

8 Gisborne's Ecological Footprint

8.1 Profile of the region

The Gisborne region has the smallest population of any region in the North Island. The 2001 Census recorded a resident population of 43,974, equating to 1.2 percent of the national population. The region's population reduced by 1,521 between the 1996 and 2001, a 4.0 percent drop in population. An analysis of the age-cohort structure of the resident population reveals that Gisborne has the youngest population of all regions in New Zealand. The region also has the largest proportion of people identifying themselves as Maori. The Gisborne urban area accounts for 72.1 percent of the region's population in 2001. It is the most sparsely populated region in the North Island with an estimated population density of 5.59 people per square kilometre in 1998.

The Gisborne region is the most eastern of all regions and has a land area of 835,100 ha or 3.0 percent of New Zealand's land area. The topography of the region makes it one of New Zealand's most isolated regions. The Bay of Plenty region forms the north-western boundary of the region, the Hawke's Bay region the south-western boundary, and the Pacific Ocean the eastern boundary. The Gisborne urban area lies at the confluence of three rivers, the Turanganui, Waimata and Taruheru. Much of the land is steep hill country. An estimated 88.2 percent of the region's land area is used for farming, the highest of any region in New Zealand (Statistics New Zealand, 1998i).

Sheep and beef farming (LQ 3.05), horticulture (LQ 4.32), forestry (LQ 4.48), fishing (LQ 1.36) and education (LQ 1.27) are the most important industries in the region. Sheep and beef farming is the dominant farming type in the region but is heavily dependent upon conservation tree planting to allow sustainable farming. Other agricultural farming includes horticulture, fruit growing and viticulture. The main crops grown are sweetcorn and squash. The region contains just under 25 percent of New Zealand's citrus plantations and an estimated 36 percent of its production (Statistics New Zealand, 1998i). The region is the third largest grape-producing region in New Zealand. Education is also a significant industry perhaps not surprisingly given that the region has the largest proportion of children of any region nationally. The region's 1997–98 GDP is estimated to be 0.9 billion or 1.0 percent of New Zealand's GDP.

During the last 20 years significant reforestation has occurred within the region. This is the result of the Gisborne region landforms (uplifted soft rock derived from marine sediments) having some of the greatest rates of natural erosion in the world. There are an estimated 359,000 ha of erosion prone hill country in the region, most of which is used for pastoral farming. Sustainable farming is only possible with soil conservation measures based around reforestation. The forestry and logging industry is thus a growing industry in the region. The east coast wood supply area accounts for 15.4 percent of the North Islands forestry estate. The region is also home to several wood processing facilities which produce laminated veneer, finger-jointed products and custom cut and treated timber.

8.2 Overall ecological footprint and comparison with other regions

The ecological footprint of Gisborne region is 141,660 ha, 1.32 percent of New Zealand’s total ecological footprint. It is the fourth lowest of any region in the country. The region’s ecological footprint compares with those of the West Coast (121,890 ha) and Marlborough (163,810 ha) regions. In comparison, Gisborne’s ecological footprint is only 6.1 percent of Auckland region’s ecological footprint (2,319,940 ha).

Per capita, Gisborne’s ecological footprint, at 3.03 ha per person, is comparable with the national per capita footprint. This may appear surprising given the region’s erosion prone nature which would suggest lower than average yields for farming activities. This is not however true. More than 92 percent of the region’s farming land is used for sheep and beef farming at higher yields per ha than the nation. Land embodied in the products of other farming types is largely imported. Finally, erosion prone land has been made sustainable through forestry plantings. Taken together, these explanations mean that Gisborne requires less land to produce the goods and services consumed by its residents than the nation does.

The useful land area of Gisborne is 732,100 ha, meaning that Gisborne has an ecological surplus of 590,440 ha. Gisborne’s ecological footprint accounts for only 19.3 percent of total useful land available in the region. In this way, the region has the highest ecological surplus per capita of any region. Overall, Gisborne is self-sufficient in ecological footprint terms with a considerable ecological surplus available.

8.3 Ecological footprint disaggregated by land type

The agricultural land component of Gisborne’s ecological footprint is estimated to be 96,010 ha (refer to Table 8.1). This represents 67.8 percent of the region’s ecological footprint. Like most New Zealand regions this is predominantly made up of land appropriated from within the region (68,290 ha). Nevertheless, an estimated 9,470, or 6.7 percent of the region’s footprint is embodied in goods and services purchased from primarily Bay of Plenty (7,600 ha) and Hawke’s Bay (1380 ha) regions. On a per capita basis, agricultural land equates to 2.06 ha per Gisborne resident.

Table 8.1 Gisborne’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	68,290	9,470	18,250	96,010	2.06	67.8
Forest land	10,940	330	1,310	12,580	0.27	8.9
Degraded land	13,790	780	910	15,480	0.33	10.9
Energy land	11,910	730	4,930	17,570	0.38	12.4
Total	104,930	11,310	25,400	141,640	3.03	100.0

The forest land component of the ecological footprint amounts to 12,580 ha. This represents 8.9 percent of the region’s ecological footprint. Over 86 percent of forest land appropriated by Gisborne residents originates from within the region. The forest land component does not include the hypothetical land appropriated to sequester CO₂ emissions associated with the goods and services consumed by Gisborne residents.

The degraded land component of the region’s ecological footprint makes up 10.9 percent, or 15,480 ha, of the total Gisborne ecological footprint. This land primarily consists of land occupied by the residential properties, although it also encapsulates non-agricultural land embodied in goods and services purchased by residents. In this way, the degraded land component of the Gisborne ecological footprint is almost entirely (over 89 percent) appropriated from within the region.

The energy land component of Gisborne’s ecological footprint is estimated to be 17,570 ha, 12.4 percent of the region’s footprint. This is lower relative to the nation where energy land constitutes 16.6 percent of the total footprint. This would seem to infer that Gisborne industries produce goods and services that are less energy intensive than the New Zealand average. However, other possible explanations exist, including:

- (1) the region’s climate is significantly warmer, which in turn, means that less energy is required for heating purposes
- (2) per capita incomes are lower restricting household purchases of appliances and machinery
- (3) higher numbers of children, rather than adults, may mean less energy is used per capita.

8.4 Ecological footprint disaggregated by goods and services purchased

8.4.1 Purchase of Gisborne produced goods and services ($P_1 + P_2 \dots P_n$)

The purchase of manufacturing sector products by Gisborne residents accounts for 56,240 ha (39.7 percent) of the region’s ecological footprint (refer to Table 8.2). The vast majority of this land is embodied in manufactured goods produced locally (41,950 ha), in particular processed food products grown on the region’s farmland. Smaller quantities of land are also embodied in manufactured goods purchased by the region’s residents from the Bay of Plenty (8060 ha) and Hawke’s Bay (1150 ha) regions. On a per capita basis, the land embodied in manufactured product purchases by Gisborne residents (1.20 ha per person) is lower relative to the nation (1.37 ha per person).

Table 8.2 Gisborne’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	19,370	10	360	19,740	0.42	13.9
Forestry	840	0	0	850	0.02	0.6
Fishing and hunting	0	0	0	0	0.00	0.0
Mining and quarrying	10	0	10	20	0.00	0.0
Manufacturing	41,950	9,570	4,710	56,240	1.20	39.7
Utilities and construction	6,960	60	860	7,880	0.17	5.6
Services	29,640	370	4,560	34,570	0.74	24.4
Domestic final demand	6,140	1,330	14,890	22,350	0.48	15.8
Total	104,920	11,340	25,400	141,660	3.03	100.0

Service sector products consumed by Gisborne residents also embody significant quantities of land. Such land accounts for 24.4 percent (0.74 ha per person) of the region’s ecological

footprint. At first this figure may appear high but closer examination reveals it occurs because of backward linkages to farming, forestry and other sectors. Although the actual physical land occupied by a service sector business may be small, the land embodied in products the business purchases can be very high (eg. land embodied in food, paper, equipment, machinery and so forth). In Gisborne's case most of the land embodied in service sector commodities is provided locally (29,640 ha) with smaller amounts derived from overseas (4550 ha).

Land embodied in residents' purchases from the remaining sectors of the economy is relatively small in comparison with the land embodied in manufactured and service sector products. Such purchases account for 28,490 ha of embodied land, or 20.1 percent of the region's ecological footprint.

8.4.2 Purchase of goods and services produced outside Gisborne (D₁+D₄)

Gisborne residents also directly purchase products from outside the region, accounting for 16,220 ha of the region's footprint. Just over 92 percent of this embodied land comes from international sources. This includes land embodied in goods purchased from retailers that were made overseas but sold locally with an additional mark-up. In this way, land embodied in items such as motor vehicles, computers, household appliances and imported food products is included in this figure.

8.5 Ecological Balance of Trade and ecological interdependencies

The land embodied in imports into the Gisborne regional economy is 54,030 ha (refer Table 8.3). By contrast, the land embodied in exports from the Gisborne economy is 398,760 ha. Gisborne therefore has a substantial positive Ecological Balance of Trade, exporting nearly 7.4 times more embodied land than it imports.

Table 8.3 Gisborne'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	150	77,940	77,790
Forestry	40	31,240	31,200
Fishing and hunting	20	160	140
Mining and quarrying	10	10	0
Manufacturing	17,370	2,010	-15,360
Utilities and construction	70	350	280
Services	440	350	-90
Domestic final demand	1,330	0	-1,330
Interregional Balance of Trade	19,430	112,050	92,620
International trade			
Agriculture	5,120	181,620	176,500
Forestry	470	49,060	48,590
Fishing and hunting	250	420	170

Mining and quarrying	30	80	50
Manufacturing	7,710	51,050	43,340
Utilities and construction	890	40	-850
Services	5,240	4,440	-800
Domestic final demand	14,890	0	-14,890
International Balance of Trade	34,600	286,710	252,110
Total Balance of Trade	54,030	398,760	344,730

8.5.1 Exports and imports by economic sectors

Some 259,560 ha of embodied land is exported from the Gisborne region in agriculture sector products while only 5,270 ha is embodied in imported agriculture sector products. In this way the region is a substantial net exporter of land embodied in agricultural products, exporting 57.5 times more land than it imports. Over 70 percent of the land embodied in agricultural products is exported overseas.

The strong primary sector export focus of the region is further reinforced by the quantity of land embodied in forest products exported outside of the region. Unlike agriculture sector products, which are predominantly sent offshore, the region's forest products are sold to nearby regions (31,240 ha) as well as overseas (49,060 ha). The land embodied in the sales of forest products accounts for 23.1 percent of the region's Ecological Balance of Trade surplus.

Although Gisborne's manufacturing sector is a net exporter of embodied land (27,960 ha), it is a significant net importer in interregional terms requiring some 15,350 ha to sustain its activities. Other industries in the region have smaller and near neutral ecological balances of trade: fishing and hunting (310 ha), utilities and construction (-570 ha) and services (-890 ha).

8.5.2 Exports and imports by type of land

Gisborne is a net producer of agricultural land having an ecological trade surplus of 259,810 ha, an estimated 198,180 ha of which is embodied in products sold internationally (refer to Table 8.4). In this way exports of embodied agricultural land outweigh imports of embodied agricultural land by just over seven times.

Table 8.4 Gisborne'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	17,100	78,730	61,630
Forest land	440	31,700	31,260
Degraded land	850	450	-400
Energy land	1,030	1,170	140
Interregional Balance of Trade	19,420	112,050	92,630
International trade			
Agricultural land	25,880	224,060	198,180
Forest land	1,930	56,090	54,160
Degraded land	1,710	1,030	-680

Energy land	5,080	5,530	450
International Balance of Trade	34,600	286,710	252,110
Total Balance of Trade	54,020	398,760	344,740

Forest land embodied in exports also represents a significant proportion of the region’s trade surplus, amounting to 85,420 ha (25 percent) in net terms. This is not surprising given the region’s comparative advantage in forestry. An estimated 56,090 ha of forest land is embodied in products destined for other nations while the remaining 31,700 ha is exported interregionally primarily for processing purposes.

Lesser quantities of embodied energy and degraded land are traded within the Gisborne economy. In embodied energy land terms, the Gisborne region has a close to neutral Balance of Trade both interregionally (140 ha) and internationally (450 ha). Only in the trading of degraded land does the region require more embodied land from external sources (2560 ha) than it exports outside the region (1480 ha). This is not surprising given that many of the region’s service sector industries are unable to satisfy local demand for their products.

8.5.3 Overall picture

Figure 8.1 provides a summary of the overall flows of embodied land associated with the Gisborne economy. This diagram indicates that Gisborne is:

- (1) comparatively self-sufficient in terms of land, with relatively small embodied land areas required to meet domestic consumption
- (2) exports a significant component of its biologically productive land abroad. In this way, the land embodied in international exports (286,710 ha) considerably outweighs land embodied in international imports (19,710 ha).

Overall, considering both international and interregional trade, Gisborne has an embodied land Balance of Trade surplus of 344,730 ha.

Figure 8.1 Flows of embodied land through the Gisborne economy

