

5 Auckland's Ecological Footprint

5.1 Profile of the region

The Auckland region is New Zealand's largest and most rapidly growing region with a population of 1,159,399 in 1997/98. Over 30 percent of New Zealanders live in the Auckland region. Most of the region's residents live in the Auckland metropolitan area. This makes Auckland by far New Zealand's most densely populated region at 224 people per square kilometre in 1997/98.

Much of the population increase in the Auckland region is due to high fertility rates and a youthful age structure resulting in a high natural increase in the population. Overseas immigration into Auckland in recent years particularly from Asia has also been an important driver of Auckland's population growth. The growth attributable to inwards migration from the regions, has been relatively minor, and often overstated, with an actual net outward flow to some regions over the 1991 to 1996 census period (eg. to Northland, Waikato, Bay of Plenty).

Geographically the Auckland metropolitan area is located on an isthmus between two natural harbours. From north to south the region measures 120 kilometres and at its widest point is 60 kilometres. The land area of the region is 519,032 ha (2 percent of New Zealand's land area). Of the total land area, 53.7 percent is used for farming purposes which is high given the fact that much of land is covered by urban dwellings and activities.

The Auckland economy is driven by strengths in both the manufacturing and service sectors. A large and diverse labour force, its close proximity to New Zealand's largest domestic market and port facilities all reinforced by various government policies resulted in a concentration of manufacturing activities in the Auckland region in the post-World War II period. Rubber, plastics and chemical products (location quotient of 1.63), printing and publishing (LQ 1.53), fabricated metal products (LQ 1.43) basic metals (LQ 1.53) and beverage manufacturing (LQ 1.53) sectors particularly dominated. The biggest single industrial site is the Glenbrook Steel Mill which produces 700,000 tonnes of steel per annum from ironsands. In the 1980s through to the 1990s many of these traditional manufacturing industries, however, have experienced some decline due to the impact of trade liberalisation and deregulation (eg. removal of tariff protection).

The service sector on the other hand has had an ascendant importance in the Auckland economy in recent years. This is reflected in the relatively high location quotients and growth rates for a number of the service sectors: business services (LQ 1.38), real estate (LQ 1.38), insurance (LQ 1.27), services to finance (LQ 1.26), cultural and recreation services (LQ 1.19) and communication services (LQ 1.23). There is an increasing trend for many service sector businesses to relocate to Auckland particularly from Wellington.

Auckland is also New Zealand's foremost cargo and transport hub. It is the nation's largest port, handling 3.4 million tonnes of exports and 6.7 million tonnes of imports in the year ending 30 June 1996. It also has New Zealand's largest airport both in terms of passenger numbers and cargo throughput.

5.2 Overall ecological footprint and comparison with other regions

Auckland has an ecological footprint of 2,319,940 ha. This represents 19.85 percent of New Zealand’s total ecological footprint and is the highest ecological footprint of any region. It is a third larger than Canterbury’s ecological footprint, the second highest.

On a per capita basis, Auckland has the second lowest ecological footprint out all of the 16 regions at 2.00 ha per capita. This figure is relatively low compared with the national average, primarily because of the high productivity of land within Auckland, meaning that less land is required to produce the same amount of product. There is also possibly savings in terms of land use due to economies of scale of having a large population which decreases the ‘within region land requirements’. For example, Auckland’s high population density does lead to certain land use efficiencies in terms of infrastructure provision and for activities such as retailing.

The useful land area of Auckland is 481,370 ha, meaning that Auckland has an ecological deficit of 1,838,567 ha. Or, put alternatively, Auckland overshoots its useful land area by 4.82 times. This means that Auckland is not self-sufficient and ecologically depends on land appropriated from other regions and overseas. Auckland has the highest ecological deficit of any region in New Zealand both in terms of total hectares and its overshoot ratio.

5.3 Ecological footprint disaggregated by land type

The agricultural land component of the ecological footprint consists of 1,525,000 ha (refer to Table 5.1). This represents 65.7 percent of Auckland’s ecological footprint. Most of this agricultural land is embodied in products imported into the region from other regions in New Zealand: Waikato (203,330 ha), Otago (183,170 ha), Northland (119,620 ha), Southland (96,680 ha), Manawatu–Wanganui (70,500 ha), Hawke’s Bay (52,200 ha), Canterbury (41,420 ha) and other (37,730 ha). There is also an additional 551,950 ha of agricultural land embodied in overseas products imported into Auckland.

Table 5.1 Auckland’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	168,330	804,720	551,950	1,525,000	1.32	65.7
Forest land	5,510	45,410	50,060	100,980	0.09	4.4
Degraded land	95,840	16,610	31,860	144,310	0.12	6.2
Energy land	354,750	18,180	176,510	549,440	0.47	23.7
Total	624,430	884,920	810,380	2,319,730	2.00	100.0

The forest land component of the ecological footprint consists of 101,000 ha. This represents only 4.4 percent of Auckland’s ecological footprint. Over half of the forest land is embodied in products imported from overseas. Most of the remainder of this forest land component consists of land embodied in products (predominantly wood based) imported from the Bay of Plenty and Waikato regions.

The degraded land component of the ecological footprint makes up 6.2 percent (144,310 ha) of Auckland’s ecological footprint. Most of this is degraded land derived from the Auckland

region. This is not surprising given the relatively high proportion of urban (degraded) land within the region. A significant amount of degraded land is also embodied in products imported from overseas. The degraded land embodied in products imported from other regions within New Zealand is relatively small.

The energy land component of Auckland's ecological footprint is 549,440 ha. This represents 23.7 percent of Auckland's ecological footprint - significantly higher than the national average of 16.6 percent. Auckland's relatively high energy footprint is due to heavy energy use within the region rather than energy embodied in imported products. Auckland's industries tend to supply products for relatively energy intensive household consumption within Auckland as well as some activities in Auckland (eg. personal transport) that may have an energy intensity above the national average.

5.4 Ecological footprint disaggregated by goods and services purchased

5.4.1 Purchase of Auckland produced goods and services ($P_1+P_2 \dots P_n$)

The purchase of manufacturing sector products accounted for 1,126,000 ha of embodied land in Auckland's ecological footprint (refer to Table 5.2). This amounts to nearly 48.6 percent of the entire ecological footprint of the Auckland region. Most (733,860 ha) of this embodied land is in manufacturing products imported into Auckland, most notably food and agricultural products from New Zealand's rural hinterland. Significant amounts of land (223,890 ha) are also embodied in manufacturing products imported from overseas into Auckland for local consumption.

Table 5.2 Auckland'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	105,010	36,890	4,920	146,820	0.13	6.3
Forestry	2,080	17,530	100	19,710	0.02	0.8
Fishing and hunting	60	0	60	120	0.00	0.0
Mining and quarrying	340	140	210	690	0.00	0.0
Manufacturing	108,940	793,860	223,890	1,126,690	0.97	48.6
Utilities and construction	44,010	16,080	35,470	95,560	0.08	4.1
Services	195,110	7,270	166,390	368,770	0.32	15.9
Domestic final demand	168,870	13,370	379,340	561,580	0.48	24.2
Total	624,430	885,140	810,370	2,319,940	2.00	100.0

The picture is quite different from the land embodied in the products purchased from the service sector (eg. insurance, financial, business consulting, restaurants). In total, this amounted to 338,770 ha (15.9 percent) of the footprint but more significantly most of this land is appropriated from within Auckland. That is, unlike manufacturing, the service sector products draw on land within Auckland rather than land appropriated from other regions. Although the land required for service sector products from other regions is very low (7270 ha), the land drawn from overseas in providing service sector products for Auckland is surprisingly high (166,390 ha).

The land embodied in other products consumed by Aucklanders is much smaller than for manufacturing and service sector products: agricultural products (146,820 ha), utilities of construction products (95,560 ha) and forestry products (19,710 ha).

5.4.2 Purchase of goods and services produced outside Auckland (D₁+D₄)

Aucklanders also purchase products from outside the region, and this accounts for 392,710 ha of land. Most of these purchases include overseas products such as computers, motor vehicles, foreign foodstuffs and various household items (379,340 ha). There is only a small amount of land embodied in the purchases of products from other regions (13,370 ha).

5.5 Ecological Balance of Trade and ecological interdependencies

The land embodied in imports into the Auckland regional economy is 2,509,040 ha (refer to Table 5.3). Whereas, the land embodied in exports from the Auckland economy is 1,089,430 ha. This means that the Ecological Balance of Trade of the Auckland economy is negative 1,419,610 ha, meaning it is overall a net consumer of land from outside the region.

Table 5.3 Auckland'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	57,890	80	-57,810
Forestry	81,910	3,420	-78,490
Fishing and hunting	110	0	-110
Mining and quarrying	360	0	-360
Manufacturing	1,282,960	15,530	-1,267,430
Utilities and construction	16,340	1,460	-14,880
Services	10,580	8,980	-1,600
Domestic final demand	13,370	0	-13,370
Interregional Balance of Trade	1,463,520	29,480	-1,434,040
International trade			
Agriculture	7,720	83,480	75,760
Forestry	470	68,950	68,480
Fishing and hunting	1,440	2,820	1,380
Mining and quarrying	550	1,110	560
Manufacturing	390,550	752,210	361,660
Utilities and construction	36,150	280	-35,870
Services	229,300	151,090	-78,210
Domestic final demand	379,340	0	-379,340
International Balance of Trade	1,045,520	1,059,950	14,430
Total Balance of Trade	2,509,040	1,089,430	-1,419,610

5.5.1 Exports and imports by economic sectors

A large percentage (66.7 percent) of the land embodied in imports into Auckland is associated with purchases of products by the manufacturing sector. Most of these purchases by the Auckland manufacturing sector are for the raw materials purchased from other regions for further processing. Approximately half of the land embodied in these imported raw materials is eventually re-exported from Auckland with approximately half being consumed within the Auckland economy.

The service sector in Auckland is also a significant consumer of land embodied in interregional imports (229,300 ha of embodied land). The service sector uses paper products, equipment, furniture, and other capital items imported from other regions in New Zealand, which cumulatively have a high embodied land content. In turn, the service sector in Auckland also exports embodied land back to other regions as service sector businesses in Auckland sell their services to other regions in New Zealand.

5.5.2 Exports and imports by type of land

Auckland is a very large net consumer of agricultural land from outside the region (refer to Table 5.4). International exports (721,028 ha) and imports (711,280 ha) of agricultural land more-or-less balance. Most of the agricultural land drawn from the regions is however channelled into household consumption within Auckland or exported internationally with little being returned to the regions. This means with respect to interregional trade Auckland has a negative Ecological Balance of Trade of 1,278,500 ha for agricultural land. Overall, accounting for these trade flows, the net effect is that Auckland consumed 1,268,500 ha of agricultural land appropriated from outside the region in 1997/98.

Table 5.4 Auckland'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	1,292,580	14,280	-1,278,300
Forest land	123,530	5,330	-118,200
Degraded land	19,120	1,130	-17,990
Energy land	28,280	8,730	-19,550
Interregional Balance of Trade	1,463,510	29,470	-1,434,040
International trade			
Agricultural land	711,280	721,080	9,800
Forest land	62,790	94,380	31,590
Degraded land	58,790	20,900	-37,890
Energy land	212,650	223,590	10,940
International Balance of Trade	1,045,510	1,059,950	14,440
Total Balance of Trade	2,509,020	1,089,420	-1,419,600

Energy land embodied in imports is also a significant proportion of land appropriated by imports into Auckland, amounting to 240,930 ha. Of this 212,650 ha is embodied in international imports. Auckland exports 232,320 ha of energy land, meaning that Auckland is a net consumer of only 8610 of energy land.

Lesser amounts of forest land (186,320 ha) and degraded land (77,910 ha) are appropriated by imports into Auckland. Auckland exports 99,910 ha of forest land and 22,030 ha of degraded land. Therefore, in overall terms, Auckland is also a net consumer of forest land (-86,610 ha), and degraded land (-55,880 ha) from outside the region as reflected in the respective ecological balances of trade for these land types.

5.5.3 Overall picture

Figure 5.1 provides a summary of the overall flows of embodied land through the Auckland region economy. This diagram indicates that even though Auckland’s domestic consumption of land is high (2,319,940 ha) as measured by its ecological footprint, the interactions Auckland has with other regions and countries is also very important. Exports of embodied land (1,089,430 ha) are significantly out-weighted by imports of embodied land (2,509,640 ha). This gives Auckland a negative Ecological Balance of Trade of 1,438,830 ha. Auckland is therefore a consumer rather than a producer of ecological capital.

Figure 5.1 Flows of embodied land through the Auckland economy

