

4 Northland's Ecological Footprint

4.1 Profile of the region

Northland is the least urbanised region in New Zealand with only slightly more than half the population living in urban areas (Statistics New Zealand, 1998e). The region had 143,400 residents in 1997/98 or 3.7 percent of the national population. The major urban area is Whangarei which accounts for 32.9 percent of the regional population. Northland's estimated population density of 9.7 people per square kilometre is significantly below the New Zealand average of just over 13. During the 1996–2001 intercensal period Northland recorded a population growth rate of 8.1 percent, slightly higher than the national average of 7.2 percent.

Northland is New Zealand's northern most region. It is bounded to the east by the Tasman Sea, to the west by the Pacific Ocean and to the south by the Auckland region. This peninsula shaped region has an approximate length of 250 kilometres and at its widest point 80 kilometres. Geographically it covers 1,394,100 ha or 5.1 percent of New Zealand's land area. This land is predominantly hill country with flats restricted to river valleys and coastal areas. Of this area farming utilises 45.5 percent and forestry 11.5 percent.

Northland's 1997–98 GDP is estimated at 3.3 billion or 3.4 percent of the nation's GDP. The economy is based on strengths in agriculture, horticulture, forestry and fishing. The predominant agricultural industry is beef cattle farming. Beef cattle stock numbers are the third highest of any region in New Zealand. Sub-tropical temperatures mean that Northland experiences warm humid summers and mild winters. This makes the region ideal for the growing of citrus and sub-tropical fruits. Principal fruits grown include lemon, mandarins, persimmons, oranges and tamarillos. Extensive indigenous and exotic forests are a feature of the Northland landscape. These forests, of predominantly *Pinus radiata*, are among the highest density and fastest growing in the country. It is perhaps not surprising that given these significant forestry holdings the wood and paper manufacturing industries also make a sizeable contribution to the regional economy. A well-developed transport infrastructure links forestry and forest processing to the ports at Whangarei and Auckland. Given the region's extensive coastline, the contribution made by fishing is also not unexpected.

Northland is home to New Zealand's only oil refinery. Marsden Point oil refinery is located near the mouth of the Whangarei harbour. Slightly less than half of the refinery's crude intake comes from the Taranaki region with the remainder imported predominantly from the Middle East in particular Saudi Arabia and the United Arab Emirates. Closely associated with the refinery is the Marsden A thermal power station which pipes heavy oil from the refinery for electricity production. Marsden A has a 240 megawatt capacity.

4.2 Overall ecological footprint and comparison with other regions

Northland has an ecological footprint of 477,120 ha. This represents 4.44 percent of New Zealand’s total ecological footprint, meaning that the Northland region’s ecological footprint is the eighth largest nationally. Northland’s ecological footprint is 25 percent higher than the Hawke’s Bay ecological footprint but 30 percent lower than Bay of Plenty, the nearest regions in ecological footprint terms.

On a per capita basis, Northland’s ecological footprint is 3.33 ha per person, slightly higher than the national average of 3.08 ha per capita. This is the seventh highest per capita ecological footprint of any region in the country. This means, on a per capita basis, that Northland requires more land to produce the goods and services consumed by its residents than the nation does. One possible reason for this is lower than average yields per hectare for dairy farms and horticultural crops. Another possible explanation is that land occupied by manufacturing industries is used less efficiently than nationally (ie. Northland manufacturing requires more land per dollar of output than manufacturing nationwide).

Northland’s useful land area is 1,089,020 ha, meaning that the region has an ecological surplus of 611,900 ha. The region’s surplus is 28 percent greater than its footprint and is the seventh largest surplus by any region. In per capita terms, each Northland resident has a surplus of 4.3 ha. In ecological footprint terms, the region is self-sufficient and is largely ecologically independent of other regions and nations.

4.3 Ecological footprint disaggregated by land type

The agricultural land component of the ecological footprint consists of 333,760 ha (refer to Table 4.1). This represents 70.0 percent of Northland’s ecological footprint. Nearly 80 percent of this agricultural land is embodied in products produced within the region with lesser amounts (51,200 ha) being imported from other nations. On a per capita basis the consumption of agricultural land accounts for 2.33 ha per person.

Table 4.1 Northland’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	263,550	19,010	51,200	333,760	2.33	70.0
Forest land	26,890	70	4,330	31,290	0.22	6.6
Degraded land	39,690	330	5,900	45,920	0.32	9.6
Energy land	47,790	1,060	17,240	66,090	0.46	13.9
Total	377,920	20,470	78,670	477,060	3.33	100.0

The forest land component of the ecological footprint equates to 31,290 ha. This represents 6.6 percent of Northland’s ecological footprint. Just over 85 percent of this land is appropriated from within the region. The remaining 15 percent is almost entirely embodied in goods and services purchased from other nations. The forest land component does not include the hypothetical land required to sequester CO₂ emissions.

The degraded land component of the ecological footprint makes up 9.6 percent (45,920 ha) of Northland’s ecological footprint. Among other things this figure is made up of three key parts:

- (1) land occupied by Northland businesses (other than farming and forestry business)
- (2) land occupied by the homes of Northland residents
- (3) degraded land embodied in purchases of goods and services by households from other nations.

Land occupied by Northland resident's homes and businesses accounts for around 86 percent of the degraded total.

The energy land component of Northland's ecological footprint is 66,090 ha or 13.9 percent of the Northland ecological footprint. This is slightly lower than the New Zealand average. One possible explanation for this is higher than average temperatures, meaning Northland residents use less energy for heating than the residents of other regions. Another explanation is that the manufacturing industries that produce goods for consumption locally are more energy efficient than manufacturing industries elsewhere in the country.

4.4 Ecological footprint disaggregated by goods and services purchased

4.4.1 Purchase of Northland produced goods and services ($P_1 + P_2 \dots P_n$)

Northland's residents appropriated 229,120 ha of land embodied in manufactured products (refer to Table 4.2). This amounts to 48.0 percent of the region's ecological footprint. The bulk of this land is embodied in manufactured goods produced locally (195,920 ha), in particular processed food products from the region's farms. Smaller quantities of land (18,880 ha) are also embodied in manufactured goods purchased by the Northland residents from other regions. On a per capita basis, land embodied in manufactured products consumed by Northland residents (1.60 ha per person) is significantly higher than the national average (1.37 ha per person).

Table 4.2 Northland'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	33,370	290	620	34,280	0.24	7.2
Forestry	1,690	0	10	1,710	0.01	0.4
Fishing and hunting	10	0	10	20	0.00	0.0
Mining and quarrying	70	0	30	100	0.00	0.0
Manufacturing	195,920	18,880	14,310	229,120	1.60	48.0
Utilities and construction	26,290	60	3,070	29,420	0.21	6.2
Services	97,110	230	15,100	112,440	0.78	23.6
Domestic final demand	23,450	1,070	45,520	70,040	0.49	14.7
Total	377,920	20,540	78,670	477,120	3.33	100.0

Service sector products consumed by Northland residents (112,440 ha) also account for large quantities of embodied land. At first glance this may appear high, particularly given that service sector businesses occupy a relatively low amount of physical space. Service sector businesses, however, reside near the top of the production chain and may have significant backward

linkages. In this way, service sector purchases (eg. food, paper, equipment, machinery etc) can account for a substantial amount of embodied land. Most of the land embodied in purchases of service sector products by Northland residents originates from within the region (97,110 ha).

By contrast, land embodied in residents' purchases from the remaining sectors of the economy is relatively small. Such purchases account for 65,530 ha, or 13.8 percent of the region's ecological footprint. This means that 0.46 ha of embodied land on average is required to support a Northland resident from sectors other than manufacturing and services which is higher than the corresponding figure of 0.42 ha nationally.

4.4.2 Purchase of goods and services produced outside Northland (D₁+D₄)

Northland residents also directly purchase products from outside the region, accounting for 46,590 ha of land. The vast majority of the land embodied in these purchases (45,520 ha) comes from offshore. These figures include land embodied in retail products purchased overseas and then sold in New Zealand with additional mark-ups. In this way, land embodied in purchases of motor vehicles, computers, many household appliances and foreign foods may be included in these figures.

4.5 Ecological Balance of Trade and ecological interdependencies

The land embodied in imports into the Northland regional economy is 158,630 ha. By comparison land embodied in exports from the Northland economy equates to 838,580 ha. This means that Northland has a positive Ecological Balance of Trade of 679,950 ha (refer to Table 4.3).

4.5.1 Exports and imports by economic sectors

Over half of the land embodied in imports (79,270 ha) into the Northland region is embodied in goods and services purchased by the manufacturing sector. Although this may appear high, it is comparatively small compared to the region's exports of land embodied in manufactured products (414,650 ha). However, a significant proportion of the embodied land exported overseas is contained within sheep and beef products and thus, indirectly, the land occupied by extensive farming in the region.

A significant amount of land is embodied in agricultural products that are exports from the Northland region (321,130 ha). This is attributable to livestock sales (predominantly sheep and beef), horticultural produce being sold to other regions and to wool sales internationally. It is perhaps not surprising therefore that most of this embodied land is destined for other regions (192,650 ha) and, after processing, to offshore locations.

The Northland service sector is also a significant importer of embodied land (17,750 ha). The vast majority of this land is embodied in goods and services purchased by the service sector from overseas sources. This includes products ranging from computers to specialist technical services required in the day-to-day operation of the Marsden Point oil refinery. The service sector also uses paper products, equipment, furniture, and other capital items with high embodied land content. Some of this embodied land is re-exported in products sold, in turn, by

the region's service sector. Northland's service sector businesses export an estimated 18,460 ha of embodied land, slightly larger than the figure imported.

Table 4.3 Northland'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	3,010	192,650	189,640
Forestry	40	27,110	27,070
Fishing and hunting	0	1,050	1,050
Mining and quarrying	30	220	190
Manufacturing	27,140	24,620	-2,520
Utilities and construction	80	2,310	2,230
Services	280	690	410
Domestic final demand	1,070	0	-1,070
Interregional Balance of Trade	31,650	248,650	217,000
International trade			
Agriculture	6,450	128,480	122,030
Forestry	580	49,960	49,380
Fishing and hunting	1,060	2,290	1,230
Mining and quarrying	240	570	330
Manufacturing	52,130	390,030	337,900
Utilities and construction	3,250	130	-3,120
Services	17,750	18,460	710
Domestic final demand	45,520	0	-45,520
International Balance of Trade	126,980	589,930	462,950
Total Balance of Trade	158,630	838,580	679,950

4.5.2 Exports and imports by type of land

The Northland region is a very large net provider of agricultural land to other regions and nations (588,110 ha) (refer to Table 4.4). The region's economy is thus very dependent upon the export of agricultural land to generate income and employment. Over two-thirds (413,770 ha) of this net land is embodied in products that are sold internationally while the remainder (174,340 ha) is embodied in products sold to other regions.

Table 4.4 Northland'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	29,750	204,090	174,340
Forest land	140	29,140	29,000
Degraded land	460	7,550	7,090
Energy land	1,290	7,870	6,580

Interregional Balance of Trade	31,640	248,650	217,010
International trade			
Agricultural land	72,010	485,780	413,770
Forest land	6,810	64,690	57,880
Degraded land	22,460	12,820	-9,640
Energy land	25,700	26,650	950
International Balance of Trade	126,980	589,940	462,960
Total Balance of Trade	158,620	838,590	679,970

The Northland economy is also strongly driven by international demand for forest products. Log exports out of Whangarei's Northland Port account for 64,690 ha of embodied land while timber exports from the region's southern forests account for 29,140 ha of the embodied land going to other regions. The importation of forest products from Auckland is captured in the purchase of 6810 ha of embodied land.

Lesser amounts of degraded land (20,370 ha) and energy land (34,520 ha) embodied in goods and services are also exported from the region. Only in the purchase of products that embodied significant quantities of degraded land does the region have a small negative Ecological Balance of Trade of 2550 ha, resulting mostly from embodied land originating overseas (22,460 ha).

4.5.3 Overall picture

The embodied land flows associated with the Northland economy are shown in Figure 4.1. This diagram indicates that the Northland region is:

- (1) comparatively self-sufficient in terms of land, with a relatively low embodied land area associated with household consumption
- (2) an internationally driven export economy with substantial outward embodied land flows.

Land embodied in international exports (589,930 ha) outweighs land embodied in international imports (81,460 ha) by 7.2 times. Taking account of both international and interregional trade flows, Northland has a large positive Ecological Balance of Trade of 725,470 ha. It is therefore a net provider of land to other regions and nations.

Figure 4.1 Flows of embodied land through the Northland economy

