

## 10 Taranaki's Ecological Footprint

### 10.1 Profile of the region

On census night 2001 Taranaki's resident population was 102,858, representing 2.8 percent of the national population. In population terms Taranaki region is the second smallest region in the North Island. In the intercensal period Taranaki experienced a significant population decline of 3732 people or 3.5 percent of the population. Most of this population loss was due to internal migration, particularly to the neighbouring Manawatu–Wanganui and Waikato regions. Population projections (based on 1996 Census data) suggest that the region will continue to lose people. Significant proportions of those leaving the region are in the 15–24 year age group. Possible reasons for this include lack of access to education and employment opportunities. Almost 47 percent of the population reside in New Plymouth (47,763 people), the region's major urban area.

The region is one of New Zealand's smallest, accounting for only 727,300 ha. The Mohakatino river marks the northern boundary of the region, the Waitotara river the southern boundary and the Whanganui river the inland eastern boundary. The most prominent feature of the region is Mt Taranaki/Egmont (2518 metres), an almost perfectly symmetrical cone-shaped volcano. Mt Taranaki is a major influence on climatic conditions in the region, resulting in considerable variation throughout the region. Land quality in the region varies considerably from fertile well drained plains and terraces to steep, erosion prone mountain slopes. Most of the region's rivers, including the Waiwhakaiho River that flows through New Plymouth, fan out from Mt Taranaki.

The 1997–98 GDP of the Taranaki region is estimated to be \$3.2 billion or 3.2 percent of the national GDP. The extraction, exploration and processing of fossil fuels are the region's most significant industries. Almost all of New Zealand's fossil fuels are extracted from the Kapuni, Maui, McKee, Ngatoro and Waihapa/Ngaere fields. The Maui gas field covers 76,500 ha and is the largest in New Zealand, accounting for an estimated two-thirds of economically recoverable reserves. At current extraction rates it is likely to be depleted by 2006 and possibly sooner. Gas from the field is pumped to New Plymouth before shipment to the Marsden Point refinery in the Northland region. The region also has two methanol plants located at Motunui and in the Waitara Valley. Motunui is one of the world's largest methanol production facilities. Specifically, the oil extraction and exploration industry has a location quotient of 33.06, manufacture of petroleum products 4.41 and gas treatment and distribution 4.87. Closely associated is the region's comparative advantage in basic metal manufacture (LQ 3.43).

Other major industries include dairying and energy production. Dairy farming (LQ 5.70) and the processing of dairy products (LQ 6.72) are also significant industries regionally. The fertile volcanic soils and mild climate are ideal for dairy farming and the region was the first specialised dairying area in New Zealand. Taranaki has two major power stations. The New Plymouth thermal power station is the second largest in the country with a net output capacity of 575 megawatts. Smaller gas turbine stations which utilise gas from the Maui, Waihapa/Ngaere fields are located at Stratford.

### 10.2 Overall ecological footprint and comparison with other regions

The Taranaki region has an estimated ecological footprint of 233,150 ha, 2.17 percent of New Zealand's total ecological footprint. This is the sixth smallest ecological footprint of any region

in New Zealand. By comparison, Taranaki's ecological footprint is smaller than Southland's (375,310 ha) but larger than Marlborough's (163,810 ha).

In per capita terms, Taranaki's ecological footprint is the fourth lowest out of all regions at 2.19 ha per person. This means that Taranaki residents have a similar per capita ecological footprint to Tasman residents (2.08 ha). The region's per capita ecological footprint is in relative terms lower than the average New Zealander's. On a per capita basis, a Taranaki resident requires only 70.1 percent of the land required to sustain an average New Zealander annually. This is a consequence of the region's agricultural land having higher than average yields per hectare. Given the region's comparative advantage in intensive dairy farming on fertile land this comes as no surprise.

The useful land area of Taranaki is 635,250 ha, ie. Taranaki has an ecological surplus of 402,100 ha, or put alternatively, the region's ecological surplus is 1.7 times its ecological footprint. In this way, the region is similar to the Hawke's Bay region. Overall, Taranaki is self-sufficient in ecological footprint terms with a considerable ecological surplus available.

### 10.3 Ecological footprint disaggregated by land type

The agricultural land component of the ecological footprint consists of 154,910 ha (refer to Table 10.1). This equates to 66.5 percent of Taranaki's ecological footprint and in relative terms is comparable with the nation's 68.8 percent. As with most of New Zealand's rural regions, the majority of the agricultural land comes from within the region, but there are significant relative differences. While an estimated 67.6 percent of agricultural land originates from within the Taranaki, this figure is significantly lower than the corresponding national figure of approximately 80.0 percent. This is explained by the higher than average amount of agricultural land embodied in interregional trade flows which, in turn, is a consequence of Taranaki's sheep, beef and mixed livestock and horticulture industries not being able to satisfy local demand. Not surprisingly, agricultural land embodied in interregional imports originate from neighbouring regions and from Canterbury and Southland which have a significant relative comparative advantage in farming types not present in Taranaki.

**Table 10.1 Taranaki's ecological footprint by land type, 1997–98**

Land type	Within region land (ha)	Land from other New Zealand regions (ha)	Land from other nations (ha)	Total land (ha)	Total land (ha per capita)	Total land (% of total)
Agricultural land	104,770	11,070	39,070	154,910	1.45	66.5
Forest land	4,090	1,550	3,620	9,260	0.09	4.0
Degraded land	20,130	450	4,040	24,620	0.23	10.6
Energy land	28,680	1,170	14,400	44,250	0.41	19.0
Total	157,670	14,240	61,130	233,040	2.18	100.0

The forest land component of the ecological footprint consists of 9260 ha or 4.0 percent of the region's footprint. Of this figure an estimated 44.0 percent (4090 ha) of the forest land component comes from within the region, while a similar amount (39.0 percent or 3620 ha) is embodied in goods and services purchased from overseas. Lesser amounts of forest land are embodied in interregional trade products purchased from primarily the Gisborne and Waikato regions. The forest land component of the footprint does not include the hypothetical land planted to sequester CO<sub>2</sub> emissions.

The degraded land component of the ecological footprint makes up 10.6 percent (24,620 ha) of the Taranaki ecological footprint. Of this 81.7 percent is within-region land consisting of land occupied by residents’ households and local businesses (excluding farming and forestry holdings). A further 16.4 percent or 4040 ha is degraded land embodied in goods and services purchased by Taranaki residents from other nations.

The energy land component of Taranaki ecological footprint is 44,250 ha. This represents 19.0 percent of Taranaki’s ecological footprint, approximately 14 percent higher than the nation in relative terms. This suggests that Taranaki residents purchase goods and services that are slightly more energy intensive than those purchased by the average New Zealander. Some 14,400 ha of energy land is embodied in goods and services purchased – from other nations.

## 10.4 Ecological footprint disaggregated by goods and services purchased

### 10.4.1 Purchase of Taranaki produced goods and services (P<sub>1</sub>+P<sub>2</sub> ... P<sub>n</sub>)

The purchase of manufacturing sector products accounted for 99,120 ha of embodied land in Taranaki’s ecological footprint (refer to Table 10.2). This amounts to nearly 42.5 percent of the entire ecological footprint of the Taranaki region. Most of this embodied land (75,550 ha) is in manufacturing products produced within Taranaki itself. Similar amounts of land were embodied in manufacturing products purchased from other regions (11,670 ha) and from overseas (11,900 ha). A significant component of the land embodied in manufacturing products is agricultural land.

**Table 10.2 Taranaki’s ecological footprint by economic products, 1997–98**

Economic products consumed	Within region land (ha)	Land from other New Zealand regions (ha)	Land from other nations (ha)	Total land (ha)	Total land (ha per capita)	Total land (% of total)
Agriculture	15,210	110	400	15,720	0.15	6.7
Forestry	510	580	10	1,100	0.01	0.5
Fishing and hunting	10	0	10	10	0.00	0.0
Mining and quarrying	300	0	10	310	0.00	0.1
Manufacturing	75,550	11,670	11,900	99,120	0.93	42.5
Utilities and construction	6,540	30	2,790	9,360	0.09	4.0
Services	43,610	380	11,260	55,240	0.52	23.7
Domestic final demand	15,950	1,580	34,750	52,280	0.49	22.4
Total	157,670	14,340	61,130	233,150	2.19	100.0

Land embodied in service sector products (eg. finance, business, insurance, government, education, health) accounted for 55,240 ha. This equates to 23.7 percent of the region’s ecological footprint. At first glance this finding may appear extraordinarily high given the small physical land area occupied by service sector industries. This result is, however, explained by the significant quantity of land embodied in inter-industry purchases made by the service sector. Overall, a significant proportion of the land embodied in service sector products is made up of within region land (43,610 ha) with lesser amounts coming from off-shore locations (11,260 ha). The land embodied in other products consumed by Taranaki residents is

significantly smaller than for manufacturing and service sector goods and services: agriculture products (15,720 ha), utilities and construction (9360 ha), and forestry products (1100 ha).

#### 10.4.2 Purchase of goods and services produced outside Taranaki (D<sub>1</sub>+D<sub>4</sub>)

Residents directly purchase products from outside the region, an estimated 36,330 ha (1580 ha interregionally, 34,750 ha internationally). This includes direct importation of motor vehicles.

### 10.5 Ecological Balance of Trade and ecological interdependencies

141,570 ha of embodied land is imported into Taranaki compared to 940,900 ha embodied in exports from the Taranaki economy, making Taranaki a net exporter of embodied land, 6.6 times more embodied land is exported than it imported.

**Table 10.3 Taranaki's Ecological Balance of Trade by economic sector, 1997–98**

Economic sector	Imports purchased by the economic sector (embodied ha)	Exports sold by the economic sector (embodied ha)	Balance of Trade (embodied ha)
<b>Interregional trade</b>			
Agriculture	1,940	224,210	222,270
Forestry	4,590	0	-4,590
Fishing and hunting	0	0	0
Mining and quarrying	0	2,010	2,010
Manufacturing	21,310	34,370	13,060
Utilities and construction	30	350	320
Services	440	270	-170
Domestic final demand	1,580	0	-1,580
Interregional Balance of Trade	29,890	261,210	231,320
<b>International trade</b>			
Agriculture	7,110	40,140	33,030
Forestry	90	7,580	7,490
Fishing and hunting	120	250	130
Mining and quarrying	510	10,850	10,340
Manufacturing	53,140	611,560	558,420
Utilities and construction	2,870	40	-2,830
Services	13,090	9,260	-3,830
Domestic final demand	34,750	0	-34,750
International Balance of Trade	111,680	679,690	568,010
Total Balance of Trade	141,570	940,900	799,330

### 10.5.1 Exports and imports by economic sectors

Over half of the land embodied in imports (74,450 ha) into the Taranaki region is encapsulated in goods and services purchased by the manufacturing sector. Although this may appear high it is comparatively small when compared with the region's exports of land embodied in manufactured products (645,930 ha). A significant proportion of the embodied land exported overseas is contained within dairy products and thus, indirectly, the land occupied by the region's dairy farms.

A significant amount of land is embodied in agricultural products that are exports from the Taranaki region (264,350 ha). This consists mainly of dairy and beef cattle and to a lesser extent sales of sheep, wool and horticultural produce processed further in other regions.

The Taranaki service sector is also a significant importer of embodied land (13,530 ha). The vast majority of this land is embodied in goods and services purchased by the service sector from international sources. This ranges from computers to specialist services required in the energy industries. The service sector also uses paper products, equipment, furniture, and other capital items that have a high embodied land content. Some of this embodied land is re-exported in products sold to other regions.

The region's comparative advantage in petroleum product manufacturing is also evident. Although not all of the land occupied by the energy fields themselves is included (as it is predominantly located in the Tasman Sea), a small but significant component is identified in embodied land exports of mining and quarrying products heading overseas (10,850 ha).

### 10.5.2 Exports and imports by type of land

The Taranaki region is a very large net exporter of agricultural land (see Table 10.4). Net exports of agricultural land equate to 773,970 ha or 96.8 percent of the region's Balance of Trade. Agricultural land embodied in products sold by the Taranaki economy is 9.6 times greater than agricultural land embodied in products purchased by the region.

**Table 10.4 Taranaki's Ecological Balance of Trade by land type, 1997–98**

Economic sector	Land embodied in imports (ha)	Land embodied in exports (ha)	Balance of Trade (ha)
<b>Interregional trade</b>			
Agricultural land	21,370	249,770	228,400
Forest land	6,300	820	-5,480
Degraded land	610	4,790	4,180
Energy land	1,600	5,820	4,220
Interregional Balance of Trade	29,880	261,200	231,320
<b>International trade</b>			
Agricultural land	69,110	614,680	545,570
Forest land	5,880	12,870	6,990
Degraded land	13,410	16,460	3,050
Energy land	23,280	35,680	12,400
International Balance of Trade	111,680	679,690	568,010
Total Balance of Trade	141,560	940,890	799,330

Lesser amounts of forest land (1510 ha), degraded land (7240 ha) and energy land (16,620 ha) are embodied in goods and services exported from the region. Only in forest land is Taranaki a net consumer of land (-5480 ha).

### 10.5.3 Overall picture

Figure 10.1 provides a summary of the overall flows of embodied land associated with the Taranaki economy. This diagram indicates that Taranaki is:

- (1) comparatively self-sufficient in terms of land, with relatively few imports for local household consumption
- (2) very much an internationally driven export economy.

Land embodied in international exports (679,690 ha) considerably outweigh local household requirements (233,140 ha). Overall, Taranaki exports 940,900 ha of embodied land compared with imports of only 141,570 ha, resulting in a positive Balance of Trade of 799,330 ha.

**Figure 10.1 Flows of embodied land through the Taranaki economy**

