support good job growth in the region. Employment is therefore an important attribute of regional prosperity and this means economic development within the region is required to expand opportunities for a regional workforce. Such employment is measured in full-time equivalents (FTEs) since about 24% of regional workforces are currently part-time employees. An important capital intensive facility such as a port may itself need only a moderate workforce for efficient operation.

However, through a port's linkages to other sectors, it can ensure profitability in those sectors and facilitate growth in employment in those sectors (e.g. *Other Fruit Growing* which includes asparagus, strawberries for the Waikato region).

The so-called *general equilibrium* nature (includes all reactions to economic stimuli) of the 114-sector Input/Output model is designed to reflect the idea that employment in any one sector generates employment in other sectors of the economy/region being analysed. From employment, related benefits such as income, value added etc. follow. As employees in the initiating sector build houses, educate their families in the general course of living, they create demands for goods and services that must be satisfied by other sectors with their own employees.

In turn, these employees create further demands in other sectors and so on and so on. In economic jargon, these successive rounds of impacts are labelled round-by-round effects with some activities down the line requiring yet further services and employment from the initiating sector. The resulting *general equilibrium* impacts (Output, Income and Value Added as well as Employment) are estimated by the Input/Output methodology and account for all rounds of economic activity.

Using accurate data from *Statistics NZ*, credible estimates of the economic importance of sectors like *Dairy Farming* for a regional economy like the Waikato can be derived. The household income created within this sector links forward into sectors such *Retail Trade*, *Other Sport & Recreation*, *Personal & Community Services* etc. The inputs required by *Dairy Farming* link backwards into supplying sectors such as *Electricity Supply*, *Agricultural Machinery* and *Road Freight*. The total of all such flow-on linkages can be estimated and in the case of *Dairy Farming* constitute 24% of the Waikato RC regional economy in terms of GRP.

## ACTIVITIES IN THE 112 SECTORS OF THE WAIKATO REGIONAL ECONOMY

1	Other Horticulture	Squash, nurseries, vegetables, floriculture
2	Apple & Pears	
3	Kiwifruit	
4	Other Fruit	Grapes, citrus, berries
5	Mixed Cropping	Wheat, maize, grains
6	Sheep & Beef Farming	
7	Dairy Farming	
8	Other Farming	Pigs, deer, horses, goats etc.
9	Services to Agriculture	Fencing, spraying
10	Forestry	Forest growing
11	Services to Forestry	
12	Logging	
13	Fishing	Ocean and fresh-water fish farming
14	Coal Mining	
15	Services to Mining	
16	Other Mining & Quarrying	
17	Oil & Gas Extraction	
18	Oil & Gas Exploration	
19	Meat Processing	
20	Poultry Processing	
21	Bacon Ham & Smallgoods	
22	Dairy Manufacturing	
23	Fruit & Veg, Oil & Cereal Processing	
24	Bakery & Confectionary	
25	Seafood Processing	
26	Other Food Manufacturing	Animal, bird feed
27	Soft Drink, Cordial, Water	
28	Beer, Wine & Tobacco	
29	Textile Manufacturing	Wool scouring, carpets
30	Clothing Manufacturing	
31	Footwear	
32	Other Leather Products	
33	Sawmilling & Timber Dressing	
34	Other Wood Products	Plywood
35	Paper & Paper Products	Newsprint, pulp, containers, paper bags
36	Printing & Services	
37	Publishing & Recorded Media	
38	Petroleum Refining	
39	Petroleum & Coal Products	
40	Fertilisers	
41	Other Industrial Chemicals	Gases, resins
42	Medicinal, Detergents & Cosmetics	
43	Other Chemical Products	Explosives, paints, pesticides
44	Rubber Manufacturing	
45	Plastic Products	
46	Glass & Ceramics	
47	Other Non-metallic, Mineral Products	Cement, lime, concrete pipes
48	Basic Metal Manufacturing	Iron, steel, tubing
49	Structural, Sheet & Fab Metal Prod	Aluminium, tools, wire, nuts & bolts
50	Motor Vehicles	
51	Ship Building	
52	Other Transport Equipment	Rail, aircraft and related equipment
53	Photographic & Scientific Equipment	
54	Electrical & Appliance Manufacturing	
55	Agricultural Equipment	
56	Other Industrial Machinery	Mining, food processing, pumps, air-conditioning
57	Prefabricated Buildings	
58	Furniture	

59	Other Manufacturing	Toys, jewellery
60	Electricity Generation	
61	Gas Supply	
62	Water Supply	
63	Residential Building	
64	Non-Residential Building	
65	Non-Building Construction	
66	Ancillary Construction Services	Landscaping, bricklaying, roofing, electrical, plumbing
67	Wholesale Trade	
68	Retail Trade	
69	Accommodation	
70	Restaurants, Cafes, Bars & Clubs	
71	Road Freight	
72	Road Passenger	Buses, taxis, tours
73	Water & Rail Services	Includes operations of Ports, customs & shipping agents
74	Air Services, Transport & Storage	Airport operations, warehousing & storage
75	Communication Services	
76	Finance & Superannuation	
77	Insurance	
78	Services to Finance & Insurance	
79	Property Services	
80	Owner Occupied Housing	Rental value imputed to homeowners
81	Vehicle & Equipment Hiring	
82	Scientific Research	Waikato Innovation Park, NIWA, LandCare
83	Technical Services	Engineering, architects, quantity surveying
84	Computer Services	
85	Legal Services	
86	Accounting Services	
87	Advertising & Marketing Services	
88	Business, Admin. & Mngt. Services	
89	Employment & Security Services	
90	Pest & Cleaning Services	
91	Other Business Services	Packing services, mail-out services, debt collection
92	Central Government	
93	Defence	
94	Fire & Police	
95	Local Government	
96	Pre-School Education	
97	Primary & Secondary Education	
98	Post School Education	University, technical & further education
99	Other Education	Language schools
100	Hospitals	
101	Medical & Dental	
102	Veterinary Services	
103	Child Care	
104	Aged Accommodation	
105	Other Community Services	Residential care services
106	Movies, Radio & TV	
107	Libraries, Museums & Arts	
108	Horse & Dog Racing	
109	Gaming	Lotteries, casinos
110	Other Sport & Recreation	Stadiums, attractions, gardens, golf courses
111	Personal & Community Services	Videos, hairdressing, massage, funeral services
112	Waste, Sewer & Drainage	

# AUTHOR PROFILE

## Dr Warren R. Hughes

The author is Cambridge born and a graduate of the University of Auckland and Indiana University in the USA, where he completed his doctorate in Business Economics and Public Policy in 1970.

Since that time, he has taught in the areas of econometrics, forecasting, financial economics and managerial strategy at The University of New South Wales in Sydney (1970 – 1978) and The University of Waikato (1978 – 2007). At various times, he has taught in MBA programmes at the University of Florida in Gainesville and in the Graduate School of Management at the University of California at Irvine.

The author has published extensively, mainly in international journals such as *Environment & Planning*, *Australian Journal of Management*, *Forest Science* and *Australasian Journal of Regional Studies*. He is a member of the Advisory Board for the Wiley journal *Managerial and Decision Economics* and maintains a continuing interest in the latest developments in economic theory as it relates to management and business. The author has developed a particular expertise in the area of impact and regional analysis. He is the Editor/Manager of the *Regional Economic Bulletin*, which focuses on topical issues relevant to the business and wider communities in the Waikato and Bay of Plenty regions. The *Bulletin* is a complimentary publication of the Department of Economics at The University of Waikato.

Apart from his current work with **The Katolyst Group**, the author has acted as a consulting economist for *Environment Waikato*, *Carter Holt Harvey Limited*, *Norske Skog Tasman Limited*, *Port of Tauranga Limited*, *Port of Napier*, *Feltex Carpets Limited*, *Zespri International*, *Creative Napier*, *Vision Manawatu*, *Venture Taranaki*, various District Councils in the Waikato, Bay of Plenty, Hawkes Bay and other regions and for events such as the *Montana Jazz Festival*, *Balloons over Waikato* and the *Art Deco Weekend*.

Dr Warren R. Hughes  
Associate Professor  
Economics

Telephone: 64-7-838 4466 Extn. 8419  
Home Phone: 64-7-856 3184  
Email: [hugheswr@waikato.ac.nz](mailto:hugheswr@waikato.ac.nz)  
Mobile: 021 124 1233

Department of Economics  
Waikato Management School  
**The University of Waikato**  
Private Bag 3105  
Hamilton, New Zealand

Telephone 64-7-838 4045  
Facsimile 64-7-838 4331  
[www.mngt.waikato.ac.nz](http://www.mngt.waikato.ac.nz)



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