

19 Southland's Ecological Footprint

19.1 Profile of the region

At the 2001 Census Southland had a resident population of 91,005, 10.0 percent of the South Island's population. Southland has continued to experience population decline, reducing by 6.3 percent between the 1996 and 2001 census (6093 people). This represents a dramatic decline and equates roughly to the 6.9 percent decline of the preceding 10 years (1986–96). The majority of Southland's population loss is through internal migration to neighbouring regions. Particularly severe is the loss of people aged between 15 and 24 to Otago and Canterbury regions, reflecting greater employment and education opportunities offered by these regions. Invercargill is the region's largest urban area accounting for 54.3 percent of the region's population (46,305 people). Southland has an estimated population density of 2.91 people per square kilometre, making it the second most sparsely populated region in the country in 1998.

Southland is the southernmost region in New Zealand. It occupies an estimated land area of 3,400,000 ha, making it the second largest region nationally. Southland occupies 12.5 percent of New Zealand's total land area. The region extends from Awarua Point (Tasman Sea) on the west coast to Brothers Point (Pacific Ocean) on the east coast. The Foveaux Strait forms Southland's southern coastline. Much of Southland is a natural, unspoiled landscape free of human intervention. Fiordland, located in the southwest corner of the region, is characterised by rugged remoteness, fiords and extensive indigenous temperate forest. By contrast, the remainder of the Southland region is pastoral land on fertile alluvial plains with small towns and numerous rivers. Southland has the lowest mean annual temperatures and lowest average sunshine hours of any region nationally.

The Southland region accounted for 2.7 percent of New Zealand's 1997–98 GDP, or \$2.6 billion. Important industries in the region's economy include agriculture, fishing, manufacturing and tourism. Agriculture is the most important industry in the Southland economy. The region has strong comparative advantage in sheep and beef farming (LQ 4.30), dairy farming (LQ 1.29), services to agriculture (LQ 2.23), meat processing (LQ 4.84) and dairy processing (LQ 1.65). Southland's fertile land is ideally suited to farming. Sheep are the predominant stock although in recent years conversion to beef and dairy farms has occurred rapidly. The region has a number of meat and dairy processing plants, including one of the world's largest meat processing facilities located at Lorneville. Fishing is an important industry within the region's economy. The comparative advantage to the region of fishing is captured in the location quotients for fishing (2.66) and water transport (1.73). The main species of fish caught are blue cod and crayfish. Shellfish such as oysters from the beds of Foveaux Strait and mussel farms are also significant industries in the region.

Basic metals manufacture (LQ 6.26) is another major industry in Southland. Given that New Zealand's only aluminium smelter is located at Tiwai Point, near Bluff, this is not surprising. This plant is powered by the large underground power station at Lake Manapouri. Most of the smelter's output is exported to Japan and other Asian countries, however, a small proportion is used for fabrication and foil products locally. Southland is also the country's third-largest coal-producing region in New Zealand (LQ 2.11).

19.2 Overall ecological footprint and comparison with other regions

Southland has an ecological footprint of 375,310 ha, 3.49 percent of New Zealand's total ecological footprint. It is the seventh largest nationally and the third largest in the South Island. Southland's ecological footprint is similar in size to that of the Hawke's Bay region (384,660 ha).

On a per capita basis, Southland region's ecological footprint is 3.92 ha per person, the third highest of any region in the country. There are several possible explanations for this finding. Relative to the nation Southland:

- (1) may have lower than average agricultural yields per hectare
- (2) manufacturing and service industries may occupy more land per dollar of output
- (3) have larger property sizes.

Southland region's useful land area is 1,257,430 ha. This is an ecological surplus of 882,120 ha. The region's surplus is 2.4 times greater than its footprint and is the fifth-largest surplus of any region. In per capita terms, each Southland resident has a surplus of 9.2 ha. In ecological footprint terms, the region is self-sufficient and with a considerable ecological surplus.

19.3 Ecological footprint disaggregated by land type

The agricultural land component of the ecological footprint consists of 269,120 ha (refer to Table 19.1). This represents 71.7 percent of Southland's ecological footprint. Approximately 85 percent of this agricultural land is embodied in goods and services produced locally. A further 36,850 ha of agricultural land is embodied in products purchased from overseas.

Table 19.1 Southland'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	229,390	2,880	36,850	269,120	2.81	71.7
Forest land	24,880	510	3,110	28,500	0.30	7.6
Degraded land	23,650	480	2,470	26,600	0.28	7.1
Energy land	38,040	1,060	11,800	50,980	0.53	13.6
Total	315,960	4,930	54,310	375,200	3.92	100.0

The forest land component of the region's footprint equates to 28,500 ha. On a per capita basis Southland residents require 0.30 ha annually to support their lifestyles. In relative terms, this figure is significantly higher than the New Zealand average of 0.20 ha per person. Heating based on wood fires is one possible explanation for this finding. The Southland forest land component is, like most rural regions in the country, appropriated from within the region (24,880 ha). Lesser, but significant, amounts of forest land are also embodied in wood-based products purchased from other nations. This component of the ecological footprint does not include the hypothetical land on which trees are planted to absorb CO₂ emissions.

The degraded land component of Southland's ecological footprint makes up 7.1 percent (26,600 ha) of the region's total footprint. Most of this is degraded land which is derived from within the Southland region. This consists primarily of the land occupied by residential

properties along with a significant proportion of the land on which local businesses occupy. A smaller share of the degraded land total (2470 ha) is embodied in imported products purchased by Southland residents from overseas.

Energy land constitutes 50,980 ha of the Southland footprint. While energy land is smaller as a share of the total footprint than in the nation (respectively 13.6 percent regionally versus 16.6 percent nationally), in per capita terms it is slightly greater. The region's colder climate which in turn means greater household and workplace heating requirements could account for this difference. While 74.6 percent (38,040 ha) of the energy land required by Southland residents comes from within the region and an additional 23.3 percent (11,880 ha) is embodied in products purchased from abroad.

19.4 Ecological footprint disaggregated by goods and services purchased

19.4.1 Purchase of Southland produced goods and services ($P_1+P_2 \dots P_n$)

The purchase of manufacturing sector products accounted for 181,590 ha of Southland's ecological footprint (refer to Table 19.2). This amounts to 48.4 percent of the entire ecological footprint of the Southland region. Most of this embodied land is contained in manufactured goods produced locally (171,990 ha), in particular food products grown on the region's farmland. Small quantities of land (8570 ha) are also embodied in manufactured goods purchased from overseas.

Table 19.2 Southland'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	28,450	20	480	28,960	0.30	7.7
Forestry	1,370	20	10	1,410	0.01	0.4
Fishing and hunting	10	0	0	10	0.00	0.0
Mining and quarrying	70	0	10	80	0.00	0.0
Manufacturing	171,990	1,030	8,570	181,590	1.90	48.4
Utilities and construction	15,340	370	2,290	18,000	0.19	4.8
Services	77,980	550	11,600	90,140	0.94	24.0
Domestic final demand	20,740	3,040	31,340	55,120	0.58	14.7
Total	315,960	5,040	54,310	375,310	3.92	100.0

Significant quantities of land are also embodied in the service sector products consumed by Southland residents. This equates to 90,140 ha or 24.0 percent of the region's footprint. At a first glance, this figure appears very high but can be explained by backward linkages to the farming, forestry and mining sectors in the economy. Thus, while a service sector business may physically occupy only a small land area, the products that it purchases from other industries (such as paper, equipment, machinery, food etc) may contain high amounts of embodied land. The vast majority of land embodied in service sector commodities originates from within the region (77,980 ha), with smaller amounts from overseas (11,600 ha).

Other industry purchases by Southland account for 19,500 ha of embodied land – 18,000 ha embodied in utility and construction products and 1410 ha embodied in forestry sector products.

19.4.2 Purchase of goods and services produced outside Southland (D₁+D₄)

Southland residents also purchase products made outside the region which accounts for 34,380 ha of land. Most of these purchases are from overseas (31,340 ha) and include land embodied in goods purchased from local retailers that are made overseas but sold with an additional margin. In this way, land embodied in items such as motor vehicles, computers, household appliances and imported food products are included in this figure.

19.5 Ecological Balance of Trade and ecological interdependencies

The land embodied in imports into the Southland regional economy is 112,860 ha (refer to Table 19.3). Land embodied in imports is, however, substantially smaller in comparison to the 1,574,870 ha of land embodied in the region's exports. Overall, this means that in Ecological Balance of Trade terms, the Southland region is a substantial net exporter, exporting 1,462,010 ha of embodied land annually.

Table 19.3 Southland'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)
Interregional trade			
Agriculture	360	283,640	283,280
Forestry	440	0	-440
Fishing and hunting	0	1,630	1,630
Mining and quarrying	20	50	30
Manufacturing	5,370	64,380	59,010
Utilities and construction	380	400	20
Services	700	660	-40
Domestic final demand	3,040	0	-3,040
Interregional Balance of Trade	10,310	350,760	340,450
International trade			
Agriculture	7,940	162,730	154,790
Forestry	230	25,110	24,880
Fishing and hunting	1,390	2,610	1,220
Mining and quarrying	140	860	720
Manufacturing	45,030	1,013,460	968,430
Utilities and construction	2,350	90	-2,260
Services	14,130	19,240	5,110
Domestic final demand	31,340	0	-31,340
International Balance of Trade	102,550	1,224,110	1,121,560
Total Balance of Trade	112,860	1,574,870	1,462,010

19.5.1 Exports and imports by economic sectors

Over half of the land embodied in imports (50,400 ha) into the Southland region is encapsulated in goods and services purchased by the manufacturing sector. Although at a first glance this may appear very high, it is minor when compared with the region's export of land embodied in manufactured products (1,077,840 ha). Most of this land is embodied in processed food products, including sheep and beef meat and dairy products all most entirely heading for international markets.

The emphasis on primary based exporting is also highlighted in the amount of land embodied in agriculture products leaving the region. An estimated 446,370 ha of land is embodied in agriculture product exports such as livestock sales, wool and horticulture produce – this is a massive 53.7 times greater than the land embodied in agriculture products entering the region.

The Southland economy's comparative advantage in fishing is also evident. The region's fishing industries has a net positive Ecological Balance of Trade both in terms of embodied land destined for other regions (1630 ha) and overseas (1220 ha). Although this may seem small these figures only include terrestrial land associated with fishing operations; they do not include sea space. If sea space were added then land embodied in fishery products would be substantially higher.

The remaining sectors of the Southland economy have the following net Ecological Balance of Trade results: forestry (24,440 ha), mining and quarrying (750 ha), services (5070 ha) and utilities and construction (-2240 ha).

19.5.2 Exports and imports by type of land

Southland is a massive net producer of agricultural land both internationally and interregionally (see Table 19.4). Agricultural land embodied in international exports (1,108,910 ha) outweigh international imports (74,450 ha) by slightly more than 14.8 times. Much of the land embodied in the region's exports includes sheep, beef and dairy products produced within the region.

Table 19.4 Southland'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)
Interregional trade			
Agricultural land	7,370	341,230	333,860
Forest land	1,080	1,860	780
Degraded land	640	1,140	500
Energy land	1,240	6,530	5,290
Interregional Balance of Trade	10,330	350,760	340,430
International trade			
Agricultural land	74,450	1,108,910	1,034,460
Forest land	4,720	45,760	41,040
Degraded land	5,040	6,060	1,020
Energy land	18,320	63,380	45,060
International Balance of Trade	102,530	1,224,110	1,121,580
Total Balance of Trade	112,860	1,574,870	1,462,010

Lesser amounts of forest land (41,820 ha), degraded land (1520 ha) and energy land (50,350 ha) are in net terms produced by Southland. Overall, across all land types and both internationally and interregionally, the Southland economy is a net provider of embodied land.

19.5.3 Overall picture

The embodied land flows associated with the Southland economy are shown in Figure 19.1. This diagram indicates that the Southland region:

- (1) is self-sufficient in terms of land, with a relatively low embodied land area supporting local household consumption
- (2) is strongly export driven, particularly by international demand for its products.

Thus, land embodied in international exports (1,224,110 ha) outweighs land embodied in international imports (102,550 ha) by more than 11.9 times. Similarly, the region is also a substantial net exporter with the land embodied in interregional exports 34 times greater than that embodied in interregional imports. Overall, the region has a substantial positive Ecological Balance of Trade of 1,462,010 ha – the vast majority of which is used to support citizens of other countries.

Figure 19.1 Flows of embodied land through the Southland economy

