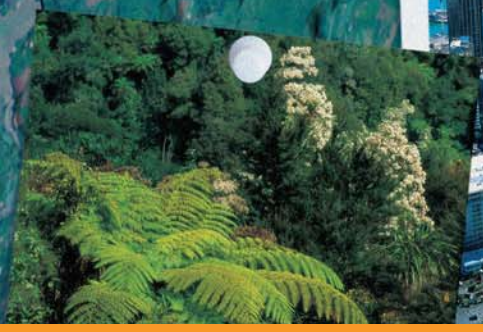
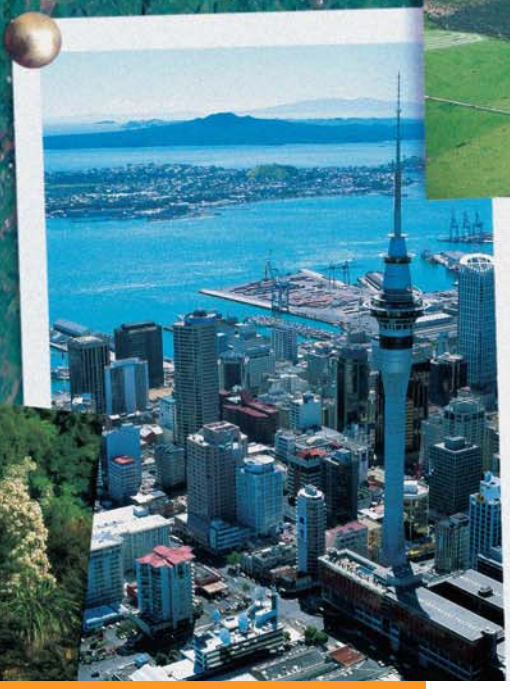
State of the Auckland Region Report 2004





Auckland Regional Council
TE RAUHITANGA TAIAO

State of the Auckland Region Report 2004

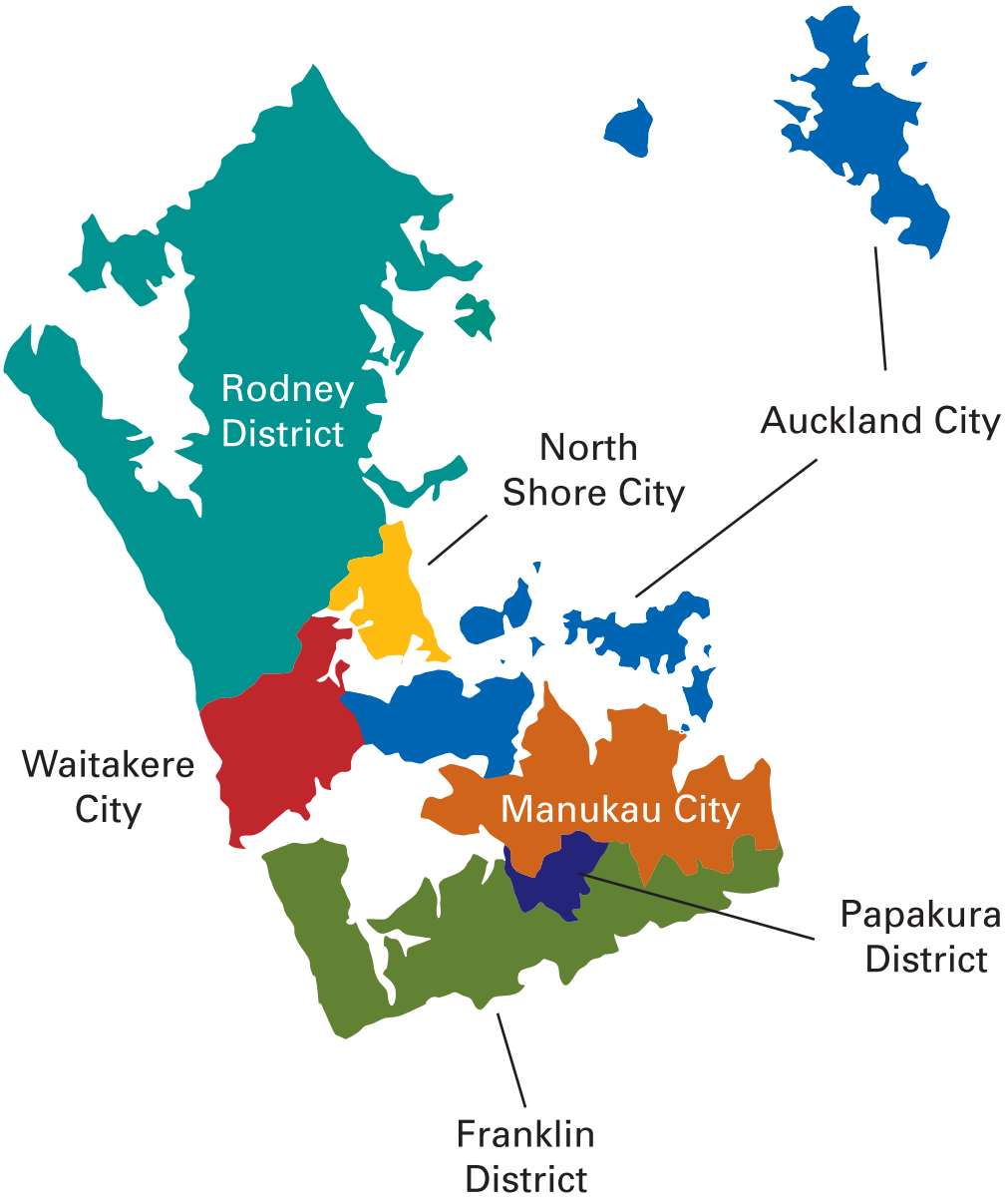
Auckland Regional Council
Vodafone House, 21 Pitt Street
Private Bag 92 012, Auckland
New Zealand

Telephone (09) 366 2000
Website http://www.arc.govt.nz

ISBN 1-877353-36-1

Table of Contents

The Auckland Region



Introduction

The Auckland region is known in Maori as "Tamaki Makaurau", or "Tamaki of many lovers". Even in pre-European times, the Auckland region was a popular place to live.

The Auckland region covers over 500,000 hectares, from Wellsford in the north to Pukekohe in the south, and contains almost one-third of New Zealand's population. The Auckland region has four cities - North Shore, Waitakere, Auckland and Manukau; and three districts - Rodney, Papakura and Franklin.

The Auckland region is the fastest growing metropolitan region in Australasia, and has been for a number of years. This rapid population growth brings with it a diverse range of issues, both positive and negative, including growth in housing needs and the requirement for more urban land, economic growth and diverse job opportunities. More people and cars mean greater levels of air pollution, while increased urbanisation means ongoing negative effects on water quality and ecology, landscapes, heritage and other valued resources.

One of the key roles of the Auckland Regional Council is to help manage our regional environment to provide for social, economic, cultural and environmental well-being. In practice this means engaging in a range of activities such as the provision of public transport, operating the regional parks network, and regulating the use of natural resources to minimise any adverse effects on the environment.

The State of the Auckland Region Report for 2004 provides a snapshot of how the Auckland region is today. It details how many people live here, where and how they live, what they earn, how they travel and work. It tells us about our weather and air quality, where our public open space is, where our quality ecosystems are, and what state they are in.

This is the second State of the Auckland Region Report, and it builds on the information provided in the 1999 report. Much of the information provided refers specifically to what has happened over the past five years, while in other areas, new information is available and has been presented for the first time.

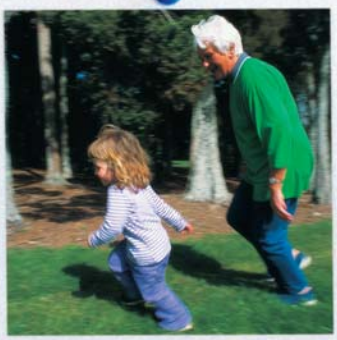
This report has four main chapters: Our People; The Air and Atmosphere; The Land; and Our Fresh and Coastal Waters. Each chapter covers a range of issues which are looked at in terms of: 'State', which illustrates how this issue is now; and 'Implications' - which defines why this issue is of importance to the regional community, and what the potential long term consequences are.

This document brings social, economic, cultural, and environmental facts together in one place. They are all related - we interact with each other and our environment every day. Only by trying to understand these interactions, can we hope to maintain the things that make the Auckland region a great place to live - a vibrant and diverse economy and culture, great beaches, and opportunities for everyone to enjoy a healthy natural environment.

Our People






Our People
Population

The Auckland region is home to approx 1.3 million people. Between June 2002 and June 2003, the region's population grew by 3.1% (39,130 people in 12 months - about 107 extra people every day).

People are our best resources and the source of the greatest pressures on infrastructure, the economy and the environment. Monitoring how the region's population is changing and growing helps to ensure that the necessary funding, services and facilities are planned and provided to serve fast growing communities. The region's population growth offers both benefits and challenges.

State

At June 2003, the Auckland region had an estimated population of 1,291,000 people. Between June 2002 and 2003, the population grew by 39,130 people or 3.1 per cent (Table 1.1). This equates to an increase of 107 people every day.

The Auckland region achieved the highest growth rate of any region in New Zealand with the second highest population growth recorded in the Tasman region (2.7 per cent) over the 2002/03 period.

The nation's population grew by 70,400 people over the same period (1.8 per cent growth). This means that the population of the Auckland region is growing twice as fast as that of New Zealand, and the Auckland region's proportion of the national population is expanding. In 1996, 30 per cent of New Zealand's population lived in the Auckland region, which is projected to increase to 37 per cent by 2021 and 42 per cent by 2041.

Table 1.1: Population Growth in New Zealand

Regional Council	Estimated Resident Population at 30 June				Annual Rate of Population Change June 2002–2003	
	1996	2001	2002	2003		
Auckland Region	**1,116,100**	**1,216,900**	**1,251,600**	**1,291,000**	**39,310**	**3.1%**
Waikato Region	360,200	369,800	373,300	377,900	4,560	1.2%
Bay of Plenty Region	230,800	246,900	250,100	254,000	3,850	1.5%
Wellington Region	427,300	440,200	445,400	451,700	6,260	1.4%
Tasman Region	38,700	42,400	43,500	44,700	1,190	2.7%
Canterbury Region	479,900	496,700	503,600	512,700	9,050	1.8%
Otago Region	189,000	188,300	190,600	192,900	2,260	1.2%
New Zealand	3,732,900	3,880,500	3,939,100	4,009,500	70,400	1.8%

(Statistics NZ, 2003)

All of the Auckland region is growing, especially Rodney District which was the fastest growing city or district in the country over the 2002/03 period. Auckland City, Manukau City and North Shore City all experienced growth rates of over 3 per cent over this period. The only local authority in the Auckland region not to grow faster than the national average was Papakura District which grew by 1.0 per cent over the last year and 2.9 per cent between 1996 and 2001.

Auckland City is home to just under a third of the region's population (32.2 per cent). Manukau City (24.6 per cent) is the next most populous area with nearly a quarter of the regional population, followed by the urban cities of North Shore (15.9 per cent) and Waitakere (14.4 per cent). The three more rural local authorities of Papakura, Rodney and Franklin together house the balance of the region's people (3.3 per cent, 6.5 per cent and 4.3 per cent respectively).

Table 1.2: Population of the Local Councils of the Auckland Region

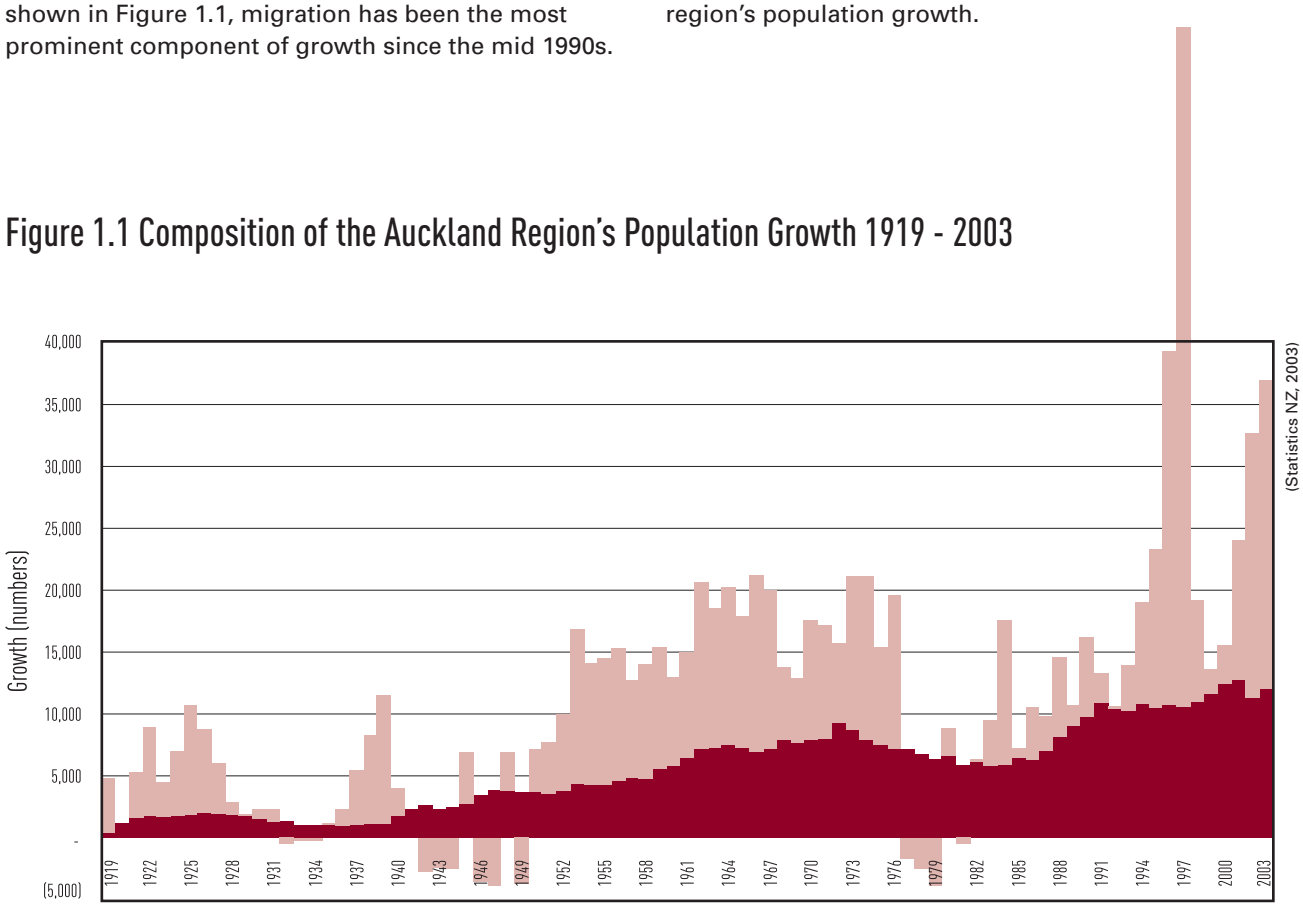
Regional Council	Estimated Resident Population at 30 June				Annual Rate of Population Change June 2002–2003	
	1996	2001	2002	2003		
Auckland Region	**1,116,100**	**1,216,900**	**1,251,600**	**1,291,000**	**39,310**	**3.1%**
Rodney District	68,400	78,500	81,100	84,100	3,010	3.7%
North Shore City	179,500	194,200	198,900	205,000	6,120	3.1%
Waitakere City	161,900	176,200	180,700	185,600	4,900	2.7%
Auckland City	362,700	388,800	401,500	415,300	13,720	3.4%
Manukau City	266,900	298,200	307,300	317,500	10,240	3.3%
Papakura District	41,100	42,300	42,700	43,100	440	1.0%
Franklin District	49,200	53,300	54,300	55,500	1,130	2.1%

(Statistics NZ, 2003)

Population growth is influenced by two main processes; natural increase (i.e. births minus deaths) and migration. Historically, most of the Auckland region's population growth has been from natural increase – more births than deaths. However, as shown in Figure 1.1, migration has been the most prominent component of growth since the mid 1990s.

Up to 70 per cent of new migrants to New Zealand settle in Auckland where they are more likely to get jobs or live close to family or friends. Internal migration (i.e. people migrating from other parts of the country) typically makes up around 10 per cent of the region's population growth.

Figure 1.1 Composition of the Auckland Region's Population Growth 1919 - 2003



Note: For Natural Increase, March years are used from 1987. Prior to 1987, December years are the only ones available.
Net Migration refers to net permanent migration but is calculated as the residual of Total Population less Natural Increase.

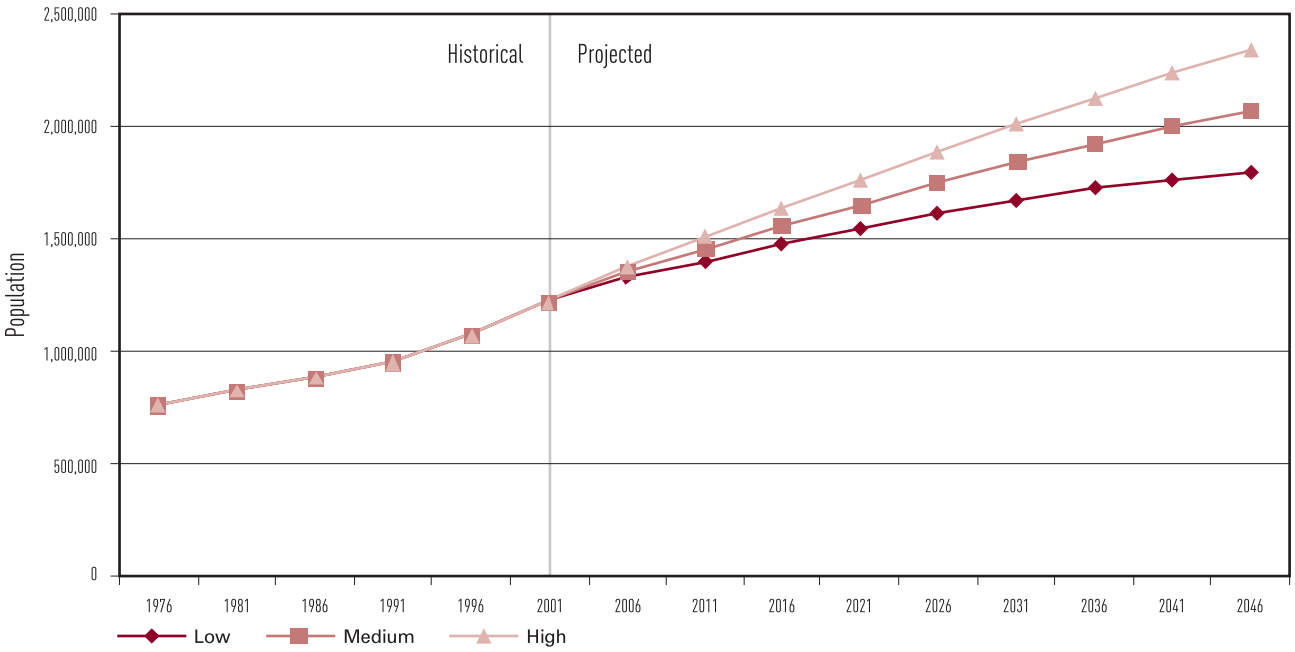
■ Natural Increase ■ Net Migration

Implications

The population of the Auckland region is projected to reach 2 million people by about 2040 (Figure 1.2). Growth is expected to slow as it reaches this milestone as the population ages and the fertility rate slows.

In 2003, 32 per cent of New Zealand's population was living in the Auckland region. By 2040, this number will have risen to 40 per cent. In 1911 it was only 11 per cent.

Figure 1.2: Historical and Projected Resident Population 1976 - 2046



The rapid population growth of the region has brought a number of benefits – a greater work and business opportunities, a more diverse and vibrant culture, and the potential for greater services such as public transport. This growth has been largely self-perpetuating, with a healthy economy attracting more people, which in turn promotes economic growth. The mild climate, stable political environment, and idyllic natural setting of the region have further fuelled population increase and are all likely to contribute to further growth in the future.

The downside of population growth is the pressure it places on infrastructure. The Auckland region has suffered from capacity problems with key services, including water supplies, wastewater and the roading network and public transportation. Upgrading infrastructure is often expensive, but properly managed, population growth can make better infrastructure more affordable.

Age and Gender

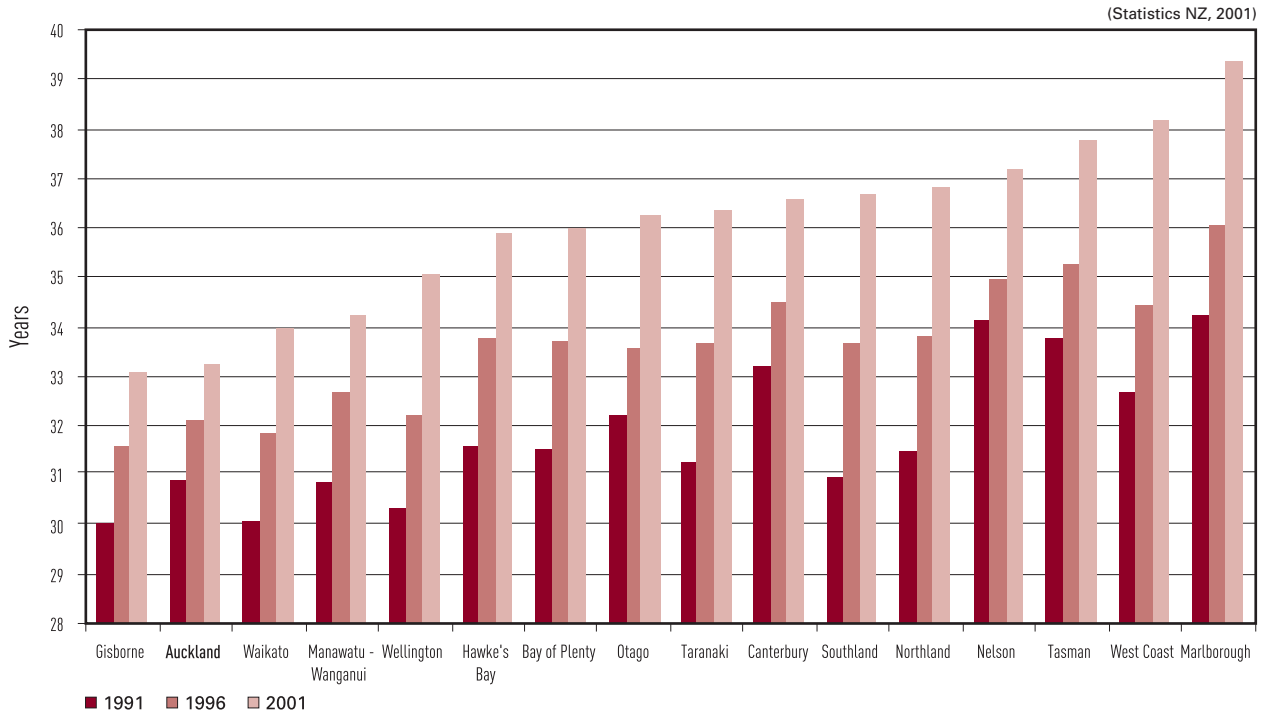
The median age of people in the region is 33.3 years – that's the second youngest of any region in New Zealand. Aucklanders live longer on average than other New Zealanders, with an average life expectancy of 77.7 years.

Our age influences things such as whether we go to school or work, drive a car, what we earn, our health, our housing needs and the resources we consume. Understanding the age structure of the region enables us to better plan and cater for the needs of our population.

State

People of the Auckland region are relatively young compared to other regions in New Zealand. In 2001, the median age of the region was 33.3 years, up from 32.1 in 1996. Although the median age is increasing throughout New Zealand, the Auckland region is increasing slower than most. Only Gisborne has a lower median age.

Figure 1.3: Median Age by Region



Implications

The age of the population impacts on a number of things including the birth rate, medical and education facilities needed, type of housing and infrastructure that needs to be provided, and the nature of the labour force.

Figures 1.4 and 1.5 show age/sex pyramids for the region. A classic pyramid shape with a broad base and narrow top indicates a young, growing population, while a narrowing base and a widening middle indicates slow growth and an aging population.

The average age of people in the Auckland region is expected to continue to slowly increase. The age/sex pyramids show a smaller proportion of those aged under 10 in 20 years time. Consequently, there will be a greater proportion of people in the older age groups, especially those aged 50 years and above. The age/sex pyramids also show higher proportions of older females.

1015 males are born for every 1000 females in New Zealand, but death rates for males are higher for all age groups. There are more males in Auckland until age 19, when females become more predominant.

Figure 1.4: Age/Sex Structure of Auckland Region

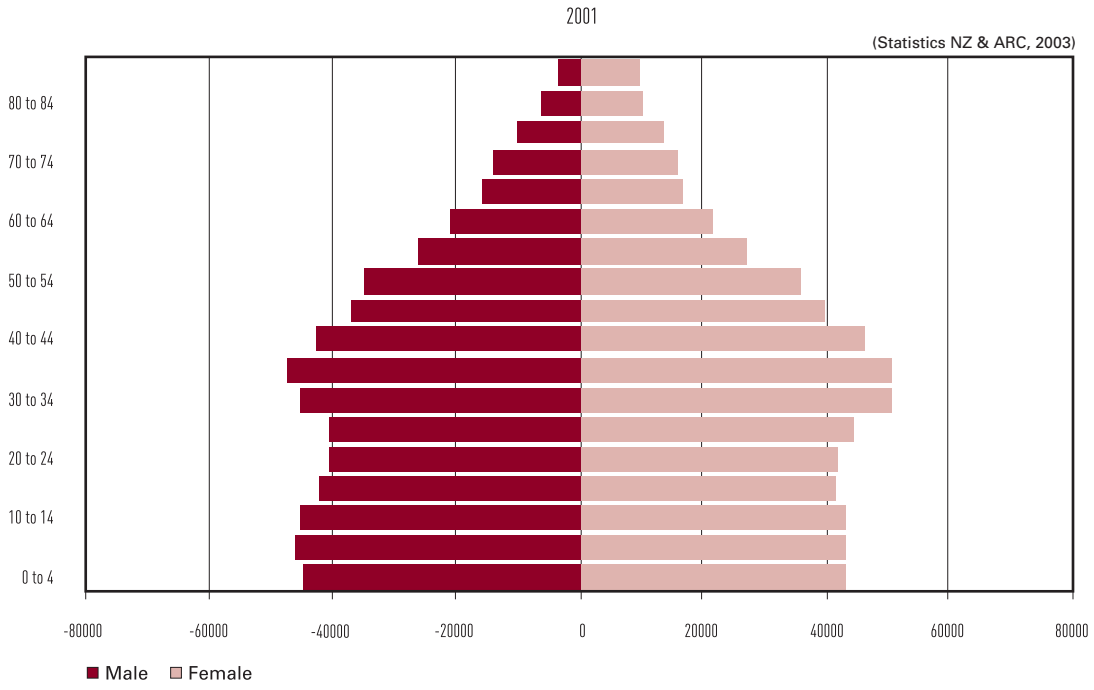
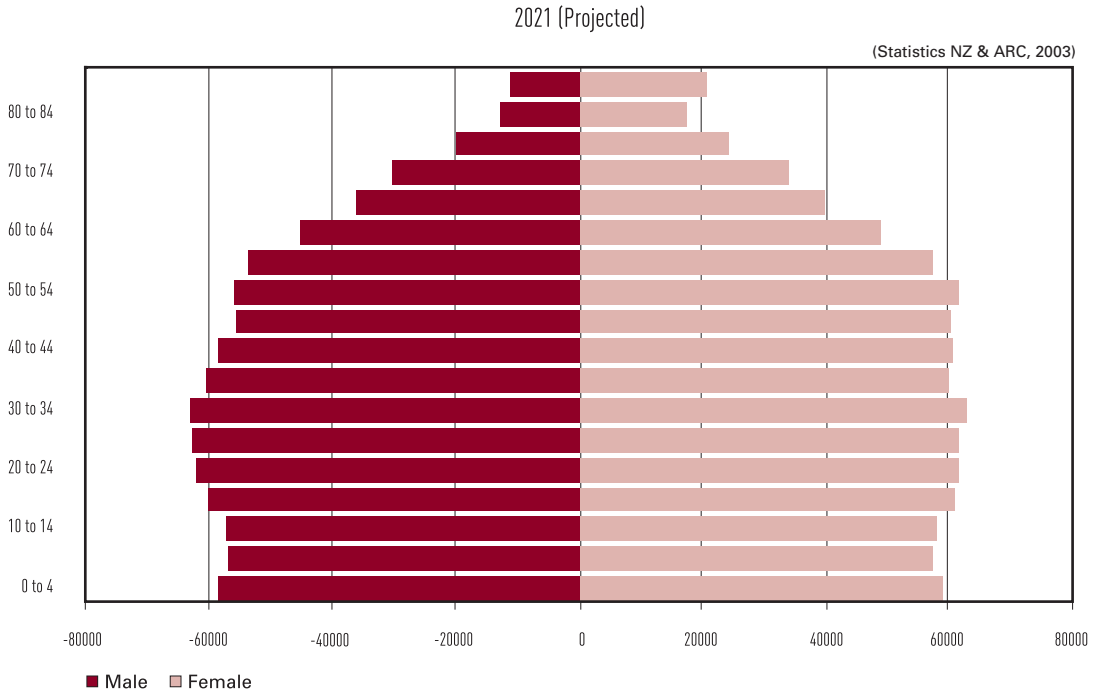


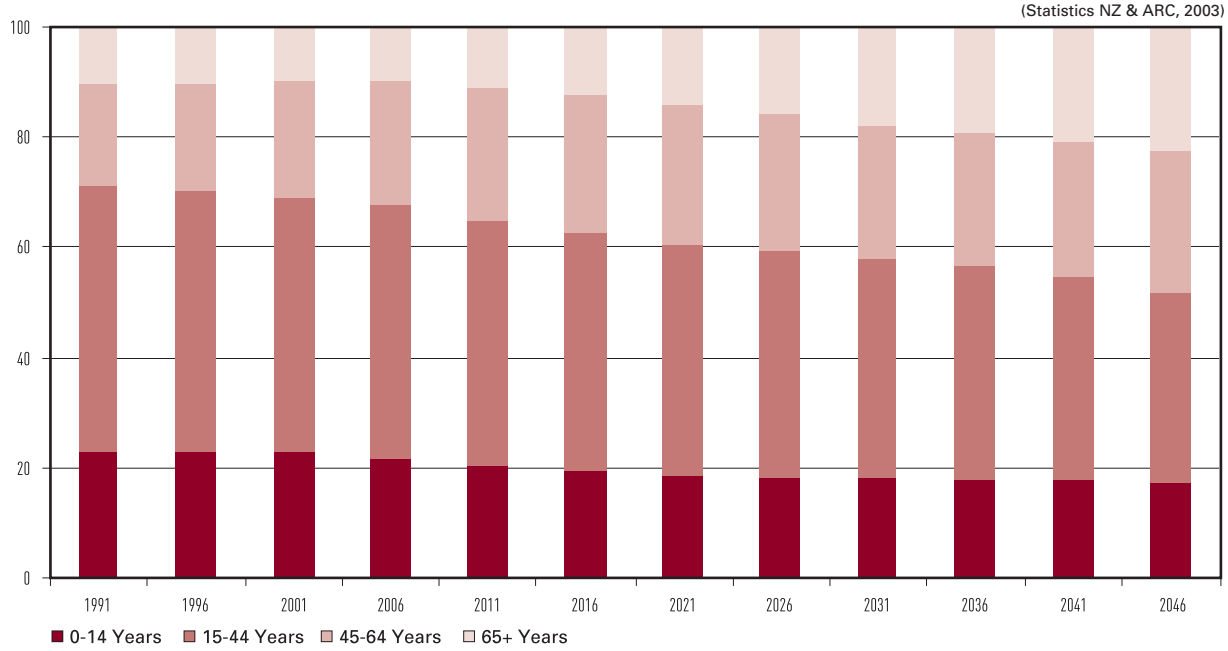
Figure 1.5: Age/Sex Structure of Auckland Region

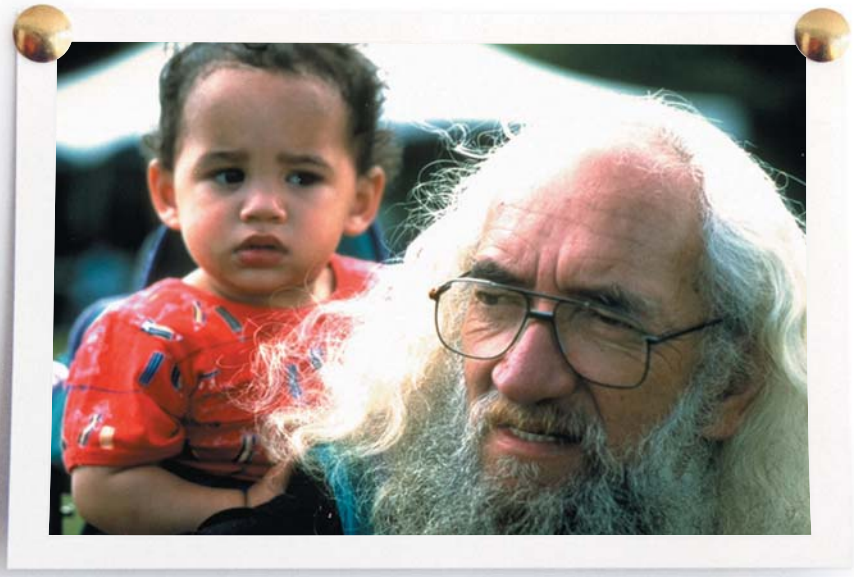


Beyond 2021, people over 65 will rapidly increase in numbers of both males and females. By 2046 it is forecast that there will be as many people aged over 65 as there are under 15. Without careful financial management, this could put serious strain on New Zealand's ability to support these older people. We may see more older people staying in employment for longer or starting their own businesses.

Figure 1.6: Age Structure: 2001-2046

(Statistics NZ & ARC, 2003)





Our People

Ethnicity

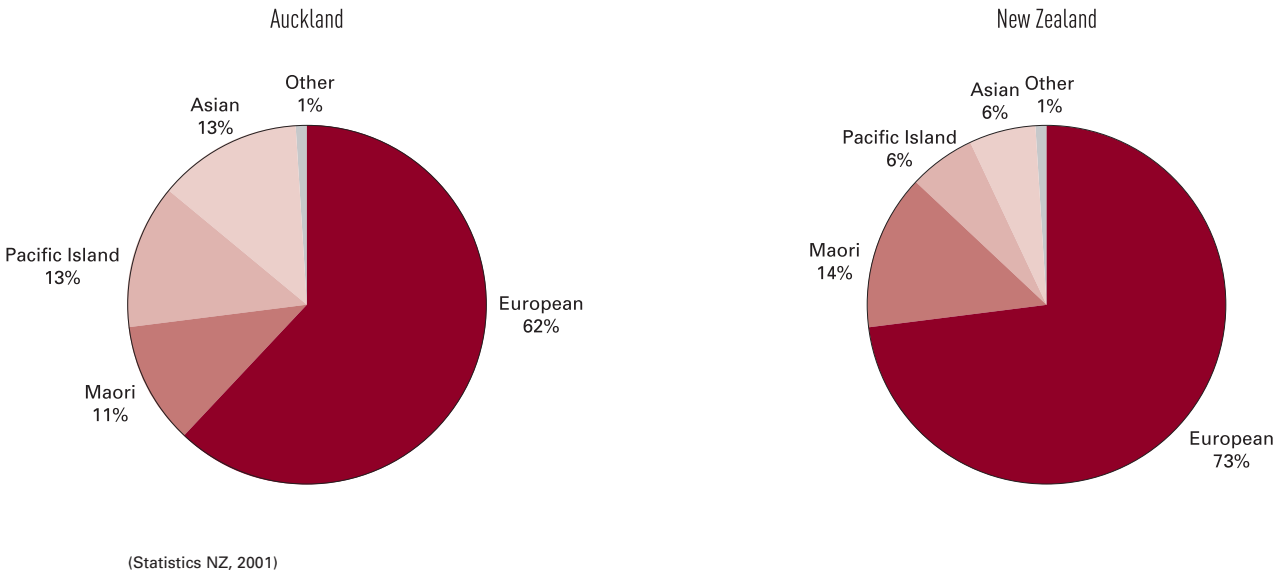
Auckland is an ethnically diverse region: 62% of people consider themselves to be of European ethnicity, 13% Pacific Island, 13% Asian, 11% Maori.

Different peoples and cultures make our region vibrant. 'Ethnicity' is the ethnic group (or groups) that people identify with or feel they belong to. It is a measure of cultural affiliation, as opposed to race, ancestry, nationality or citizenship. A diverse ethnic mix dramatically influences growth patterns and community needs.

State

The Auckland region is becoming an increasingly diverse place to live. In 1991, 75 per cent of people living in the Auckland region were born in New Zealand. However, in 2001, this had fallen to 68 per cent of the region's population being New Zealand born. Figure 1.7 shows the region's current ethnic composition against that of New Zealand as a whole.

Figure 1.7: The Auckland Region and New Zealand's Ethnic Composition



(Statistics NZ, 2001)

New Zealand European

Auckland has a smaller proportion of its population identifying themselves as European than most other urban centres in New Zealand. Only 62 per cent (711,264) of Aucklanders consider themselves to be of European ethnicity compared to 73 per cent for New Zealand as a whole. This proportion has dropped markedly from 1991 when Europeans made up 74 per cent of the region's population (754,749).

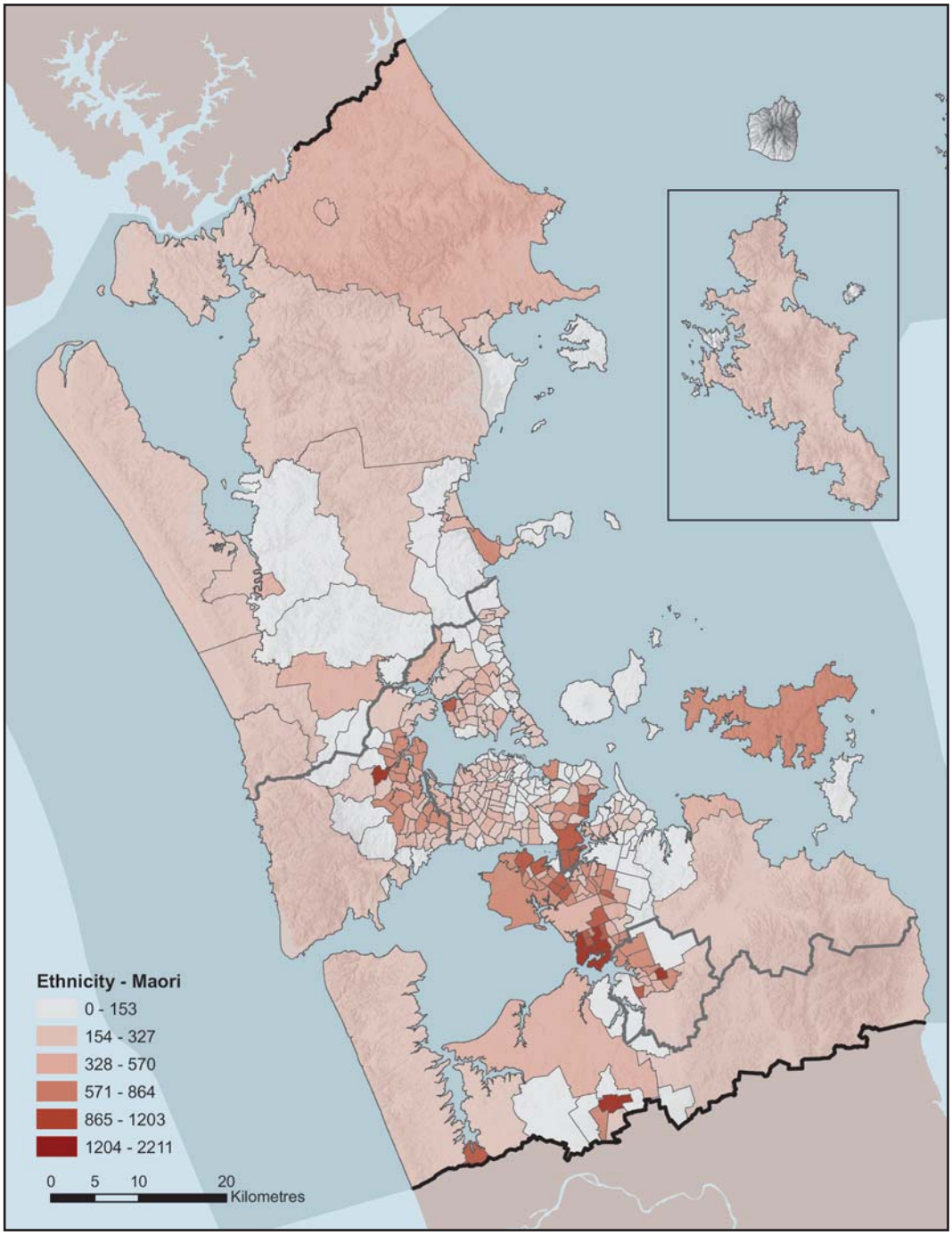
New Zealand Maori

In 2001, 127,629 people in the region (11 per cent) identified themselves as Maori. This proportion has remained relatively stable over time with the Maori population also making up 11 per cent (103,587) of the region's population in 1991. Nationally, 14 per cent of the population was Maori in 2001.

Within the region, higher proportions of Maori are primarily located in the southern urban area and rural parts of the region as shown in Figure 1.8.

Figure 1.8: Population Belonging to the Maori Ethnic Group by Area Unit, 2001

(Statistics NZ, 2001)



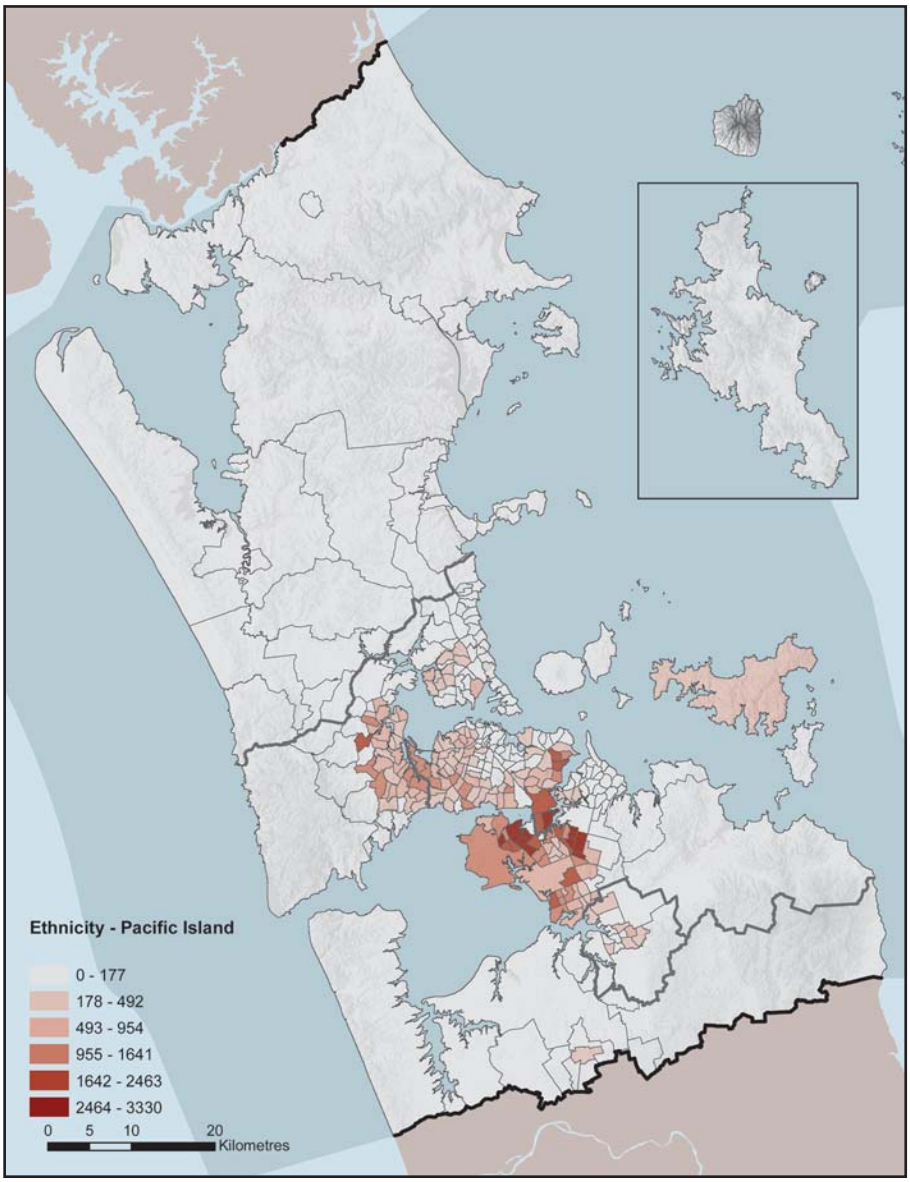
Pacific Islanders

The Auckland region is home to the largest Pacific Island community in the world. In 2001, Pacific Islanders comprised 13 per cent of the population (154,680). This community has been growing steadily and there are now more Pacific Islanders in the Auckland region than there are New Zealand Maori. Since the large migrations of the 1970s and 1980s, recent growth has largely been due to natural increase.

The majority of the Pacific Island population is located in the southern and western parts of the urban area, as shown in Figure 1.9.

Figure 1.9: Population Belonging to the Pacific Island Ethnic Group by Area Unit, 2001

(Statistics NZ, 2001)



Asian

The most rapidly growing ethnic group is from Asia. Asian migrants come from many countries including mainland China, India, Taiwan, Japan, Korea, Philippines, Singapore, Hong Kong, Malaysia and Thailand.

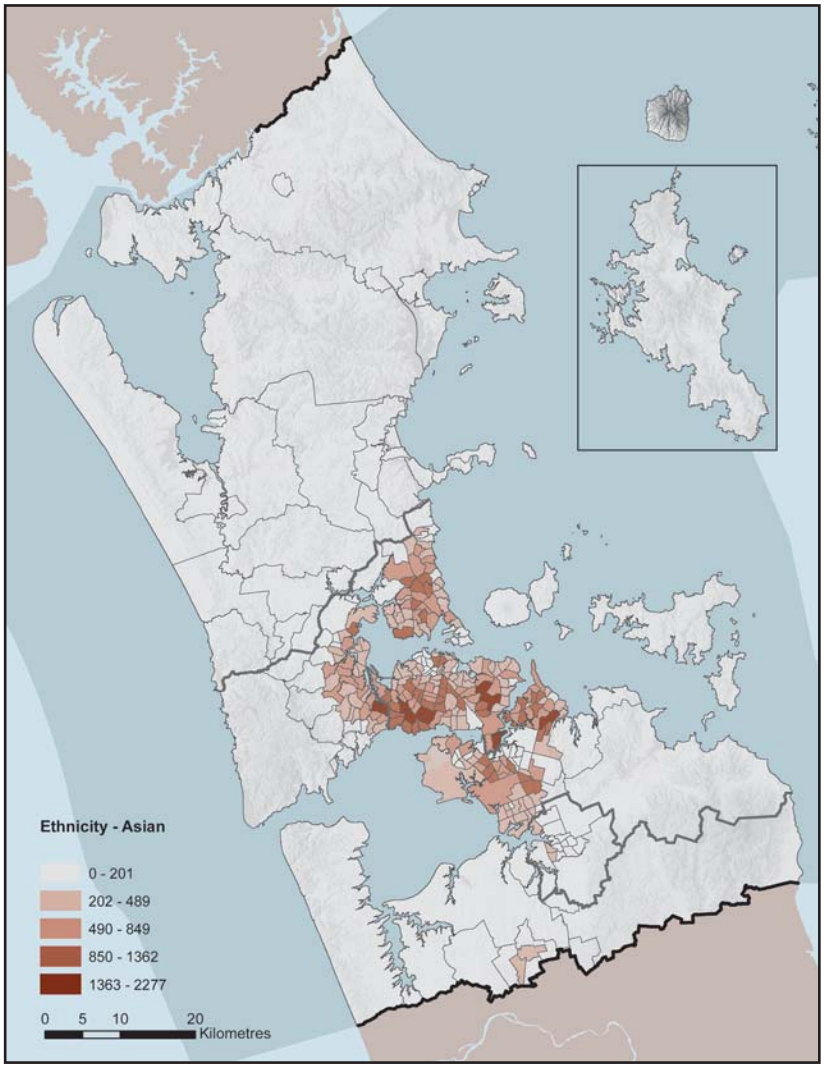
Numbers increased rapidly through the mid-1990s largely due to a shift in national immigration policy. This migration has continued into the 21st century, reinforced by high numbers of students and tourists from Asia.

In 2001, the Asian ethnic group comprised 13 per cent of the total regional population (151,602) – significantly larger than 1991 when Asians made up 5 per cent (an increase of 99,477). The Asian ethnic group made up 6 per cent of the national population in 2001.

Figure 1.10 shows that the majority of the Asian population is located in the urban area, especially around the Central Business District, central isthmus, east Auckland and North Shore City.

Figure 1.10: Population Belonging to the Asian Ethnic Group by Area Unit, 2001

(Statistics NZ, 2001)



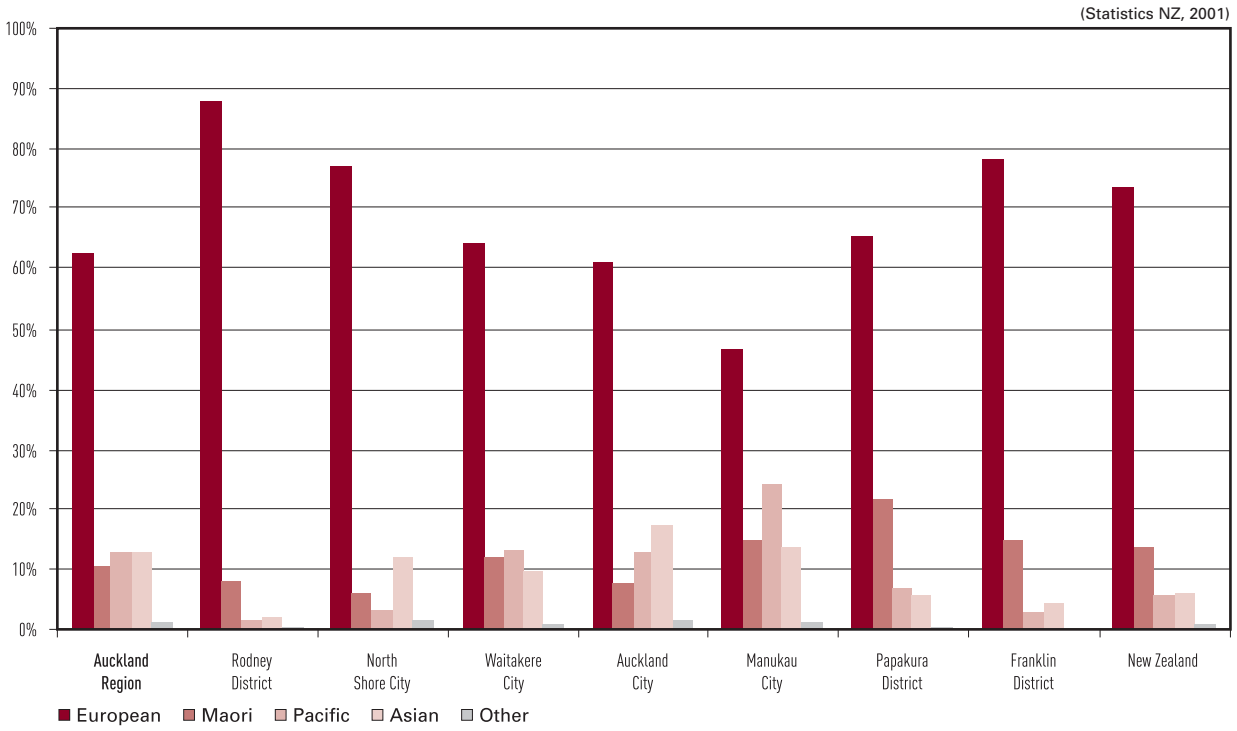
Figures 1.8, 1.9 and 1.10 show that the distribution of ethnic groups varies widely across the region. Figure 1.11 shows that there is considerable variation in the proportion of ethnicities in each local authority.

Maori are well represented in Waitakere City and areas in the south of the region (Manukau City, Papakura and Franklin districts). This is particularly true in Papakura District where Maori make up 22 per cent of the population.

The majority of Pacific Islanders reside in Manukau or Auckland City with 80 per cent of the region's total Pacific Island population living in these two areas. Pacific Islanders are also well represented in Waitakere City (12 per cent).

The Asian ethnic groups are well represented in North Shore City, Auckland City, Waitakere City and Manukau City. In North Shore and Auckland City they outnumber all other ethnic groups except Europeans.

Figure 1.11: Ethnicity by Local Authority



Ethnic Growth

Figure 1.12 shows the relative growth of different ethnic groups from 1991 through to 2001. There has been dramatic growth in the Asian ethnic group with the population increasing by nearly 100,000 people over this period. This growth occurred in all areas, but especially in North Shore City with a growth rate of over 300 per cent (or 16 per cent per annum).

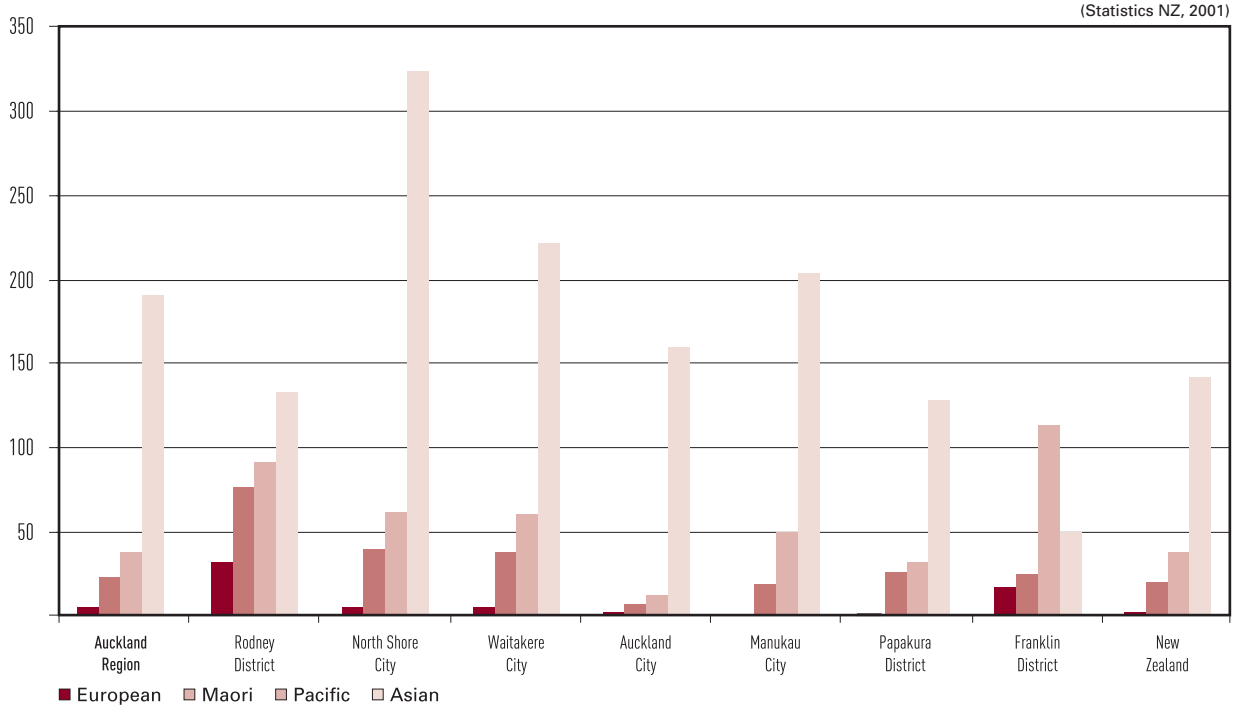
There has been solid growth of the Maori population in Rodney, North Shore City and Waitakere City, but low growth in Auckland City. Overall, the Maori population has increased by 24,000 people.

A similar pattern is seen with Pacific Islanders, whose population has grown faster than average in Rodney, North Shore City, Waitakere City and Franklin, but quite slowly in Auckland City. The regional population of the Pacific Island group has grown from 111,900 in 1991 to 154,700 in 2001, an increase of 42,800 people.

The growth rate of the European ethnic group is much slower than the other ethnicities in all areas. This is because this group is much larger and a generally more stable population. Between 1991 and 2001, the European population increased by approximately 43,500 people.

Figure 1.12: Ethnic Growth 1991 - 2001

(Statistics NZ, 2001)



Implications

Immigration has been a subject of widespread debate in New Zealand over the last few decades. Immigration policy is determined by Central Government and is not easily influenced by local and regional councils.

Changes in the number and location of different ethnic groups have dramatically influenced the housing types, recreation needs, educational and support services in some areas.

Ethnic diversity also has implications in terms of the way the Auckland region will develop in the future, in terms of the likely demand for residential land, regional facilities and differing transport needs. The media, cultural events, fashion, arts and sports of the region will also change over time as a result of a more varied ethnic mix.

Families and Households

70% of households contain one family. 46% of families include two parents, 19% are one-parent, and 35% are couples with no children.

Our living arrangements are quite diverse. A household may contain a single person living alone, parents with children, a group of individuals flatting together, or several families under one roof. Our living arrangements affect the number and types of housing we need.

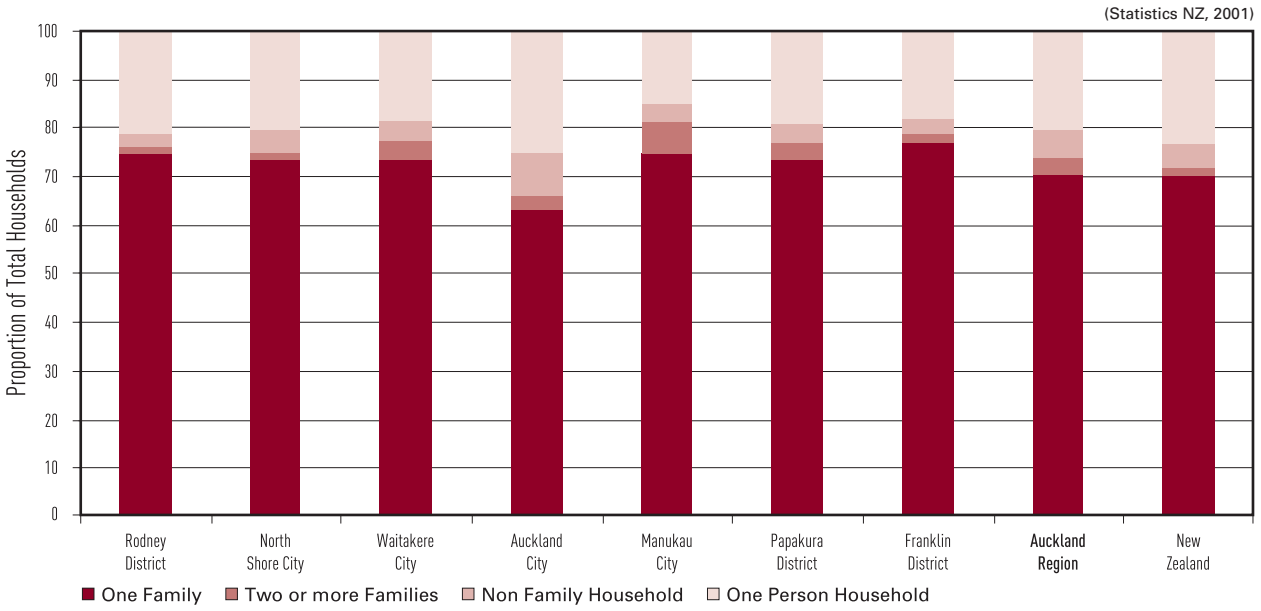
State

Living arrangements in the Auckland region are becoming increasingly complex with greater variation in household structure. Most Auckland households (70 per cent) are just one family. However, this proportion has decreased slightly over time with 72 per cent of households being one family in 1991.

One-person households are the next most common living arrangement (20 per cent). Two or more families living together account for four per cent of total households, while the remaining 6 per cent is made up of non-family households, for example individuals flatting together.

As shown by Figure 1.13, the structure of households varies around the region reflecting the different types and cost of housing available, the distribution of ethnic groups, age structure, available facilities and perceptions about the desirability of certain areas. Auckland City has a large proportion of its population living alone and in non-family household arrangements relative to other authorities in the region. In contrast Manukau City has very high levels of family living situations.

Figure 1.13: Household Structure

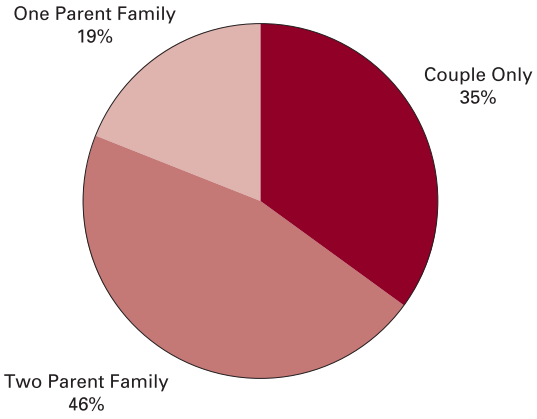


A 'family' is defined as a couple, with or without children of any age living in the same dwelling, or a sole parent living with their children of any age. In 2001 there were 293,142 families in the region compared to 245,217 recorded in 1991. This represents an increase of 47,925 or 19.5 per cent over 10 years. Figure 1.14 shows the proportions of different family living arrangements in 2001.

The proportion of people living in a traditional two-parent family has been declining in recent years. Single parent families and couples without children are becoming increasingly common for a number of reasons, including the increasing divorce rate, changing attitudes to marriage, living together and childbearing.

However, two-parent families still make up the majority of family living arrangements with 46 per cent of all families. One-parent families and couples without children comprise 19 and 35 per cent respectively.

Figure 1.14: Family Structure



(Statistics NZ, 2001)

Implications

Household and family structure affect the type of housing demanded. Families generally prefer traditional family homes. However, non-traditional households often prefer other types of housing (such as apartments and terraced houses) and the available housing stock may not be suitable to meet these needs.

Other implications result from the greater transience of non-traditional households, their relatively greater mobility and higher car ownership and the changing demand for social infrastructure such as medical facilities, schools, entertainment and after hours shopping facilities. These changes affect transport infrastructure demand and can sometimes cause conflict between different types of land use.

Housing

There are over 390,000 private dwellings in the region. The average home occupancy is 2.93 people per house. House prices in the region rose 15% in 2003. 21 new houses are added each day.

Housing is a basic human need and has one of the biggest impacts on people's well-being and quality of life. In addition to the traditional quarter acre, Aucklanders' housing choices now include high-rise apartments, townhouses, terrace and cluster housing, and rural lifestyle blocks. Changes in the number of people per house, age and family structures, and ethnic composition all have an effect on the demand for housing, and in turn the demand for residential land.

State

In 2001, there were 393,000 private dwellings in the region, up from 355,000 dwellings in 1996 and 320,000 in 1991. The growth in the number of houses mirrored population growth, although the type of housing varies widely. The majority (72 per cent) of private homes are separate houses on their own sections but this proportion has decreased from 77 per cent in 1996.

The proportion of multiple unit dwellings, such as apartments, varies around the region. The regional average is 28 per cent but the greatest proportion by far is in highly urban areas, especially Auckland City where 39 per cent of the housing is multiple units. By contrast, the more rural Franklin District has just 15 per cent of its housing in multiple units.

Figure 1.15: Housing Types in the Auckland Region

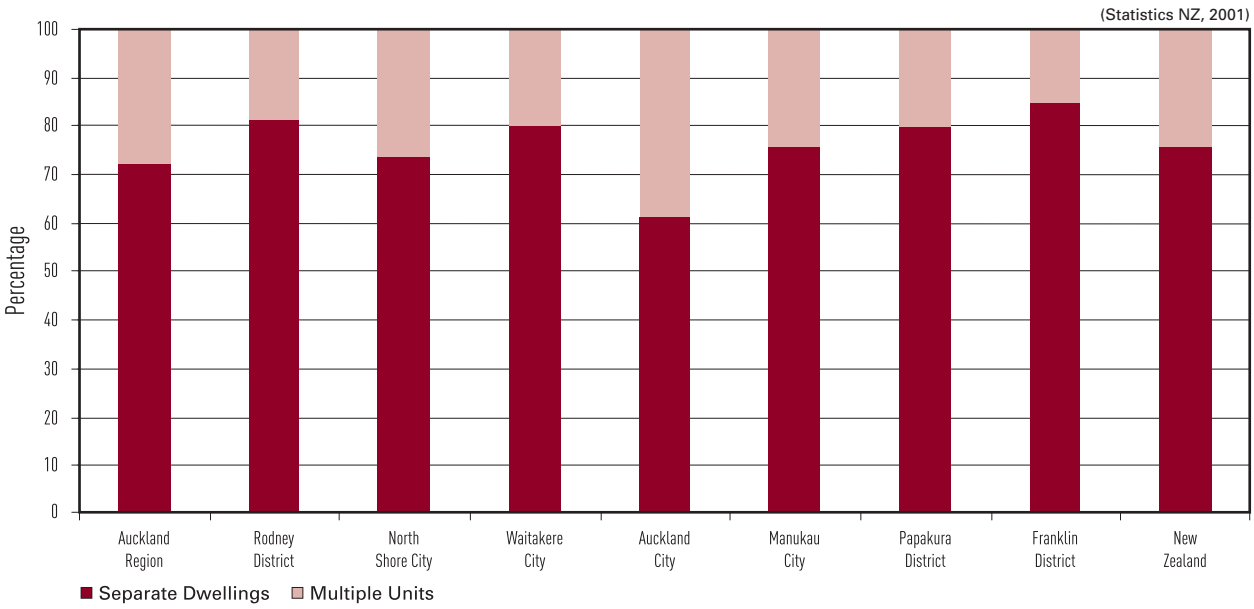
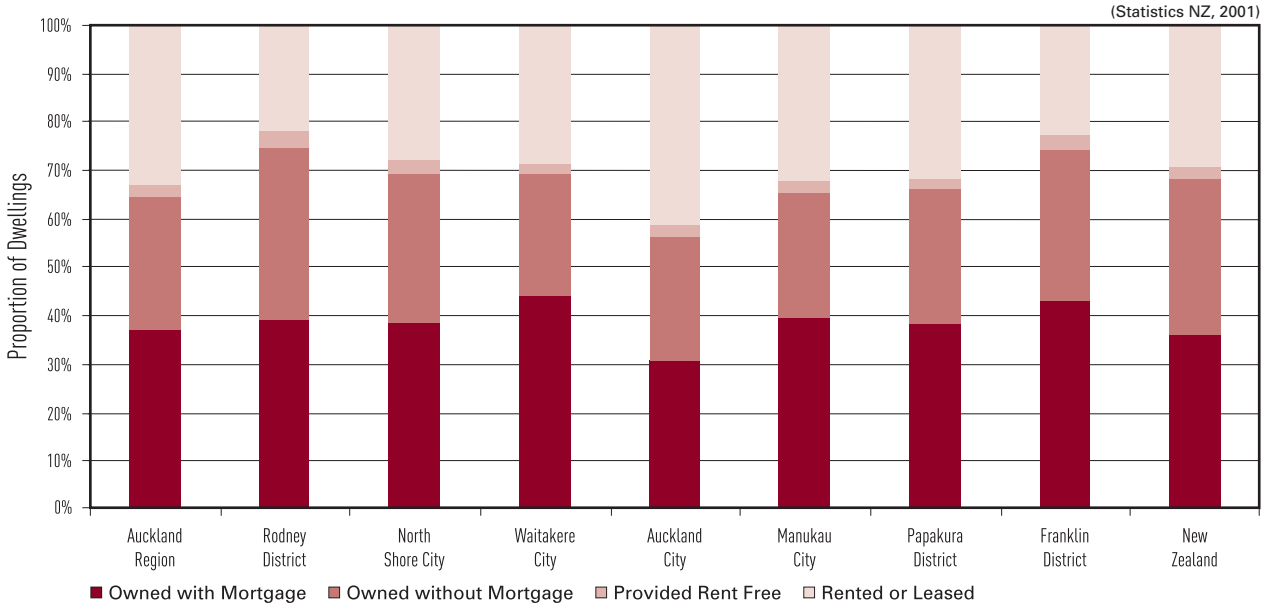


Figure 1.16: Dwelling Ownership



As housing choices change, home ownership is becoming less common, although it is still high by international standards. In 2001, 64 per cent of the region's homes were owned either with or without a mortgage, down from 69 per cent in 1996 and 73 per cent in 1991. Nationally, 68 per cent of dwellings were owned (with or without a mortgage) in 2001, down from 70 per cent in 1996.

Renting has become increasingly more popular. People's preference for renting or owning tends to vary depending on affordability, how often they move residence, and changing attitudes to home ownership.

The average number of people living in each home (occupancy) reveals much about the family structure of the population and potential housing demand. Occupancy rates have generally been falling over time, reflecting an aging population, the trend towards independent living, having children later and more childless couples.

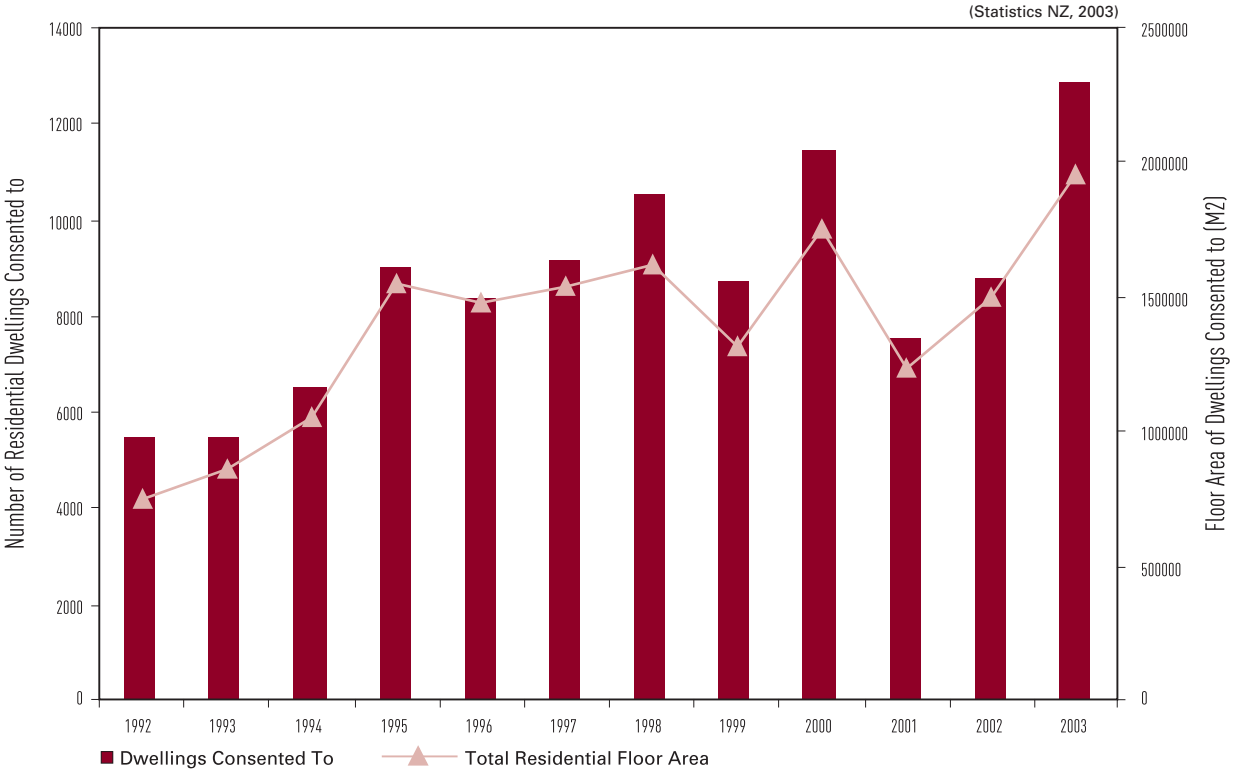
The average home occupancy rate in the Auckland region was 2.93 people per dwelling in 2001, down from a rate of 2.99 in 1996. Even this small decrease (0.06 people per house on average) means there needs to be an additional 8400 homes to house everyone in the region.

In addition to variances over time, occupancy rates also vary across the region. This reflects differences in the type and size of houses, affordability, ethnicity, socio-economic status, age and family structures. Auckland City has a lower occupancy rate than the regional average (2.79 in 2001), reflecting the larger proportion of multi-unit dwellings in this area.

On the other hand, Manukau City has a higher than average occupancy rate (3.39 in 2001) largely due to the larger proportion of Pacific Island households which often include extended family members.

Building consents are a good indicator of the number of new houses as well as of house size and construction cost. In the year ending March 2003, 12,800 consents for residential buildings were issued, well up on 8800 consents the year before. This growth reflects the boom experienced in the housing market throughout the region over the past few years.

Figure 1.17: New Dwellings



In 2003, 1.95 million m² was potentially added to the regional housing stock (not all building consents are acted on). This is up substantially from the 1.5 million m² the previous year, and higher than the peaks that occurred in the boom of the mid-1990s. A 1998 ARC survey suggested that around 97.5 per cent of buildings for which consents are issued are actually built.

Implications

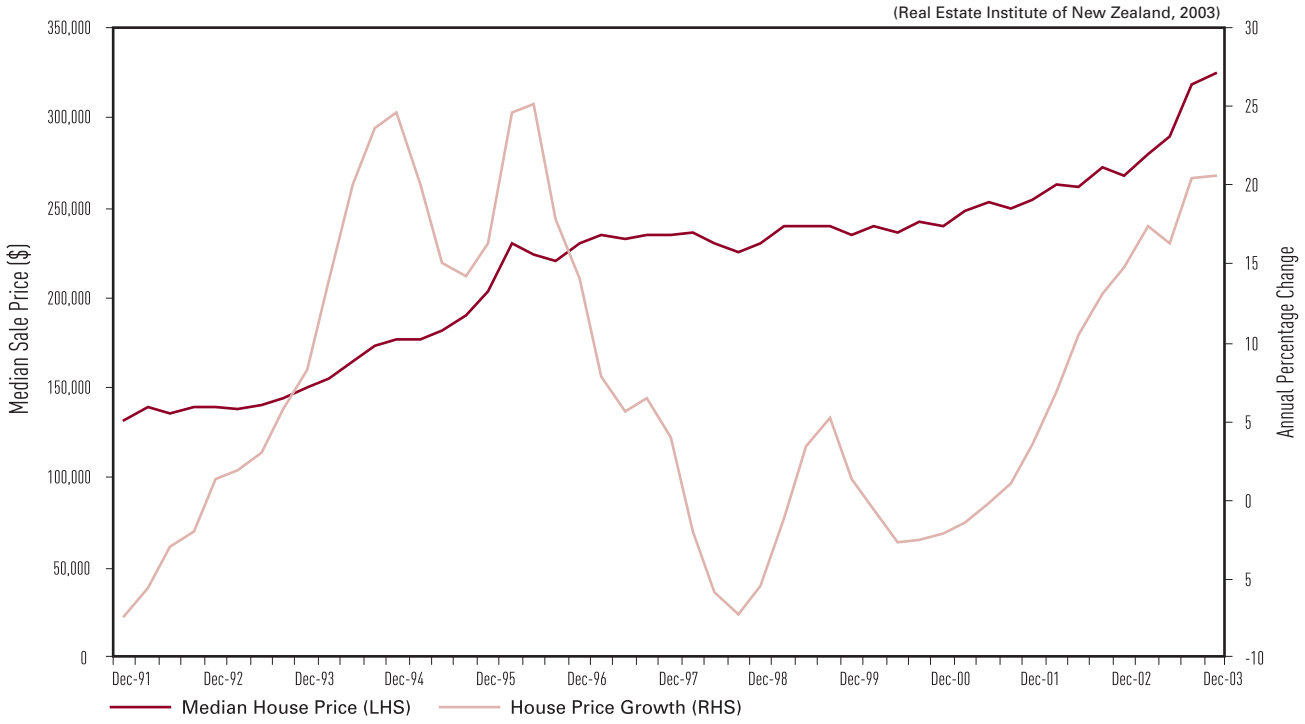
Housing demand is likely to keep pace with expected population growth. Different scenarios put the number of houses at between 724,000 and 958,000 by 2046. This pressure will put more demand on available land, potentially causing land prices to rise. However, more intensive forms of housing will become increasingly common. While this will reduce the amount of land required for development, less private open space (such as back yards) will need to be compensated with public open space, such as city and regional parks.

There is at present between 14 and 23 years supply of residential land (as at 2003) left within the present urban limits on which to build new houses. It is intended to retain such a supply of land for urban development for the foreseeable future as a reduction could create pressure on housing patterns and house affordability.

House Prices

The housing market has been a key source of economic growth within the Auckland region over 2003. Fuelled by high levels of net migration and low interest rates, Auckland house prices have risen 25 per cent over 2002-2003 and 15 per cent in 2003 alone. The median house price in the Auckland region in December 2003 was $325,000 compared to $240,000 in December 2000 (see Figure 1.18).

Figure 1.18: House Price Growth in the Auckland Region



Travel Patterns

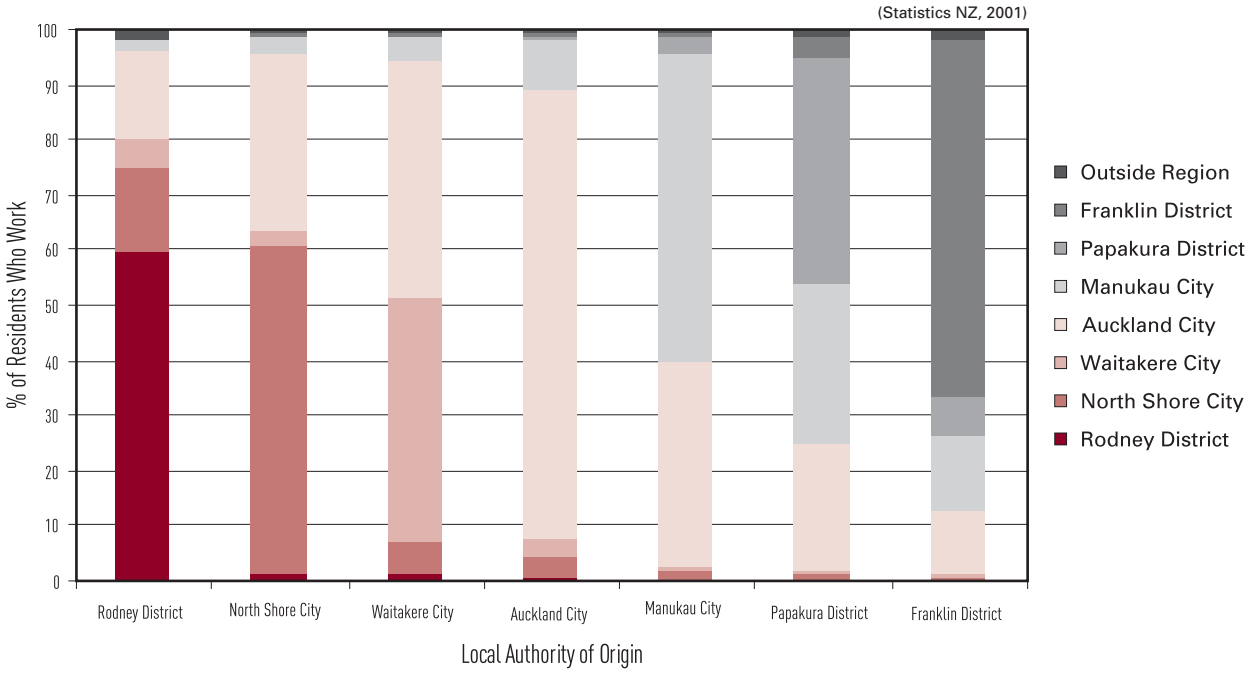
There are about 630,000 cars and 95,000 heavy vehicles registered in the Auckland region. There is approximately one car for every two people. 35 new vehicles are added to our roads every day.
If everyone who currently uses public transport suddenly used a car, the amount of extra cars on our roads would create a 368km long queue!

The mobility provided in the past by a relatively good road system and high car ownership has led to a diverse pattern of land uses and trips. This is now resulting in increasing congestion, particularly in the central area and is difficult to handle cost effectively with public transport.

State

The Auckland region has developed with a dependence on the motorcar and is characterised by low-density housing and a dispersed pattern of trips with households and employment spread widely. In 2002, 12 per cent of employment was located in the Central Business District (CBD), compared with 15 per cent in 1986. Figure 1.19 illustrates the nature of trips to work made within the region. While a large proportion of trips remain within the local authority of origin, a significant number are made to other areas, especially to and from Auckland City.

Figure 1.19: Travel to Work Destinations 2001



Based on current trends, 35 new vehicles are added to our roads per day and the number of cars is expected to double in the next 20 years. The implications of such trends are made worse by low car occupancy rates, with only 1.24 people per car on average during peak periods.

A look at the region's motorways shows increasing vehicle use and congestion; approximately 155,000 vehicles cross the Auckland Harbour Bridge every day compared with 122,000 vehicles in 1991 (Transit NZ, 2001). Similarly, average daily traffic at Spaghetti Junction has increased from 161,000 vehicles in 1991 to nearly 200,000 vehicles in 2001 and is the busiest section of motorway in New Zealand. Traffic growth in the region over selected motorway sites has averaged approximately 3 per cent a year over the last 10 years. Traffic volumes also vary throughout the year, with congestion generally reducing during school holidays.

People in the Auckland region are making more trips per person than ever before, and a greater (and increasing) proportion of these trips are being made in private cars. The region has high and increasing level of car ownership. Car ownership has increased from 1.47 per household in 1991 to 1.66 in 2001. There are now some 630,000 cars and 95,000 heavy motor vehicles registered in the region. At approximately one car for every two people in the Auckland region, we have one of the highest car ownership rates in the world, comparable to the United States, Canada and Australia.

Figure 1.20 shows the number of trips made to work by different modes of transport. While public transport usage on the whole increased by 10.2 per cent between 1996 and 2001. However, the number of public transport trips as a proportion of total trips to work has remained relatively unchanged (6.8 per cent in 1996 and 7.0 per cent in 2001). The number of trips to work by car increased by 7.6 per cent between 1996 and 2001. This means that there are an additional 25,000 people travelling to work by car. Walking, jogging and cycling to work is becoming less popular with a decline of 1.2 per cent between 1996 and 2001.

Figure 1.20: Journey to Work Mode Split

(Statistics NZ, 2001)

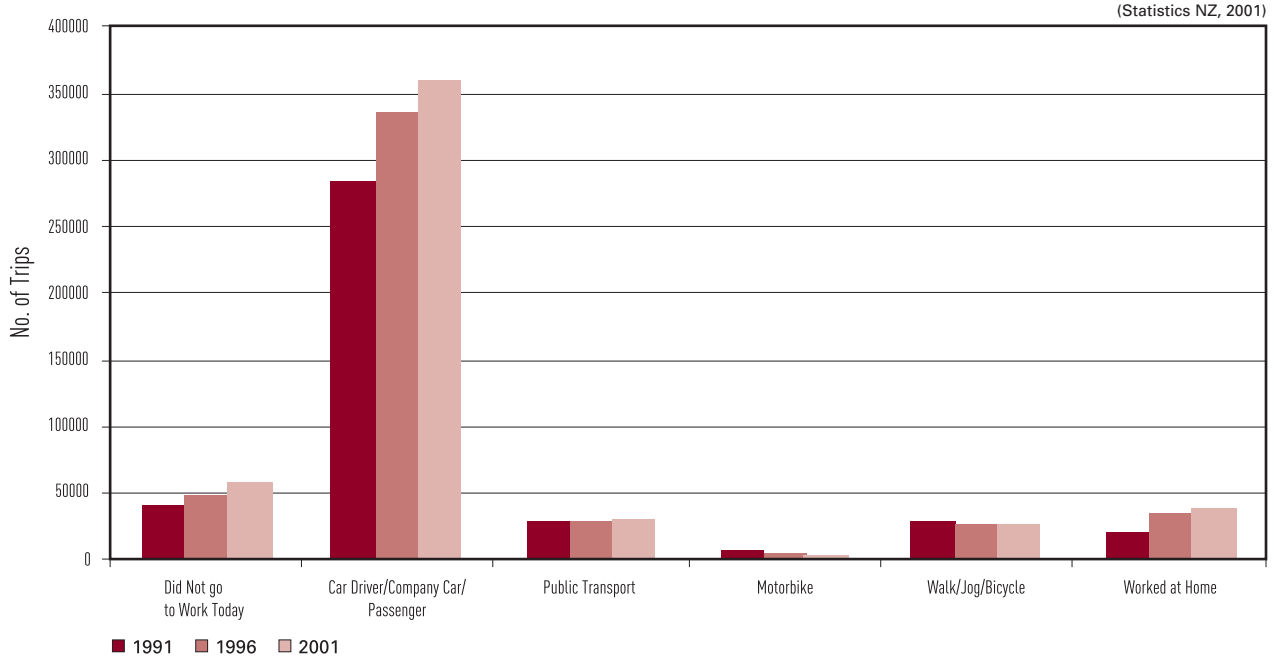


Figure 1.20 also shows a 16 per cent increase in the number of people working from home between 1996 and 2001. This is likely to continue to rise with increasing traffic congestion, broadband internet availability, and flexible work conditions making telecommuting a popular option.

Factors contributing to the relatively low public transport usage (by international standards) include increased car ownership, where we live and work, long-standing under-investment in public transport infrastructure, and low motoring costs.

Recent surveys have indicated greater use of public transport with small but consistent increases in the proportion of morning peak period trips observed at a number of monitoring sites, especially those heading into the CBD. Recent investment in trains and buses should see patronage continue to increase.

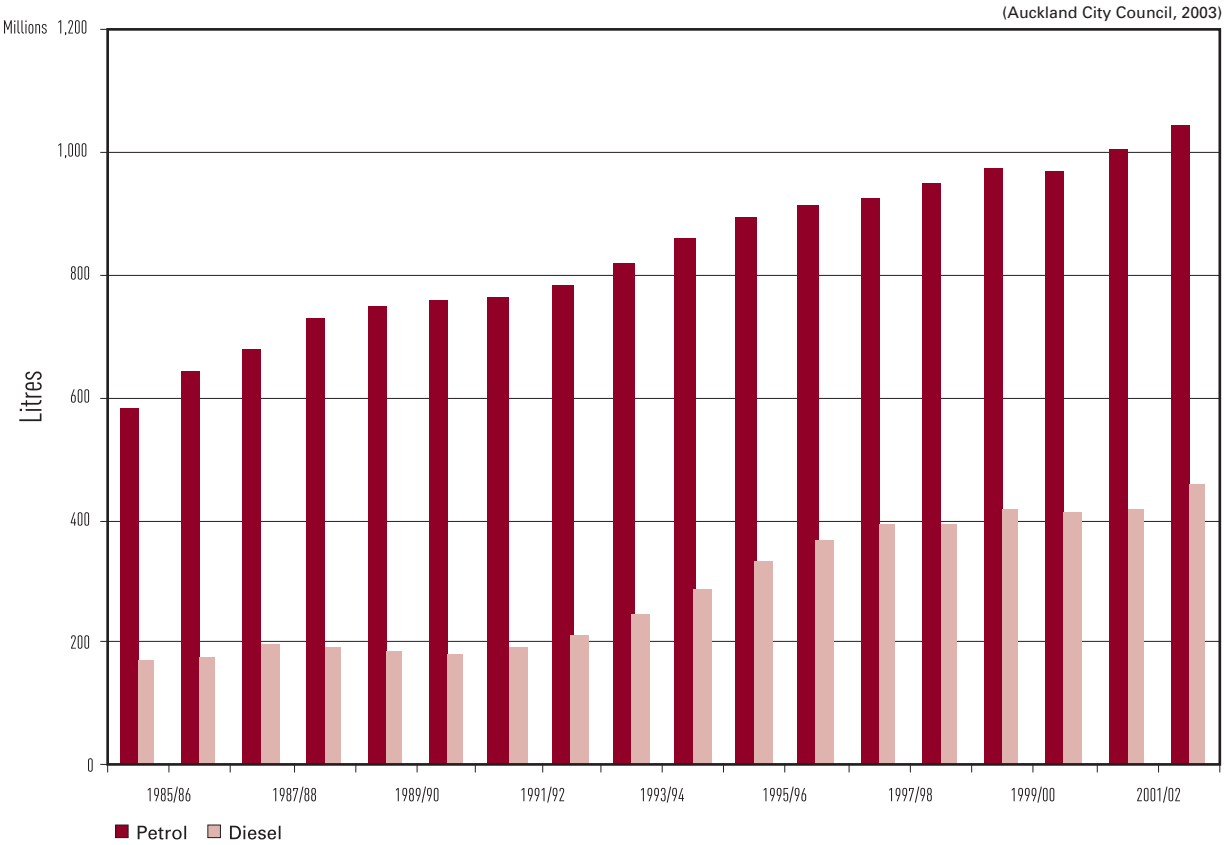
New Zealand's road fatality rate is relatively high among developed countries. In 2002, there were 77 road deaths and nearly 3700 injuries resulting from road crashes in the Auckland region. Speed accounts for nearly 40 per cent of road fatalities, while alcohol accounts for a further 25 per cent. The social cost of road crashes in New Zealand is an estimated $800 million a year (LTSA, 2002).

Implications

Motor vehicles are the largest source of air pollution in the region affecting public health, welfare and property (see Ambient Air Quality).

The transport system is a big user of energy and consumes non-renewable resources, both fossil fuels and land. Figure 1.21 illustrates the strong growth in transport fuel usage over the past 15 years. Since 1986, petrol consumption has increased by 79 per cent while diesel consumption has risen 168 per cent. Over the same period, the regions population has only increased by 42 per cent.

Figure 1.21: Petrol and Diesel Usage in the Auckland Region



The Auckland region's relatively low-density growth has encouraged us to rely on car travel for nearly all trips. As a result, we now have a road network that has become overloaded, especially in the central area where there are few options for expansion. This, in combination with concerns over the environmental and social impact of continued urban sprawl, has led to the concept of compact, mixed-use communities in the future. These will need to be supported by high quality public transport systems operating on designated corridors to link these centres.

Every weekday, buses, trains and ferries carry about 205,000 passengers. If all these people decided to use cars instead, they would add another 78,500 cars (at current occupancy rates) to our already congested roads and create a traffic queue of cars 368km long. Thus, public transport improves the level of accessibility and mobility of the overall transport system.

A major thrust in the development of the region's public transport network is to develop a series of exclusive corridors dedicated to buses and rail. Significant investment has been put into the rail network over the past few years. In addition to the construction of the Britomart terminal and upgrades to station facilities, refurbishment of existing trains and the purchase of new trains have been ongoing. These measures have resulted in an increase in rail patronage which is expected to continue as the quality, reliability and frequency of rail services improve. Ticket sales for trains over the year to February 2004 indicate an increase of 27 per cent over the February 2003 year.

Similarly, work is progressing to expand and further develop bus priority measures on main roads and to increase the frequency of services. Construction has commenced on the North Shore Busway, which is a 7.3km dedicated two-way roadway for buses and high occupancy vehicles that will run alongside the Northern motorway from Albany to the Harbour Bridge. There is also ongoing investment planned for ferry terminals and wharf facilities around the region.

Growth will continue to be accommodated in higher density areas and public transport use is expected to increase in these areas. However, the use of the car will remain high and the need to provide additional capacity on the roading network will remain a priority.

Ease of Travel

During the morning peak period, the average speed on the Northern Motorway is 19km per hour.
On the Southern Motorway it is 51km per hour.

The Auckland region's road system capacity has not kept pace with rapid traffic growth over the last two decades, producing serious levels of congestion. This is mainly during peak periods, but some areas are also becoming congested throughout the day. Traffic congestion is estimated to cost the region about $1 billion a year.

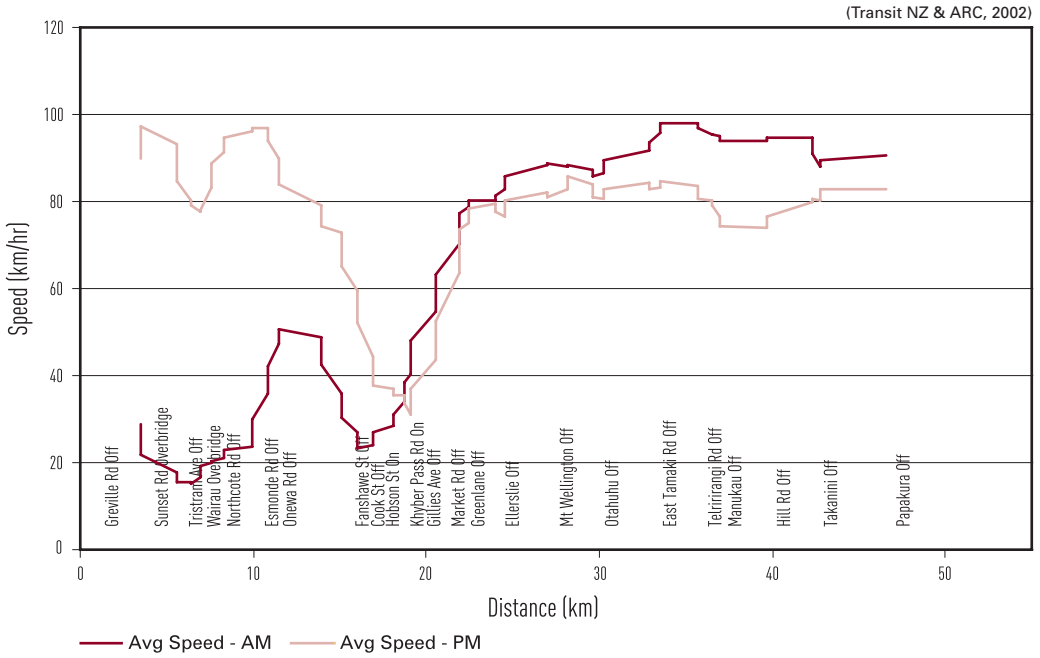
State

Morning and afternoon peak travel times between the outer suburbs and Auckland City increase every year as traffic volumes grow. Main roads leading to the motorway are heavily congested during these peak periods, which in turn has an effect on local roads. As traffic volumes increase, the waiting period lengthens, creating further delays.

On the region's motorway network, long queues occur. On the Harbour Bridge approaches, 10km long queues often extend north to Greville Road, and 8km long queues build up south of the Newmarket Viaduct during the evening peak.

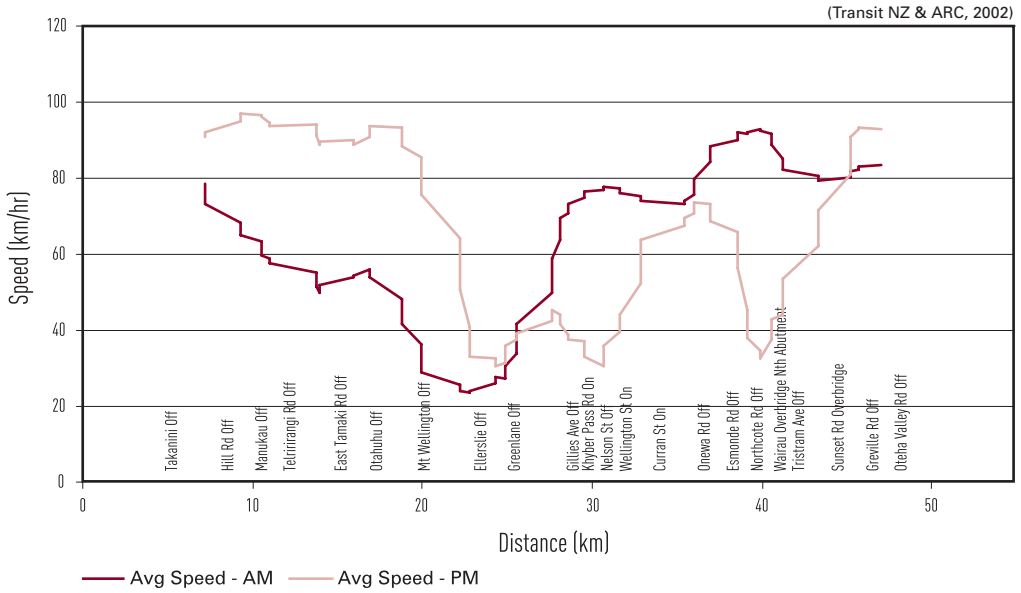
Figures 1.22 and 1.23 show the average traffic speeds at peak periods (morning and evening) heading both north and south on the Northern/Southern motorway. The morning peak moving towards the city is particularly congested.

Figure 1.22: Southbound Average Speed on State Highway 1



In 2003 during the morning peak period, it took on average 37 minutes to travel from Oteha Valley Road to Auckland City on the Northern Motorway, a distance of 15.3km. This represents an average speed of 19km per hour. During off peak times this trip would take around 10-12 minutes (at the posted speed limits of 80-100km per hour).

Figure 1.23: Northbound Average Speed on State Highway 1



From Papakura to Auckland City on the Southern Motorway, a distance of 30 kilometres, the average travel time in the morning peak is 35 minutes. This represents an average speed of 51km per hour. This same trip takes 20-22 minutes at the posted speed limits of 80-100km per hour.

The morning peak starts at around 7am and continues until well after 9am. The evening peak begins around 4pm and extends to 6.30pm. The duration of the peak periods have been extending over time as congestion has increased.

Bus priority measures have been introduced on some important public transport links. Measures include dedicated bus lanes on motorways and main arterials, priority turns and priority at traffic signals. Real time information systems that display the arrival times of buses for passengers are currently being trialled on selected routes. This initiative leads to significant savings in travel times for bus passengers and a more user-friendly and reliable service. Shorter travel times allow more trips to be run on the same number of buses.

Upgrades to the rail services and infrastructure have also been progressing. More frequent services are being run on both the western and southern lines. Rail offers a fast and reliable public transport option as it operates in its own dedicated corridor.

Implications

Travel times continue to increase on the major roads to and from Auckland's central areas as a result of more cars on the road. The economic costs of congestion in the Auckland region are estimated to be in the vicinity of $1 billion per annum (this equates to around 0.8 per cent of New Zealand's GDP). Public transport and bus priority measures are provided to alleviate this congestion, while other ways of getting around such as walking and cycling can also play a role.

Growing vehicle use disadvantages those without cars, especially the young, elderly, disabled and those from low socio-economic groups – there are 34,000 households (9 per cent of all households) in the region with no access to a car. This because the car's growing dominance of the transport system makes it more and more difficult to provide cost effective comprehensive public transport.

Roads also affect the communities they pass through. Busy roads are difficult to cross, severing local communities and creating environmental problems such as air, water and noise pollution. Heavily used roads are also an unpleasant and sometimes unsafe environment for pedestrians and cyclists.

Economy and Industry

The Auckland region contributes 32% of national GDP. Economic growth within the region has averaged 3.3% per year over the past decade.

How we make a living affects how the region functions and what it is like to live in. Like everything else in the Auckland region, this too is changing, in line with international trends and pressures.

State

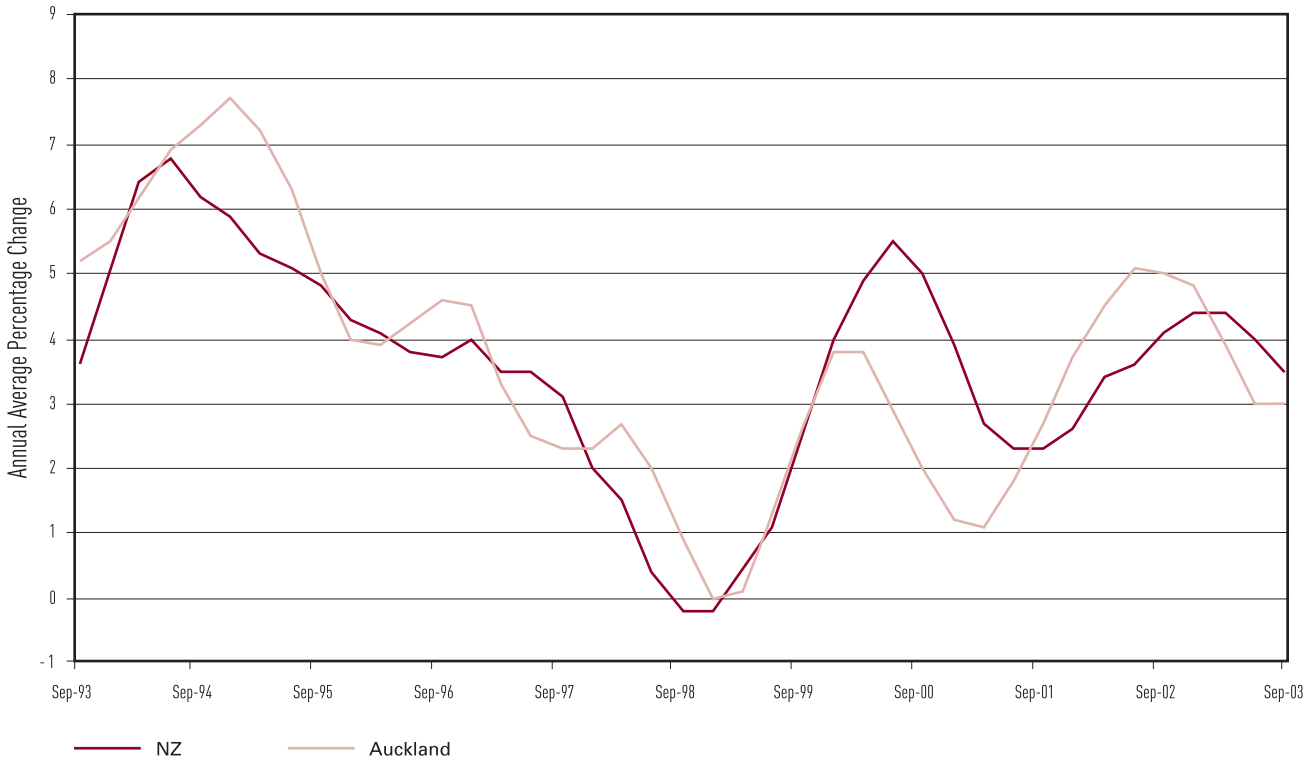
The Auckland regional economy is the nation's biggest, accounting for around 32 per cent of national GDP and 31 per cent of New Zealand's employment.

Our economy closely follows the national business cycle, which is hardly surprising given that the Auckland region accounts for one-third of the national economy and population. The Auckland regional economy is structured around commercial and domestic activity, which makes it relatively less exposed to exchange rate and global developments, but more sensitive to interest rate and immigration movements.

Growth in the Auckland regional economy over 2003 was 2.7 per cent, which puts the region below the national GDP of 3.5 per cent. Economic growth within the Auckland region and national economy has both averaged 3.3 per cent per year over the past decade.

The Auckland region's domestic exposure should make it one of New Zealand's better performing regions. The region's economy is expected to expand by 3.3 per cent over the 2004 calendar year. This is slightly better than the economy as a whole.

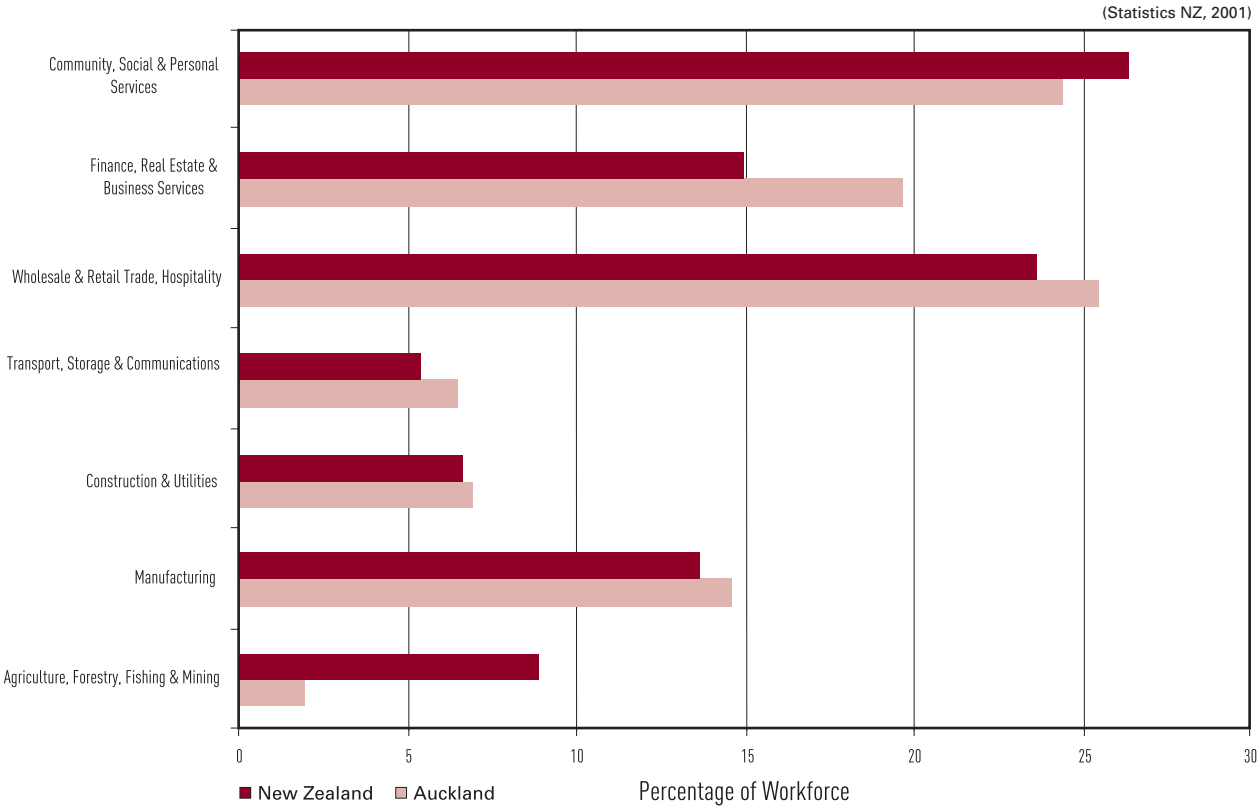
Figure 1.24: Auckland Regional Economic Growth versus Nationwide



The key industries that drive economic growth in the Auckland region include business and financial services, manufacturing, transport and communications and wholesale and retail trade, and manufacturing (Figure 1.25).

All of the sectors except Agriculture, Forestry & and Mining and Community,Social & Personal Services play a bigger role in the Auckland region's economy than elsewhere in New Zealand.

Figure 1.25: Key Industries – by Employment



Implications

The Auckland region is expected to continue to record solid growth over the next few years fueled by high population growth and infrastructure investment. The strong New Zealand dollar is restricting our international competitiveness but the Auckland region has a relatively smaller reliance upon the export sector than the rest of New Zealand. Economic activity is forecasted to expand at more than 3 per cent over the 2004 year and 2.5 per cent in 2005.

Summary of Auckland Economic Forecasts

Calendar years	Actual 2003	Forecast 2004	Forecast 2005
Real GDP growth	2.7	3.3	2.5
Unemployment Rate (Dec qtr)	3.9	4.0	4.4
CPI inflation	1.5	2.1	2.2

The Auckland region's role as the major distribution point for goods and services flowing in and out of the country has seen continued growth in the retail, wholesale and transportation sectors.

Echoing world trends, manufacturing has lost its share of employment and output to growth in the service and trade sectors. Decreasing commodity prices worldwide and the removal of protectionist trade barriers have seen a move from large commodity processing operations towards more value-added manufacturing production in Auckland. There are relatively fewer government jobs, but population growth has led to the rapid development of population-based services such as health and education. Skill levels have risen in the trade, hospitality, finance, business and service sectors. This service sector growth also reflects the uptake of new technologies, overseas immigration, rapidly improving communications and the availability of a skilled workforce.

Changes in occupational structure mean more service, administrative and professional jobs but fewer jobs in manual and low-skilled production occupations. Traditionally male-dominated low and semi-skilled jobs in particular have reduced, as all sectors (even the manufacturing industry) require higher skilled and more service-orientated jobs.

Reflecting these trends, distribution patterns of industry are changing. While the CBD and southern industrial edge still dominate, smaller centres such as Albany are growing faster.

Work and Income

The Auckland region has the highest median household income of any region in New Zealand. Over 1/3 of NZ's workforce is employed in the Auckland region. The region's unemployment rate is 3.5%.

Work and income are key determinants of individual, family and household well-being. Age, ethnicity and gender all effect our work and income; whether or not we have a job, the hours we work, the skills we have, and the options open to us.

State

Income

The Auckland region has the highest mean and median household income of any region in New Zealand. However, Wellington has the nation's highest levels of personal income, closely followed by Auckland. The regions with the lowest levels of income are West Coast, Northland and Gisborne.

On average, men earn more than women and Europeans earn more than other ethnic groups.

Income distribution has become more uneven over recent years with the top 10 per cent of income earners increasing their pay packet at a much greater rate than all others. Most of the households in the lowest-earning 20 per cent are older people living alone and single-parent households.

Table 1.3: Personal and Household Income 2001

Region	Personal Income		Household Income	
	Mean	Median	Mean	Median
Northland	$ 21,902	$ 15,187	$ 40,609	$ 30,231
Auckland	**$ 27,782**	**$ 21,117**	**$ 58,094**	**$ 48,997**
Waikato	$ 24,672	$ 18,055	$ 47,302	$ 38,477
Bay of Plenty	$ 23,294	$ 16,800	$ 43,683	$ 34,429
Gisborne	$ 21,192	$ 15,279	$ 40,243	$ 30,922
Hawke's Bay	$ 22,433	$ 16,749	$ 42,021	$ 33,442
Taranaki	$ 24,547	$ 17,330	$ 44,555	$ 34,257
Manawatu-Wanganui	$ 22,254	$ 16,344	$ 41,696	$ 32,629
Wellington	$ 29,700	$ 22,371	$ 57,489	$ 47,636
West Coast	$ 21,110	$ 14,591	$ 36,882	$ 28,390
Canterbury	$ 23,640	$ 17,602	$ 44,781	$ 36,233
Otago	$ 22,028	$ 15,719	$ 41,994	$ 33,215
Southland	$ 24,144	$ 17,752	$ 43,627	$ 35,067
Tasman	$ 22,143	$ 16,149	$ 41,551	$ 32,756
Nelson	$ 22,921	$ 17,103	$ 42,039	$ 33,587
Marlborough	$ 22,453	$ 16,956	$ 41,513	$ 33,615

(Statistics NZ, 2001)

The Size of the Workforce

In 1996 the region's labour force was 521,300 with an unemployment rate of 5.3 per cent. Between 1996 and 2001 the labour force grew to 574,300 people. By 2003 the labour force had reached 600,000, of whom only 22,300 (3.5 per cent of the region's labour force) were unemployed (Statistics NZ, 2003).

Participation in Work

A slightly lower proportion of working-age people are in employment in the Auckland region (65.5 per cent in September 2003) compared to the rest of New Zealand (66.3 per cent).

There are also variations in labour force participation between different ethnic groups. Europeans tend to have the highest participation rates (69.6 per cent in 2003), while other ethnic groups (including Asians, recent immigrants, and those whose first language is not English) have consistently lower participation rates.

Age and Employment

A greater number of young people are in tertiary education or still at school, so they now form a smaller proportion of the labour force than in the past. However, those who are in the labour force have much higher unemployment rates than those in older age groups (10.4 per cent of 15-19 year olds and 4.8 per cent of 20-24 year olds). The gap in unemployment rates between the young and older age groups is narrowing in line with an overall decrease in unemployment.

There has been an increase in the proportion of those in the 55 years and over age group who are in the labour force. In 2003, 40 per cent of the over 55 population were in the labour force compared to only 26 per cent in 1991. This is most likely the result of increased debt and a desire for financial security in retirement.

Ethnic Groups and Employment

The ethnic mix of the region's labour force (both employed and unemployed) is changing. In 1991, Europeans made up 80 per cent of the labour force but only 55 per cent in 2003. This reflects the growth of 'other' ethnic groups from 4 per cent of the labour force in 1991 to nearly 24 per cent in 2003. This result can largely be attributed to high levels of immigration during the 1990s from Asia. The Pacific Island ethnic group and Maori also increased substantially over the last decade as a proportion of the labour force.

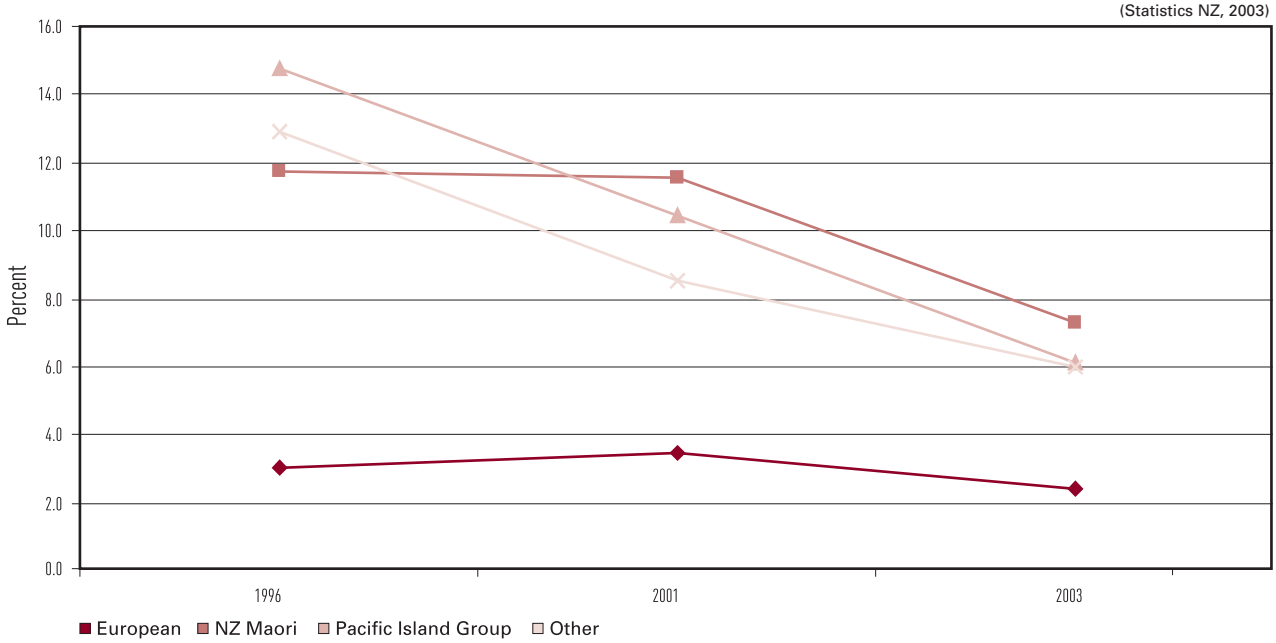
There are large differences between the ethnic groups in terms of participation in different occupational and industrial areas. Europeans (especially males) dominate managerial and administrative occupations while Maori and Pacific Island people are over-represented in manufacturing and elementary occupations and under-represented in managerial, professional, technical occupations and the trades.

The 'other' ethnic group, which includes Asian, African and some European groups, are well represented in managerial occupations and in the trade and industrial sectors, reflecting immigration trends and policies.

Maori, Pacific Island and other ethnic groups are still significantly over-represented in the unemployed group, although this has improved substantially with the current low unemployment rate (see Figure 1.26). In 2003, 7.3 per cent of Maori, 6.1 per cent of Pacific Islanders and 6.0 per cent of 'other' ethnic groups were unemployed, while Europeans had an unemployment rate of 2.4 per cent.

Figure 1.26: Unemployment Rate by Ethnic Group

(Statistics NZ, 2003)



Gender and Employment and the Nature of Work

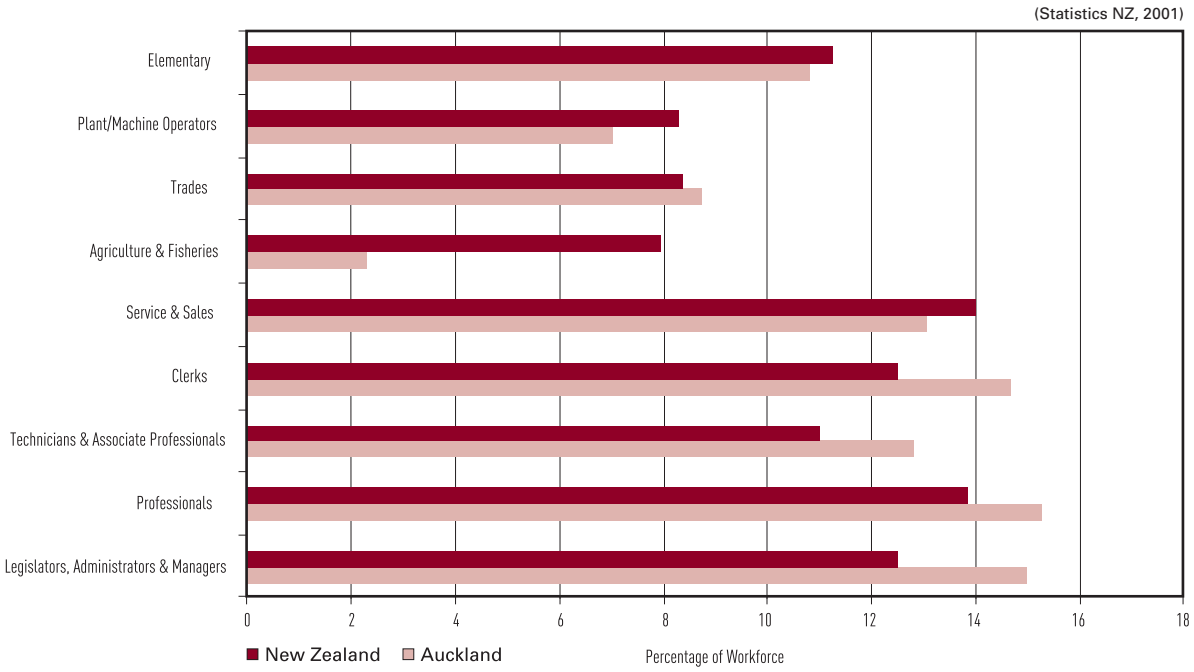
In 2003, 274,500 women made up 46 per cent of the region's labour force, compared to 44 per cent in 1991. Over 60 per cent of women were working compared with around 57 per cent in 1991, which mirrors international trends. In the Auckland region, the availability of service sector jobs, increasing numbers of women in professional occupations, and the need for multiple incomes to service living costs add to this trend.

The high-status occupational categories, particularly the managerial and administrative groups, are largely dominated by European men. However, women make up an increasing proportion of professional (53 per cent) and technical groups (47 per cent).

Figure 1.27 shows the proportion of employment in each occupation group for the Auckland region and New Zealand. It can be seen that the Auckland region has a higher proportion of employment in the skilled occupational groups (such as legislators, administrators, professionals and technicians) but lower levels of elementary jobs.

Figure 1.27: Occupations 2001

(Statistics NZ, 2001)



The average working week was 38.1 hours in 2003, 43.6 hours for full-time and 15.5 for part-time workers. Women are much more likely to be working part-time than men, working an average 33.7 hours per week, compared to 41.7 hours for men.
Legislators, administrators and managers worked longer than other occupational groups averaging 44.8 hours a week, followed by tradespeople and machine operators (averaging 42.3 and 41.7 hours respectively). Those employed in the construction and manufacturing industries generally worked the longest hours.

In 2003, people working part-time made up 19.6 per cent of the labour force, compared to 17.6 per cent in 1991. Part-time workers are concentrated in the service and sales industries, and clerical occupations.

The shift to occupations in service-based industries has resulted in manufacturing slipping to fourth in providing employment, while the wholesale and retail trades, community and personal services and business services each employ more people.

Substantial growth in professional, technical, clerical and sales and service groups between 1996 and 2003 has been at the expense of declining jobs in trade, plant and machine operators, agriculture and fisheries and elementary occupations. While men still dominate in the elementary, production and managerial occupations, women dominate in sales and service and clerical occupations.

Implications

Occupational shifts since 1996 emphasise the rise of knowledge occupations with a high growth of professionals and managers (and to some extent semi-professionals/technicians) and also some growth of service, sales and to a lesser extent, clerical and semi-skilled occupations.

There is also a trend for workers to change jobs frequently and many are investing in retraining, so they can switch occupations at some points in their careers.

In the medium to long term, the proportion of people in paid full-time employment is likely to decrease as a result of the effects of an aging population. This is enforced by lower participation rates of young people who are entering the workforce later in order to pursue higher education opportunities. However, the participation rate of those in the 55-plus age group has been increasing, with people retiring at a later age to ensure financial security in retirement.

Over the last few years access to skilled labour has been a significant limiting factor for firms. The region's unemployment rate of 3.9 per cent is one of the lowest levels in the OECD. Rising immigration and higher labour force participation have expanded the pool of labour, but have been insufficient to meet demand. Skill shortages are in turn placing upward pressure on wages.

At the workplace, your colleagues are more likely to be non-European, female and in their middle years than 10 years ago. As the make-up of the labour force changes, so will the support services needed in areas such as childcare, public transport and recreation. Maori and Pacific Island groups, especially young people and young men in particular, represent a major proportion of unemployed and jobless in the region. This has not changed much over the last decade.

Education

Over 160,000 students are enrolled in primary and intermediate schools in the Auckland region. 88,900 students attend tertiary institutions. The number of people with university qualifications has grown from 9 to 15% during the 1990s.

Access to education provides people with the knowledge and skills they need to participate fully in society. Education can also enhance people's self-worth, security and sense of belonging.

State

Education opportunities in the Auckland region are provided at the pre-school, primary, intermediate, secondary and tertiary levels. Many people also continue to learn through work-based training and community-based programmes throughout their lifetimes.

Early Childhood Education

An increasing proportion of children under five are participating in early childhood education with 60 per cent nationally in 2000 compared to 54 per cent in 1996. Between 1996 and 2001, national enrolments in early childhood education increased by 9,536 (7 per cent). In July 2000, there were 1,073 early childhood education facilities in the Auckland region serving 49,529 children.

The main providers of early childhood education are kindergartens, play centres, Pacific Islands language groups, education and care services, home-based care services and köhanga reo.

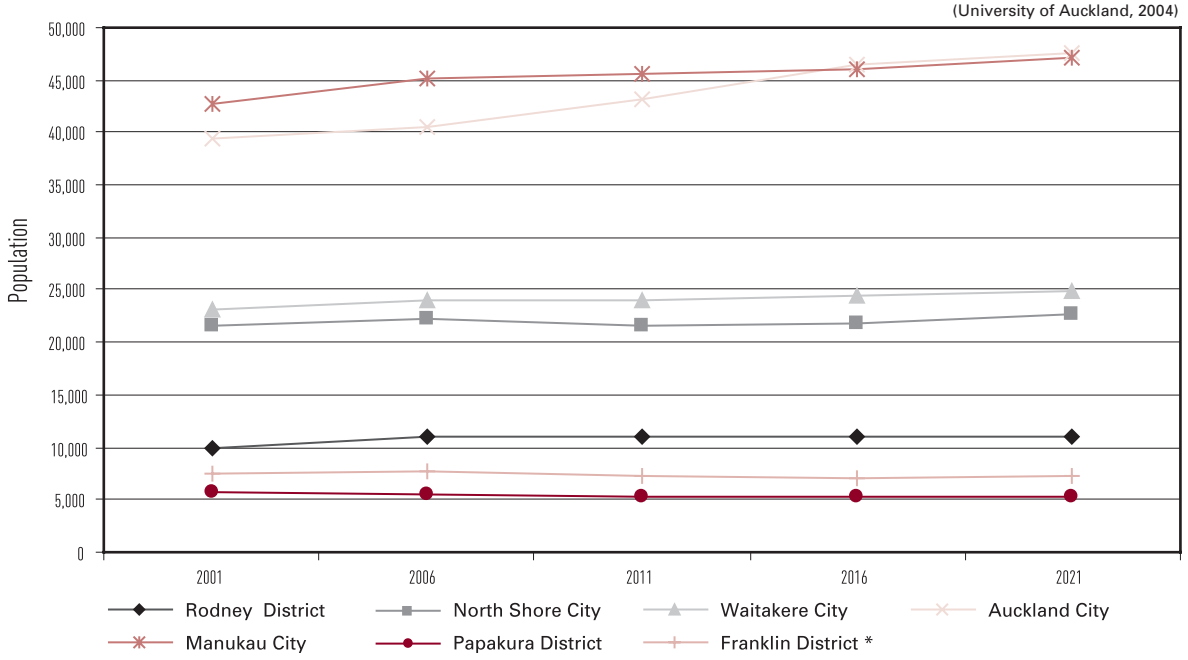
Primary, Intermediate and Secondary Schools

The growth rate of enrolments in primary/intermediate schools in the Auckland region remains the highest in New Zealand at 3.8 percent annually. Enrolments in the region were 161,365 in 2003, an increase of 8 per cent from enrolments in 2000 (149,569).

The number of children aged 5 – 12 is expected to flatten off after the large increases of the 1990s caused by the 'echo baby boomers' – children of baby boomers born in the late 1980s and early 1990s. Franklin and Papakura are expected to experience a drop in the population aged 5 –12, while the greatest level of growth is predicted to occur in Auckland City (with 20 per cent over the 20 year period) followed by Rodney District (11 per cent) and Manukau City (10 per cent).

Figure 1.28: Population Projections Ages 5 - 12

(University of Auckland, 2004)

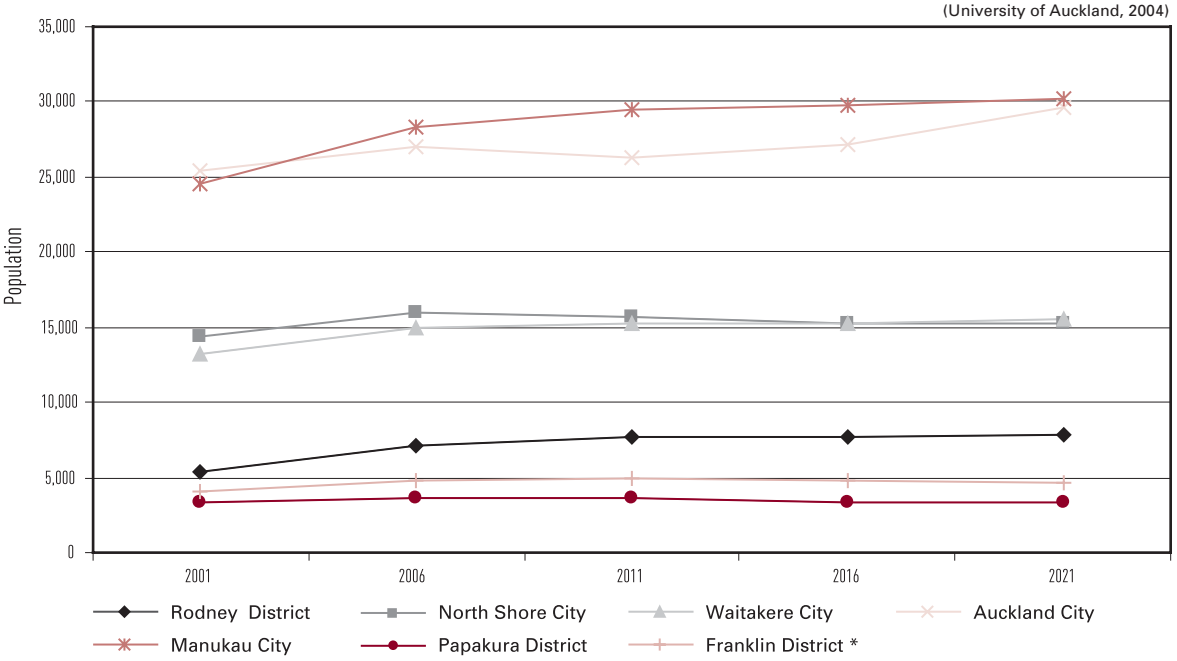


At the secondary school level, enrolments in the Auckland region were 87,113 in 2003, up from 72,359 in 2000 (an increase of 20 per cent over the three year period). This high rate of growth is a result of more people staying at school longer due to an increase in the leaving age and relatively few jobs for school leavers, the entry of the 'echo boomers' into secondary education and high levels of migration.

The 'echo baby boomers' are now moving into the 13-17 age group between 2001 – 2004, resulting in a relatively high level of growth for this age group. The greatest growth rate over the 20 year period is seen in Rodney District (44 per cent) followed by Manukau (23 per cent), Auckland and Waitakere City (17 per cent) and Franklin (15 per cent).

Figure 1.29: Population Projections Ages 13 - 17

(University of Auckland, 2004)



In 2003, 47 per cent of students were of European ethnicity, 15 per cent were Maori, 19 per cent Pacific Island, 16 percent Asian and the remaining 3 per cent were classified as other.

Tertiary Education

There were 88,900 students attending the public tertiary institutions throughout the Auckland region in 2002, up from 68,000 in 1999.

Currently, the Auckland region has three universities, two polytechnics and a teacher's college. They are scattered throughout the region with a concentration in central Auckland and are notably absent from the west. Table 1 shows the numbers of students at the various tertiary institutions in the Auckland region.

Table 1.4: Key Tertiary Education Providers in the Auckland Region

Institution	Year								
	1994	1995	1996	1997	1998	1999	2000	2001	2002
Auckland College of Education	4615	4895	4973	5039	4586	5245	5480	5280	5,024
University of Auckland	24202	24864	25900	25752	26076	26953	27571	29450	31,515
Auckland University of Technology	14468	14270	14783	15361	15385	15671	18331	18908	21,482
Manukau Institute of Technology	9809	11674	12829	11903	10739	10221	10415	11226	11634
UNITEC Institute of Technology	11871	10557	10537	11526	10406	10553	11704	13338	14886
Massey University									4,389
Total	**64965**	**66260**	**69022**	**69581**	**67192**	**68643**	**73501**	**78202**	**88930**

(Ministry of Education, 2002)

While nearly two thirds of university students study full-time, less than half of polytechnic students study full-time. Women make up 56 per cent of the region's tertiary student population and 51 per cent of the polytechnic student population. This may indicate that more males are taking up training opportunities in trade and work-based training.

Educational Achievement

Census data shows that the proportion of people with university qualifications grew from 9 to 15 per cent between 1991 and 2001. A further 19 per cent had a post school qualification from a non-university institution in 2001, down from 32 per cent in 1991. In 2001, 43 per cent of people had a school qualification, up from 33 per cent in 1991. At the other end of the spectrum, 23 percent of the region's population reported having no qualifications in 2001, down 7 per cent from 1991.

Overall, people appear to be achieving higher school qualifications, due in part to raising the school leaving age, changes in the system to allow more people to achieve a school qualification and increased requirements and competition for entry into tertiary institutions and employment.

Implications

The wave of 'echo bay boomers' progressing through the secondary school system will make demands on secondary and tertiary education for the next 20 years. In addition, the increasing requirements of employers and competition for jobs will increase demands for post school education facilities. Like other elements of social infrastructure, these facilities will need to be sited close to growing communities, such as in higher-density urban areas.

Full participation in the labour market and in tertiary education is becoming more dependent on achievement at school. OECD Education Indicators show that access to formal education in early years is important to be able to make use of opportunities to learn later in life.

Household Labour Force Survey figures suggest that people with no school qualifications are more likely to be unemployed. As proportionally more people participate in education after the school leaving age, this will create more pressure on education providers to allow for life-long learning opportunities.

Energy Use and Waste

In 2003 Aucklanders used 111 million cubic metres of fresh water, and discharged 122 million cubic metres of treated wastewater, and 1.02 million tonnes of solid waste.

Every living thing uses resources (including air, water and energy) and produces waste (in liquid and solid form). People can disrupt the natural cycling of resources by using more resources than are available on an ongoing basis, and generating more waste than can be assimilated by our environment.

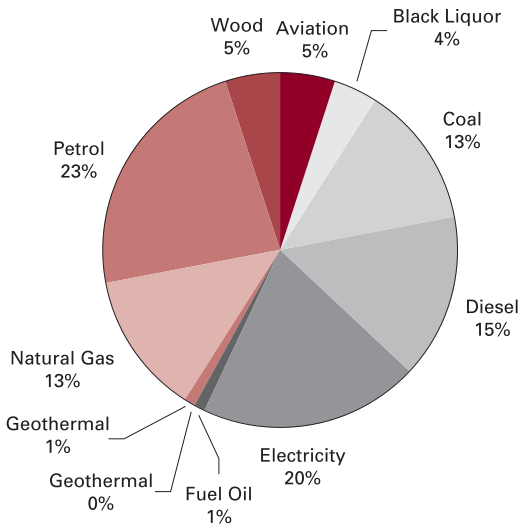
State

Energy

Energy is consumed in many forms. We need electricity and other fuels to help provide us with goods and services, such as warmth, light and transportation. In 2002, the people in the Auckland region used almost 146 million gigajoules (GJ[1]) of energy, derived from a variety of sources.

Figure 1.31 shows what types of energy were consumed in the Auckland region in 2002. About 43 per cent of all the energy consumed (petrol, diesel and aviation fuel) was used for transport.

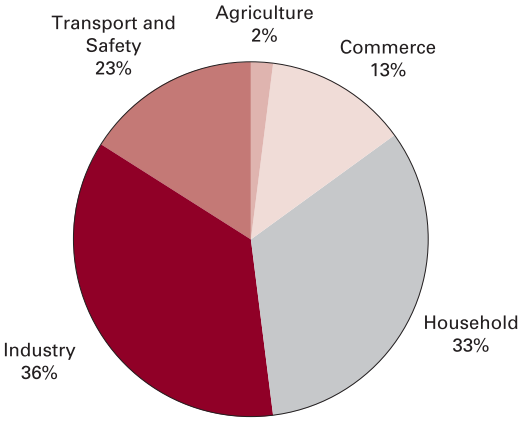
Fig 1.30: Energy Sources in the Auckland Region in 2002



(Eeca, 2004)

[1] GJ is 1 billion (109) joules or 238,800,000 calories.

Fig 1.31: Use of Energy in the Auckland Region in 2002



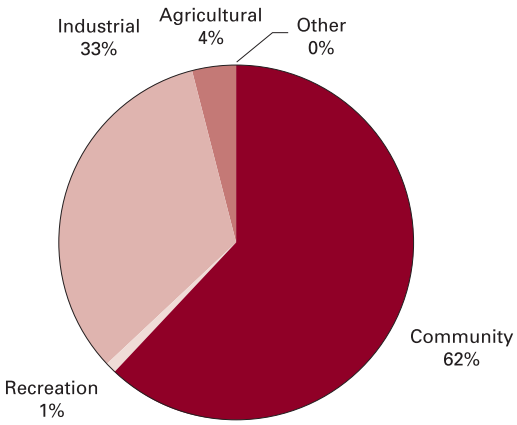
(Eeca, 2004)

Figure 1.32 shows which sectors of our society consume this energy, for example the household sector energy consumption includes the use of transport fuels. Households have increased their energy consumption by 7 per cent since 1995.

Water

Water is essential to maintain life on Earth, and although it seems a plentiful resource, clean fresh water is not as ubiquitous as many people think. In the Auckland region, water comes from surface water sources (67 per cent) such as streams, rivers and dams, and groundwater (33 per cent) – in 2003, over 111 million cubic metres were consumed. The majority is used for domestic purposes (see Figure 1.33), although industry also uses a significant amount of water.

Fig 1.32: Water Use in the Auckland Region 2003

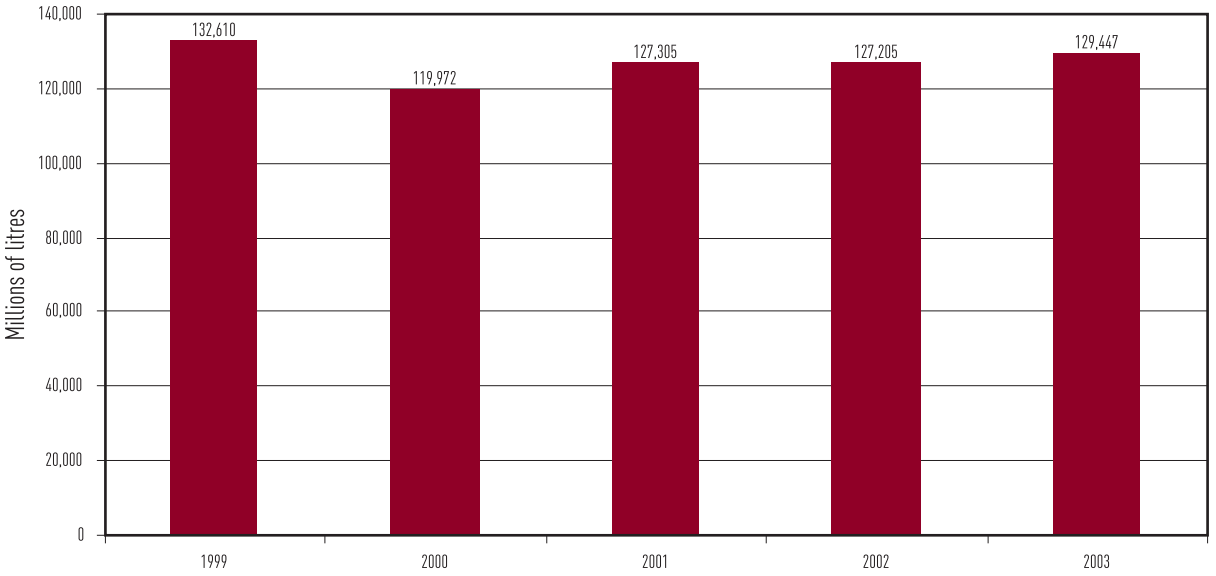


Liquid waste

The Auckland region is home to 16 sewage treatment plants. Fourteen of them are in the Franklin and Rodney Districts and are relatively small. The remaining two – in Mangere and Rosedale – service the Auckland, Manukau and Waitakere urban areas and the North Shore respectively.

Figure 1.33 shows the amount of treated sewage effluent that has been discharged form these facilities since 1999. The Mangere and Rosedale plants contribute 96 per cent of the total quantity, which means that urbanised Auckland discharges an average of 122,000 million litres of sewage per year, or around 334 litres per person per day!!

Figure 1.33: Sewage discharged in the Auckland Region

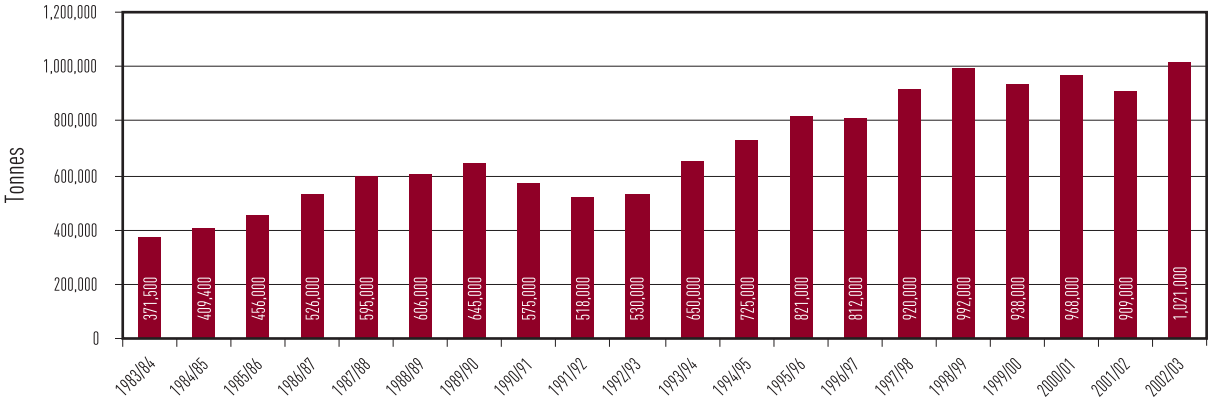


Solid waste

Between July 2002 and June 2003, over 1 million tonnes of solid waste was disposed of in the landfills throughout the Auckland Region (Figure 1.34) - almost twice as much as only 10 years ago. About a third of this waste is from households. The amount of solid waste disposed is closely linked to economic and population growth. It has also increased due to an increasing amount of special wastes requiring disposal.

Special wastes (22 per cent in 2003) mainly consist of contaminated soils, which are treated and landfilled after a contaminated site has been cleaned up. As more and more contaminated sites are being dealt with, this part of the waste stream continues to increase.

Figure 1.34: Solid Waste Disposal in the Auckland Region

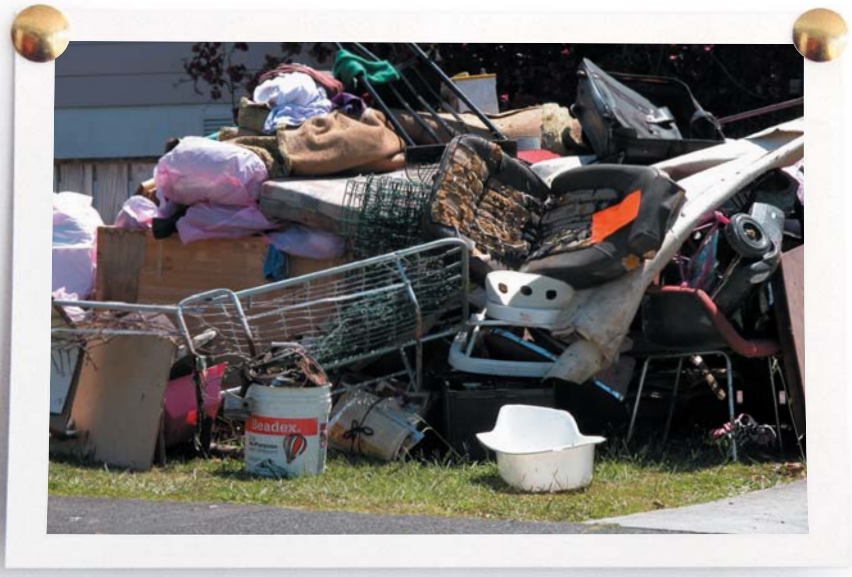


Implications

Our modern way of life utilises large quantities of natural resources such as energy and water. Population growth outstripping the development of our infrastructure has meant that at times our access to these resources has been constrained, as the water supply crisis of 1994 and the electricity supply crisis of 1998 have amply demonstrated.

Waste production is a normal part of life. However, human beings are now generating wastes that are not easily broken down by natural processes, and in quantities that are unprecedented. This applies both to solid and liquid wastes, the former being deposited in landfills and the latter being discharged from sewage treatment plants.

While minimising the potential effects on waste on the environment, the increasing waste burden not only has the potential to adversely effect the environment, but it also represents an inefficient use of resources. In order to live more sustainably, we need to minimise our waste generation, through activities such as waste reduction, reuse and recycling.



Leisure Patterns

67% of adults in the Auckland region are active for more that 2 1/2 hours each week.

The average amount of time spent being active each week is 8.6 hours.

The region needs to be able to accommodate the increasingly diverse leisure-time needs of its growing population. The growing pressure on outdoor recreational resources is placing demands on the quality of these environments.

State

Sixty-seven per cent of adults in the Auckland region are physically active – meaning they undertake at least 2.5 hours of physical activity per week. Men are more likely to be active than women, and on average for 1.5 hours longer per week. On average, adults in the region spend 8.6 hours being active per week, slightly lower than the national average of 9.3 hours.

Sixty-four per cent of young people in the Auckland region take part in sports and leisure activities, spending on average 6.0 hours per week, compared with 68 per cent of young people in New Zealand, who spend 6.6 hours per week. However, 9-12 year olds have a lower level of activity than the New Zealand average (6.0 hours compared to 7.2 hours).

Figure 1.35: Activity Levels

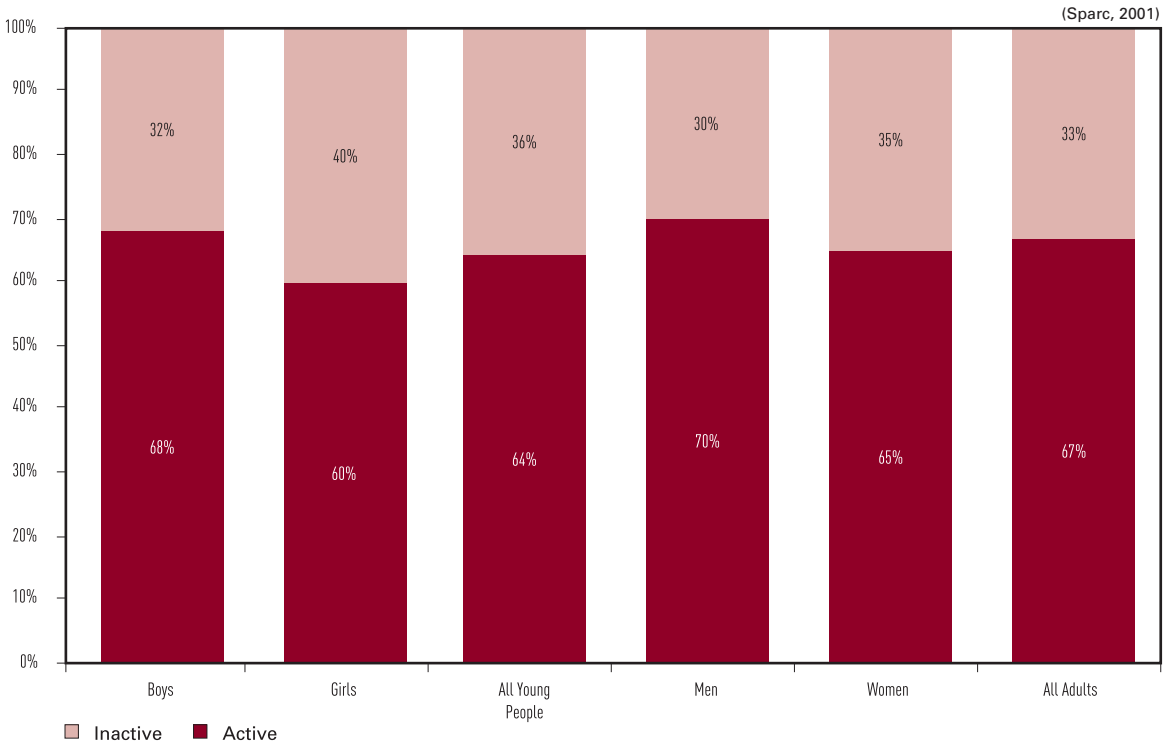
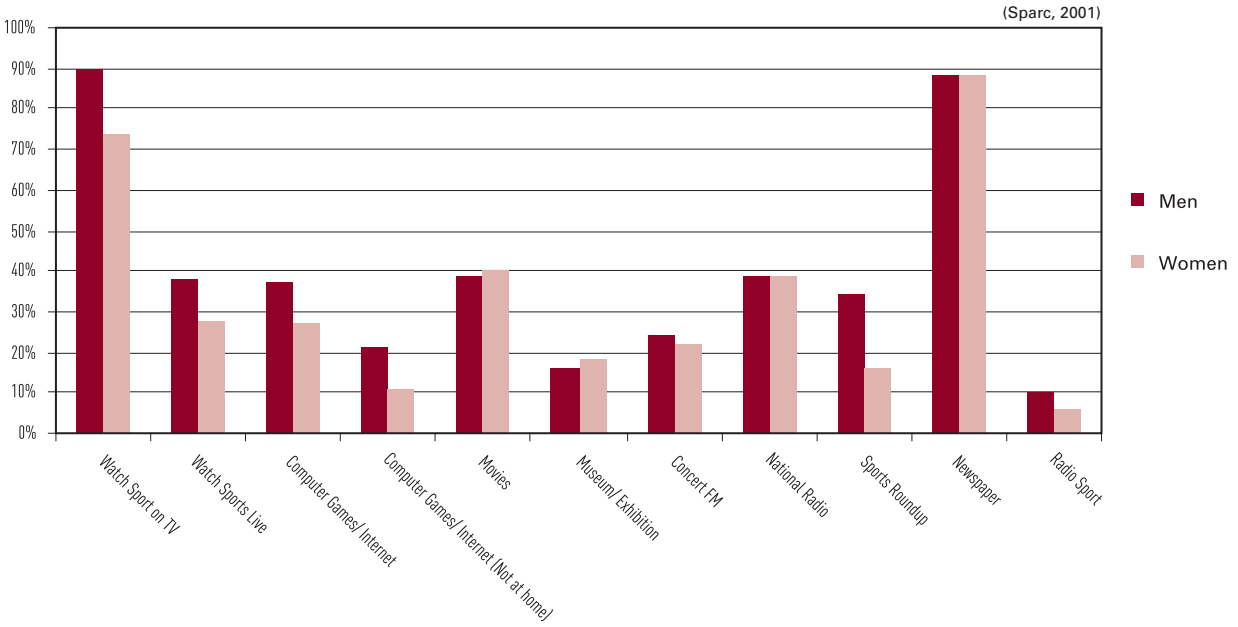


Figure 1.36: Other Leisure Activities



By international standards people in the Auckland region are relatively physically active, despite sedentary activities (such as watching TV) being the most frequently reported leisure activities for New Zealanders.

The Auckland Region's 67 per cent of physically active adults compares well with places like Finland at 70 per cent, and is better than Australia at 57 per cent, the UK at 35 per cent, and the USA at 32 per cent. Almost all adults in the Auckland region enjoy some form of sport or active leisure – golf (25 per cent) being the most popular sport with men, and tennis (10 per cent) the most popular with women. Walking (83 per cent of women and 65 per cent of men) is the most popular active leisure pursuit for adults in the Auckland region.

However, there are emerging trends that give cause for concern. The level of inactivity in young people is growing. One third of young people (5-17years old), and up to 48 per cent of Pacific Island girls, undertake no or less than 2.5 hours of physical activity per week.

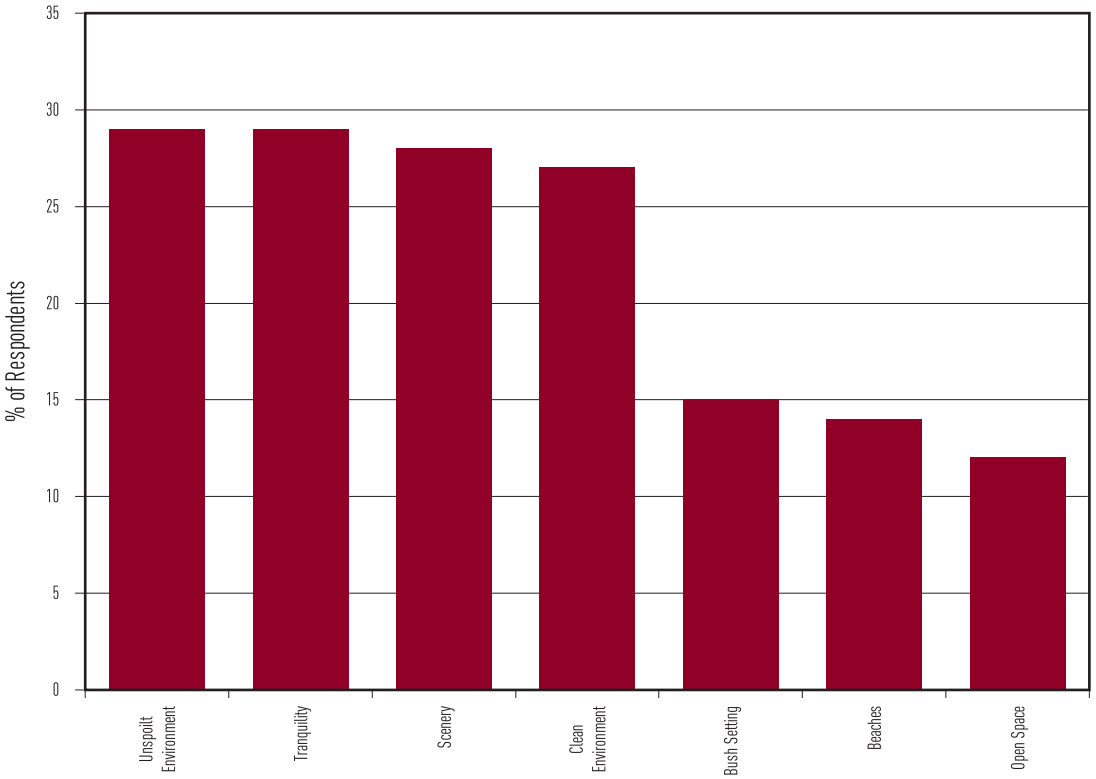
The main leisure settings (for people to have visited in the last four weeks) are shopping centres (56 per cent), restaurants (52 per cent), beaches/rivers/lakes (50 per cent) and walking tracks (23 per cent). The most common activities in New Zealand's parks include sightseeing, viewing scenery, relaxing and short walks.

Our most popular activities – walks, picnics, and driving for pleasure have remained stable over time, with emerging activities including mountain biking, wind surfing and parapenting. People are attempting more short-lived activities and are seeking a variety of experiences from any location. Many activities are also becoming more specialised. For example, distinctions are now made between sea, white-water or flat-water kayaking. Outdoor activities are also becoming less structured and more individual.

Types of recreation activity are influenced by a range of personal characteristics. For example, active outdoor pursuits tend to attract younger people, while more passive activity appeals across all age groups. Outdoor recreationists are often more highly educated, with some studies indicating as much as 50 per cent having full or some tertiary qualification. Age also affects how we use parks – studies of non-users of parks found higher proportions of non-European, disabled, older and low socio-economic groups.

People in the Auckland region most value, in order of importance, a natural unspoiled environment, peace and quiet, scenery, an unpolluted and clean environment, bush settings, beaches/sea water and open space. Our parks are used for a wide range of informal recreation activities.

Figure 1.37: Reasons People Value Outdoors



Implications

Our leisure patterns influence the type of facilities that need to be provided. Increasing growth and development of urban areas mean greater opportunities for urban leisure experiences such as in shopping malls and restaurants.

However, greater population also means more pressure on non-urban leisure settings, and potentially having to go further and to different places for experiences such as remote bush walks and fishing.

ARC Responses

The ARC undertakes a range of functions in relation to the issues discussed in the People chapter. These can be summarised as follows:

Key Planning Initiatives

The focus of the Auckland Regional Growth Strategy is to ensure that the Auckland region grows in a way that maintains the values which make the region a great place to live - a vibrant economy and society, and a clean and healthy natural environment.

The Auckland Regional Land Transport Strategy sets an overall strategy for improving transport in the region, both through new roading projects and public transport services.

The Auckland Regional Economic Development Strategy seeks to ensure opportunities for economic development in the Auckland region are maximised.

The Regional Open Space Strategy helps to provide for leisure and recreational opportunities in open space areas throughout the Auckland region.

Key Monitoring Initiatives

The ARC indirectly monitors (i.e. we use information gathered by other agencies such as Statistics NZ) many of the issues discussed in the People chapter. Things like the size of the regional population, their ethnicity, age and income all affect the demand for urban land and housing and a range of social infrastructure as the region grows.

The ARC monitors issues such as public transport use and traffic congestion. In addition, the ARC monitors the direct use of resources and the disposal of waste to ensure that these activities take place in a way which minimises any adverse effects on the environment.

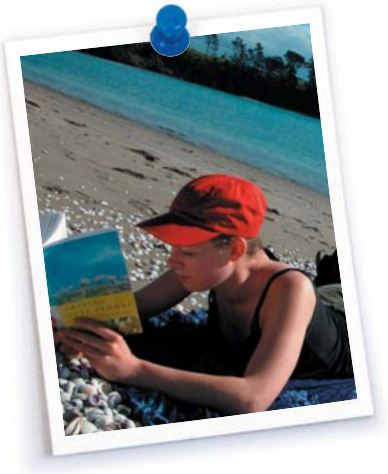
More information on ARC functions and activities can be found in the ARC Long Term Council Community Plan (LTCCP).

Key Implementation Initiatives

In order to help reduce congestion and improve accessibility and mobility, the ARC subsidises much of the public transport services in the Auckland region - including buses, trains and ferries. To help people use these services, Rideline provides information about public transport services. Additional assistance is provided for students, the elderly and the disabled to use public transport.

The ARC owns and operates 21 regional parks covering 38,000 hectares andranging from sandy beaches, farmland and bush-clad hills to the Regional Botanic Gardens and Ericsson Stadium, which provide for a range of leisure opportunities. Parksline allows people to make reservations or enquire about the regional parks network.

The ARC directly regulates the use of some resources, such as the abstraction of water or the disposal of waste, to ensure that any adverse effects on the environment are minimised. In addition, the ARC along with city and district councils operates the Hazmobile to enable the correct disposal of household hazardous wastes.



Air and Atmosphere

Air and Atmosphere

Weather and Climate

Auckland typically receives around 2,000 hours of sunshine each year. The average temperature is 15.2 degrees.

"Weather" is the overall state of the atmosphere at any particular time and, in the Auckland region, is notoriously changeable. It affects how we feel, and how we enjoy the outdoors. "Climate" refers to the average weather experienced by a region over time. Extremes in our climate and weather patterns can lead to a range of environmental issues such as drought and floods.

State

Table 2.1 summarises the key climate indicators for the Auckland region for 2003 compared to the other two main centres – Christchurch and Wellington - and long term averages over the past four decades.

Typically, the Auckland region experiences comparable sunshine hours to both Wellington and Christchurch. However, in 2003 we enjoyed 200 fewer sunshine hours than our long term average, and 400-500 fewer hours than either of the other two main centres. However, sunshine hours in the Auckland region vary significantly from year to year as they are dependent on the amount of cloud cover.

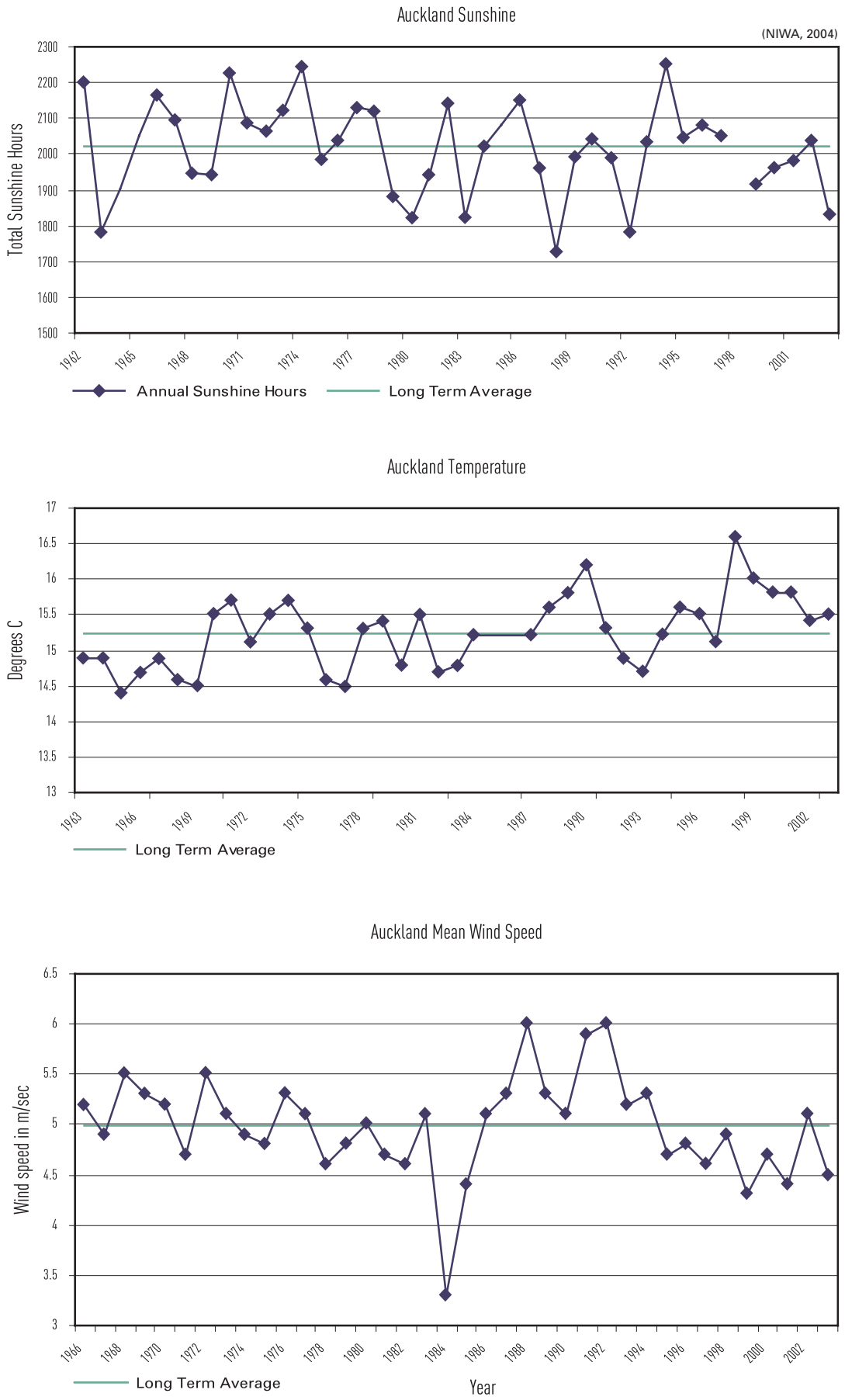
The 2003 average temperature for the region, at 15.5 °C was slightly warmer than our long term average of 15.2 °C and significantly warmer than Wellington or Christchurch (13.1 °C and 11.4 °C respectively), mainly because of our more northern latitude and marine setting. The temperature also varies significantly across the region, with the Takapuna monitoring station recording the highest mean temperature and other monitoring sites logging mean annual temperatures up to 3.7 °C less. Since 1998, the annual mean temperature measured for Auckland has been consistently higher than the long-term average.

Table 2.1: Key Climate Indicators for Auckland versus Other NZ Locations

	Auckland	Wellington	Christchurch
Sunshine 2003 (Hours)	1833.2	2271.4	2361.6
Long-term Average Sunshine (since 1962)	2020.5	2062.3	2079.0
Mean Temp 2003 (°C)	15.5	13.1	11.4
Long-term Average Mean Temp (since 1963)	15.2	12.8	11.6
Mean Wind Speed 2003 (m/s)	4.5	6.9	4.0
Long-term Average Mean Wind Speed (since 1966)	5.0	7.4	4.1

(NIWA, 2004)

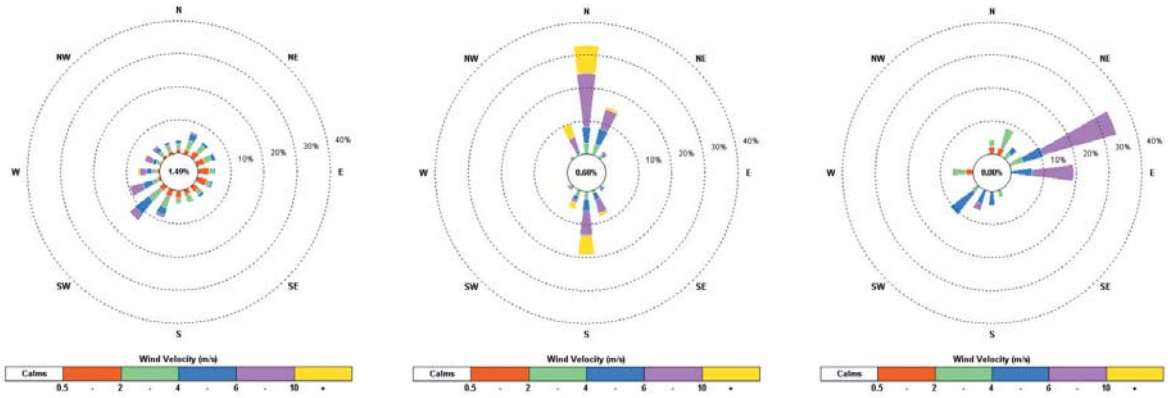
Figure 2.1: Variability in Key Climate Indicators for Auckland



As seen in Figure 2.2, the prevailing winds in the Auckland region in 2003 were moderate and predominantly from the south-west and west. By comparison, Wellington was affected by significantly stronger winds, principally from the north and south because of its geography. The majority of winds in Christchurch are from the north-east or easterly direction due to offshore conditions produced by the Southern Alps and land sea breezes. There is little variation in the mean wind speeds recorded for Auckland on a year by year basis.

Figure 2.2: Wind Speeds and Wind Directions for Auckland, Wellington and Christchurch in 2003

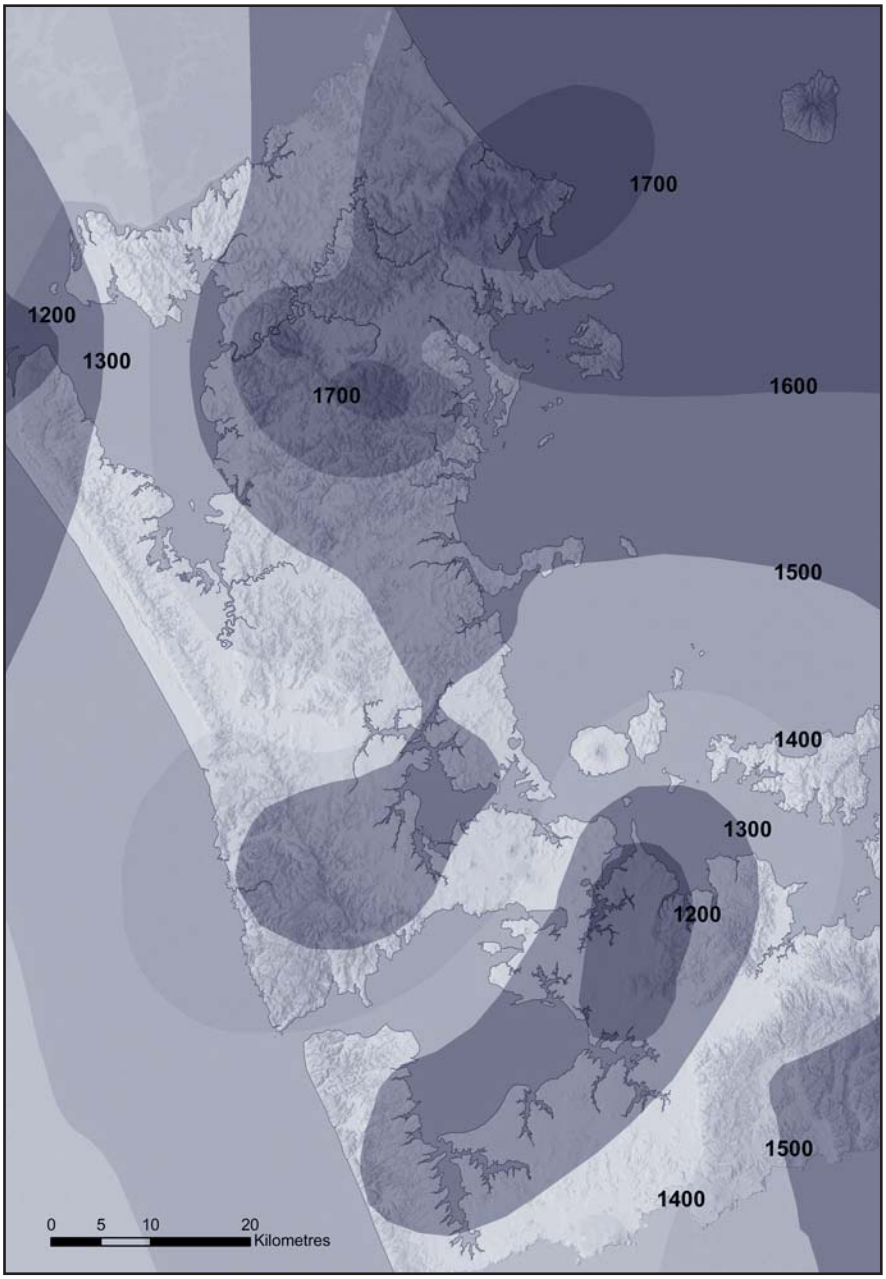
(NIWA, 2004)



Auckland Wellington Christchurch

Figure 2.3 illustrates the average rainfall measured in 2003. There was a reasonably wide distribution of rainfall throughout the region, with relatively dry areas around Manukau and the Franklin lowlands, while areas near Warkworth and Leigh received up to 50% more rain. Rainfall is determined to a large degree by the wind direction, and the general pattern across the region is more rainfall in elevated areas, such as the Waitakere Ranges.

Figure 2.3: Auckland Regional Annual Rainfall (mm) for 2003



Implications

The weather and climate affects many things we do, and often about how we feel about living in the Auckland region. Weather dependent activities include beach outings and our enjoyment of summer, sports events, agriculture and primary production, and just moving around outdoors.

Rainfall affects many things – too much and we can experience flooding, too little and we can have water crises and drought. Wind itself can cause damage to trees and property, while not enough wind (for example on cold, still winter days) can lead to a build up of air pollution in urban areas.

While the weather in the Auckland region is already variable, there is a concern that our climate (long term weather conditions) may be changing as a result of human activities – see Global Atmospheric Issues.

Global Atmospheric Issues

Ultra Violet Light levels have increased by 6-9 per cent since the 1970s. Carbon dioxide levels have risen by about 30 per cent since pre-industrial times.

In the past, long-term climate change and short-term climate variability have been caused principally by naturally occurring processes, which have a tendency to vary about a "normal" state due to self-regulating processes. Now this situation appears to be changing. With an increasing human impact on the atmosphere, there is now the possibility for major changes in global climate which could have significant impacts on our regional climate.

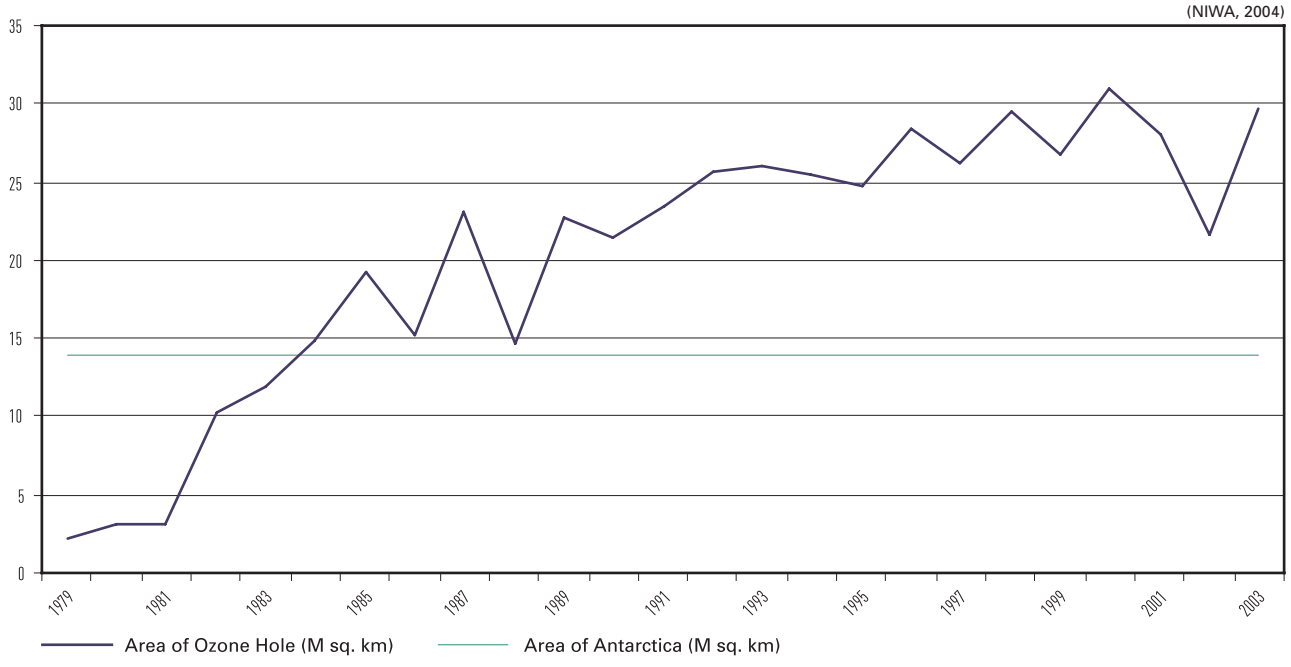
State

The two main global atmospheric processes that affect life on earth are the ozone layer and the greenhouse effect.

The ozone layer in the stratosphere (around 25km from ground level) protects us from the sun's ultraviolet radiation. Ozone (O_3) concentrations in the upper atmosphere have been significantly depleted over the past 20 years by manufactured gases that contain chlorine, such as chlorofluorocarbons (CFCs).

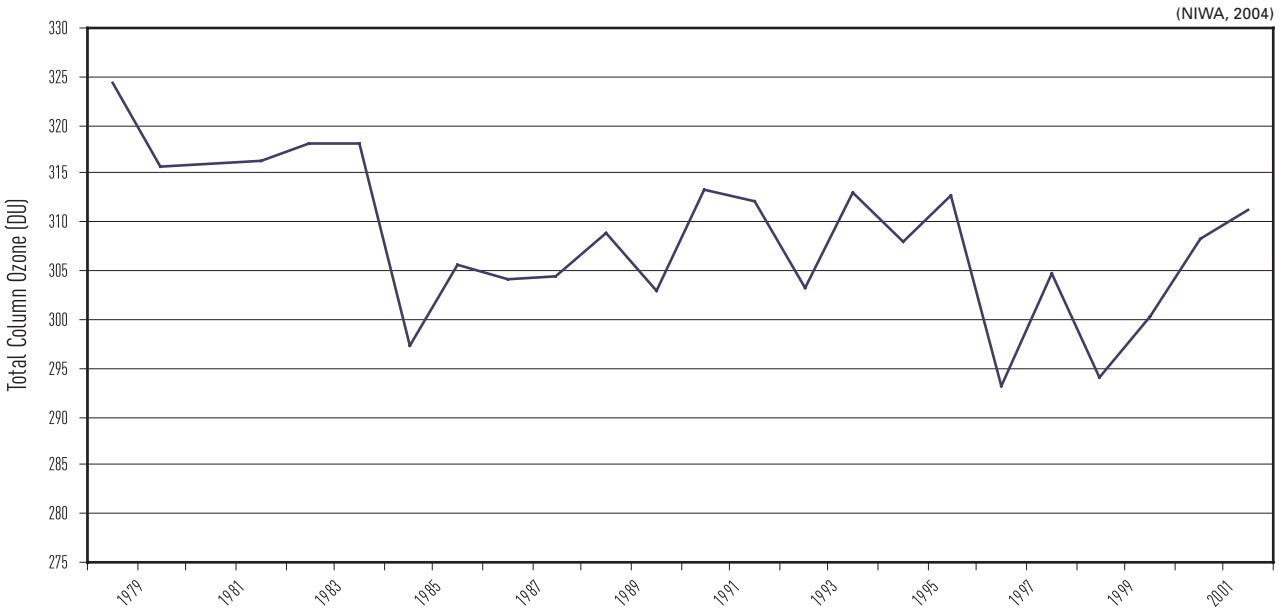
Figure 2.4 shows the size of the ozone hole over the Antarctic, which has appeared every spring since the 1980s. Depletion of ozone in the upper atmosphere has resulted in increased levels of ultraviolet radiation (UV). In New Zealand UV-B levels have increased by 6-9 per cent since the 1970s, mirrored by a corresponding decrease in stratospheric O_3 shown in Figure 2.5.

Figure 2.4: Change in Size of the Ozone Hole over Antarctica



Since pre-industrial times, the total concentration of chlorine in the atmosphere has risen by more than 600 per cent from 0.6 parts per billion to 4 parts per billion. However, since international agreements were signed in 1989, the emission of ozone-depleting substances has reduced globally, and it is expected that the concentration of chlorine in the atmosphere will begin to decline from now onwards. In New Zealand for example, the import and manufacture of most ozone-depleting substances has been banned. Even with these measures in place it will still take at least 100 years before the amount of chlorine in the atmosphere returns to near its natural level because of their long life in the atmosphere.

Figure 2.5: Change in Stratospheric Ozone measured at Lauder (Otago)

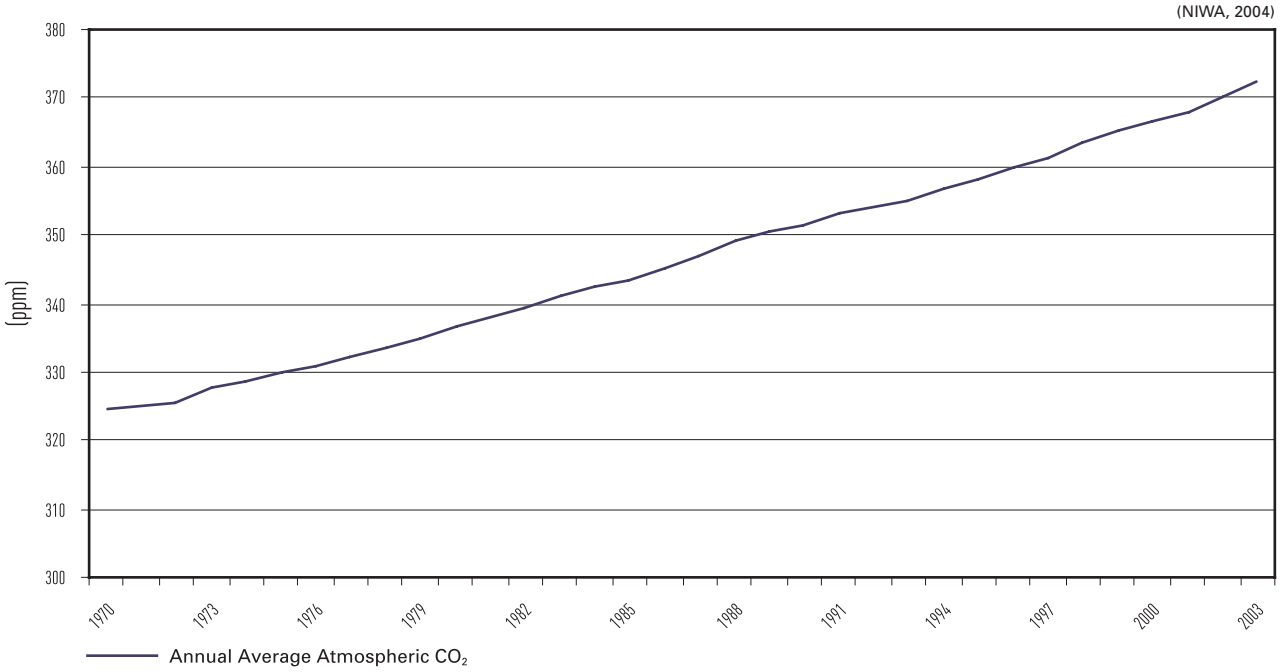


Greenhouse gases provide insulation to maintain the earth's climate within a relatively stable temperature range. Greenhouse gases include water vapour, carbon dioxide and methane. Carbon dioxide (CO_2) levels in the atmosphere are higher than they have been for millions of years. Figure 2.6 shows the increase in the levels of CO_2 in the atmosphere measured at Baring Head (near Wellington) since 1970. Since pre-industrial times, CO_2 levels in the atmosphere have risen about 30 per cent – primarily from the burning of fossil fuels and the global reduction in forests which act as carbon sinks. The largest growth in New Zealand's CO_2 emissions has come through the increase in fossil fuel usage for transport and electricity generation.

Methane levels in the atmosphere have also risen dramatically, almost doubling over the last 400 years, due to more intensive farming methods and increased waste generation with the growth of the world's population. Methane is produced primarily by livestock and decomposing waste in landfills and sewage treatment plants.

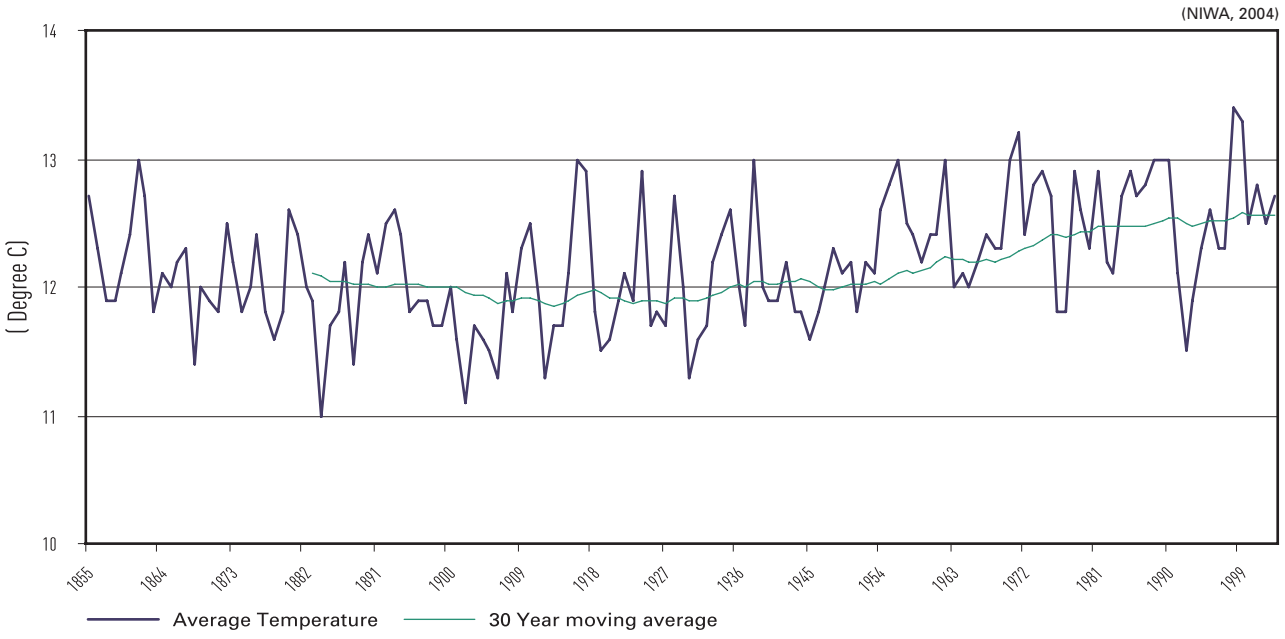
Current predictions indicate that in the absence of further policy measures, New Zealand's net greenhouse gas emissions will be 34 million tonnes more than the 1990 level by 2012.

Figure 2.6: Change in Atmospheric CO_2 measured at Baring Head (Wellington)



From 1885, the starting point for detailed measurements in New Zealand, we have seen a corresponding increase in the mean temperatures across New Zealand (see Figure 2.7). This suggests that the greenhouse effect is indeed being enhanced by man-made emissions of CO_2 and other gases, but the likely extent of the effect is still being debated in the scientific community.

Figure 2.7: Change in NZ's Annual Average Temperature



Implications

Life on earth depends on the protective shield of ozone in the upper atmosphere, and the natural greenhouse effect of the various gases in our atmosphere. The ozone layer filters harmful radiation from the sun before it reaches the earth's surface, whilst the greenhouse effect keeps temperatures within a liveable range. Scientists believe that through human activities, a range of gases have been, and are continuing to be released into the atmosphere which may impact and modify these natural processes.

Production and use of chlorinated chemicals such as CFCs continues to result in depletion of ozone in the upper atmosphere well after the majority of these chemicals have been banned or restricted, due to their long atmospheric lifetimes. As a consequence, increased levels of ultraviolet radiation (UV) are now passing through the Earth's atmosphere and are likely to remain high for another 100 years until the chlorine in the atmosphere returns to its near natural levels. Increased levels of UV can lead to effects on plant life (including possible crop size reductions) along with eye and skin problems.

The scientific community now believe that the release of greenhouse gases from human activities is causing global temperatures to rise and weather patterns to change. In New Zealand, our average temperature has risen 1.1 °C and our sea level has risen by 15 cm in the past century. These changes still fall within the range of natural variability, but scientists believe that human activities have and will influence global climate.

Higher global temperatures in the long term may lead to effects such as sea level rise. The last major change in sea level (about 6000 years ago) established the general position of our present coastline, although subsequent minor sea-level changes, the action of coastal processes and human activities have modified this slightly. There is substantial evidence of historical sea-level rise on a world-wide scale.

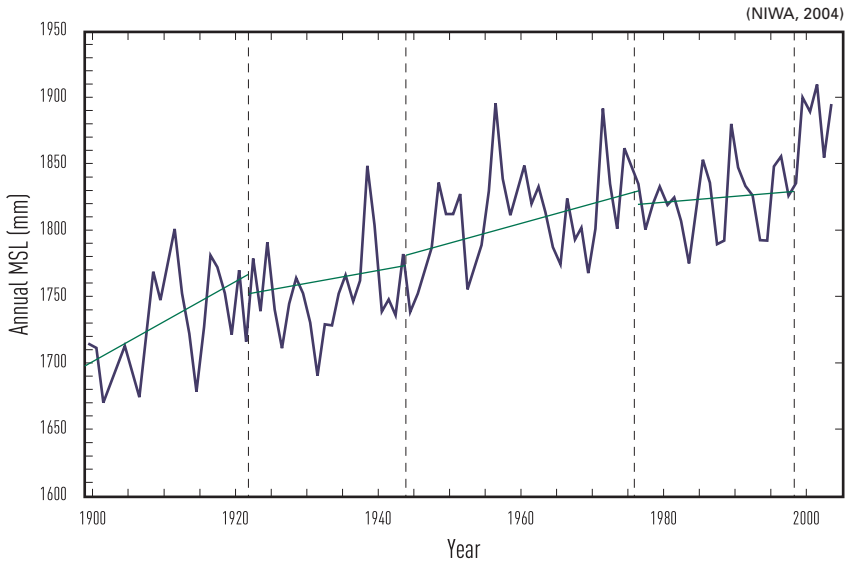
The longest sea-level record in New Zealand is that for the Port of Auckland (Waitemata Harbour). This shows a trend of rising sea-level since 1899 of 1.4 mm per year (or 0.14 m per century – see Figure 2.8). In comparison, the NZ average has been slightly higher at 1.7 mm/yr, and the global average was a rise of between 0.1m – 0.2m over the 20th Century.

There is no discernible evidence of a recent increase in the rate of sea-level rise. However, sea-level is influenced by a wide range of physical driving forces, e.g. storm surges, tides, changing atmospheric pressure, effects of the Southern Oscillation (which results in El Niño and La Niña climate patterns), and a recently discovered phenomenon called the Inter-decadal Pacific Oscillation (IPO - which operates across the Pacific Ocean at 20-30 year cycles). This means identifying a change that is measured in millimetres will be difficult to discern.

The sea-level record shown in Figure 2.8 has distinct fluctuations at timescales of a few decades that appear to match with the 20-30 year cycle of the IPO. It is notable that when the IPO is in its negative phase, sea level rises faster than when IPO is positive. The graph shows that the IPO appears to have shifted to a negative phase around 1998. Therefore over the next 20-30 years sea levels round NZ will probably rise faster than the average trend.

The potential problems arising from climate changes include: more frequent floods and droughts; land encroachment and coastal erosion from rising seas; more frequent invasions by tropical pests and infectious diseases; and the disappearance of some types of ecosystems. In New Zealand, patterns of agriculture could be changed by different climate patterns and some fisheries may be affected.

Figure 2.8 Sea Level Rise on the Waitemata Harbour



Ambient Air Quality

Fine particle and carbon monoxide levels have decreased significantly since 1999. Nitrogen dioxide and ozone levels haven't changed significantly. Over two thirds of air quality complaints throughout the Auckland region are about back-yard burning.

Many of our daily activities release chemicals and particles into the air we breathe. These air pollutants can cause unpleasant smells, hazy days and damage to people's health. Ambient air quality (the measure of the "cleanliness" of the air) depends on the amount of pollution produced by human and natural activities, the degree of dispersion due to wind and weather effects, and complex chemical reactions between pollutants.

State

Key air pollutants that impact air quality in the Auckland region include fine particulates (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2), and ozone (O_3). These are monitored by the ARC because they are known to endanger human health and well-being and are compared to either national guidelines (MfE 2002) or regional air quality targets (which are generally set at lower values to protect and maintain the best air quality possible in sensitive areas).

Ambient air quality is monitored at 11 sites around the region. Because it is not possible to monitor everywhere, monitoring sites are selected to be representative of a range of situations where people might be exposed to air pollution. These include:

- **Roadside:** monitoring takes place 2 to 3 metres from the roadside. This provides an indication of the amount of pollution pedestrians and people working close to busy roads might be exposed to.
- **Urban:** monitoring takes place at least 10 metres from the roadside representing areas where people live, work, study or play.
- **Rural:** monitoring takes place away from the influence of roads and houses, these areas are monitored because they can be affected by pollution from urban Auckland.
- **Industrial:** monitoring takes place in an industrial area, however, motor vehicles are still the main source of air pollution in these areas.

Because air pollutants derive from sources such as motor vehicles, urban and industrial activities, built up areas tend to experience a higher level of air pollution, as shown in Figure 2.9.

Figure 2.10 shows the number of days where regional air quality targets have been exceeded at air quality monitoring sites for the key pollutants between 1998 and 2003. Over the past few years there has been a significant reduction in the number of CO exceedences, largely believed to be a result of improvements in vehicle technology. For other contaminants, the trends in exceedences are less apparent and are likely to mirror the meteorological conditions of the region rather than the sources.

Figure 2.9: Pollution Exposure Index across the Auckland Region

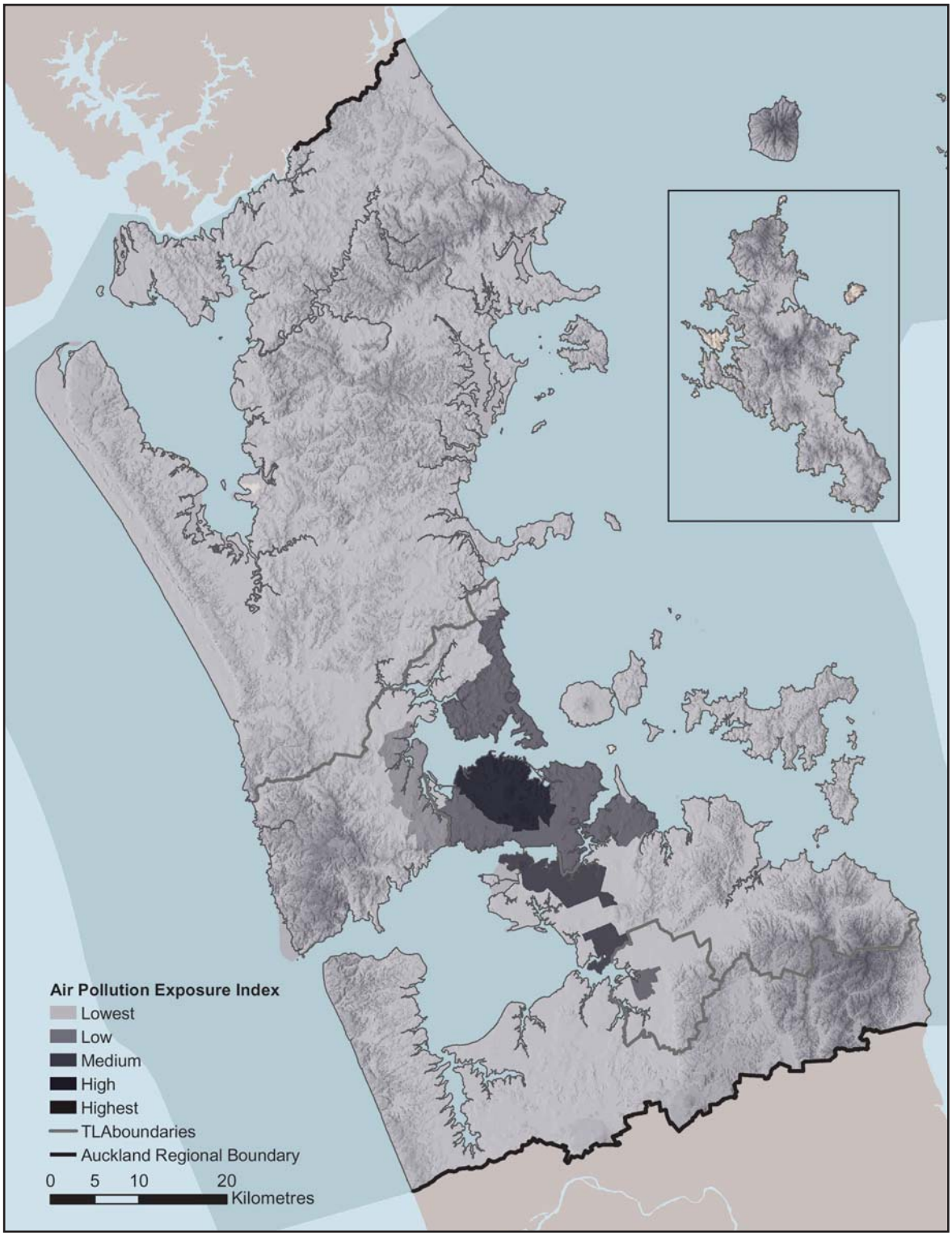
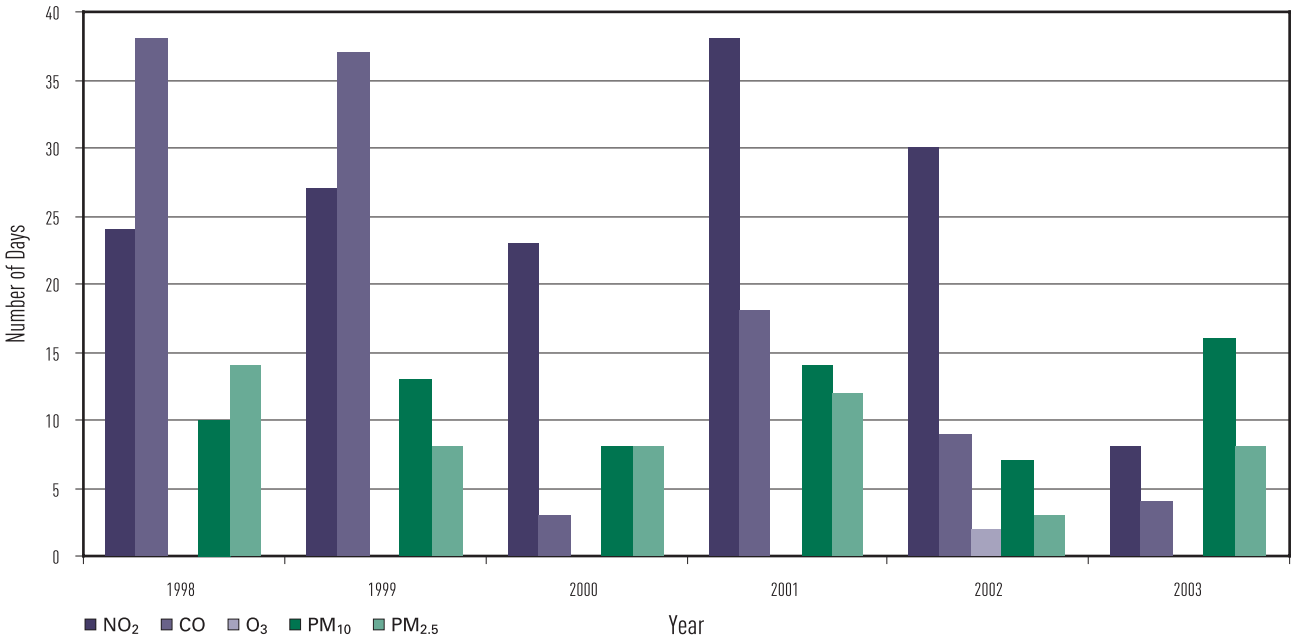


Figure 2.10: Exceedences of Regional Air Quality Targets



Fine Particles (PM_{10} and $PM_{2.5}$)

PM_{10} and $PM_{2.5}$ are tiny particles suspended in the air that are invisible to the human eye. PM_{10} are particles less than 10 microns (10-6 m) in diameter, which is about 1/5th the size of a human hair, and $PM_{2.5}$ is four times smaller again. Fine particles are mainly produced from the combustion of fuels (such as home heating fires and motor vehicles) but can also result from some industrial activities. These particles are a problem as they are easily inhaled into the lungs (the finer the particle, the more deeply the penetration) and cause serious health effects, especially in asthmatics and people with heart and lung diseases. PM_{10} and $PM_{2.5}$ can result in increased hospital visits, lost work/school days, restricted activity days and even premature death.

Fine particle concentrations vary across the region depending on the site (and proximity to key sources) as seen in Figure 2.11. These type of plots are called "box and whisker" plots and are very useful to indicate trends in the monitoring data. They show the highest ("maximum"), lowest ("minimum"), and average ("mean") values, and also the spread in the measurements (for example, there are bands showing where the lowest 1%, 5%, 10% and 25% of the samples lie). For fine particle data, levels are generally higher at roadside sites as opposed to urban sites due to the impact of motor vehicles, particularly diesel fuelled ones.

Fine particle levels have decreased appreciably over the past five years and now generally meet the regional targets set for protecting health (see Figure 2.12). This improvement is most likely to be due to a combination of factors - improved awareness about the effects of smoky vehicles, the reduction of sulphur in Auckland's diesel, and the gradual improvement in vehicle technology (this is further explained in the remote sensing case study at the end of this chapter).

Figure 2.11: Fine Particulate Matter in the Auckland Region

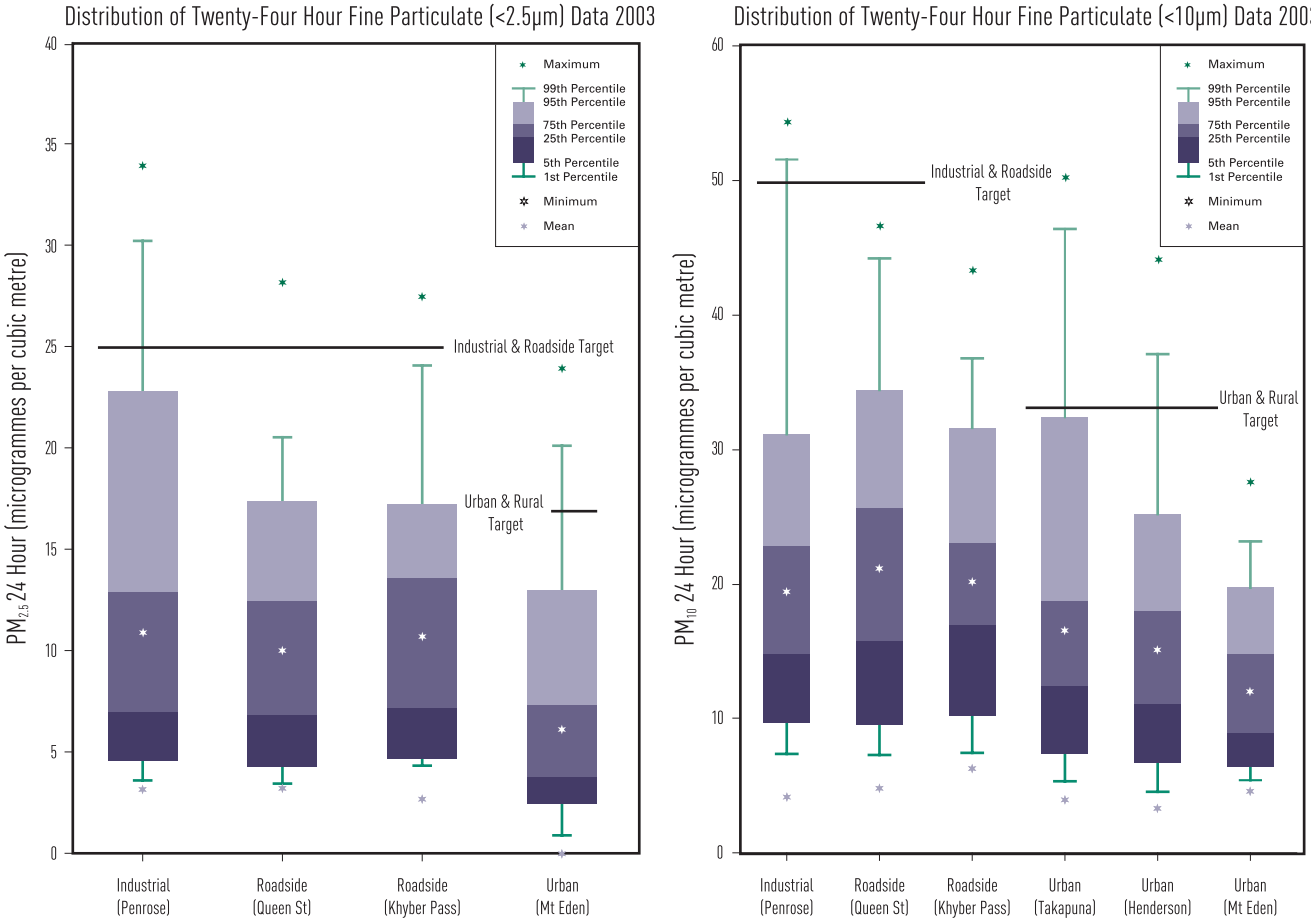
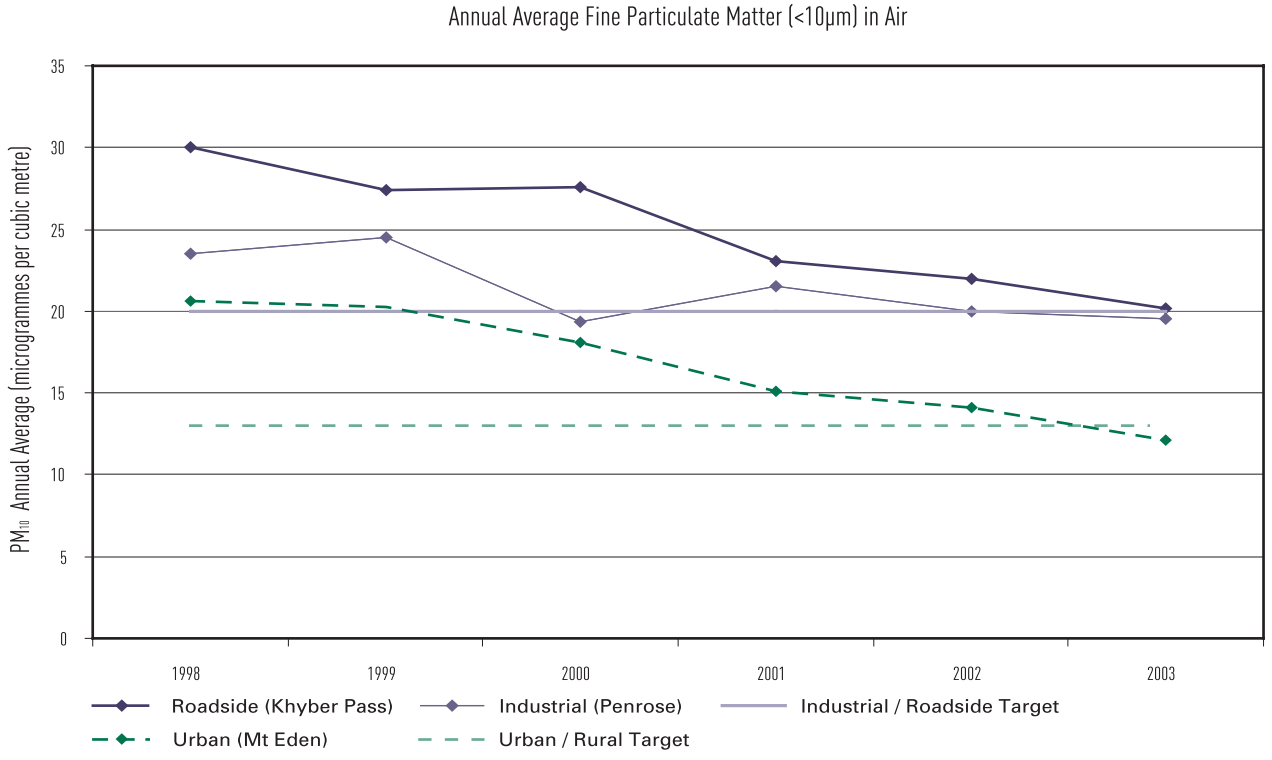


Figure 2.12: Annual Average Fine Particulate Matter in Air



Carbon Monoxide

Carbon monoxide (CO) is a colourless, odourless gas, which is produced from partial combustion of carbon-based fuels in air. When combustion is complete (i.e. there is sufficient oxygen), CO transforms to carbon dioxide (CO_2). Carbon monoxide interferes with the blood's ability to absorb and circulate oxygen, making it relatively toxic. High levels can affect people with heart conditions such as angina and can impair co-ordination and attention.

As with fine particles, CO levels are generally worse for roadside locations as motor vehicles are a significant regional contributor (as seen in Figure 2.13).

Carbon monoxide levels have dropped significantly over the past 5-10 years, as indicated in Figure 2.14, mainly due to the proportion of vehicles fitted with catalytic converters increasing in the fleet.

Figure 2.13: Carbon Monoxide in the Auckland Region

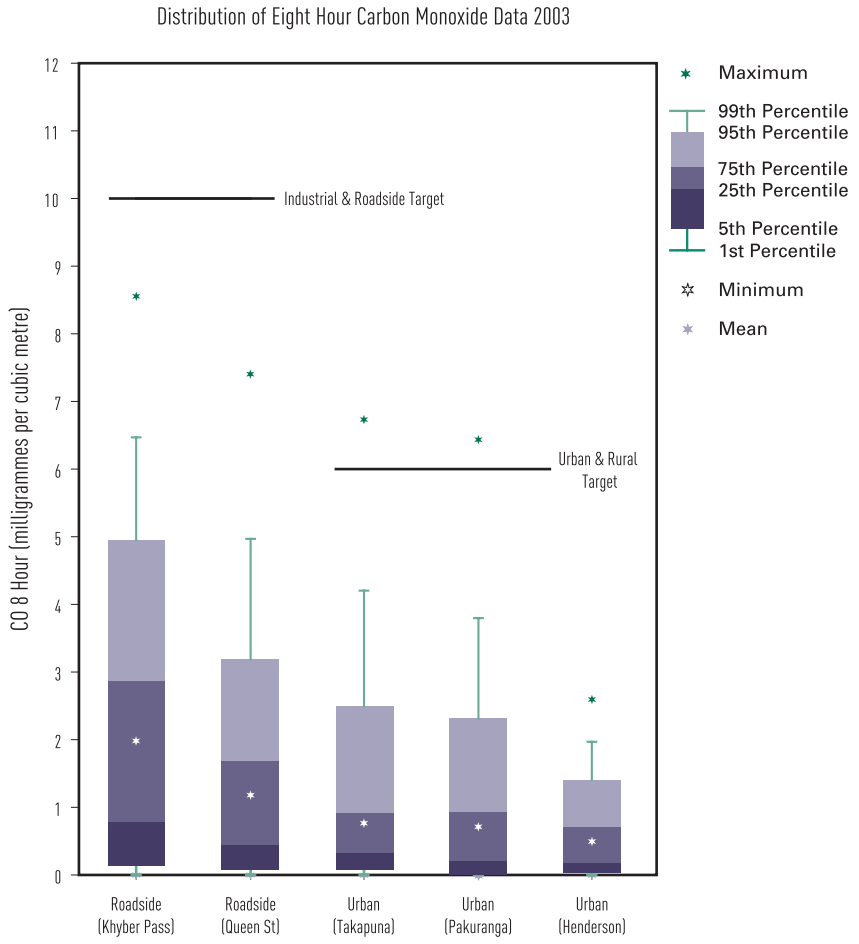
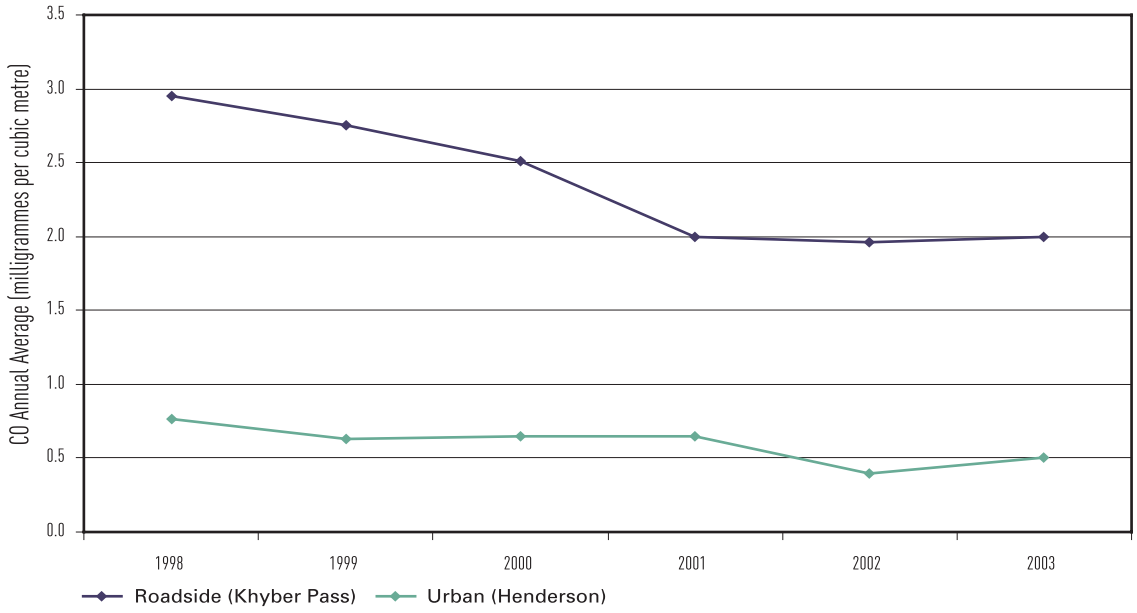


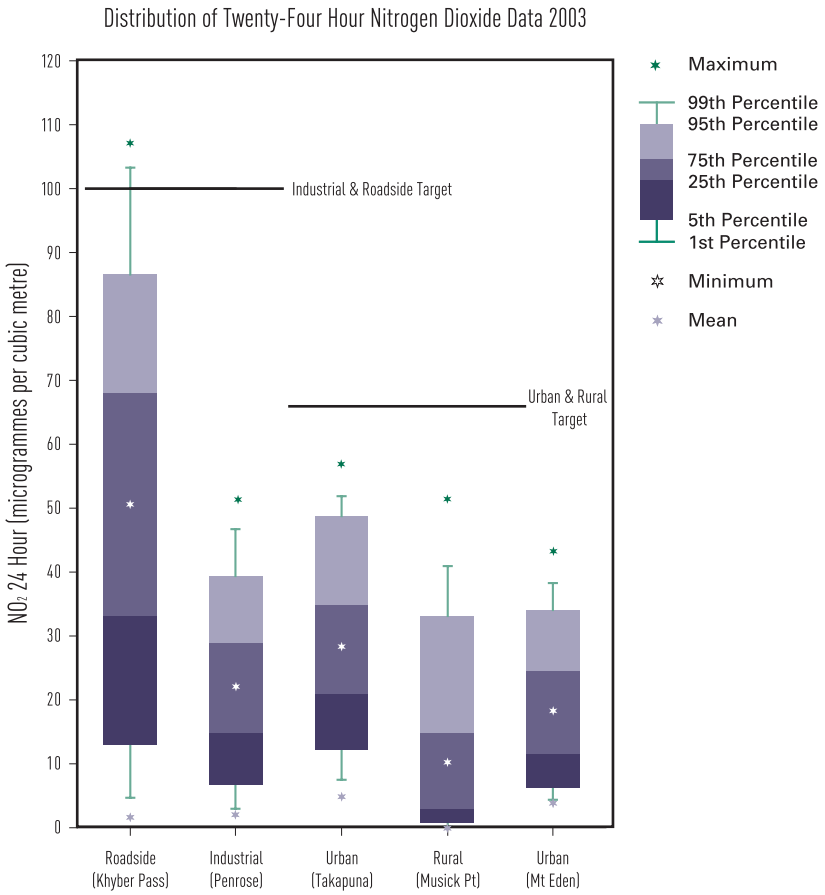
Figure 2.14: Annual Average Carbon Monoxide in Air



Nitrogen Dioxide

Nitrogen oxide (NO) and nitrogen dioxide (NO_2) are together referred to as nitrogen oxides (NO_x). Nitrogen oxides form when air (a mixture of nitrogen and oxygen) reacts as part of fuel combustion processes. NO combines with ozone in the atmosphere to produce NO_2, and under certain conditions the reverse reaction can occur forming NO and ozone. NO_2 can irritate the lungs, increase susceptibility and severity of asthma, and lower resistance to infections, colds and flu. It can also significantly degrade visibility as it contributes to the formation of brown hazes and smog.

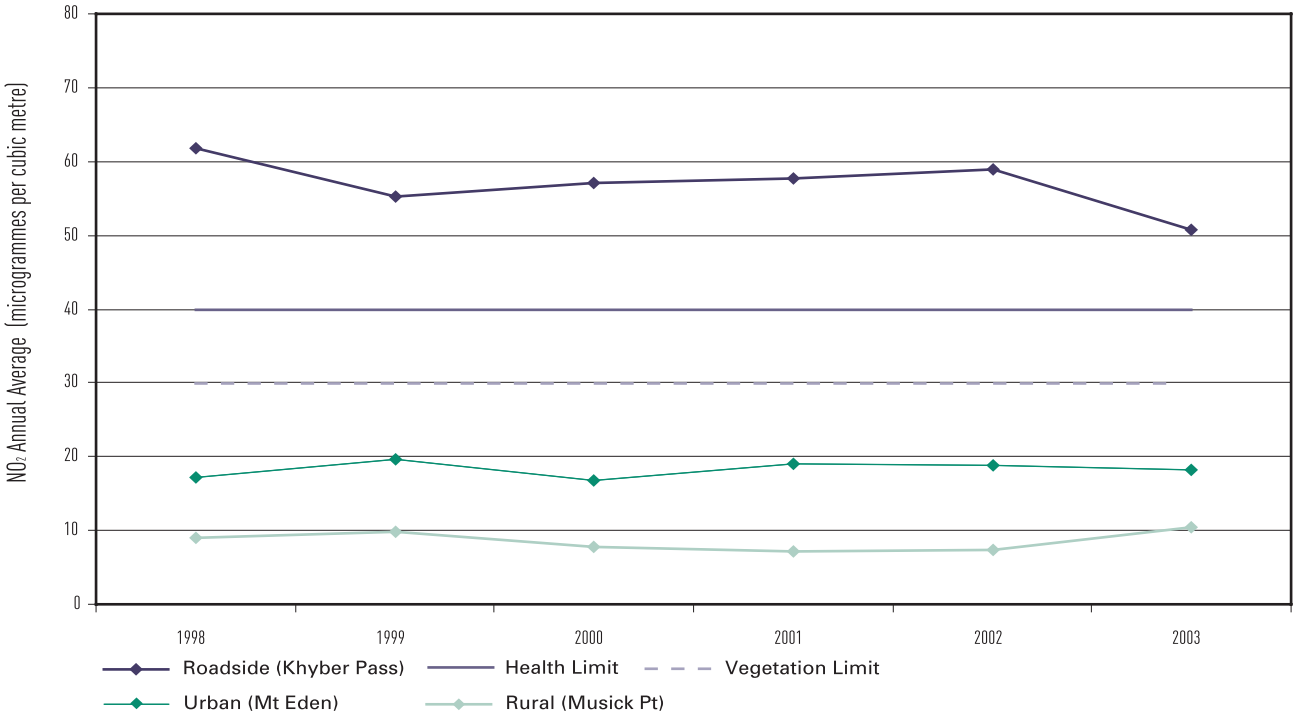
Figure 2.15: Nitrogen Dioxide in the Auckland Region



Over the past 5 years, the number of exceedences of the ambient air quality guideline, as well as average NO_2 levels, has not changed significantly at the monitoring sites (see Figure 2.15).

Khyber Pass (the roadside peak site) currently experiences exceedences of regional targets more than 1% of the time (see Figure 2.16).

Figure 2.16: Annual Average Nitrogen Dioxide in Air



Ozone

Although ozone (O_3) is a vital component of the upper atmosphere, it is an unwanted toxic gas at ground level. Ozone forms when NO emissions (generally from urban sources) react with oxygen in the air in the presence of sunlight. Concentrations tend to be the highest at points further away from the city because in the time taken for the NO emissions to transform, the pollution has been shifted by the prevailing winds. The health effects of O_3 can include runny eyes, nose and throat irritation, breathing difficulties, increase in respiratory and cardiovascular disease, increased hospitalisations, and, in extreme cases, mortality.

Ozone is referred to as a "secondary pollutant" because it is not emitted directly from typical pollution sources in the region. Because of the mixing and reaction times needed, concentrations across the region tend to be more uniformly distributed (see Fig 2.17).

Average ozone levels have not changed significantly over the past five years as seen in Fig 2.18 and are generally below regional targets.

Figure 2.17: Ozone in the Auckland Region

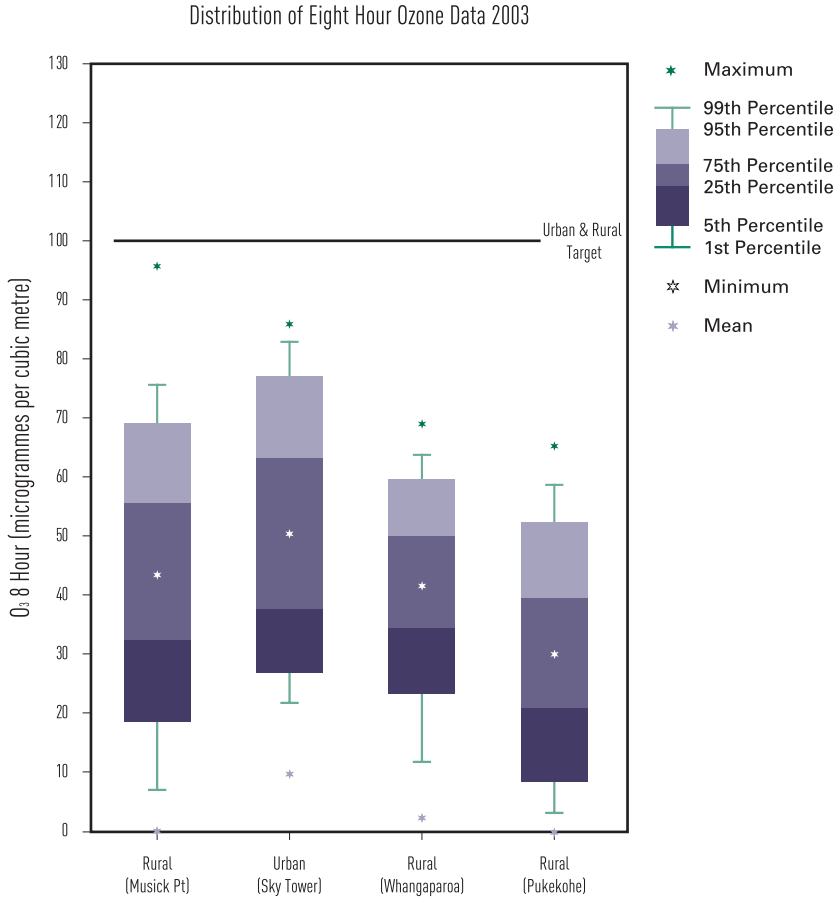
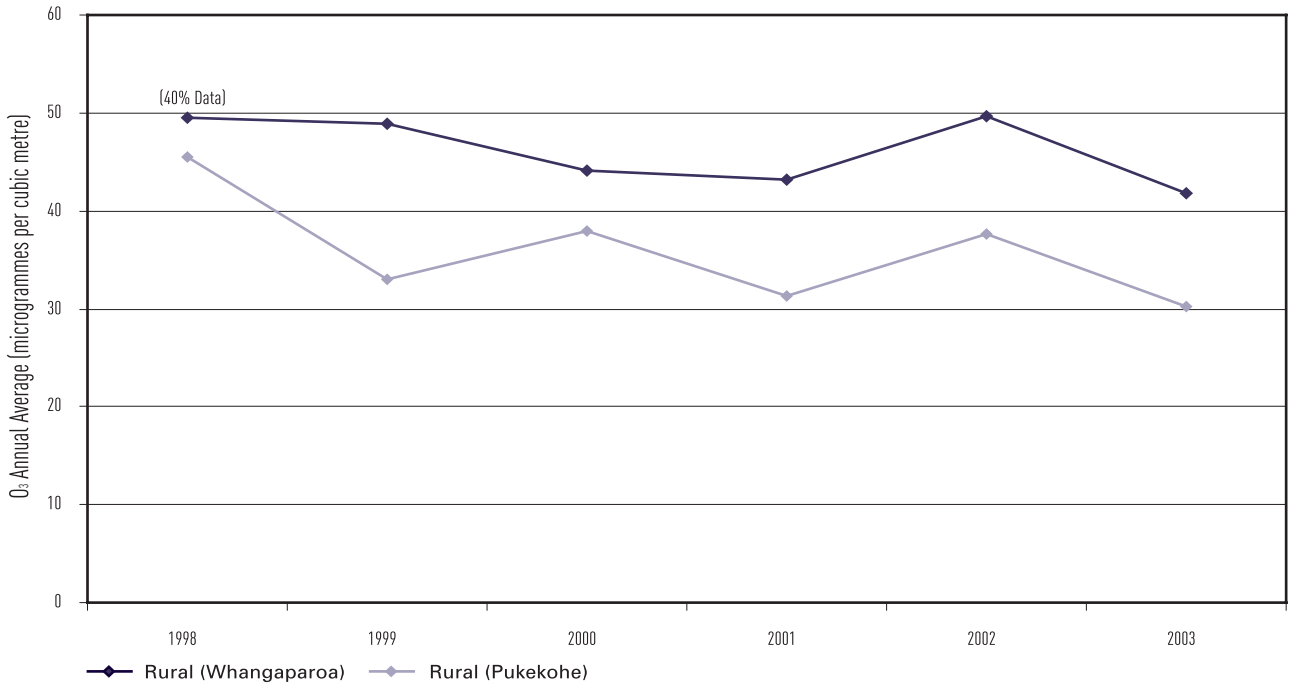


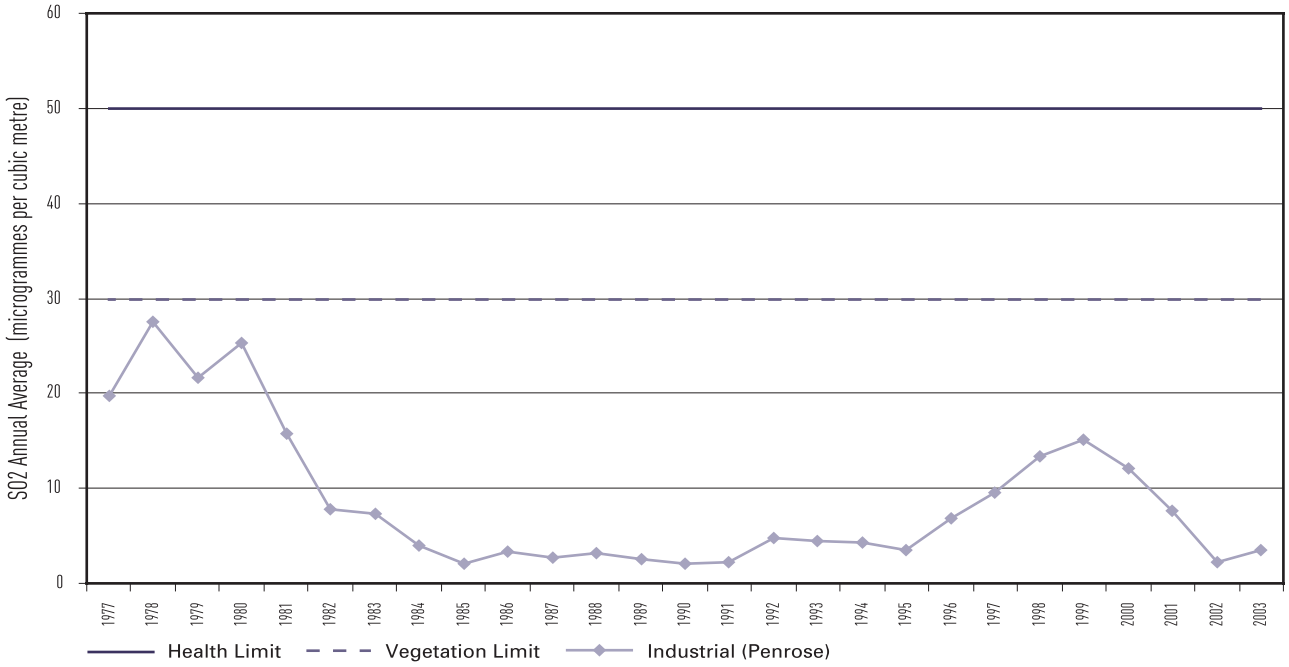
Figure 2.18: Annual Average Ozone in Air



Sulphur Dioxide

Sulphur dioxide (SO_2) is a colourless gas which, when combined with water, forms sulphuric acid. Sources include the combustion of fossil fuels containing sulphur (e.g. coal and diesel), and industrial processes. Sulphur dioxide can cause respiratory problems such as bronchitis and can irritate noses, throats and lungs. It may also cause coughing, wheezing, phlegm and asthma attacks. This gas also contributes to fine particle pollution because it reacts in the air to form "secondary particles" (sulphates).

Figure 2.19: Sulphur Dioxide in the Auckland Region



Sulphur dioxide levels in the Auckland Region increased from 1995 to 1999 due to the increasing prevalence of diesel vehicles (see Figure 2.19). However, the introduction of lower sulphur diesel has seen these levels drop in recent years.

Benzene

Benzene is a harmful air pollutant, which is haemotoxic, genotoxic and carcinogenic. It is emitted from a range of sources including motor vehicle exhausts, evaporation of petrol, petrol lawnmowers, cigarette smoke and home heating fires. If sufficient amounts of benzene are inhaled over a relatively long period of time, there is a risk that it may cause cancer, in particular, leukaemia.

Limited monitoring of benzene has been undertaken in the Auckland region. To date, this has demonstrated that benzene levels may exceed the ambient air quality guideline at roadside sites, but are within the guideline in other areas. However, benzene levels will significantly reduce over the next 2-3 years, as new government regulations progressively reduce the allowed level of benzene in petrol from 4% to 1% in 2006.

Sources of Air Pollution

Figures 2.20, 2.21 and 2.22 show the sources of three key pollutants: carbon monoxide; nitrogen oxides; and fine particles. Motor vehicles are the main source of air pollution in the Auckland region. For example, motor vehicles produce around 3000 tonnes of particulate pollution per year, which is the equivalent of 200 bags of cement every day! Other sources include home heating fires, industry, and open burning.

Figure 2.20: Sources of Carbon Monoxide in the Auckland Region

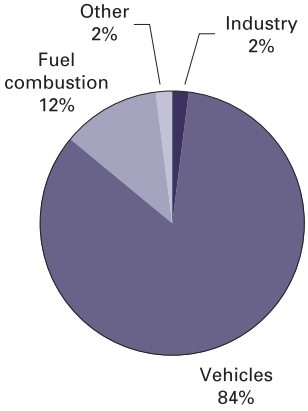


Figure 2.21: Sources of Nitrogen Oxides in the Auckland Region

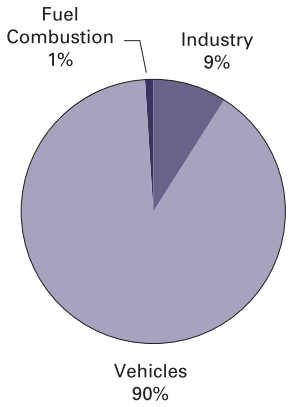
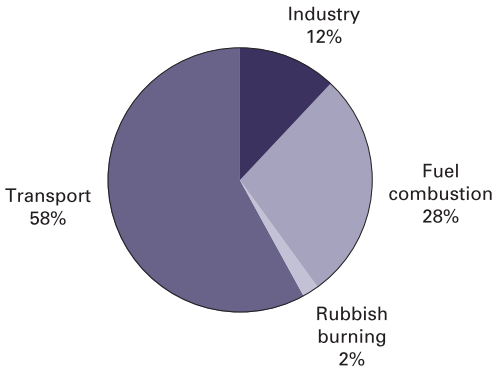


Figure 2.22: Sources of Fine Particles in the Auckland Region



Implications

Many of the activities we take for granted as part of modern life including driving a car or heating our homes with a domestic fireplace can lead to degraded air quality. However, with careful management, these effects can be mitigated.

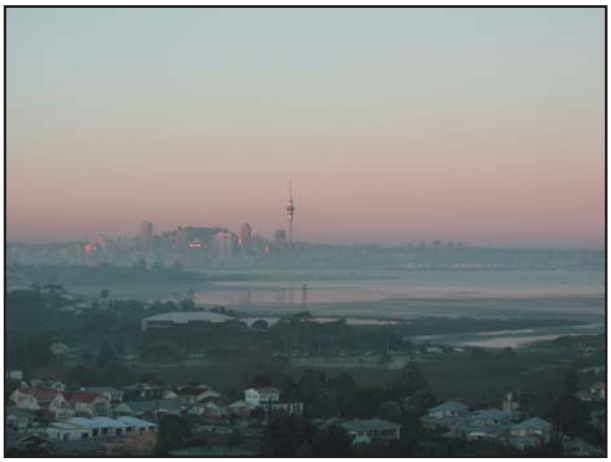
Poor air quality can seriously affect our health. Air pollution particularly affects our heart and lungs, and can cause cancer. A recent study undertaken by health experts around the country for the Ministry of Transport estimated that air pollution causes at least 486 premature deaths per year in the Auckland Region (MoT 2002). 58% of these (253) are due to motor vehicle emissions.

As well as premature deaths, air pollution is known to cause sickness and hospitalisation. Air pollution particularly affects people with heart disease, respiratory disease, asthma and bronchitis. In the Auckland region, air pollution is estimated to result in 750,000 restricted activity days per year. The health effects of air pollutants are a major concern because of the prevalence of respiratory and heart disease in the region's population. The Auckland region has one of the highest asthma rates in the world, with between 12 and 23% of all adults being diagnosed as asthmatic. Asthma is the fourth highest cause of hospitalisation in the region.

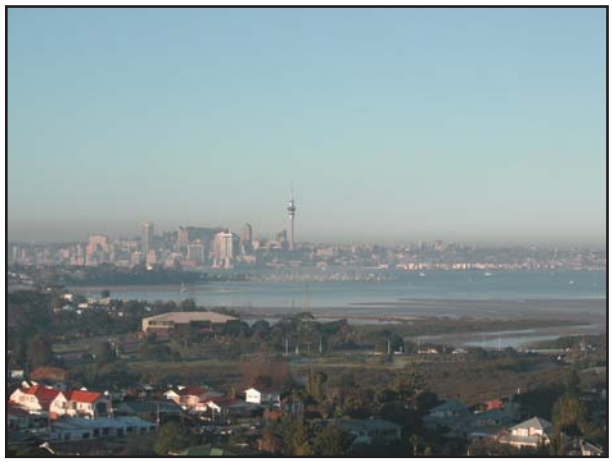
Overall, New Zealand has the fifth highest rate of chronic obstructive respiratory disease in the world. As a group, Maori have the highest rate of chronic obstructive respiratory disease in the world. The main cause of death in the region is coronary heart disease. Any increase in the rate of hospitalisation or the use of medications due to air pollution is a huge cost to society.

Air pollution also causes degraded visibility, brown hazes and smog (see Figure 2.23).

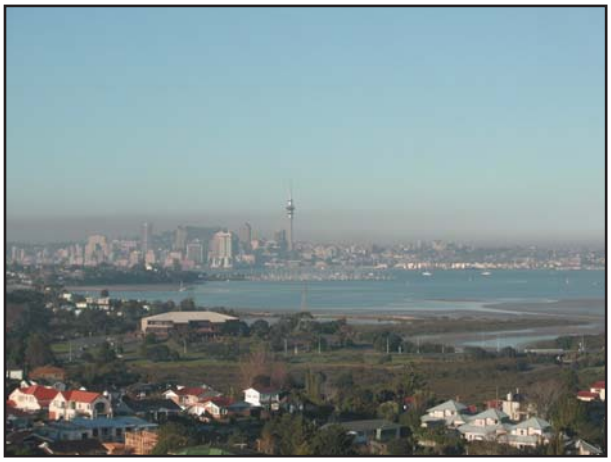
Figure 2.23: Smog forming over Auckland - 22 July 2003



07.30



08.30



09.00

09.30

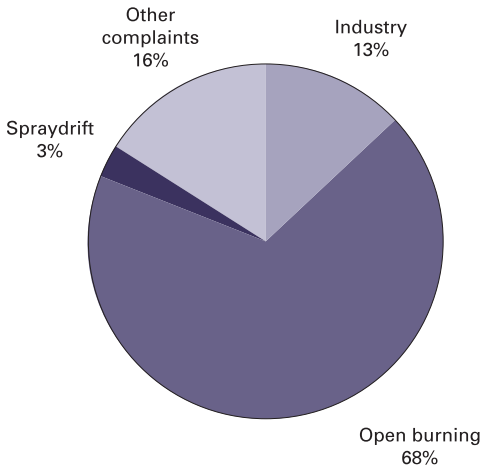
10.30

12.30

Air pollution can also cause unpleasant smells, dust and visible emissions.

The majority of complaints about air pollution in the Auckland Region are about outdoor burning of garden and other waste (see Figure 2.24). About 13% of public complaints relate to odour, dust, and other pollution from industry. Overall, industry is responsible for less than 5% of ambient air pollution in the Auckland region, however some industries have the potential to cause significant air pollution problems, including health, odour and dust effects, and are carefully controlled for this reason.

Figure 2.24: Air Quality Complaints to the Auckland Regional Council



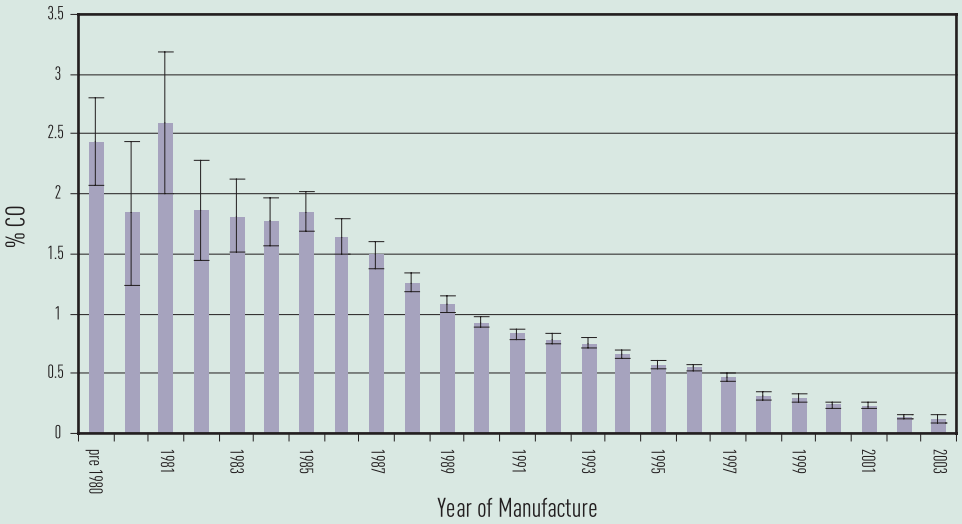
Case Study:
Drive-by Emissions Testing Project

In April 2003, the Auckland Regional Council undertook a remote sensing programme to provide comprehensive real-world characterisation of vehicle fleet emissions. This was the first time such a study had been attempted in New Zealand. The study measured exhaust emissions from over 40,000 vehicles at 16 sites, across all seven city and district councils throughout the region. Measurements were made of carbon monoxide (CO), nitric oxide (NO), unburned hydrocarbons (HC), and opacity (smokiness) in the exhausts of vehicles as they drove along the road.

Figure 2.25: On Road Emissions Testing

The results of the month long study demonstrated that newer vehicles generally have much lower emissions than older vehicles. This is because new vehicles are required to meet emissions standards when they are manufactured.

Figure 2.26: Percentage of CO measured in Vehicle Exhaust



The results also showed that vehicle maintenance is important for keeping emissions at low levels, even for new vehicles. It was found that the best older (1982 or older) vehicles can have emissions that are one fifth or less of the worst of new vehicle emissions (2000 or newer) if regular tuning is undertaken.

The study indicated that emissions testing to target the worst vehicles would be very effective in reducing overall emissions because only a small proportion of vehicles produce a high proportion of pollution. It was found that the worst 10% of vehicles are responsible for more than half of the pollution from all vehicles. The results of the drive-by emissions testing campaign are being used by Ministry of Transport in the development of vehicle emissions testing policy.

Figure 2.27: Clean Air Auckland Co-Chair, Nancy Eisenberg and daughter Zoe at a Clean Air Auckland Protest in July 2003.

ARC Responses

The ARC undertakes a range of functions in relation to the issues discussed in the Air and Atmosphere chapter. These can be summarised as follows:

Key Planning Initiatives

The ARC has direct responsibility for controlling discharges of contaminants to air. The regional policy on air quality and discharges is laid out in the Auckland Regional Policy Statement. The rules on discharges to air are laid out in the Proposed Regional Plan: Air, Land and Water, which outlines which activities are controlled (i.e. require a consent from the ARC) because of their potential to create adverse effects on the environment. In addition, the ARC works with city and district councils to ensure the effects of discharges are minimised, such as by ensuring that industrial discharges occur only in industrial areas, rather than residential areas.

In addition, many other key planning initiatives, such as the Regional Growth Strategy, take into account issues such as air quality in defining a desired future for the Auckland region, and helping to define how the region grows.

Documents such as the Auckland Regional Policy Statement define a range of roles and responsibilities in relation to hazards, such as extreme weather events or sea level rise as a result of climate change.

Key Implementation Initiatives

Some of the activities which discharge contaminants into air require a consent from the ARC as outlined in the Proposed Regional Plan: Air, Land and Water. These activities, such as industrial air discharges, have conditions imposed on them to ensure that adverse effects on air quality are minimised.

The majority of air pollution in the Auckland region comes from motor vehicles, and the ARC has been actively working with central government and industry to improve fuel quality and vehicle emission controls. Global atmospheric issues such as global warming and ozone depletion are primarily managed by central government in New Zealand.

Various other initiatives have been undertaken recently to help improve air quality and to educate the regional community, including 0800 Smoky (which allowed people to report smoky vehicles, the owners of which were then sent vouchers for tuning their vehicle) and the Big Clean Up (which encourages people to tune their cars, take fewer trips where possible, and to stop back-yard burning).

The ARC also runs an Air Quality Pollution Complaints response service (which people can ring to report air pollution events).

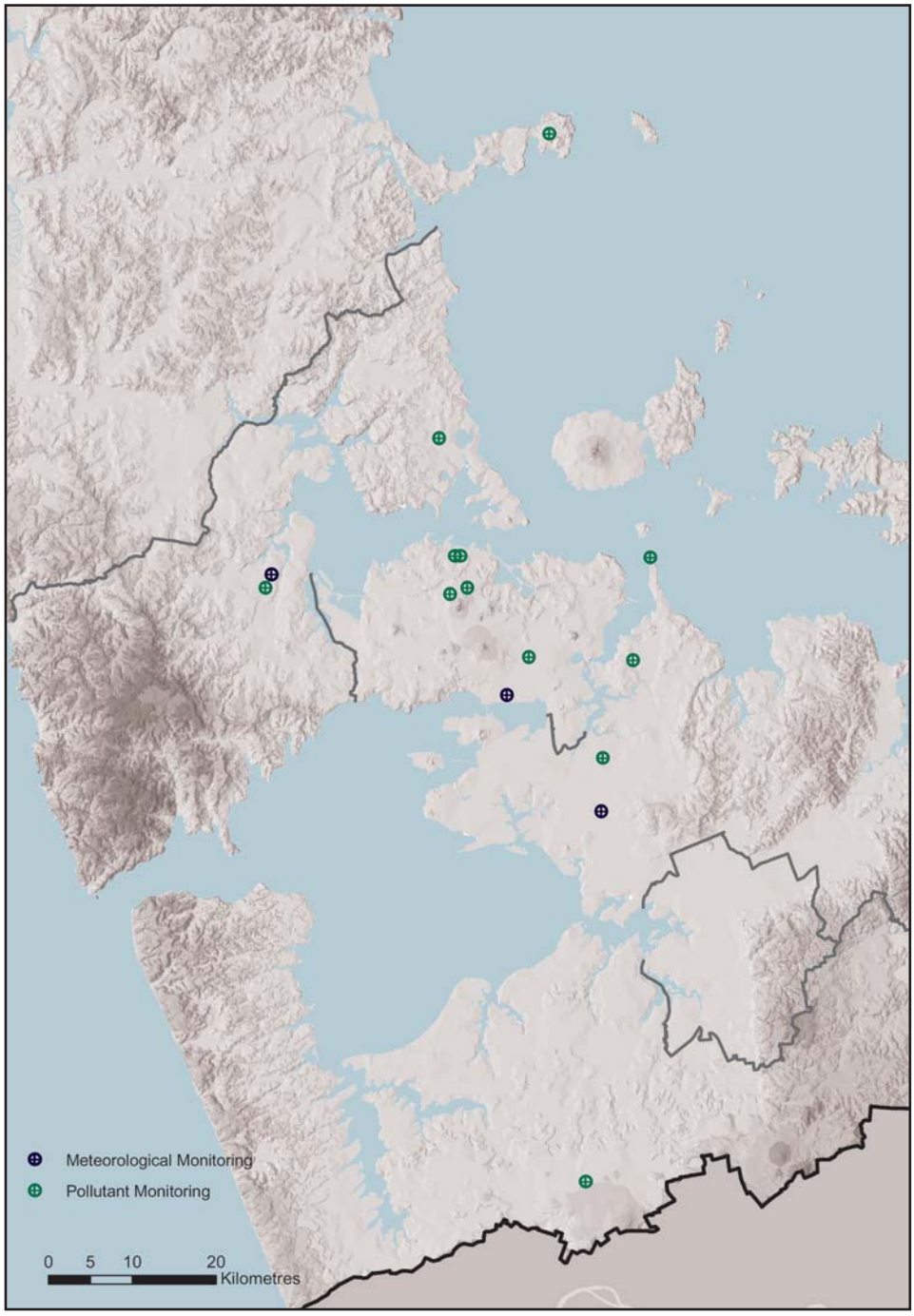
Key Monitoring Initiatives

The ARC monitors air quality and weather conditions at a range of sites throughout the region as shown below. This is so we can determine how good our air quality is and determine what issues may need to be addressed in our policy development processes, such as through the Proposed Regional Plan: Air, Land and Water.

In addition, we use this monitoring information to develop models to help us predict air quality across the region, the overall potential health effects of air pollution, and how air pollution will change over time.

More information on ARC functions and activities can be found in the ARC Long Term Council Community Plan (LTCCP).

Figure 2.28: Air and Atmosphere Monitoring Locations



The Land

Landscape

As our population grows, our landscapes constantly change. Our Volcanic Cones, the Harbour Bridge, beaches and cliffs are all unique to the Auckland region's landscape.

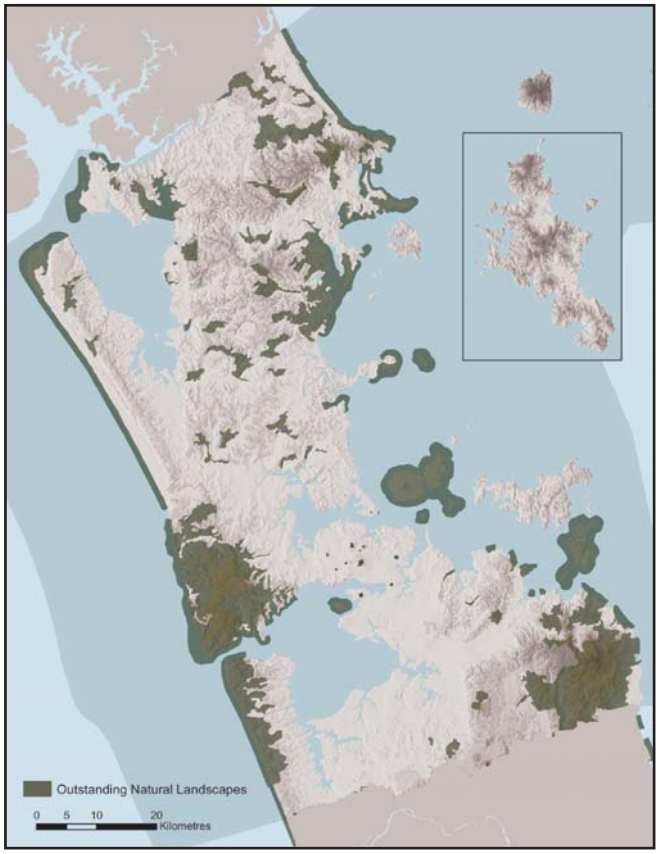
The Auckland region has a rich diversity of landscapes, which often change character over short distances.

State

The contrast of land and water, in addition to indigenous vegetation and prominent landforms, all contribute to the landscape of the region. Rural parts of the Auckland region, including the Hauraki Gulf Islands, continue to remain important areas of natural landscape to be enjoyed by Aucklanders and others due to the relative absence of buildings, roads and other structures associated with development.

However, some of the landscape icons of the region are urban, such as the Auckland Harbour Bridge, Tāmaki Drive and the intermix of beach and cliff found at the East Coast beaches. Most characteristic of the Auckland region are the volcanic cones which are visually dominant markers in our urban areas as well as being important geological, archaeological, historic and cultural sites. Views to and from these volcanic cones are an important part of living in metropolitan Auckland.

Figure 3.1: Outstanding Natural Landscapes of the Auckland Region



The rapid growth of Auckland's population means that our landscapes are experiencing constant change. In 1983 a landscape assessment was undertaken of the rural areas of the region which identified areas of outstanding and regionally significant landscape value. In 2003 the ARC completed a new public preference landscape assessment to find out the value that the community places on landscapes, and how our rural landscapes have changed.

In 1983 the landscapes that were most highly valued by the community were our coastal environment and large expanses of indigenous vegetation such as the Waitakere and Hunua Ranges. These same areas continued to be identified by the public in 2003 as outstanding natural landscapes.

This means much of the coastal margins of north east Rodney from Waiwera to Te Arai Point were assessed as being outstanding natural landscapes. Similarly, the West Coast from South Kaipara Head south to Karioitahi has been identified as an outstanding natural landscape. However on both coasts, the significant coastal landscape is associated with a narrow area on either side of the high tide mark. In contrast the whole of the Hauraki Gulf islands of Rangitoto, Motutapu, Moihuhe, Motukorea (Browns Island) and Ponui are considered to be outstanding natural landscapes. The landscape value of the Hauraki Gulf Islands is being reviewed in 2004 in consultation with the community.

However, there have been some changes in public perceptions of the value of rural land in the region, particularly in relation to the contribution of farming land and exotic vegetation to the landscape. For instance, between Helensville and Warkworth and through the Franklin lowlands there has been a decrease in amount of rural land regarded by the public as being an outstanding natural landscape, compared to that identified in 1983. On the other hand, the landscape value of the western half of the Awhitu Peninsula has increased.

Regional landscape evaluation of Auckland's metropolitan areas has focused on the volcanic cones. Views to and from our urban volcanic cones have been protected from intrusive development since 1974 by the operation of height restrictions within the region's Volcanic Cone View Shafts. These view shafts or sightlines have recently been re-surveyed to produce accurate three-dimensional sightlines, which will provide more certainty for landowners and will enable better long-term protection of views to and from the volcanic cones.

Implications

The rapid growth of Auckland's population means that our landscapes are experiencing constant change. In 1983 a landscape assessment was undertaken of the rural areas of the region which identified areas of outstanding and regionally significant landscape value. In 2003 the ARC completed a new public preference landscape assessment to find out the value that the community places on landscapes, and how our rural landscapes have changed.

In 1983 the landscapes that were most highly valued by the community were our coastal environment and large expanses of indigenous vegetation such as the Waitakere and Hunua Ranges. These same areas continued to be identified by the public in 2003 as outstanding natural landscapes.

This means much of the coastal margins of north east Rodney from Waiwera to Te Arai Point were assessed as being outstanding natural landscapes. Similarly, the West Coast from South Kaipara Head south to Karioitahi has been identified as an outstanding natural landscape. However on both coasts, the significant coastal landscape is associated with a narrow area on either side of the high tide mark. In contrast the whole of the Hauraki Gulf islands of Rangitoto, Motutapu, Moihuhe, Motukorea (Browns Island) and Ponui are considered to be outstanding natural landscapes. The landscape value of the Hauraki Gulf Islands is being reviewed in 2004 in consultation with the community.

However, there have been some changes in public perceptions of the value of rural land in the region, particularly in relation to the contribution of farming land and exotic vegetation to the landscape. For instance, between Helensville and Warkworth and through the Franklin lowlands there has been a decrease in amount of rural land regarded by the public as being an outstanding natural landscape, compared to that identified in 1983. On the other hand, the landscape value of the western half of the Awhitu Peninsula has increased.

Regional landscape evaluation of Auckland's metropolitan areas has focused on the volcanic cones. Views to and from our urban volcanic cones have been protected from intrusive development since 1974 by the operation of height restrictions within the region's Volcanic Cone View Shafts. These view shafts or sightlines have recently been re-surveyed to produce accurate three-dimensional sightlines, which will provide more certainty for landowners and will enable better long-term protection of views to and from the volcanic cones.

Figure 3.2: Height Restrictions Control Building Heights Within Sightlines

Rural residential subdivision has resulted in increasing numbers of buildings and other built structures being located in our rural areas. People's desire to live near and enjoy the region's coastline means that development pressures are most intense in the coastal environment. This has become a significant issue in the regional community as rural and coastal areas have been identified by the public as being the outstanding natural landscapes of the Auckland region.

Changes in rural land use activities have reduced pastoral farming which is associated with open landscape character. This has led to the emergence of more intensive and enclosed landscapes associated with horticulture, viticulture, lifestyle blocks or commercial exotic forestry.

The scale and intensity of housing development in our coastal areas means that many of the unique coastal and estuarine landscapes that contribute significantly to the identity of the Auckland region are being modified or disappearing. The important diversity of landscape types is being lost as development results in a reduction in the value and greater uniformity in our coastal and rural landscapes. Although buildings and accessways can be designed and located in ways which reduce their visual impacts, the cumulative effects of increasing numbers of buildings is to reduce the naturalness of our landscapes.

A critical issue for the future of our significant rural and coastal landscapes is the balance to be struck between identifying and protecting some remaining outstanding natural landscape areas from development while at the same time avoiding inappropriate and visually insensitive development in other areas.

The intensification of urban development within the Metropolitan Urban Limits is being promoted by the Auckland Regional Growth Strategy. This has landscape and amenity implications as traditional single dwellings are replaced by higher density development. Growth is being directed towards 'nodes' focused around major transport corridors.

Open Space

16.7%, or 83,000 hectares, of the region's total land area is public open space.
Almost 46% of this is regional parks managed by the ARC.

Open space serves a variety of needs in society, including providing a setting for active and passive recreation, contributing to our social and psychological well being, and containing examples of natural and cultural heritage.

State

The region has 83,347 hectares of public open space – 16.7 per cent of the total land area. This is made up of land owned and controlled by the city, district and regional councils and the Department of Conservation (DoC). Of the 83,347 hectares of public open space, the ARC provides 38,029 hectares (45.6 per cent of the total) and the Department of Conservation provides 34,344 hectares (40.7 per cent of the total). This represents an increase of about 7,200 hectares since 1999.

Open space has a multitude of overlapping functions, including a range of recreational, cultural and environmental uses by the community. The distinctions between active and passive recreation, between recreation and conservation, between regional and local and between public and private are becoming increasingly blurred.

Figure 3.3: Parks in the Auckland Region

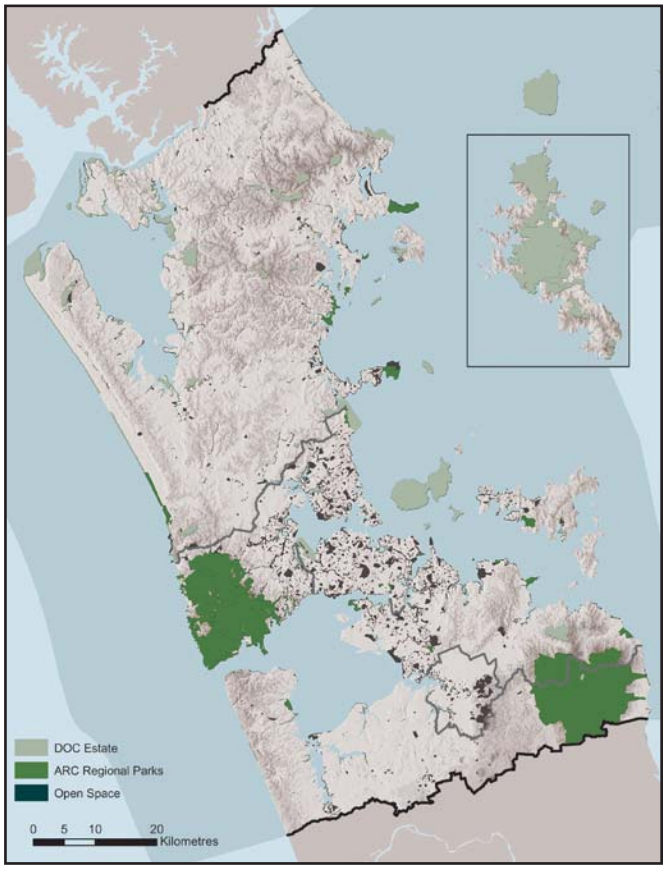


Table 3.1: Public Open Space in the Auckland Region (2001)

Distribution of Regional Open Space

City or District	Urban Open Space	Total Open Space	Total Area	Per cent of total area	Population (2001)	Population/ha
Rodney	504	12,233	235,727	5.19%	77,004	6.3
North Shore	1,565	1,721	12,724	13.52%	184,284	107.1
Waitakere	1,187	18,281	36,057	50.70%	167,181	9.1
Auckland	**2,402**	**27,748**	**62,851**	**44.15%**	**377,364**	**13.6**
Auckland-Islands		25,508	47,488	53.71%		
Auckland - Isthmus		2,240	15,363	14.58%		
Manukau	1,657	7,771	54,043	14.38%	281,535	36.2
Papakura	205	256	10,973	2.33%	40,035	156.4
Franklin	0	15,337	87,103	17.61%	44,880	2.9
Total	**7519**	**83347**	**499478**	**16.69%**	**1172283**	**14.06**

The above city and district council areas contain only those areas assessed as currently used for recreation and conservation purposes. The Auckland City Council area includes 21,317 ha of land managed by the Department of Conservation on the Great and Little Barrier Islands

Regional Parks and Department of Conservation land were originally purchased to protect valued natural and cultural features. West and South Auckland benefit from the major bush-covered ranges of the Waitakeres and the Hunuas, while Auckland City benefits from its jurisdiction over the Hauraki Gulf Islands.

With people willing to travel to other areas to enjoy the value of this diversity in landscape, there is no ideal regional distribution of natural parkland. However, visitor patterns indicate there is currently not enough open space in the north of the region.

Auckland's maritime setting means its harbours and the Hauraki Gulf play a major role in meeting the region's overall recreational needs. There are approximately 82,000 recreational boats in the region.

Implications

There is no simple formula for determining how much parkland will satisfy the needs and wishes of the region's people. While the level of formal recreational space provided in the future is likely to grow with population, the protection of significant heritage features is determined by the value placed on them by the regional community and the level of threat to them.

Compared to other parts of New Zealand and internationally, Auckland is not over-endowed with parkland, even when Department of Conservation land is included.

New parks will become more expensive, making existing open space more precious as urban growth intensifies. In time, space available around schools and other institutions may be better used to meet demand while other open areas may be enhanced to provide high quality amenity.

The need for more land for recreation depends on how well the existing areas satisfy the range and quality of experience expected from parkland. Remote or wilderness areas are especially vulnerable, as increased use can reduce or destroy the quality of experience people are seeking. This may mean that further land should be purchased before existing holdings are fully utilised.

Population growth and increased tourism will put more pressure on popular harbour areas and on the gulf. The number of boats will grow and demand will increase for a range of coastal services, including boat ramps and moorings, water, fuel and provisions, disposal of solid and liquid waste as well as shore-based recreation.

Hazards

Flooding, land instability, volcanic activity, and earthquakes are all hazards that could happen in the Auckland region. The more our population grows, so does the pressure to develop land.

The Auckland region is exposed to a wide range of natural hazards such as flooding (including coastal), land instability (including coastal), volcanic activity, earthquakes and climate change. These events are all part of the earth's natural processes and only become a risk when they interact with people, property or valued environments.

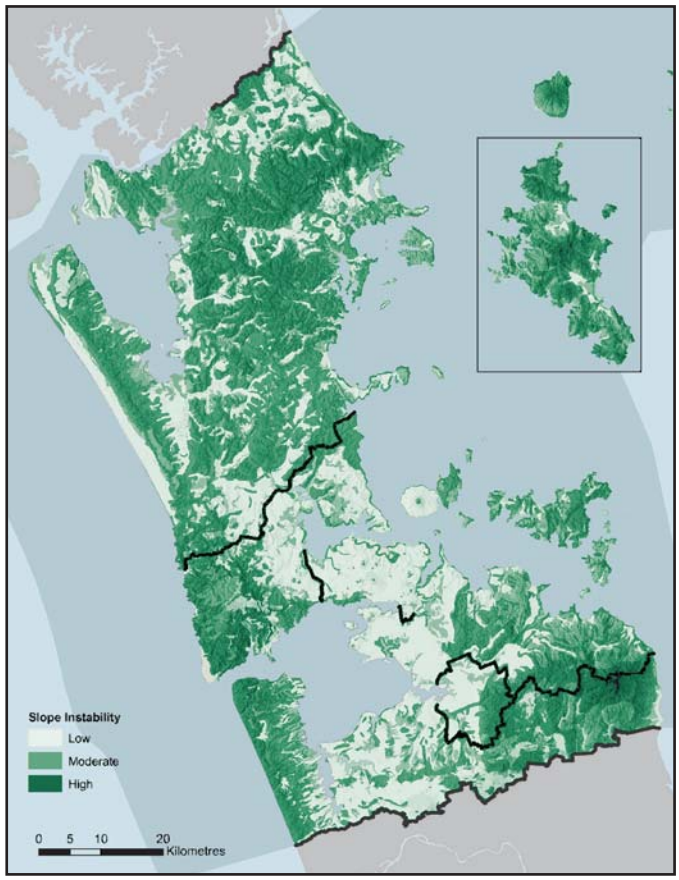
State

Flooding

With small, steep and often urban catchments, the hazard created by flooding in the Auckland region differs from most other parts of New Zealand. Since the heaviest rainfall in the area is the result of thunderstorms, flooding occurs quickly and with little warning. Over the last five years severe flooding (in excess of one in 100 year levels – or in other words, when streams and rivers rise more than would be expected once every 100 years) has occurred on four separate occasions:

- **January 21, 1999 (Pukekohe Township):** 145mm of rain fell over a 6hr period;
- **May 29/30, 2001 (Leigh):** this event occurred in the very wet month of May when 109.4mm fell over a 1hr period on already saturated soil;
- **September, 2001 (Puhoi):** flooding occurred on the Puhoi River and inundated Puhoi township;
- **January 28, 2004 (Titirangi):** heavy rainfall occurred in a narrow band resulting in the flooding of some houses in Titirangi.

Figure 3.4: Areas of Known Instability Hazard



Land Instability

Land instability is another natural event that occurs frequently throughout the Auckland region. Geological factors, weathering, defects, slope angle and height, existing instability and groundwater all contribute to the high degree of land instability in the area. In addition, human activity contributes to the problem by increasing pore water pressure from leaking drains, removal of stabilising vegetation and the added weight of buildings. Areas of known instability in the Auckland region are shown in Figure 3.4. This shows that areas of high instability hazard include:

- Coastal Areas (e.g. Whangaparoa Peninsula)
- Steep slopes 20+ (Whitford-Brookby area)
- Pumiceous Deposits (e.g. Te Atatu North, East Tamaki, Manurewa)
- Onerahi Chaos Breccia (Silverdale Area)

Volcanic Activity

The Auckland Volcanic Field (AVF), which lies under most of the metropolitan area, first became active approximately 150,000 – 200,000 years ago. The field is still considered potentially active, with the most recent and largest eruption around 800 years ago creating Rangitoto Island. Eruptions in Auckland are unpredictable occurring at different locations about once every 1000 years. Since volcanic monitoring began in 1995 there have been no earthquakes detected that are associated with the AVF.

Volcanic activity in other parts of New Zealand can also affect the Auckland region. Cores taken at the Onepoto Basin on the North Shore contain layers of ash 1mm-63cm thick from the Taupo Volcanic Zone and Taranaki. Ash from the Taupo Volcanic Centre is recorded in Onepoto Basin on average once every 5800 years, once every 2200 years from the Okatina Volcanic

Centre, once every 2900 years from the Tongariro Volcanic Centre, and from Taranaki once every 830 years.

Even small amounts of ash fall can cause disruption to the Auckland region, as was clearly demonstrated in 1996 when the Auckland International Airport was shut for three nights following the relatively small eruption at Ruapehu. From deposits in Onepoto Basin it appears that the Auckland region is exposed to ash fall from remote sources on average once every 460 years.

Earthquake

On average between one and two, usually very small and rarely felt, earthquakes are detected in the Auckland region every year (see Figure 3.5)

Figure 3.5: Earthquakes Detected in the Auckland Region

NZ Date	NZ Time	Latitude	Longitude	NZMG E	NZMG N	Depth	Magnitude	Quality
18-Jan-1999	11.31	-36.911	174.857	2675914	6475324	10.9	2.6	A
1-Oct-2000	22.51	-36.924	175.064	2694267	6473439	5.0	2.4	C
28-Sep-2001	23.01	-36.755	175.042	2692761	6492208	5.0	1.6	C
10-Sep-2002	16.55	-37.127	174.980	2686285	6451064	10.7	2.0	B

The only confirmed active fault in the region is the Wairoa North Fault which is active approximately once every 13,000-43,000 years. The Drury and Beachlands faults in the region are also considered to be active though further research is needed to confirm their status. The Kerepehi Fault, just outside the region, is active about once every 2500 years and has the potential to cause ground shaking in south Auckland and may be capable of creating tsunami. No activity has been detected on any of these faults in the last five years.

Climate Change

While climate has always changed, average temperature has been increasing rapidly in the last few decades. Global surface temperatures have increased by 0.2 to 0.3°C over the past 25 years (see Global Atmospheric Issues). Climate change is expected to amplify existing hazards due to:

- Increased temperature
- Increased rainfall
- Increased frequency and intensity of extreme rain
- Increased sea level

Implications

While the effects of flooding and land instability are not as widespread as that of earthquakes and volcanic eruptions, they do occur more often in the Auckland region. And while the risk to life is less, flooding and land instability still exact a high financial and emotional recovery cost.

By contrast, earthquakes and volcanic activity do not occur as frequently and therefore people may not often consider these hazards significant. However, the risk presented by a volcanic eruption is significant due to the unpredictable nature of an eruption, the widespread damage that can occur and the relative frequency of activity.

As the population of Auckland increases so does the pressure to develop land previously considered marginal or inappropriate, therefore increasing the risk to life, property and the environment. The Resource Management Act requires councils to promote avoidance, remediation and mitigation of hazards prior to approving subdivision or development of land. Some of these hazards occur in defined areas and can be avoided by restricting development in land prone to flooding, instability, active faults, coastal cliffs etc. Other hazards do not occur in predictable locations but can be monitored and evacuations can be undertaken, if needed, to avoid loss of life and limit damage to property. This type of hazard includes volcanic activity, cyclones and tsunami.

Urban Growth

Urban Auckland covers 55,000 hectares and is home to 1.1 million people – it is the fastest growing city-region in Australasia. New jobs, choices and diversity, congestion, and pollution are all the result of growth.

Growth generates new jobs, income and tax revenue, and raises property values, offering residents more choices and diversity. However, it also leads to increased traffic congestion, more air and water pollution, loss of open space and pressure on social and physical infrastructure.

State

In 1896 Auckland overtook Dunedin as New Zealand's largest urban area. Almost all urban growth has been into surrounding rural areas, and from its beginnings 150 years ago as a town centre between Parnell and Freeman's Bay, metropolitan Auckland moved outwards, swallowing up smaller isolated settlements such as Onehunga, Henderson, Otahuhu and Howick.

Since 1990, the Auckland urban area has continued its historical expansion but is now also experiencing a sustained period of consolidation.

Apartments, terraced housing, town houses and infill housing are being built in greater numbers throughout metropolitan Auckland. Most obvious on the Auckland isthmus, they are also found in places as far afield as Albany and Botany Downs. This reflects an increasing desire to trade traditional housing for more compact housing closer to work, cafes, beaches and other amenities. Suburban houses on large sections are no longer everyone's first choice of housing.

Figure 3.6: How the Auckland Urban Area Has Grown

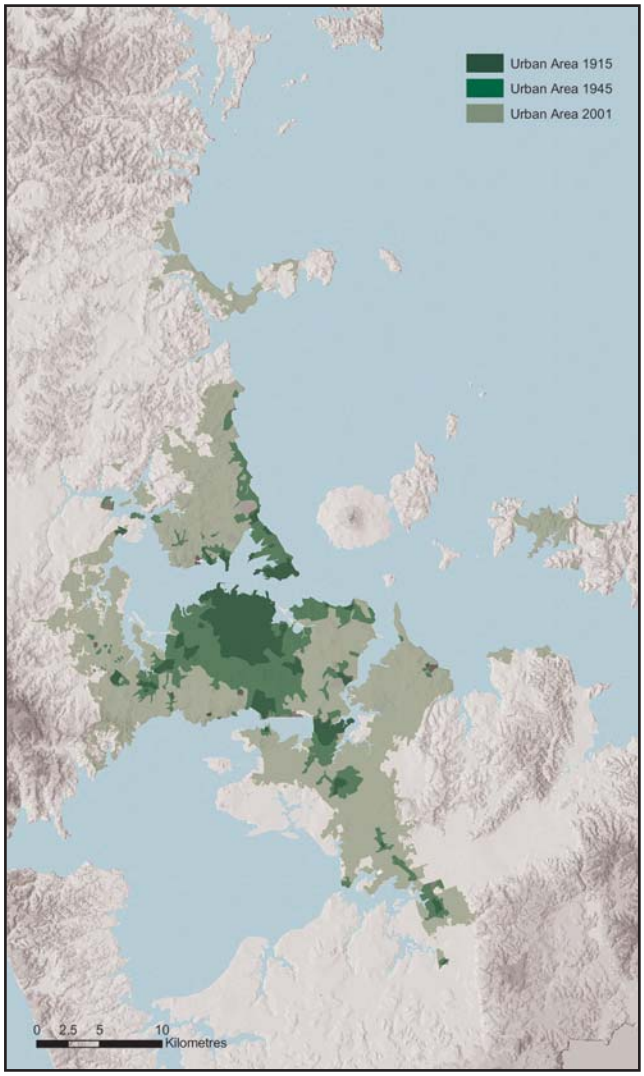


Figure 3.6 shows just how many new dwellings have recently been built in central areas instead of on the city fringe. In contrast to the situation 20 years ago when numbers of new dwellings in the Auckland city area were among the lowest in the region, Auckland city now has the highest rate of growth in this sector.

Urban Auckland - which includes urban areas in six or seven cities and districts in the region - is now home to around 1.1m people and covers approximately 55,000 hectares, making Auckland one of the largest cities in the world relative to population size.

Implications

The Auckland metropolitan area is the fastest growing city in Australasia and in 1999 overtook Adelaide to become the fifth largest city in that area. By 2050 it is expected that Auckland will have a population of over 2 million and cover around 60,000 hectares.

Developing new areas for urban land use affects the natural and physical environment and how the existing urban area functions. Effects range from removal of natural areas and sediment discharged from new subdivisions, to congestion on previously uncrowded transport routes.

While these concerns are being managed at the city fringes, increased redevelopment and intensification of already urbanised areas present new issues that must be addressed. These include the need to provide adequate social and physical infrastructure such as schools, passenger transport and additional stormwater capacity.

As part of the Growth Strategy (1999) a set of urban areas has been identified for future intensification. These growth areas or 'nodes' are based largely around existing town centres and are expected to accommodate high-density residential communities as well as commercial activities. As densities increase, passenger transport will become more efficient and effective.

Within the areas identified for intensification, population density was already higher in 1991 (17.9 per hectare compared to 13.8 in the rest of the urban area) and this trend has continued so that by 2001 intensification areas had 22.5 people per hectare compared to 16.8 for the rest of the urban area.

Cultural Heritage

There are 3100 protected cultural heritage resources in the region.

The ARC's Cultural Heritage Inventory has more than 13,000 items recorded.

The Auckland region has a rich cultural heritage which is of central importance in defining our identity as Aucklanders. It links people and place, enables a better understanding of cultural differences and the origins of our present day society.

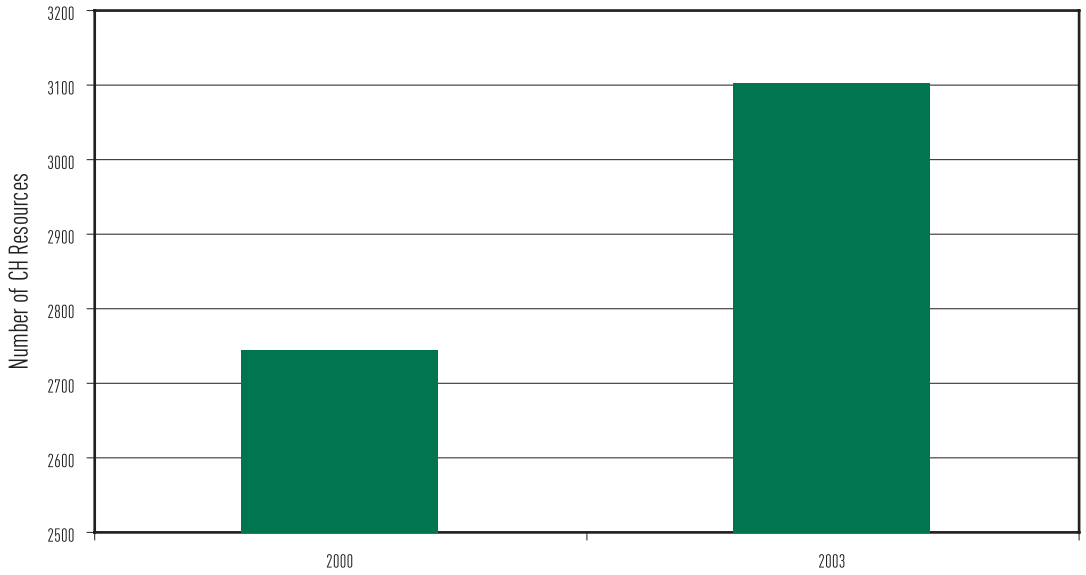
State

Our cultural heritage is dynamic in that it is constantly being created. It is however modified by natural processes such as coastal erosion, and elements of it have come under increasing pressure from land use practices and development in the fastest growing region in New Zealand.

Many gains in the advocacy and conservation of cultural heritage have been made in the Auckland region since 1999. Cultural heritage resources are now evaluated consistently across the region in accordance with the Auckland Regional Policy Statement (1999).

Schedules of significant cultural heritage resources and related policy are now included in all district plans in the region and in the Regional Plan Coastal. Between 2000 and 2003 cultural heritage resources given formal protection in district plans rose by 350 from 2750 to 3100.

Fig 3.7 Cultural Heritage Resources Formally Protected in District Plans



Schedules of significant cultural heritage resources now contain a more representative and diverse range than previously. They are relatively complete for significant historic structures places and areas, but are still incomplete for a range of archaeological sites, and resources of local significance. Cultural heritage places of significance to tangata whenua are still hugely under-represented in statutory documents in the region.

The acquisition of new areas of public open space in the region, and conservation undertaken on existing public land has benefited the conservation of cultural heritage significantly. Significant examples include the acquisition of the historic Warkworth Cement Works (RDC), Scandrett Regional Park (ARC), the Monte Cecelia property, Hillsborough (ACC), the Otuataua Stonefields Historic Reserve (MCC, DoC, ARC) and most recently Kaikoura Island which has been acquired through a Central/Local Government partnership. A feature of recent infrastructural development in the Auckland region has been the adaptation and conservation of major historic buildings such as the Auckland Town Hall, the Civic Theatre and the former Chief Post Office (Britomart Transport Centre) by Auckland City. The Department of Conservation has completed major conservation work on historic areas on North Head and Fort Takapuna, while the ARC has initiated a major conservation programme for historic structures on regional parks and has worked with owners to promote the conservation of significant historic structures in the coastal marine area.

Numerous community groups have also worked with local government and heritage agencies to conserve a wide range of historic places and areas like Stoney Batter (Waiheke Island) the Rangitoto Baches, Swanson Railway Station, and Te Maketu Historic Reserve (Ramarama). A number of kaitiakitanga projects have also been initiated by the ARC with tangata whenua. Examples include the Ngati Te Ata 'Tohu Kaitiaki' project in rural Franklin, the erection of nine carved pou throughout the regional parks network, and the promotion of these initiatives through the regional Maori newsletter, the Taiao Times.

The sustainable management and condition of archaeological sites continues to be a significant issue in the region as illustrated in Table 3.2. This shows that since 1999 741 sites were added to the record and of these 158 were intact, 379 were damaged, 174 destroyed, and there was no record for 30.

Table 3.2: Condition of Archaeological Sites

	Intact		Damaged		Destroyed		No Info		Total	
	1999	2004	1999	2004	1999	2004	1999	2004	1999	2004
ACC	635	689	1,385	1485	183	275	184	207	2387	2656
FDC	100	118	624	659	44	49	247	238	1,015	1064
MCC	282	303	629	708	86	108	111	108	1,108	1227
NSCC	27	25	105	151	24	30	30	45	186	251
PDC	7	24	21	35	6	9	6	8	40	76
RDC	537	573	1,989	2076	149	181	97	96	2,772	2926
WCC	15	29	432	450	100	114	34	37	581	630
Total	**1,603**	**1761**	**5,185**	**5564**	**592**	**766**	**709**	**739**	**8,089**	**8830**
Per cent	19.8	19.9	64	63	7.3	8.7	8.7	8.4	100	100

(NZAA Site File)

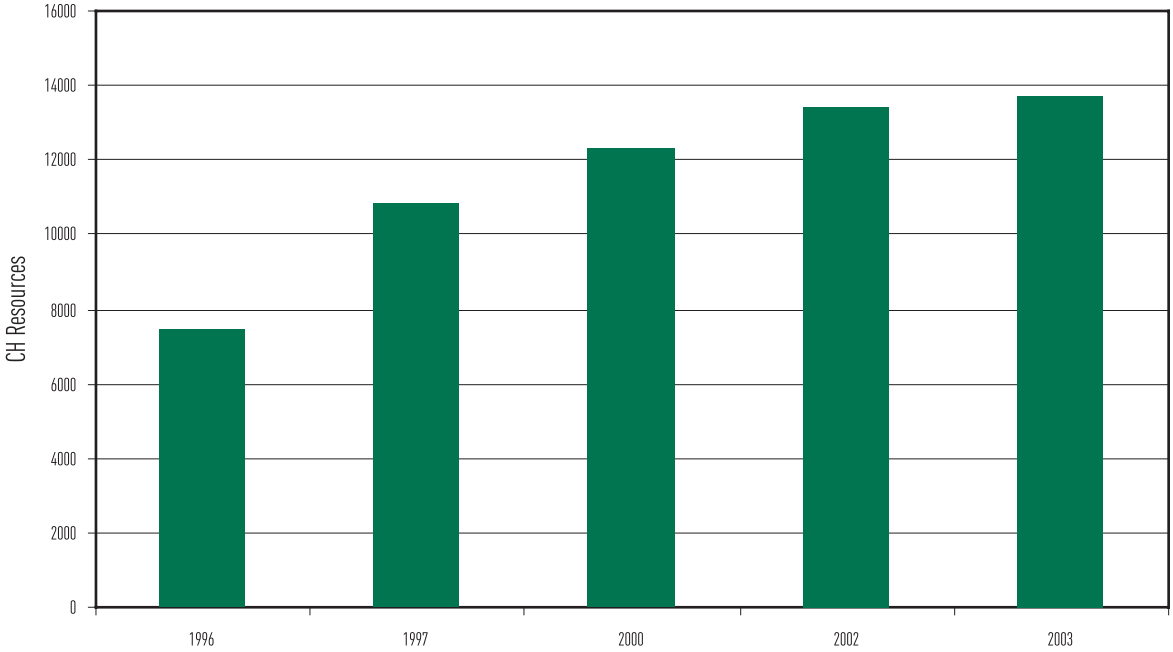
A significant portion of the region still remains to be formally surveyed for its cultural heritage values (Tatton 2001). Since 2001, progress has been made in the identification of historic places and areas in the region both as a result of RMA processes, and through specific area-based surveys undertaken by the ARC and most of the city and district councils.

This work has resulted in a significant increase in our knowledge of the region's cultural heritage. The Cultural Heritage Inventory (CHI) maintained by the ARC now has records for approximately 14,100 historic heritage sites in the region compared with 7462 in 1996. These resources include:

- Over 9000 recorded archaeological sites;
- 1000 sites with historic maritime associations within the coastal marine area;
- Over 2000 historic buildings and structures; and
- Approximately 700 botanical heritage sites.

Of these sites, 2450 are formally scheduled for protection in regional or district council plans.

Figure 3.8: Cultural Heritage Resources in the ARC Cultural Heritage Inventory



Since 2002, a regional cultural heritage monitoring network has been implemented by the ARC in partnership with MfE, tangata whenua, heritage agencies and the regional community to establish a baseline for the state of the region's cultural heritage. It has also provided the opportunity to develop a more integrated approach to cultural heritage conservation, and has enabled greater input to the process by the regional community and tangata whenua.

Public awareness has also been raised through comprehensive cultural heritage education and advocacy programmes ranging from the ARC environmental education programme to local initiatives. A major development has been the growth in the number of place-based interpretation programmes, for example those at North Head (DoC), the Huia Heritage Trail (ARC), the Otuataua Stonefields Historic Reserve (MCC, ARC, DoC) and the Mangere Mountain Education Centre (MCC, ARC, DoC, Te Waiohua). Most city and district councils now also have self-guided heritage walkways. Significant education programmes are also undertaken by regional heritage agencies like the Auckland Museum, MOTAT, the NZ National Maritime Museum and Howick Historical Village. People of the Auckland region currently place cultural heritage as the fifth most highly valued asset in the region (EAS 2003/04) and 76 per cent are aware of historic places to visit.

Implications

A key issue that remains for the region is the completion of the identification and evaluation of significant cultural heritage resources by local government in partnership with tangata whenua and the wider community. Significant amendments to the RMA have raised the status of historic heritage although this is not yet fully reflected in regional and district plans. To date, only 25 per cent of the total Auckland region has been systematically assessed and surveyed to identify cultural heritage resources. This is up 8 per cent on 2000 when the ARC CHI recorded 12,300 sites across 17 per cent (84,019 ha) of the region as a whole.

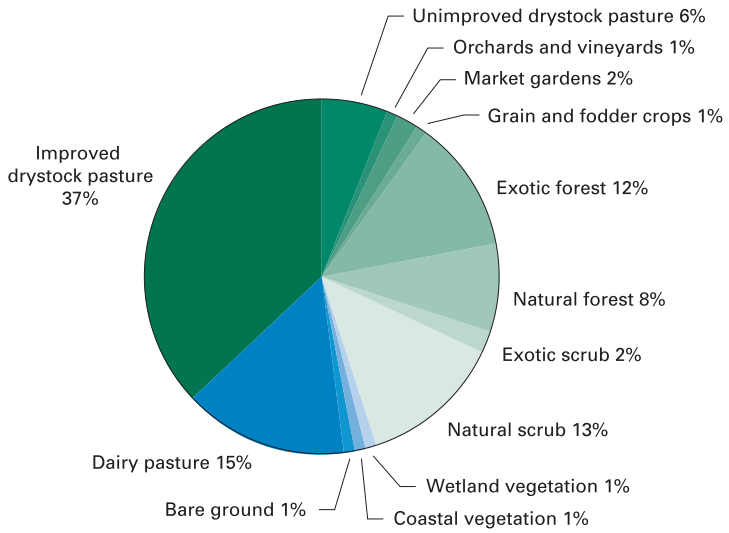
A critical issue to address is how to recognise and provide for the protection of cultural heritage resources of significance to tangata whenua. There is also a continued need to raise awareness of the value of cultural heritage in a fast growing region that is not seen as 'home' by many of its residents.

Soil Erosion and Land Use

A large proportion of rural parts of the Auckland region is hill or sand country, and prone to erosion. Soil erosion leads to the loss of nutrients and loss of soil structure - meaning the soil can no longer support plants.

Different land uses can affect soil quality and influence the type and amount of erosion.

Figure 3.9: Rural Land Uses in the Auckland Region

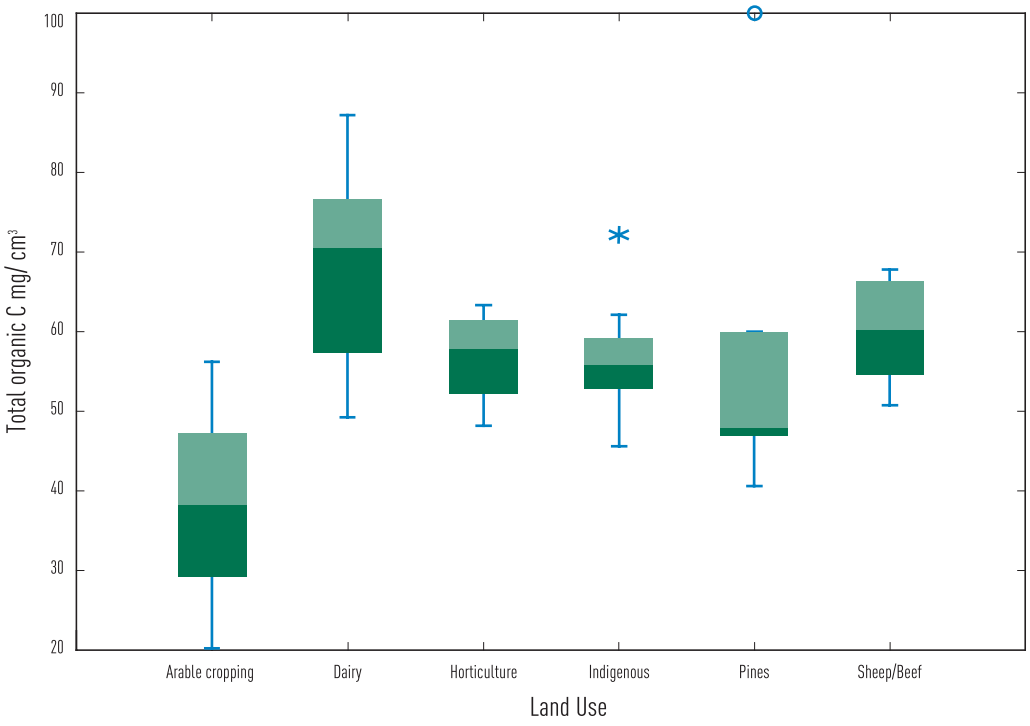


State

Figure 3.9 illustrates the rural land use types of the Auckland region, showing a predominance of drystock and dairy pasture, scrub and forest.

Most of the soil quality in rural areas is acceptable given the land uses taking place. However, in some areas there are signs of soil quality degradation, such as low levels of total organic carbon under some areas of arable cropping, as illustrated in Fig 3.10.

Figure 3.10: Total Organic Carbon Under Rural Land Uses



Implications

A large part of the Auckland region is comprised of hill country and sand country, making the potential for erosion naturally high in these areas. This land may not be suitable for some land uses.

A recent survey of hill and sandy country concluded that most of the land uses in these areas are not causing significantly higher erosion than expected, and some of them have levels of erosion that are close to those of natural vegetation cover.

Soil degradation through erosion or loss of soil quality leads to the removal of soil, loss of nutrients and loss of soil structure. These reduce the soil's ability to support the growth of plants - in turn potentially reducing stock health and increasing the requirement for capital inputs to maintain soil quality.

Understanding and monitoring the impacts of different land uses on soil quality means that we can look to protect the long-term health, stability, versatility and productivity of soils in the Auckland region.

Terrestrial Ecosystems

The land area of the Auckland region includes 15% indigenous forest, 11% regenerating scrub, and less than 0.4% freshwater wetland. Pest control has enabled important and threatened species such as kokako and Hochstetter's frog to recover in our protected natural areas.

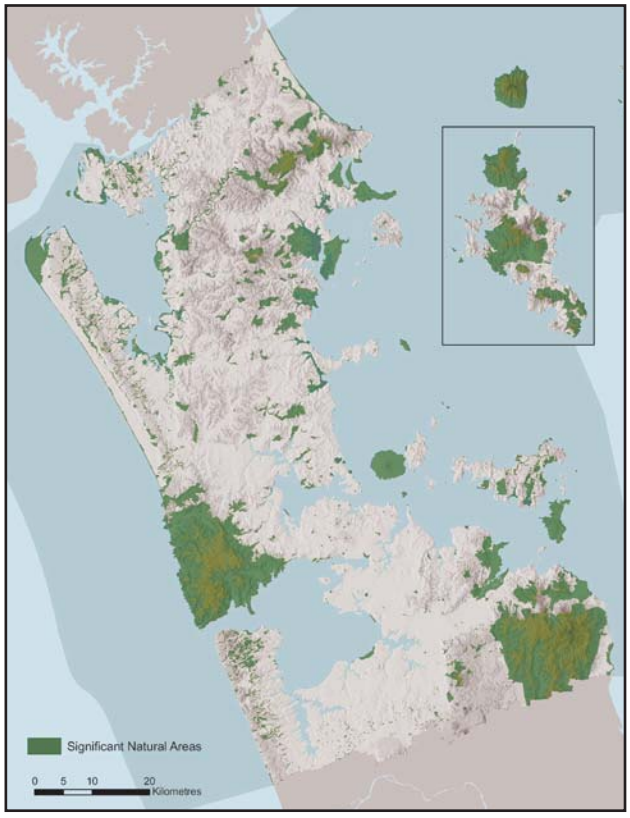
The Auckland region contains a diverse range of ecosystem types including coastal and lowland forest remnants, volcanic cones, the rainforest of the Waitakere ranges, the windswept west coast, dune systems, large estuaries and inner gulf islands.

State

The Auckland region's natural environment and indigenous biodiversity has been extensively modified and reduced from its original state. Of the total land area of the region 15 per cent remains as indigenous forest, 11 per cent as regenerating scrub and less than 0.4 per cent as freshwater wetland. Freshwater wetlands and coastal and lowland forest are particularly threatened. Modified forest and scrublands are the most extensive of the remaining vegetation communities.

Before the arrival of humans in New Zealand, kauri forest was probably predominant, intermingling with rich coastal and lowland forest of taraire, pohutukawa, kohekohe, nikau and puriri. Today significant areas of biodiversity are found in the Waitakere and Hunua Ranges and the Hauraki Gulf Island while forest and wetland remnants are found in Rodney, Franklin, Kaipara and the Auckland isthmus. These sites are identified in Figure 3.11.

Fig 3.11: Significant Natural Areas in the Region



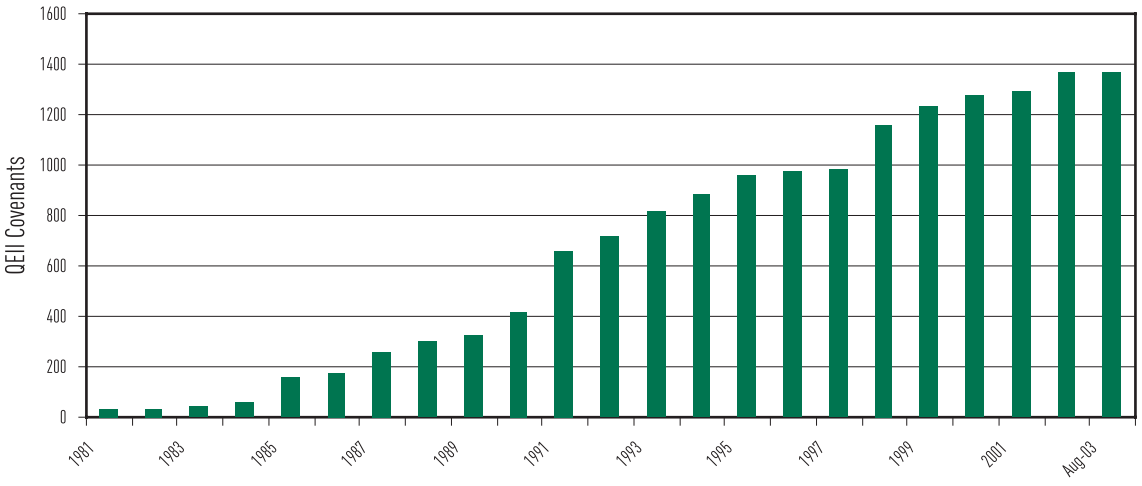
An estimated 11 per cent of the region's land area is within protected natural areas, with the majority in regional parks (38,000 ha) and Department of Conservation estate, as well as private land covenants (including QEII National Trust covenants) and local scenic and recreation reserves (Table 3.3).

Table 3.3: Protected Land in the Auckland Region

Ecological District	Land in Protected Areas (ha)	Percentage of Land Protected
Rodney	4775.4	3
Kaipara	3823.1	6
Tamaki	7787.5	1
Waitakere	16958.8	64
Hunua	19591.7	29
Manukau	200.7	1
Awhitu	244.4	2
Rangitoto	2329.7	100
Inner Gulf	2584.3	17
Great Barrier	15574.9	56
Little Barrier	3080.0	100
Total	**73509.5**	**11**

A significant amount of what remains of our forest remnants, scrub and wetlands are on private land, particularly in rural areas. Currently, 1379 ha of natural areas on private land have been protected by private landowners as QEII National Trust Covenants and these are increasing on an annual basis (Fig 3.12).

Figure 3.12: QEII Open Space Covenants in the Auckland Region



Significant ecological restoration projects on regional parks include the establishment of the Tawharanui Open Sanctuary and the restoration of over 20 ha of coastal and freshwater wetlands at Awhitu Regional Park and dune restoration at Long Bay Regional Park.

There has been a huge increase in community participation in biodiversity protection and restoration on public and private land in recent times, is illustrated in the significant increase in the number of Care Groups working with the ARC and city and district councils. Examples of these groups include the Tawharanui Open Sanctuary Supporters Inc., 'Ark in the Park' in the Waitakere Ranges, Te Henga Beach Care Group, Landcare Groups including at Puhoi, Awhitu and South Kaipara, and Little Windy Hill and Glenfern Sanctuary on Great Barrier Island.

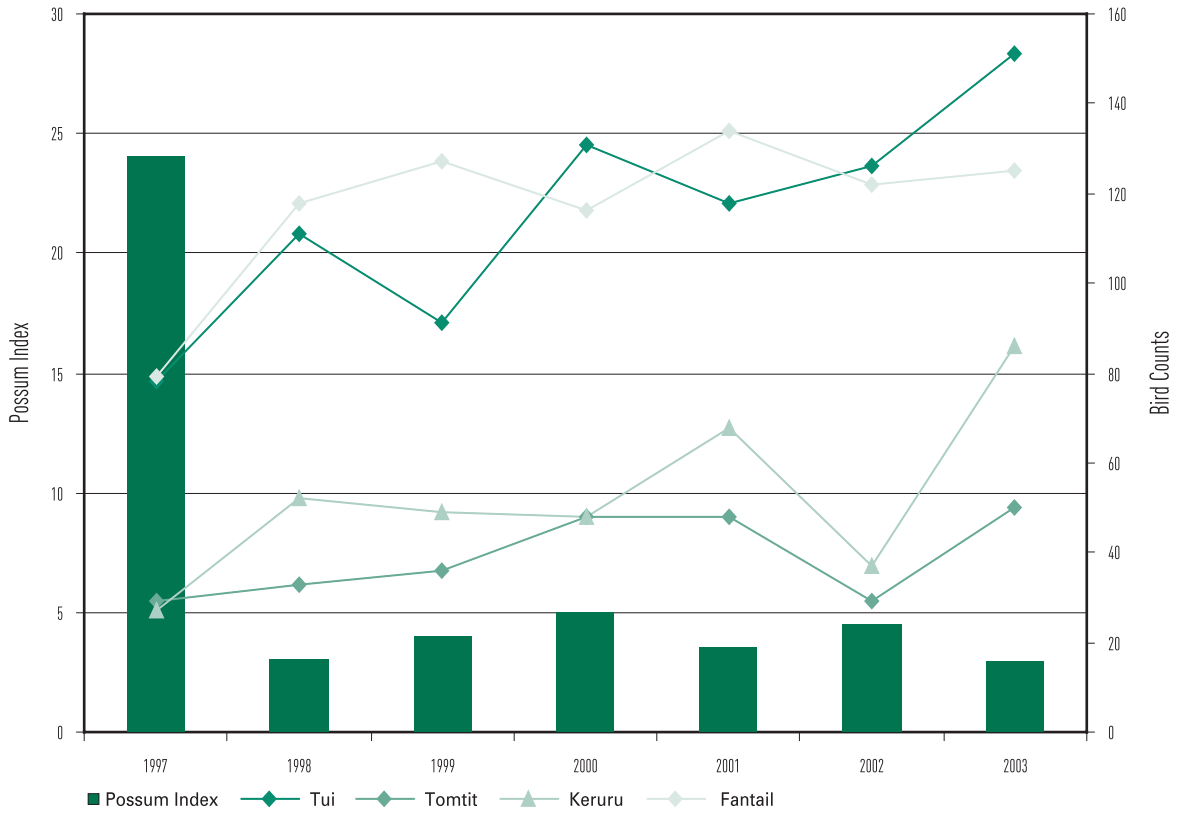
Table 3.4: Threatened Species in the Auckland Region

	Number of Nationally Threatened Species
Birds	55
Vascular Plants	149
Lower Plants	39
Invertebrates	64
Bats	2
Reptiles	11
Frogs	1
Freshwater fish	7
Marine fish	2
Marine mammals	8
Total	**338**

Vegetation clearance, urban growth and development continue to threaten biodiversity in the region, as do introduced weeds and pests. Possums are one of the most serious threats, as they forage and browse on vulnerable tree species, resulting in marked changes to the existing forest structure and species composition. Possums are also significant predators of the eggs and young of native birds.

The results of bird counts in the Waitakere Ranges (one of the region's key mainland natural areas) show the effectiveness of this intensive possum control since the mid 1990s, with kereru, fantail, tui and tomtit numbers increasing significantly over time. Intensive pest control has resulted in forest areas in the Auckland region showing some of the lowest numbers of possums nationally (see Pests), with bird count numbers in the Waitakere Ranges indicating good general health of the native forests in the region.

Figure 3.13: Possum Population Index and Bird Count Numbers in the Waitakere Ranges



Implications

Seven to eight hundred years of human settlement in New Zealand along with introduced pests have caused significant damage and loss to biodiversity, leaving about 1000 known animal and plant species threatened. The protection of the remaining habitat of these species is important to their long-term survival. The Auckland region's forest, scrubland and wetland provide habitat for a number of nationally threatened species including 55 birds and 149 vascular plants, a native frog, bats reptiles, invertebrates and fish (Table 3.4)

New Zealand's indigenous biodiversity is unique and internationally important. A high percentage of New Zealand's indigenous species are endemic (they are found nowhere else on earth). The rich coastal and lowland forests, scrublands and wetland ecosystems are a unique part of the Auckland region. Many contain plant and animal species that are only found in the warm subtropical northern forests of New Zealand.

Over a third of New Zealand's 2200 native vascular plants (approx 800 species) have been recorded in the Auckland region and over half of New Zealand's bird species (127 species). Sixteen species of native frog, reptiles and bats are found in the Auckland region. All New Zealand's native bats, reptiles and frogs, and many native birds and plants are endemic to New Zealand.

Native species are lost or threatened as a result of loss of habitat and ecosystems. Introduced weeds and pests are one of the most serious threats and must be controlled and managed to ensure the survival of ecosystems and many species that are unique to New Zealand.

Intensive pest control can have benefits for numbers and viability of the populations of threatened species. Two endemic nationally threatened species which occur in the Auckland region and which are benefiting from ongoing management and pest control are the kokako (nationally endangered) and the Hochstetter's frog (nationally scarce).

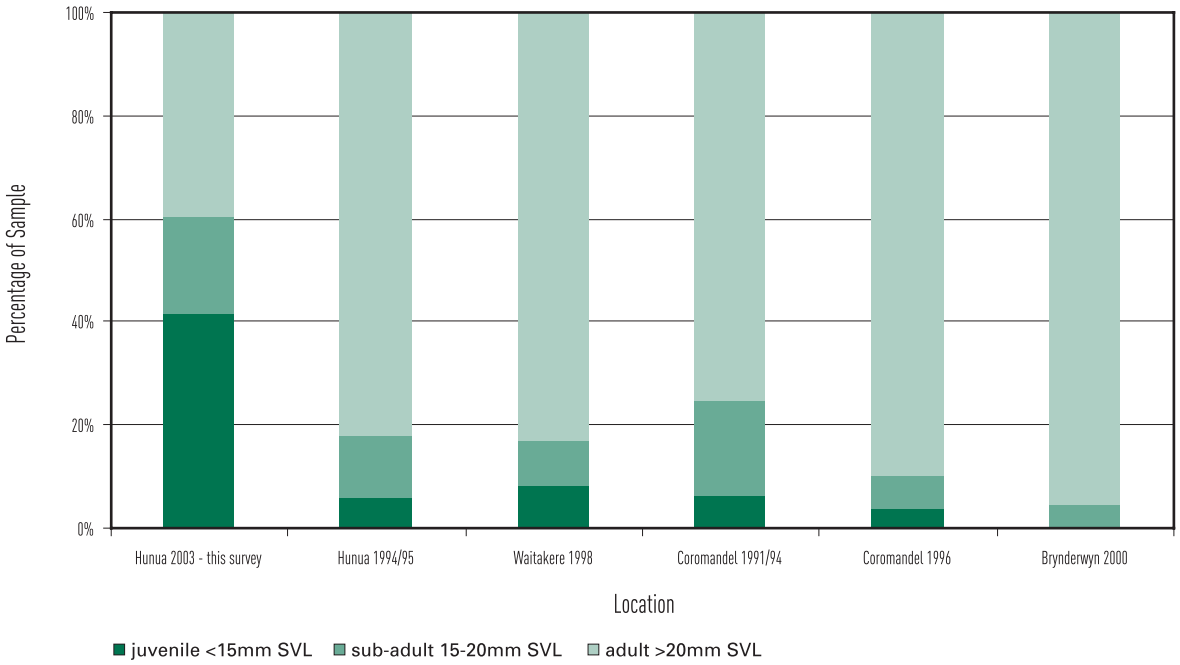
The small population of the endangered kokako in the Hunua Ranges Regional Parks is the only surviving natural population between Waipoua Forest in Northland and the south Waikato. Intensive management of this area began in 1994 (with the control of goats and possums over the entire ranges and control of mustelids and rodents within the kokako management block). To date a total of 30 kokako have fledged.

Table 3.5: Status of Hunua Kokako Population and Breeding to 2004

Breeding Year	No. of pairs at start of season	Total population at start of season	No. of nests per year	No. of nests failed	No. of young produced
1994-95	1	25	2	1	3
1995-96	1	20	1	1	0
1996-97	2	17	4	4	0
1997-98	3	17	4	2	2
1998-99	3	19	4	1	4
1999-00	4	23	2	2	0
2000-01	5	16	7	2	3
2001-02	5	19	10	4	10
2002-03	4	15	7	5	5
2003-04	9	30	5	2	3

Similar positive results have been recorded for the Hochstetter's frog - one of just four frogs native to mainland New Zealand. A recent survey of frogs in the Mangatawhiri stream catchment of the Hunua Ranges show a very healthy population, with frogs found at all study sites. The proportion of young to adult frogs was high compared to other North Island locations (Figure 3.14), indicating that the population is more sustainable here than elsewhere in the North Island.

Fig 3.14. Hochstetter's Frogs in the Hunua Ranges in 2003



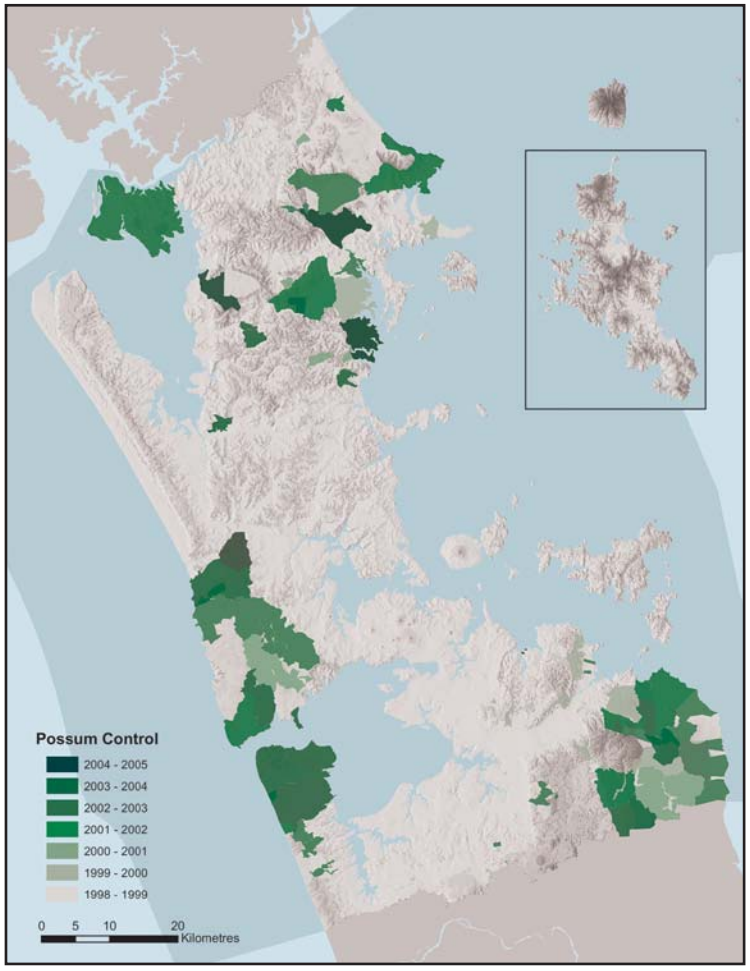
The results of these studies provide evidence of the environmental benefit of large-scale possum control programmes in the region, and intensive control in the mainland island sites. Pest control programmes have resulted in a healthier forest ecosystem, with regeneration and a more diverse range of species. Pest control has also allowed the successful breeding and survival of endangered species, important to the region's remaining biodiversity.

Pests

Painted apple moth, southern saltmarsh mosquito, red imported fire ant, eastern banjo frog, cane toad and scollid wasps are all pests that have been found in the Auckland region over the past five years. Possums, stoats, wasps and wallabies all threaten our ecosystems,

The majority of the Auckland region's introduced plant, anima, and invertebrate species are beneficial or at least do not impact detrimentally on the environment. However, there are some which do harm the natural, human or economic environment.

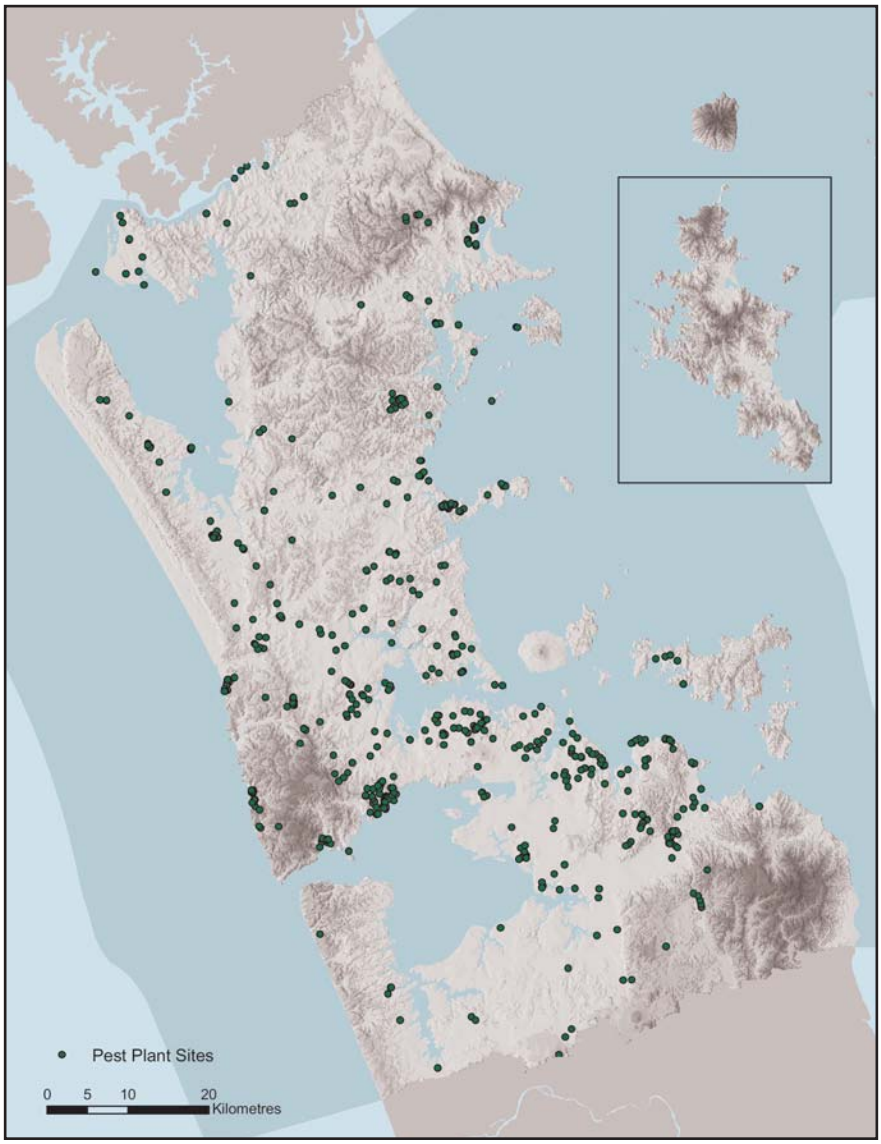
Figure 3.15: Possum Operations Map



State

In excess of 20,000 plant species or varieties grow in the Auckland region, including 2100 native species. About 2400 exotic plants have naturalized and about five more do so every year. Thirty-nine weed species are controlled through the Auckland Regional Pest Management Strategy (RPMS) by the ARC bio-security team or individual occupiers. These weeds and a further 84 species are banned from sale, distribution or propagation under the RPMS.

Figure 3.16: Identified Weed Sites Since 1997



The number of sites where the ARC carries out pest plant control has risen from 405 Total Control sites in 1999 to 667 today. To date, 116 infestations have been eradicated - 67 of these since 1999. At a further 1168 sites, which are the responsibility of the land occupier to control, containment plants are under regular inspection.

There are a number of significant pest animal species within the Auckland region, including possums, mustelids, feral goats, feral deer, rats and pigs. Control of these pest animals is carried out in areas of high conservation or ecological value to reduce the populations to a level that allows the native ecosystems to cope. Much of the animal control work is carried out with the aim of protecting remnant habitats and ecosystems. Some of these areas, such as certain Hauraki Gulf islands, are isolated and free of many of the pests present on the mainland. The Hauraki Gulf has been declared a Controlled Area to prevent the movement of pest animals to these islands.

The numbers of possums within these high conservation value areas is measured by the residual trap catch (RTC) - a level of 5 per cent is considered to be the threshold of possum numbers to maintain a healthy forest ecosystem. The RTC levels in the majority of areas in the Auckland region where control has been carried out are below 3 per cent.

Possum control is also carried out in the South Kaipara area as a precaution against bovine tuberculosis (Tb). In areas of intensive control work in the South Kaipara bovine Tb zone, RTCs of 0 per cent have generally been achieved. There have been no (possum) vector-related outbreaks of bovine Tb in the Auckland region since 1998, and the region is on track to be declared bovine Tb free by July 2004.

Control programmes to eradicate feral goats in the Hunua Ranges and on Great Barrier Island carried out over the last few years are nearly complete. A programme to eradicate wild pigs recently got underway in the Waitakere Ranges.

Figure 3.17: Examples of new Incursions since 1999

New Incursions

Argentine Ant

Painted Apple Moth

Southern Salt Marsh Mosquito

Eradicated

Cane Toad

Neoclytus

Red Imported Fire Ant

A number of new incursions of pest species into the Auckland region have occurred over the last five years. These include the guava moth, painted apple moth, fall webworm, gum leaf skeletoniser, southern saltmarsh mosquito, red imported fire ant, Argentine ant, eastern banjo frog, cane toad, scollid wasp, scrambling lily and devils tail (tearthumb).

Implications

Plant and animal pests have a significant impact on the environment, wildlife, economy and quality of life of the Auckland region. Pest plants compete with desirable species for space, light, water and nutrients, and they suppress growth. In the long term this can lead to permanent changes in the structure and composition of our native habitats. Pest animals are having a serious effect on our native ecosystems, feeding on native plants and wildlife. They also damage crops and pasture, and may carry disease.

The majority of pest plants in the Auckland region were introduced as garden species. Other plants have arrived here accidentally as contaminants of seed or other plant stock. Many of these species have been widely distributed through the nursery and garden trade, prior to being recognised as pests, and are now escaping from cultivation. They spread through natural means, such as birds, animals, wind, water, machinery, clothing, topsoil and also in illegally dumped garden waste.

Several pest plants are also a problem in agricultural or cropping situations, competing with pasture or crops, reducing stock capacity and in some cases carrying the risk of poisoning or injuring stock. Plants such as ragwort, Bathurst bur and Californian thistle may have an impact on farmers' livelihoods by tainting milk, downgrading wool and contaminating crops such as peas.

While there is a low incidence of many of the pest plants in the region, if left untreated they will gradually increase and be distributed more widely until active control is impossible. In many cases, species that are widespread may require biocontrol to reduce the infestation to levels where traditional methods are feasible.

Both pest plants and animals can negatively affect human health and quality of life. Some plants are poisonous or irritating if touched or eaten, and others have pollens that can aggravate respiratory ailments. Some plants can be obstructive to recreational activities. Pest animals can also sting, bite, scratch, irritate or spread disease.

Possums, mustelids, wasps and wallabies present some of the greatest threats to our native ecosystems, competing with native species for food and shelter and eating and damaging large extents of native vegetation. Some are predators of native animals, birds and insects.

Possums, mustelids and feral deer can carry bovine tuberculosis, increasing the risk of this disease spreading to farmed deer or cattle herds. Possums and rabbits also cause damage to crops and forestry plantings.

Case Study: Mistflower

Mistflower (Ageratina riparia), an invasive weed from the daisy family was introduced to New Zealand as an ornamental plant in the 1930s. It is shade tolerant and has established widely throughout the upper North Island.

This weed is common on roadsides, riverbanks, tracksides and clearings as well as forest margins and waste ground. It is a serious problem in a number of countries with tropical and warm temperatures. It was particularly insidious in Hawaii where an extensive biocontrol programme was carried out in the late 1980s and early 1990s.

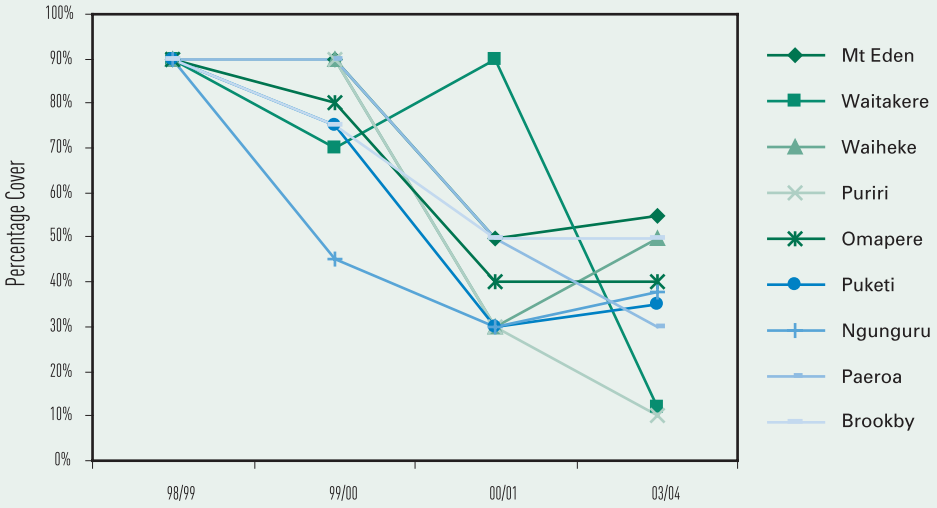
In 1998 the Auckland Regional Council applied for, and received permission to import and release the mistflower white smut fungus (Entyloma ageratinae). The fungus was released in a number of sites in Northland, Auckland and the Waikato, and it spread rapidly throughout mistflower infestations. Release sites were monitored over several years to determine the rate and extent of spread, and the effects on the mistflower population. This was the first time extensive post-release monitoring of biological control agents effects had been carried out in New Zealand (Fig 3.18). The fungus appears to have spread now to all the populations within Auckland region except the most easterly and southerly ones.

In 2000, permission was also gained to release the mistflower gall fly (Procecidochares alani). Flies were released from early 2001, and the establishment and spread of the insects monitored. The gall flies were released at 33 sites and established in 14 of these. In the one site where the gall numbers were quantified, there was a steady increase from 0.2 galls/stem in 2001 to 1.8 galls/stem in 2003.

The fungus appears to have substantially reduced the cover of mistflower in all sites assessed. A number of monitoring sites were established in the Waitakere Ranges and assessed for changes in mistflower density and cover, and for establishment and growth of native or other exotic species. In a number of the plots, the cover and diversity of native species has increased with the decrease in mistflower cover. In some plots exotic cover has remained the same or increased, particularly where other exotic species were already present (e.g. periwinkle and Mexican daisy).

One of the most significant outcomes from the release of the mistflower biocontrol agents is the increased chance of survival of two rare Hebe species. H. bishopiana in the Waitakere Ranges and H. acutifolia, which is found in Northland, were considered to be under severe threat from mistflower infestations. The populations of these rare species are showing substantial recovery following the release of the agents and, with a further reduction in the mistflower population, they may be able to be moved off the 'vulnerable' list entirely.

Figure 3.18: Mistflower Pre and Post Introduction of Bio-control Agents



ARC Responses

The ARC undertakes a range of functions in relation to the issues discussed in the Land chapter. These can be summarised as follows:

Key Planning Initiatives

The Auckland Regional Growth Strategy lays out a vision for how the region should grow while maintaining the values and amenities we enjoy. These values include many of the issues discussed within the Land chapter, including our landscapes, and terrestrial ecosystems.

The ARC works with city and district councils through their district plans on issues such as minimising the risks to people and property from a range of hazards, or protecting sightlines to volcanic cones and landscapes from inappropriate subdivision and use. Cultural heritage resources are primarily protected through being listed in plans, either district plans, or documents such as the Auckland Regional Policy Statement, or the Proposed Regional Plan: Coastal.

The Erosion and Sediment Control Regional Plan puts in place controls on land-disturbing activities such as bulk earthworks for subdivision.

The ARC has produced a Regional Open Space Strategy, which defines a vision for the provision of open space as the region grows, and a Regional Parks Network Management Plan, which defines how ARC regional parks will be managed.

The ARC has in place a Regional Pest Management Strategy which defines a strategy for managing plant and animal pests in the Auckland region.

Key Implementation Initiatives

The ARC owns and operates 21 regional parks covering 38,000 hectares, ranging from sandy beaches, farmland and bush-clad hills to the Regional Botanic Gardens and Ericsson Stadium, which provide open spaces for a range of leisure and recreational opportunities. The regional parks network also serves as a way of protecting important and valued resources such as the natural terrestrial ecosystems of the Waitakere and Hunua Ranges (which are also important landscapes) and a variety of cultural heritage resources.

Pest management operations are carried out throughout the region on plant and animal pests, such as Operation Forest Save in the Waitakere Ranges. These pest control operations keep pests such as possums to a minimum to help maintain the health of terrestrial ecosystems.

Key Monitoring Initiatives

The ARC monitors the land of the region to ensure that valued aspects of our region, such as our terrestrial ecosystems, remain healthy throughout the region. In addition, the ARC is evaluating where the highly valued landscapes in the region are, and assessing hazards which may pose a risk to human life or property.

Urban growth and the capacity for further development are monitored to ensure there is sufficient room for the region to grow, and soils are monitored to ensure land use activities are not having adverse effects on soil structure and quality.

More information on ARC functions and activities can be found in the ARC Long Term Council Community Plan (LTCCP).

Our Fresh and Coastal Waters

Fresh Water Resources

136 million cubic metres of water is allocated each year - equivalent to 288 litres per person per day.
There are more than 4500 dams in the Auckland region.

The Auckland region utilises two sources of fresh water: groundwater (including geothermal water) and surface water either from lakes and dams or directly from streams.

State

Water is a precious commodity in the Auckland region. A rapidly growing population of 1.3 million people requires water for household use, domestic purposes, industry and farming.

Water, as an important economic resource, is provided from a range of sources. Surface water is taken from streams, or from dams on streams. Groundwater is abstracted through water bores from aquifers. Rainwater is also stored in tanks for many rural households, and increasingly in glass and hot house horticulture and some industrial applications.

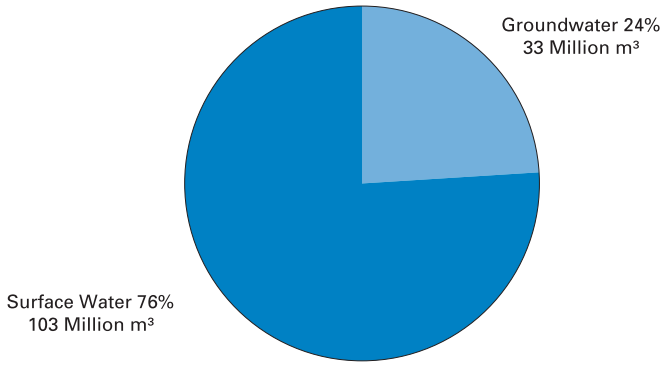
The Resource Management Act 1991 (RMA) allows some "as of right" taking of surface water and groundwater for individual domestic purposes and animal drinking water. Taking of water for other purposes, including municipal supplies, is governed by resource consents granted under the RMA.

The amount of water taken for "as of right" purposes is not recorded although the effects on major streams and aquifers are monitored. The estimated average amount of "domestic" water used per household is 144m³ per annum.

The abstraction of water under resource consents is measured both as an allocation and as an actual use. In the Auckland Region 136 million cubic metres (Mm³) of water is allocated each year by resource consents, which equates to about 288 litres per person per day.

Figure 4.1 shows that about three quarters of allocated water in the Auckland region comes from streams and dams (surface water), and the balance is groundwater.

Figure 4.1: The Source of Allocated Water in the Auckland Region



The major use of water in the Auckland region is for household purposes - to meet the demands of a growing population. Water is provided by reticulated supply to the metropolitan area and to the larger towns in the region.

Watercare Services Ltd take 72 per cent of the total water allocated in the region, approximately 7 Mm^3 of groundwater and 91 Mm^3 of surface water (not including water drawn from the Waikato River) to service the households, industrial and commercial users in the metropolitan area.

The other major reticulated suppliers are Franklin District Council, 1.75 per cent of the total (1.3 Mm^3 of groundwater and 1 Mm^3 of surface water) and Rodney District Council, 1.4 per cent of the total annual allocation (0.7 Mm^3 of groundwater and 1.2 Mm^3 of surface water).

The balance - 34 Mm^3 or 25 per cent of the consented allocation is distributed between a range of agricultural and horticultural purposes, industry and small community supplies.

Groundwater

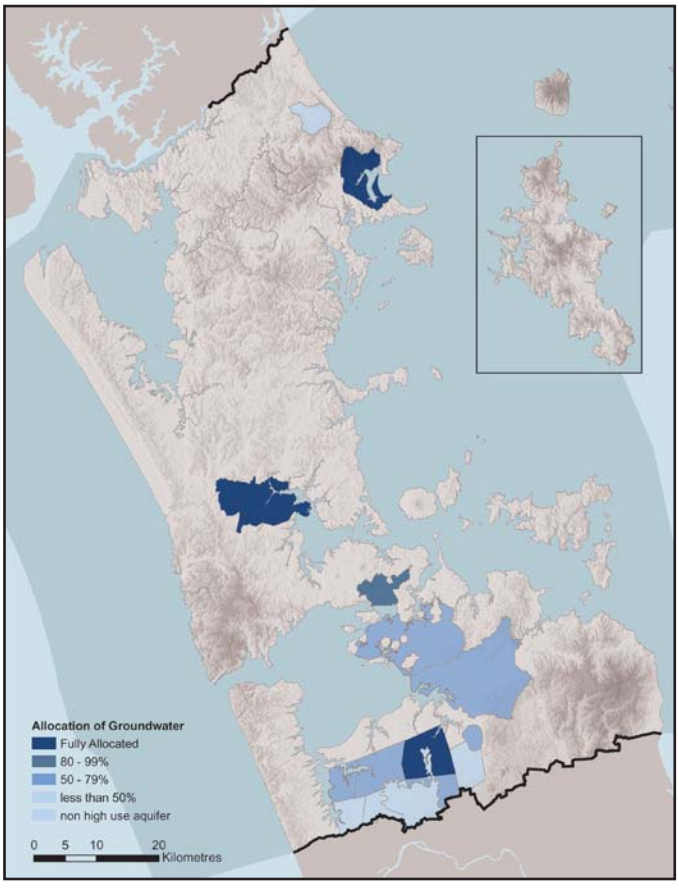
Groundwater is held in pore spaces and fractures in rock below the ground surface. The accumulation of groundwater in rock is called an aquifer, which is bounded by layers of impermeable material, like clay, so there can be a number of layered aquifers at varying depths. The aquifers are recharged by rainwater and some streams. Some aquifers hold water that is tens or hundreds of years old.

Aquifers in the Auckland region are generally low-yielding compared to other parts of New Zealand, although they are an important source of water, particularly in basalt rocks of south Auckland and the shell and sandstone rocks found throughout the region.

The Auckland region also has two significant geothermal aquifers at Waiwera and Parakai. Water is heated at depth and rises through fractures in the rock to provide warm geothermal waters, with maximum temperatures between 53°C to 65°C.

Water is allocated up to sustainable levels, commonly known as water availability, to ensure sufficient water for streams in dry years and to maintain the aquifer. Some groundwater aquifers in the region are susceptible to adverse effects from being over-pumped. These aquifers have been identified as High Use Aquifer Management Areas and the extent to which they are allocated, is shown below in Figure 4.2.

Figure 4.2: Allocation levels of Groundwater Aquifers in the Auckland Region

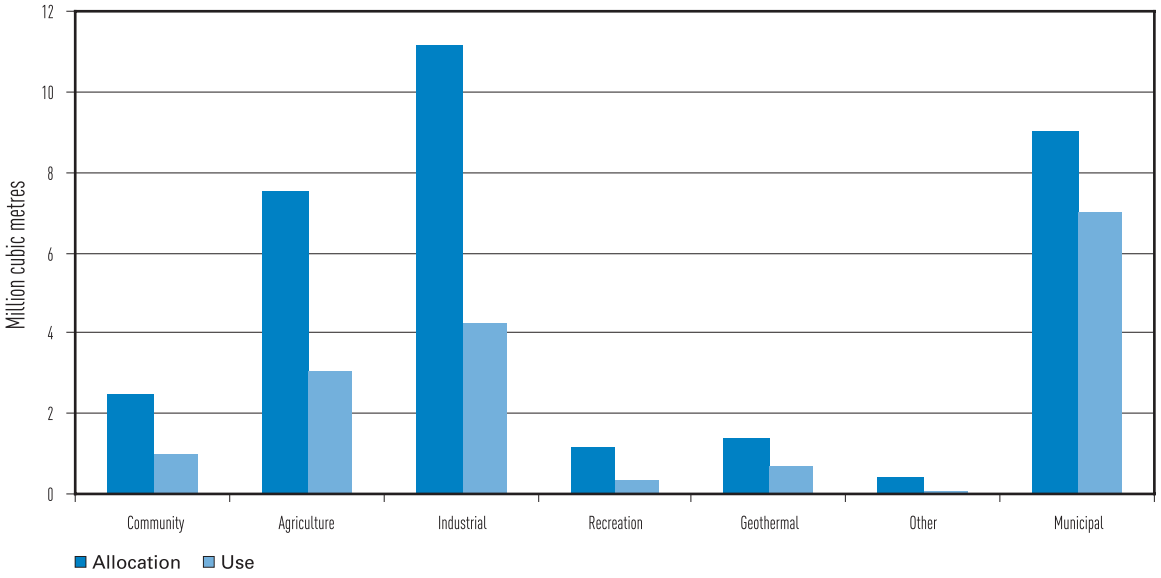


Groundwater is used for a range of activities including municipal supply, smaller community reticulated supplies, irrigation for agriculture or horticulture, industrial processes and irrigation of community recreation facilities such as sports fields and golf courses. Geothermal water is mainly used for recreation and bathing.

Figure 4.3 shows the allocation and use of groundwater in the 2003 year which was relatively wet - meaning actual use was lower than allocation.

The allocation is generally greater than actual use as the allocation takes into account the potential for dry summers when there will be much higher demands for irrigation. Industrial use was less than allocation as a number of major enterprises were not using water or operating well below their allocation.

Figure 4.3 Groundwater - Allocation and Use for the 2003 year

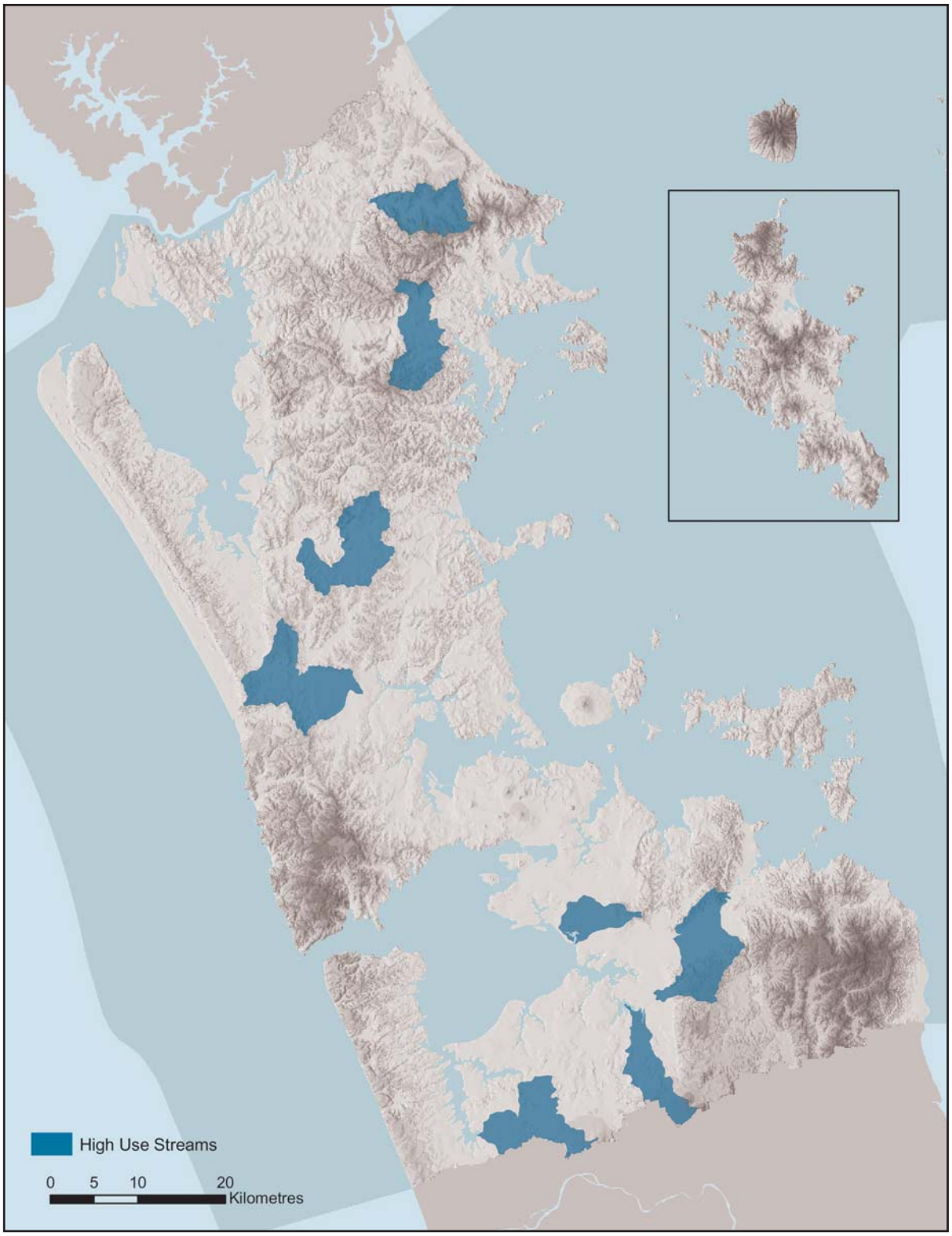


Surface Water

Surface water includes all the water in lakes and dams and flowing through rivers and streams. The Auckland region is characterised by small first or second order streams (the "finger tip" tributaries at the head of a catchment), which are particularly sensitive to the amount of rainfall and abstraction. The largest river in the Auckland region (5th order) is the Hoteo River with a catchment of 405 km².

A number of streams in the Auckland region are under pressure from demands for water abstraction by a number of users, and are shown below as 'High Use Streams'.

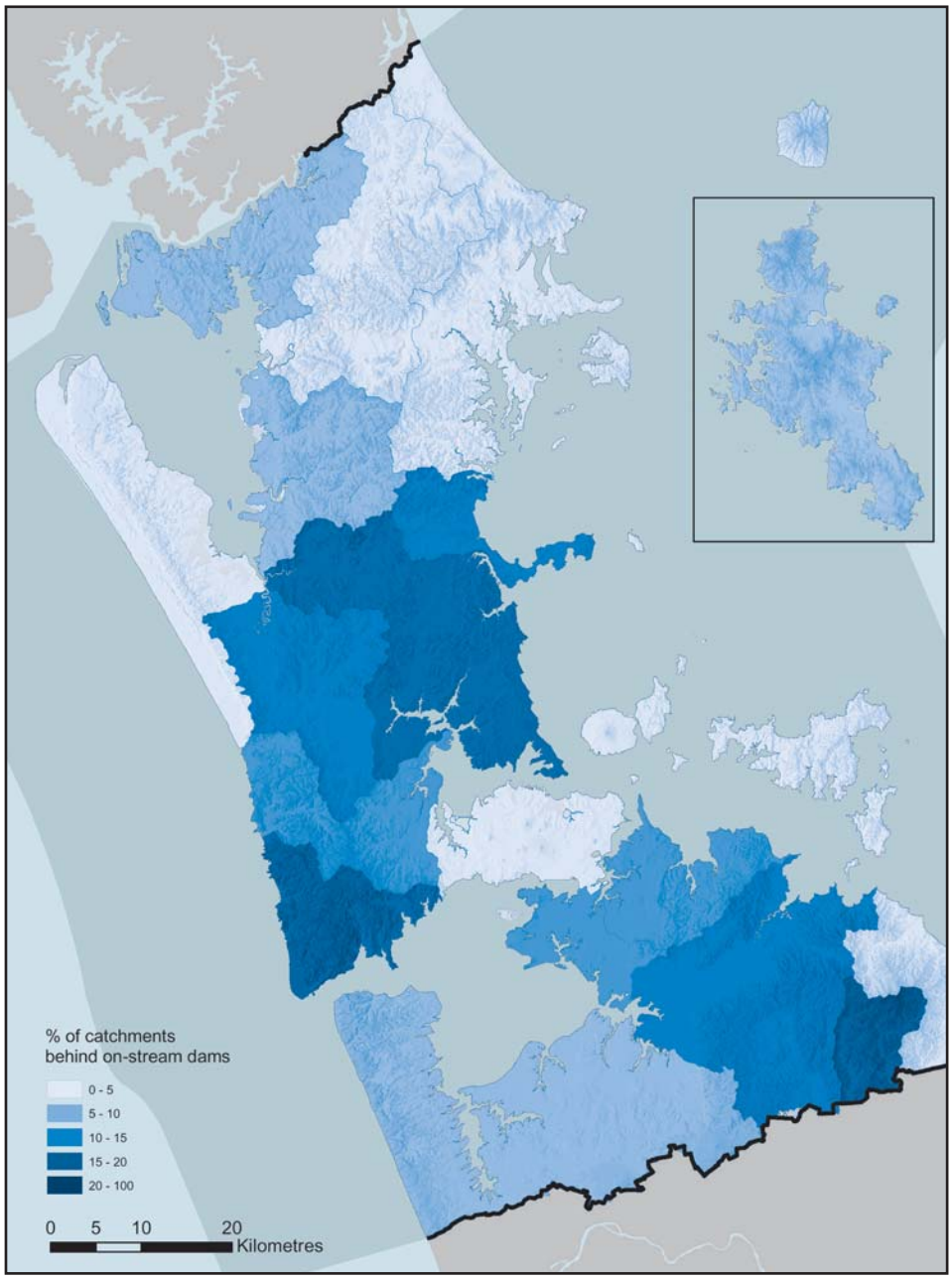
Figure 4.4: High Use Streams Management Areas in the Auckland Region



Water stored in reservoirs is the main source of water for the metropolitan supply through Watercare Services Ltd. Dams also provide significant volumes of water for farm supply. In 2004, the ARC identified 4538 dams in the Region, of which 1342 are on-stream, and 3196 are off-stream. On-stream dams are now discouraged as they have detrimental effects on stream water quality.

Figure 4.5 illustrates water catchments which have large numbers of dams in the Auckland region.

Figure 4.5: Proportion of catchments behind on-stream dams

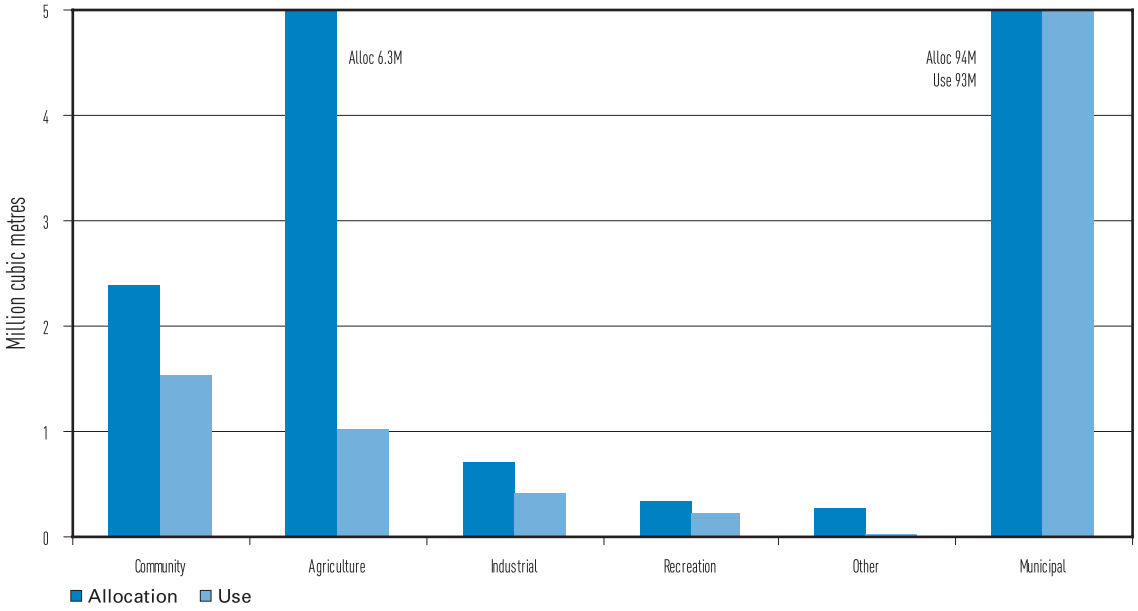


The allocation of surface water is determined by preserving minimum natural flows in streams to maintain ecological systems.

Surface water is used for similar purposes to groundwater. Figure 4.6 shows the allocation and use of surface water for the 2003 year. The demand for municipal reticulated supply accounts for the largest volume of surface water, predominantly from the Watercare Services Ltd dams in the Hunua and Waitakere Ranges.

Again, as 2003 was a relatively wet year, actual use is much lower than total allocation.

Figure 4.6: Surface water Allocation and Use for the 2003 year



Implications

The Auckland region has a finite supply of water available for use, and many people wanting to use it. Overuse can cause adverse environmental effects and can affect the future use of the resource.

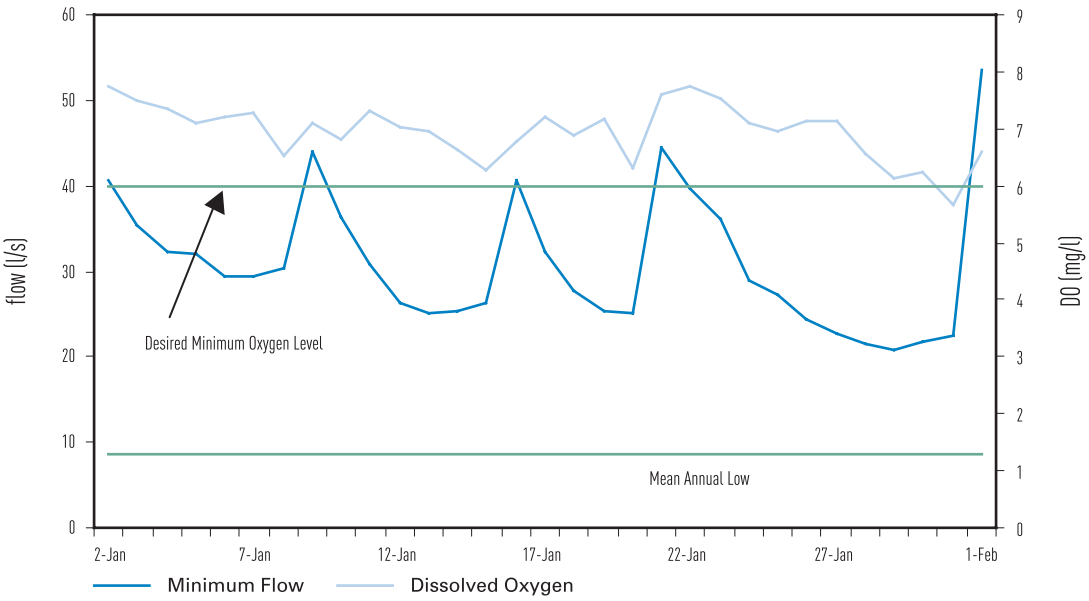
Groundwater is susceptible to contamination. Overpumping from coastal groundwater aquifers risks the potential for salt water to seep in and mix with the fresh water in the aquifer. Contaminants such as fertilisers, on-site wastewater or stormwater pollutants can seep through the soil layer and may affect the quality of groundwater. Also, pumping more water than replenishes an aquifer can lead to a lowering of water levels and depletion of the resource.

Unfortunately, the time when people want to use water the most, (i.e. in the summer for the irrigation of crops) is also the time when the resource is most limited (dry weather flows).

Surface water can only be allocated up to an environmentally sustainable level - that is the amount of water required to maintain the habitat of freshwater animals and plants, and to maintain acceptable water quality. Allocating more than this amount can contribute to the degradation of these freshwater ecosystems. Dissolved oxygen is necessary for aquatic animals, and is depleted by raised water temperature (which often occurs in low flow conditions).

Figure 4.7 shows the relationship between the flow of water and oxygen levels in one stream in South Auckland over the summer of 2003/04. Although the flow in the stream did not fall as low as the mean annual low flow, it can be seen that the level of dissolved oxygen has similar troughs to the flow, and on a number of occasions the amount of oxygen has been close to 6 mg/L, regarded as a desirable minimum level to support healthy aquatic life.

Figure 4.7 Surface Water Quantity and Quality



Current investigations by the ARC show that dams on perennial streams also have a detrimental affect on stream flows, shape and ecology. Reduced stream flow can reduce the amount of water to dilute contaminants, while dams can restrict fish movements in various stages of their life-cycle (90 per cent of freshwater fish require access to and from the sea). Dams also tend to increase water temperatures, which reduces the level of dissolved oxygen.

The effects of fresh water use need to be managed to maintain the quality of our rivers and streams, but also to allow for the economic benefits from industry and agriculture, as well providing for drinking, recreational, and community needs to be realised.

Streams

There are approximately 10,000 km of streams in the Auckland region.

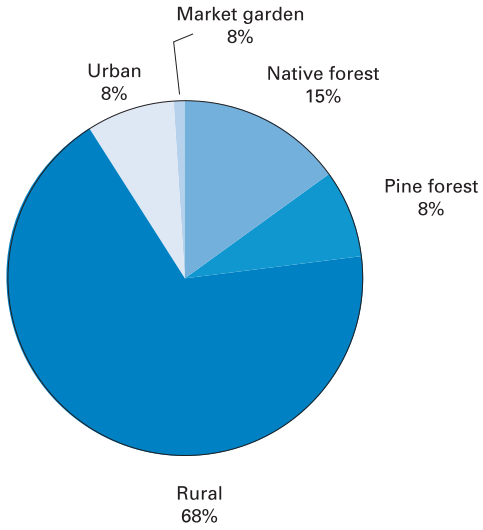
Stream water quality is monitored at 16 sites throughout the region.

State

The majority of streams in the Auckland region (68 per cent) are contained in catchments predominated by rural land uses, with the remainder in native forest (15 per cent), urban (8 per cent) and commercial forestry catchments (8 per cent).

However, many other small streams are not mapped, and include permanent streams that flow year round, and intermittent streams that flow only during certain times of the year.

Figure 4.8: Predominant Catchment Types of Streams in the Auckland Region



Stream water quality in the Auckland region is measured for 22 water quality parameters in monthly samples taken from 16 sites. The sites represent the five major land uses classes shown above, and are distributed across the region.

Stream water quality is strongly associated with the catchment land use. Native forest and forestry sites have the best fresh water quality, market garden and rural sites have lower quality, and urban sites had the poorest water quality.

The results are summarised below using a ranking of sites, where the "best" sites were given a score of one and the "worst" site a score of 16 for seven key water quality parameters. These data produced a ranking in decreasing order of biological quality, as shown in Table 4.1, and which is summarised below:

Freshwater Quality Ranking:
Native forest > exotic forestry > market garden > rural > urban

Table 4.1: Water Quality Ranking of Auckland Streams

Site	Land Use	Black disk (clarity)	DO % sat. (oxygen)	Faecal coliform (bacteria)	NH4-N (Ammonia)	NO3-N (Nitrate)	TP (Phosphorus)	SS (Solids)	Rank sum	Rank
Cascade	Native forest	1	1	1	1	1	3	1	9	1
Matakana	Rural	3	11	5	5	2	3	4	33	2
Mahurangi	Forestry	8	5	2	5	5	1	8	34	3
Ngakoroa	Market garden	2	8	4	2	16	1	2	35	4
Wairoa	Rural	4	2	6	3	9	6	5	35	4
Opanuku	Rural	6	4	13	4	3	3	6	39	6
Waiwera	Rural	9	3	10	7	4	6	9	48	7
Hoteo	Rural	7	7	3	8	10	8	10	53	8
Oakley	Urban	5	10	10	9	15	10	3	62	9
Kumeu	Rural	11	9	10	10	11	10	11	72	10
Rangitopuni	Rural	13	12	7	11	7	10	13	73	11
Lucas	Urban	15	13	9	13	6	9	16	81	12
Papakura	Rural	10	14	15	12	13	15	7	86	13
Puhinui	Urban	14	6	14	15	14	10	14	87	14
Oteha	Urban	16	15	7	14	12	10	15	89	15
Otara	Urban	12	16	16	16	8	16	12	96	16

(Wilcock and Stroud, 2000)

Ecological Quality (biology and physical habitat)

Physical habitat and biological quality of Auckland streams has been assessed from a network of 55 sites representing two stream bottom types and four land use classes. Physical habitat is measured from seven characteristics of the stream channel, stream banks, and riparian vegetation. Biological quality is determined using benthic macroinvertebrates (bottom dwelling insects) and the Semi-quantitative Macroinvertebrate Community Index (SQMCI - Stark 1998). Separate groups of sites were selected for hard-bottomed and soft-bottomed streams because research has shown that biological condition is affected by substrate type. The vast majority of Auckland streams (85 per cent) are soft-bottomed, and these therefore provide the best approximation of the overall condition of Auckland streams.

Biological quality also followed a pattern of water quality determined by land use for both hard-bottomed and soft-bottomed substrata (Figure 4.9). Exotic forestry sites had similar biological conditions to native bush sites, rural sites had lower ecology (SQMCI) scores, and urban sites had the lowest scores. These data produced a ranking of land use in decreasing order of biological quality, summarised as:

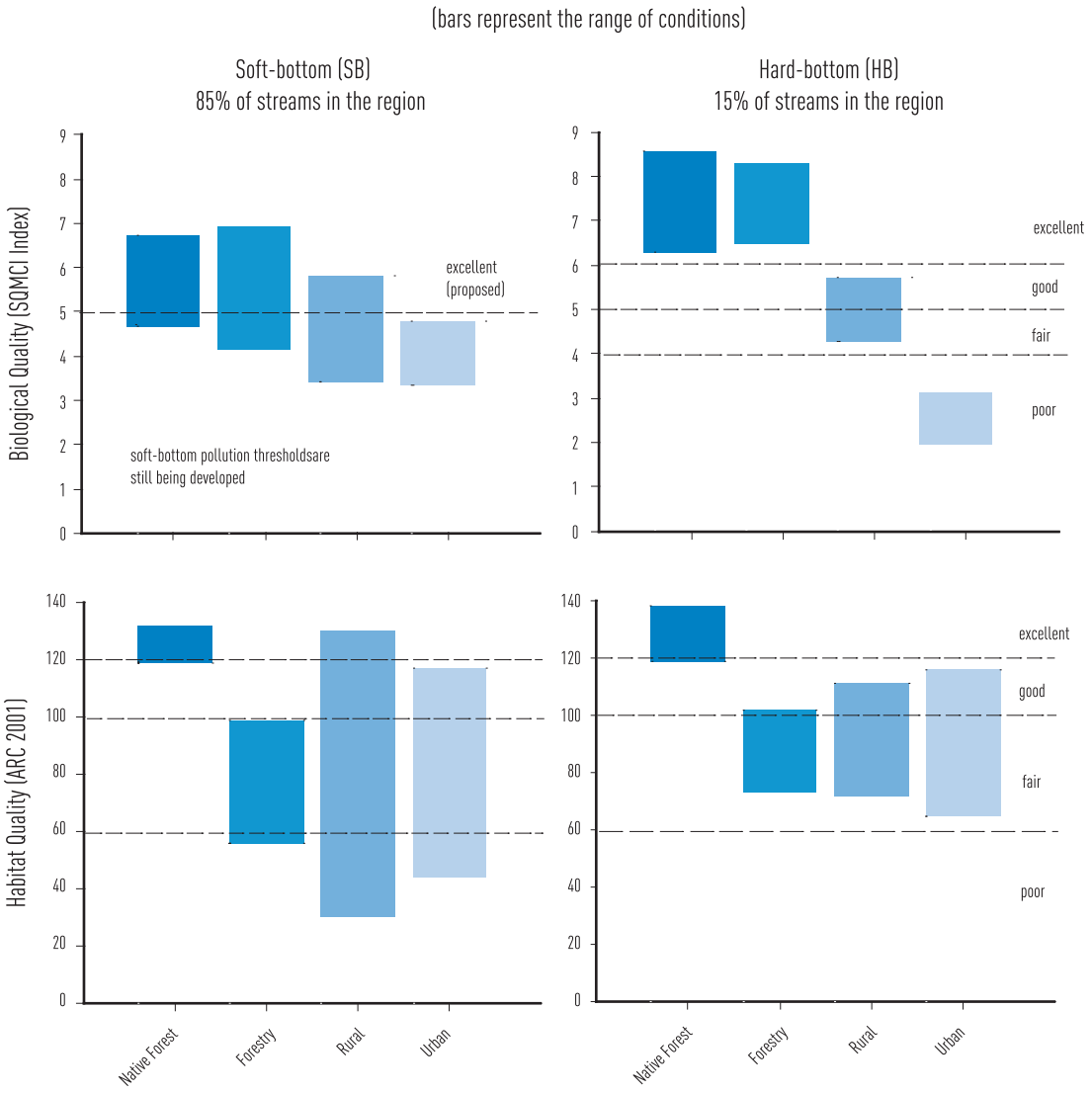
Biological Quality Ranking of Land Use:

Native forest = exotic forestry > rural > urban

The physical habitat of streams varies widely across all land use categories and substrate types (Figure 4.9). The widest range of habitat quality was found at rural sites. Biological quality was found to be strongly associated with habitat quality, and was independent of substrate type and land use. This indicates that biological quality is affected by local physical habitat quality in both hard-bottomed and soft-bottomed streams and for all land uses.

A Stream with Bush Catchment

Figure 4.9: The Ecological Health of Auckland Region Streams (Summer 2002/03)



Implications

Stream quality, as measured here by water quality and ecological health indicators, is very dependant on the land uses within the catchment. Well vegetated and natural catchments such as at the Cascades in the Waitakere Ranges, exhibit the best water quality and ecological health - with natural habitat, stream flows, and lack of contaminant inputs. By comparison, urban sites have often very modified habitats, stream flow regimes, and urban stormwater contaminant inputs.

As the Auckland region grows, more stream catchments are likely to become urbanised or subject to increasing levels of development. However, with care, stream habitat and protective riparian margins can be protected or planted to maintain or even enhance freshwater quality and ecological values.

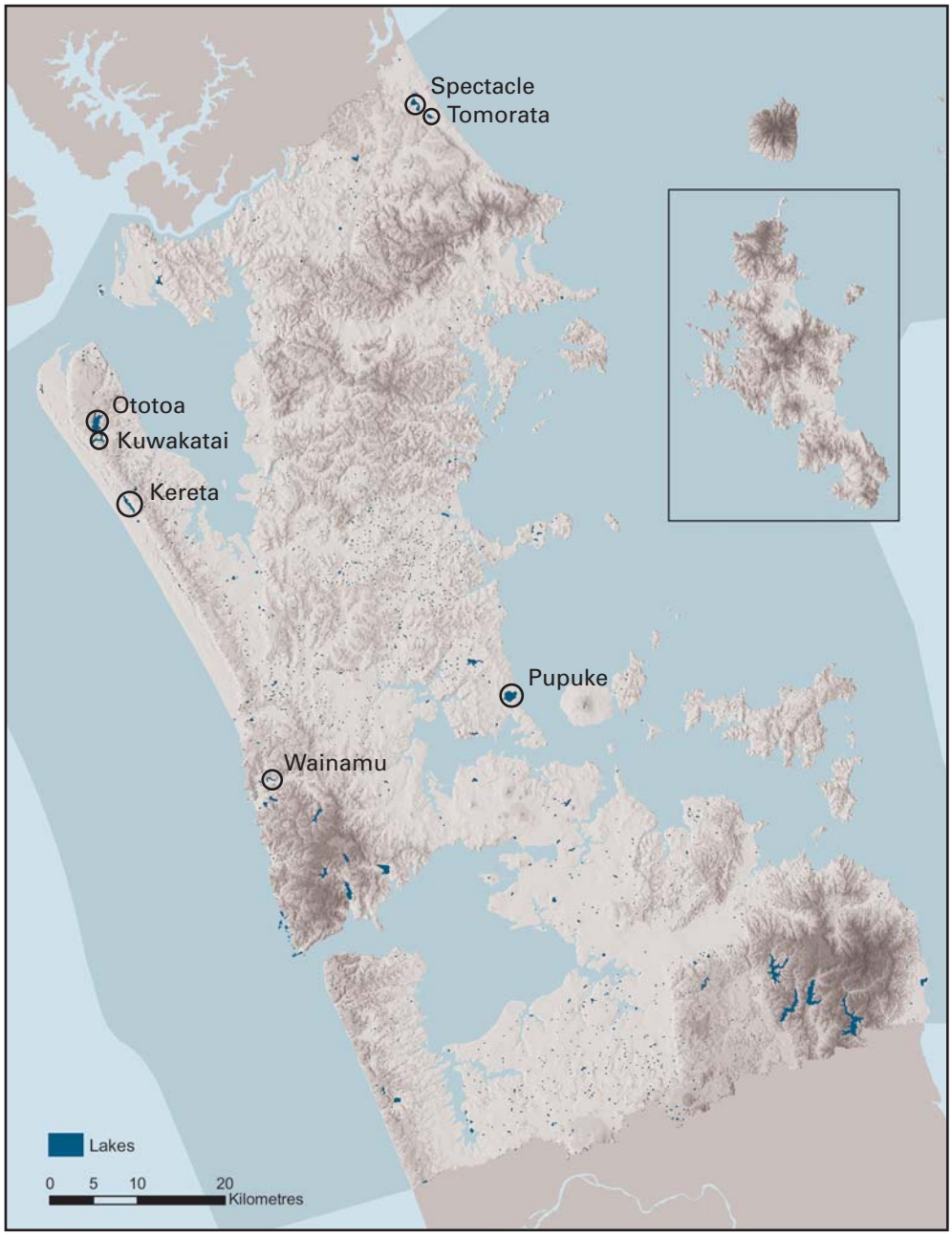
An Urban Stream

Our Fresh and Coastal Waters
Lakes

There are 30 lakes of greater than five hectares in the Auckland region - all home to a range of birds, plants and fish. The ARC monitors seven lakes throughout the region.

State

Figure 4.10: Monitored Lakes in the Auckland Region



Lakes in the Auckland region are divided into several groups: reservoirs (such as the Upper Mangatawhiri), West Coast sand dune lakes (e.g. Ototoa), volcanic lakes (e.g. Pupuke), and other (e.g. Kawaupaku).

The lakes of the Auckland region are a valuable habitat for many unique birds, fish and plants. A variety of waterfowl, including several threatened native species have been recorded in our lakes, for example the Australasian bittern, the banded rail, the NZ dabchick, and the NZ shoveler. The lakes support a diverse native fishery, with species such as the longfinned and shortfinned eel, grey mullet and whitebait species moving between lakes, wetlands, streams and the sea.

Many lakes are intensively used for recreation, including competitive sports such as rowing, kayaking and dragon boating. Other activities like fishing, swimming, water-skiing and boating are also popular, particularly during summer.

The ARC has monitored the water quality of seven lakes since 1992. These seven lakes can be ranked in order of reducing water quality using the criteria of water clarity, algal biomass, suspended solids, dissolved nutrients and bacteria.

The lakes rank as follows:

Ototoa > Pupuke Tomarata > Wainamu > Kereta > Kuwakatai > Spectacle

Lakes Ototoa and Pupuke have high water quality with consistently high water clarity, and low levels of suspended solids and the plant nutrients phosphorus and nitrogen. Blooms of undesirable species such as blue green algae are uncommon.

Lakes Tomarata and Wainamu are transitional lakes exhibiting some signs of poor water quality but not sufficient to be classified as degraded. These lakes periodically suffer blooms of potentially harmful blue green algae during periods of warm calm weather conditions.

Lakes Kereta, Kuwakatai and Spectacle have degraded water quality with consistently low water clarity and high levels of suspended solids and nutrients. Blooms of potentially harmful blue green algae are common.

Implications

Like streams, lake water quality is heavily influenced by land uses within their catchments, and are subject to much less flushing than streams or rivers. Apart from the reservoirs located within native forest catchments of the Hunua and Waitakere Ranges, most lakes have been influenced by vegetation clearance, pastoral land use and/or urban development within their catchment areas.

Lakes located within agricultural catchments are generally highly nutrient enriched. They have high levels of nutrients such as phosphorus and nitrogen. The amount of nutrients entering a lake from its catchment mainly determines its trophic state, i.e. how productive the lake is - equivalent to pasture production on land. Nutrient enrichment results in poor water quality and increased trophic state, which in lakes is undesirable.

Stormwater discharges from urban catchments contribute sediment, nutrients and substances that can be toxic to aquatic life.

Increasing nutrient enrichment, or 'eutrophication', results from runoff and leaching of contaminants such as animal wastes, fertiliser and sediment (which can carry nutrients) from the land use in a lake's catchment.

Lakes within the Auckland region are also threatened by introduced plants and animals. Many have had illegal introductions of exotic fish, which can contribute to water quality decline and adversely affect native fish and plant species. Nuisance aquatic plants such as 'oxygen weeds' are common in many lakes. These can out-compete desirable native species and can disrupt recreation activities such as boating and swimming.

Case Study: Lake Ototoa

Lake Ototoa is a large deep lake located amongst the sand dunes of the South Kaipara Heads, which was formed when an advancing sand dune blocked a stream valley. It has the best water quality of the lakes monitored by the ARC.

The lake supports a variety of native plants within the lake and around its margin, and is home to several native fish that are uncommon in the Auckland region. Lake Ototoa is also a significant rainbow and brown trout fishery.

Four years ago, perch, an introduced fish from the Northern Hemisphere, was illegally released into the Lake. Perch are voracious predators and recent declines in the populations of native dwarf inanga, common bullies and koura are a consequence of perch predation.

Experts predict that some of these species may be wiped out from Lake Ototoa if the population of perch is not dramatically reduced. Perch also threaten the trout fishery with recent catches being of smaller size and lower quality.

Recent decline in native fish have mirrored increases in perch in Lake Otatoa.

Figure 4.11: Ecological changes in Lake Ototoa

		2003	2004
	**Koura**	Average 8 per net	1 or 2 per net
	**Bullies**	Average 84 per net	Average 1 per net
	**Dwarf Inanga** 75% reduction - now a threatened species in Auckland & Northland		
	**Trout** Declining		
	**Perch (Pest)** Now large schools		

Fig 4.12: Reduction in Water Clarity in Lake Ototoa

In addition, and thought to be related to the introduction of perch, has been a gradual decline in water quality, measured above by how clear the water is in Figure 4.12.

Pollution Events, Earthworks, and Contaminated Sites

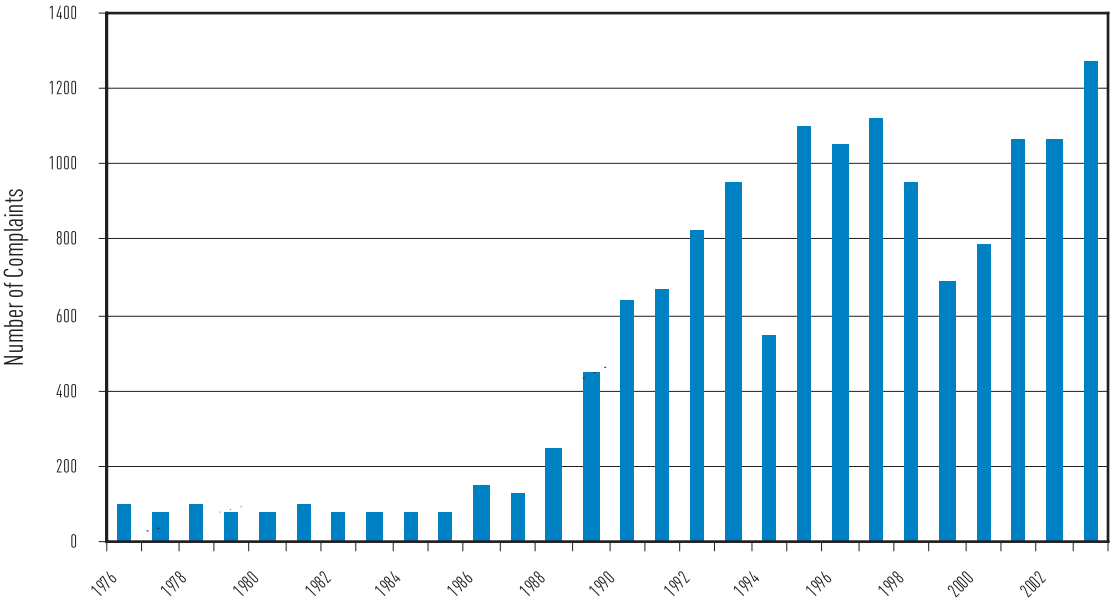
The ARC received over 1200 water pollution complaints in 2003.

Water quality in our streams, groundwater and coastal waters is affected by our activities on the land.

State

Figure 4.13 illustrates the number of water pollution complaints received by the ARC. The increase in complaints over the years is likely to be a function of the increased awareness of the effects on water pollution and the role of the ARC in dealing with water pollution.

Figure 4.13: Water Pollution Complaints



Figures 4.14, 4.15, and 4.16 show the reasons for these water pollution complaints. Most of these (89 per cent) relate to industrial sources, particularly from vehicle and equipment washing and oil and petrochemical spills. Domestic sources (8 per cent of all complaints) also often come from vehicle and equipment washing and oil and petrochemical spills, while two thirds of rural complaints (3 per cent) relate to dairy or horticultural activities.

Figure 4.14: Sources of Industrial Pollution Events

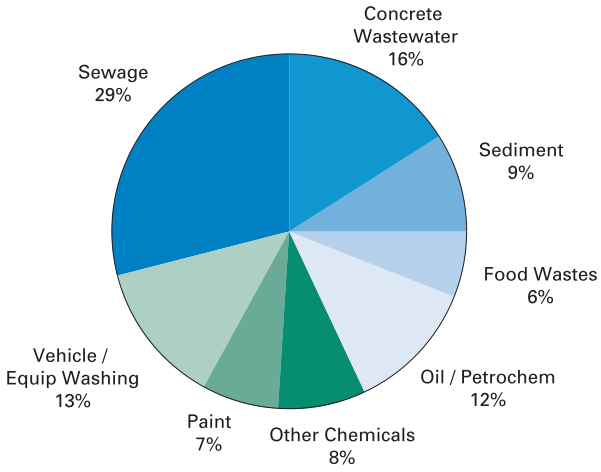


Figure 4.15: Sources of Domestic Pollution Events

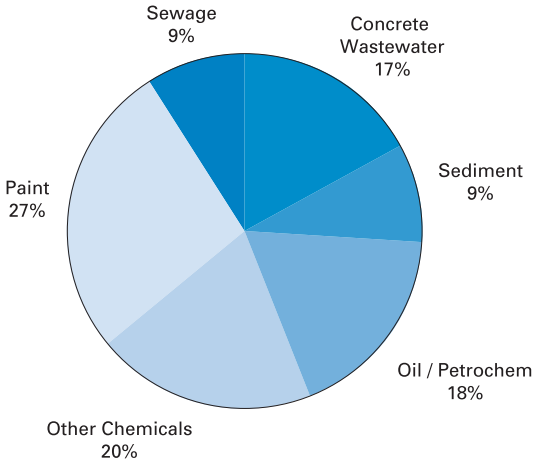


Figure 4.16: Sources of Rural Pollution Events

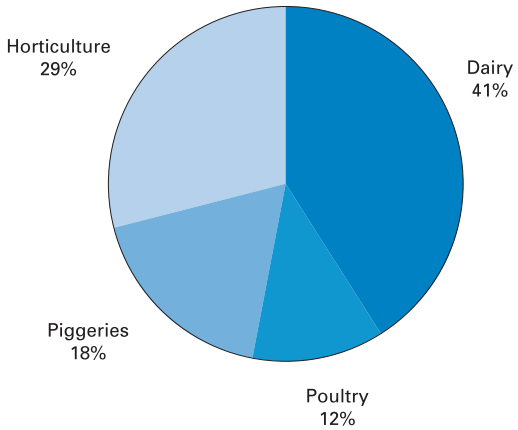


Figure 4.17: Area of Earthworks Consented, and Length of Stream Disturbed/piped Per Annum

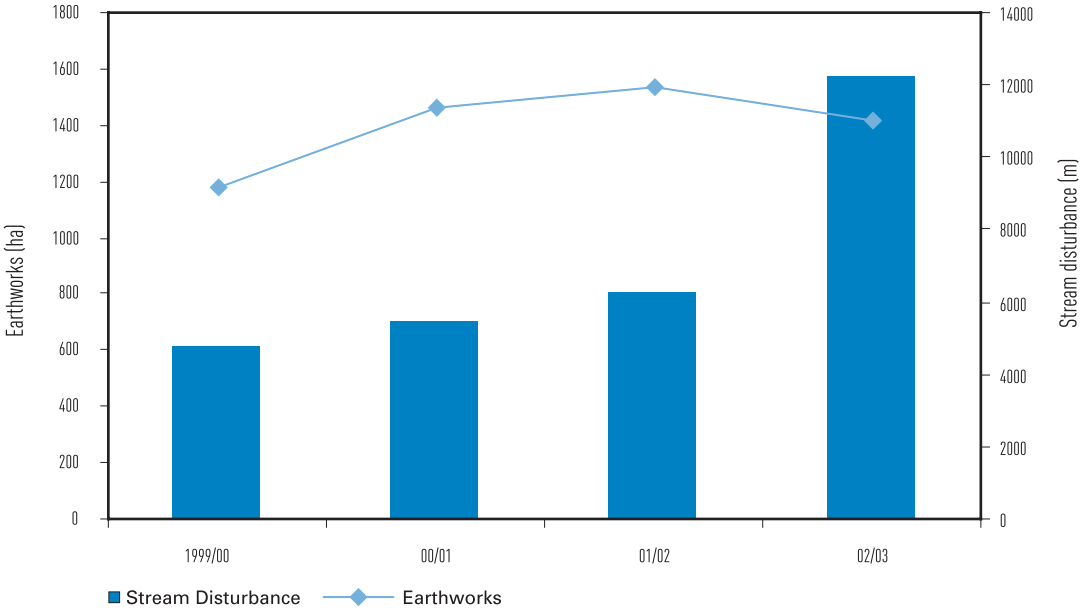


Figure 4.17 illustrates the area of bulk earthworks consented and the length of streams disturbed or piped since 1999. Both of these activities have the potential to modify water quality and stream morphology.

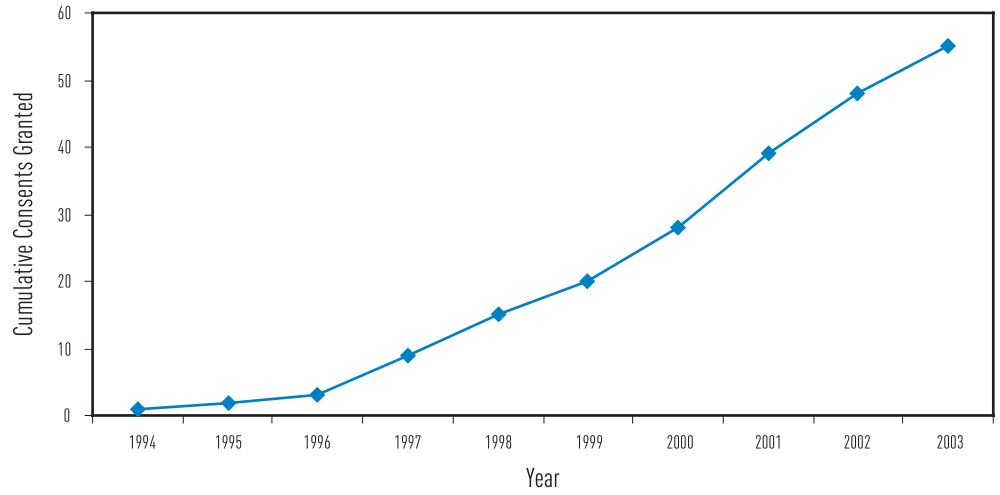
A contaminated site is where hazardous substances (e.g. underground storage of petrol or diesel, timber treatment chemicals, chemicals used in industrial processes) occur in the soil or groundwater at concentrations above background levels. Some substances break down very rapidly in the environment and therefore cause no long-term risk, whereas other substances are very persistent or do not break down (e.g. DDT, dieldrin, arsenic, mercury, and lead).

It is important that contaminated sites are identified so that the environmental and human health risk is managed safely and appropriately for the given land use of the site (e.g. it may be an acceptable risk to have a higher level of contamination remaining on industrial sites when compared to the level of contaminants remaining on residential sites).

An estimated 10-15 per cent of 'verified landuse' sites (which have been identified as having had any of 51 different types of industrial, horticultural or other potentially polluting land uses) are likely to have hazardous substances on site which pose an unacceptable risk to human health or the environment. If there is an ongoing discharge of these contaminants to groundwater beneath the site a discharge consent from the ARC is required, or work must be done to cease the discharge.

Figure 4.18 illustrates the cumulative number of Contaminated Site consents by the ARC.

Figure 4.18. Contaminated Site Consents Granted by the ARC.



Implications

Streams in the Auckland region contain a diverse range of aquatic life, although these can be lost through a single pollution event, and can remain devoid of life for a long time. In addition, our streams have an important amenity role within rural and urban areas.

Land development affects streams in a number of ways, either through complete loss due to urbanisation, or reduced biological health through incremental change and modification. In addition, stream modification leads to the release of sediment, affecting water quality, and degrading marine areas. Protecting and enhancing our streams will ensure that we retain a diverse aquatic community, and retain an important amenity in our region.

Sediment released from land-disturbing activities is known to be the single largest contaminant of water by volume in the Auckland region. Our research has indicated that earthworks have the potential to result in 66 tonnes of sediment per hectare per year on average released to our streams, estuaries and harbours. The effects of sediment are numerous but generally result in a reduction of water quality, and the degradation of receiving environments. By ensuring that land-disturbing activities are undertaken with comprehensive erosion and sediment control measures, the effects of sediment can be minimised.

Pollution events can have the effect of killing all life from certain stretches of streams, as well as temporarily reducing water quality.

Apart from potentially posing a threat to health, contaminated sites can also reduce water quality, as contaminants leach from the land into groundwater, streams and the marine environment. Contaminated sites are gradually being identified and cleaned up over time, and more careful site management and proactive pollution audits can help prevent future contaminated sites from being created.

Case Study: Farm Dairy Discharges

The Regional Plan: Farm Dairy Discharges (1999) regulates the discharge of washwater from dairy farms. Dairy washwater is typically high in ammonia and suspended solids, which can have adverse effects on water quality and freshwater ecology.

This plan was implemented over a three-year period in six sub-regional areas, and allows discharges of dairy shed washwater to land as a Permitted Activity (i.e. no resource consent from the ARC is required), provided that conditions to minimise potential adverse effects on water quality are met. Discharges of treated farm dairy washwater to surface water require a consent to discharge under the plan, as there is more potential for adverse effects on water quality if discharging directly to water.

Figures 4.19 and 4.20 illustrate the change in application of dairy washwater following the implementation of the plan in Priority Area 1: North Eastern Rodney.

Figure 4.19: Priority Area 1 - Pre May 1999

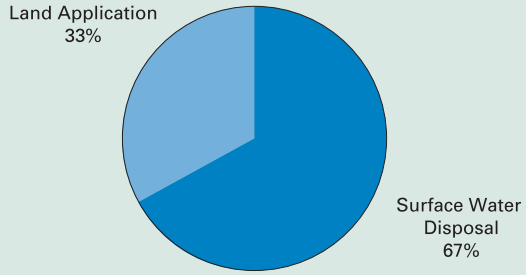
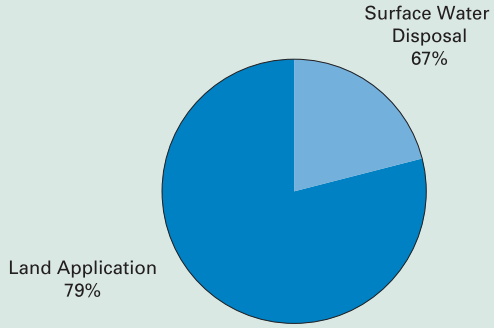


Figure 4.20: Priority Area 1 - Post Plan Implementation



This trend of promoting land application of dairy wastewater over direct discharges to streams has been very similar throughout the rest of the region. The ability for a farm to gain a consented stream discharge is mainly affected by the size of the catchment and dilution available at the discharge point. In many cases dilution has not been adequate to allow discharges to continue following the implementation of the plan.

Prior to the implementation of the plan, North East Rodney had approximately 950 m^3 of washwater discharged to streams in the catchment network per day, or approximately 73 kg of ammonia (a freshwater contaminant) per day.

Following the implementation of the plan, the total volume of farm dairy washwater discharged to streams was approximately 258 m^3 per day and by the end of the 2002/2003 dairy season this was reduced to approximately 216 m^3 per day. This equates approximately 16.6 kg of ammonia directly discharged to the catchment, a reduction of 77 per cent, or 56.4 kg less of ammonia per day.

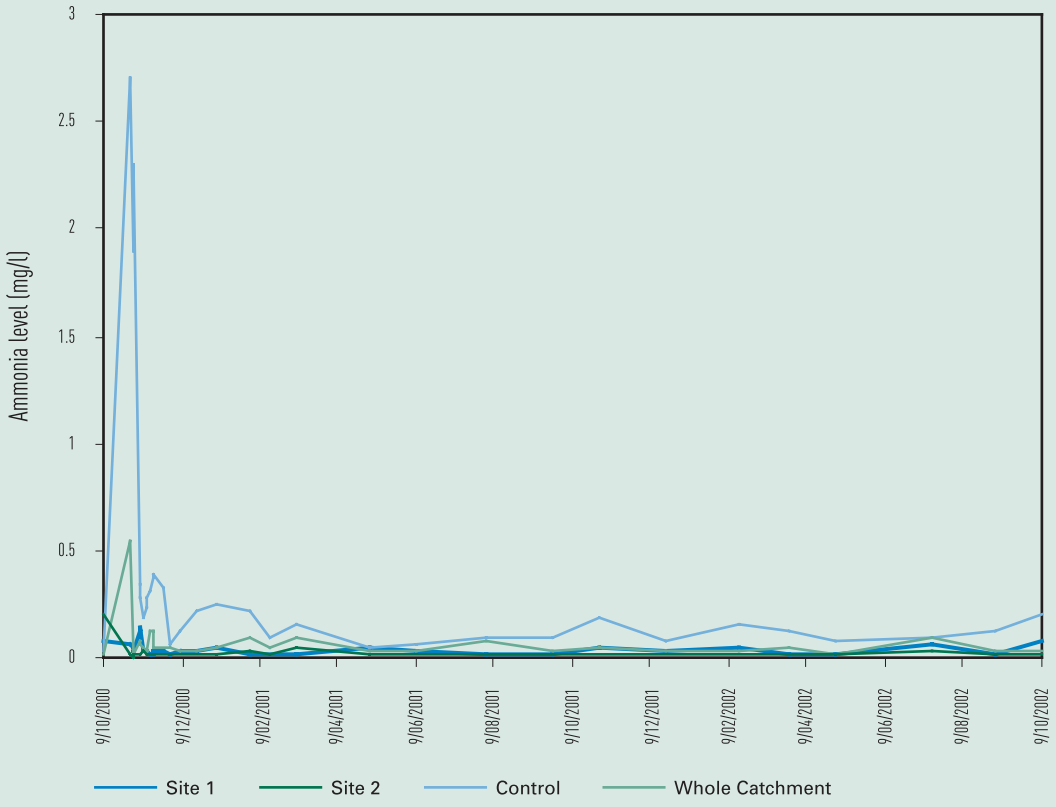
The Upper Kaukapakapa catchment was chosen as an area to study the effects on water quality of this due to the high density of dairy farms in a relatively small catchment.

There were 16 dairy farms operating in the catchment, of which 14 were discharging to water. Of these 14 farms, it was estimated that only one of these farms would be able to comply with the plan and continue to discharge to surface water during the summer months.

Figure 4.21 captures the change in the ammonia sampled at each of the sites over a two-year period. There was a significant drop in both the ammonia level sampled at both of the sites located below farm dairy discharges in the catchment. The implementation of the Dairy Plan initially resulted in both of these sites opting for a land disposal option and ceasing discharge to surface water. This is evident in the significant drop in the ammonia levels that were found at these sites after November 2000.

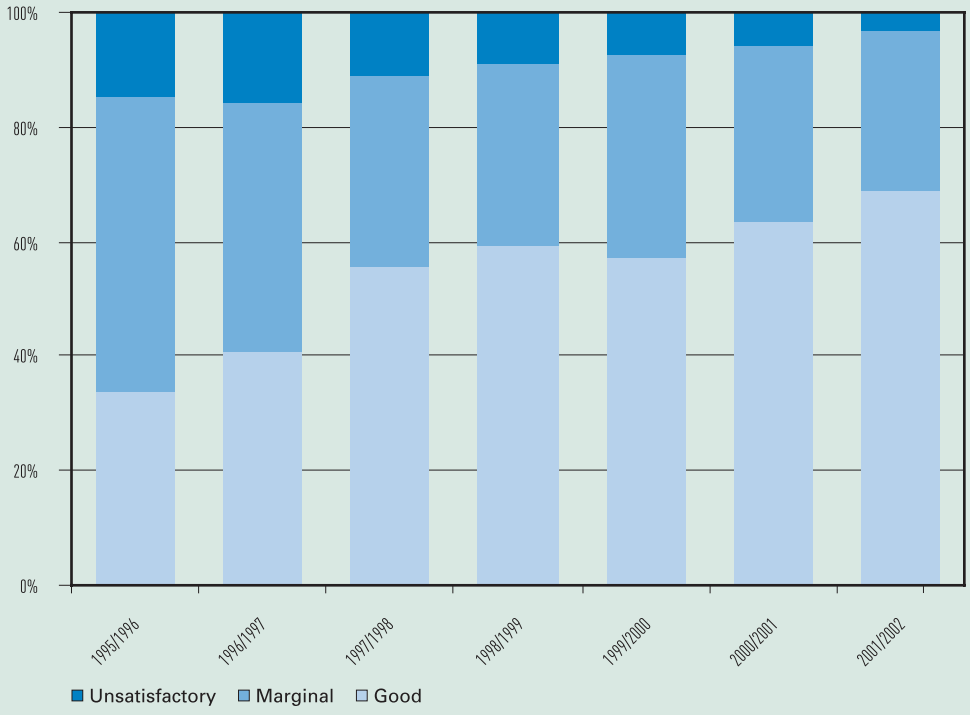
This graph also illustrates that following the implementation of the plan, although there were fluctuations in the level of ammonia sampled at the sites, the levels remained below the plan requirement of 0.7mg/l ammonia.

Figure 4.21: Ammonia in Streams October 2000 to October 2002



Farm dairy washwater systems are inspected annually and checked for compliance with the Regional Plan. Fig 4.22 shows a continuing gradual improvement in the standard of farm dairy discharges, both before and after the implementation of the plan in 1999.

Figure 4.22 Annual Inspection Results for Farm Dairy Washwater Systems



Natural Character of the Coastal Environment

The Auckland regions coastal environment is home to a diverse range of landscapes, landforms and ecosystems.

The natural character of the coastal environment refers to those qualities and features in coastal environments that are the products of nature, including the dynamic functioning of the physical coastal processes, the presence of indigenous vegetation, the intactness and naturalness of natural landforms and ecosystems

State

All parts of the coastal environment have natural character, but this ranges according to the degree of modification as a result of human activities - from the largely developed, built environment, such as the CBD waterfront, to largely unmodified environments, such as at Whatipu.

The east and west coasts of the Auckland region are on two different oceans and environmental influences, which results in two different marine ecosystems. The west coast is influenced by cold waters flowing north and a high wave energy environment, and is divided into highly exposed open coastal beaches, rocky shores, and the sheltered estuarine areas. The east coast is influenced by warm waters flowing south, low to moderate wave conditions with occasional storm events, and displays a spectrum from sheltered harbours to exposed rocky islands.

Together the two coasts support a very wide variety and diversity of habitats, and an exceptionally high diversity of species. The coastal waters are nutrient rich and support high levels of plant and animal life.

Much of Auckland's coastal environment has been modified, with extensive areas of urban development and farmland adjoining the coastline. Coastal areas adjoining metropolitan Auckland usually have a highly modified character. For example, many beaches, such as those along the Auckland City and North Shore City waterfronts, are modified by the presence of seawalls, stormwater outfalls and other structures, while within the more sheltered locations such as the Waitemata Harbour there are considerable numbers of jetties, boat ramps, boat sheds, seawalls, boat moorings and the like. Whilst these locations have their own particular character, the 'natural character' of such places are usually highly modified.

Beaches

Most of the beaches along Auckland's east coast have also been modified. Most of the original dunelands were originally covered by a distinct vegetation sequence, ranging from indigenous sand grasses on the seaward face of the foredune, through to increasingly larger and more diverse groundcover, shrubs, trees and coastal forests inland. These areas have largely been cleared, levelled and developed. The relatively narrow beaches that remain have also been modified, by the construction of seawalls, groynes, coastal outfall structures etc.

Most of the west coast beaches are devoid of human built structures, though moderately sized settlements have been established at Bethells/Te Henga, Piha and Muriwai, and deforestation and conversion to pasture and exotic forestry has modified the natural character of this coast.

Estuaries

Auckland's numerous and varied estuaries are highly valued features of the coastal environment. They are highly productive habitats, and are important spawning, nursery and feeding grounds for many animal species. Deforestation in the last 150 years, conversion to pasture, and in some cases urbanisation has permanently altered the quality and quantity of sediments deposited in estuaries. Over the last 50 years, intertidal flats have decreased in depth by about 0.5m, leading to changes in the distribution of estuarine vegetation and habitat, and natural, recreational and amenity values.

The riparian vegetation, e.g. manuka, kanuka, ngaio, five finger, saltmarsh ribbonwood, flax and cabbage trees, that originally colonised the margins of most estuaries has largely been cleared, being replaced by urban coastlines and agricultural practices.

Cliff and rocky areas

Most of the cliffed and rocky coastlines of the Auckland coast remain unmodified by human-built structures, except in urbanised areas where subdivision practices have extended to the cliff tops, and seawalls, stormwater outfall structures and maritime structures, e.g. jetties, steps and boat ramps have been constructed along the coastline. As with beach and estuarine environments, human practices such as urbanisation and agriculture have degraded the natural ecosystems of these areas. Nonetheless along the east and west coast, cliffed and rocky coastlines of outstanding natural character are to be found.

Much of the information about natural character is summarised in the Auckland Regional Statement and Auckland Proposed Regional Plan: Coastal. Some 80 sites/areas are classified as being of significant natural heritage value in the RPS, and 134 areas are defined as Coastal Protection Areas - areas that are of regional, national or international significance due to their ecological, landform, or geological values.

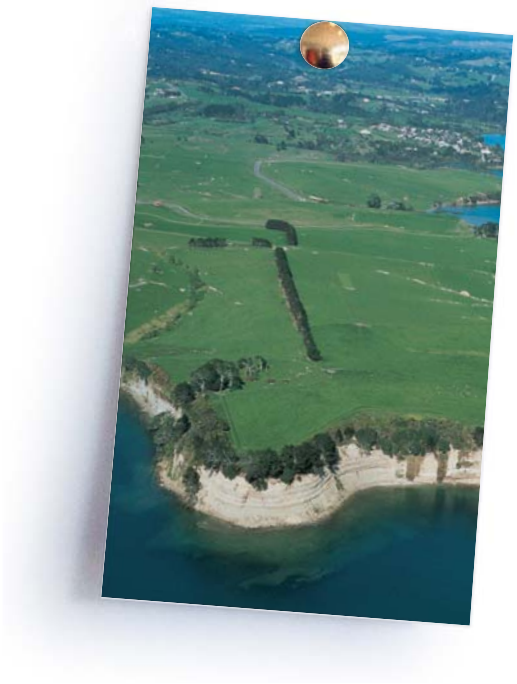
Implications

The preservation of the natural character of the coastal environment is identified as a matter of national importance in the Resource Management Act. Consequently it is given high priority in the New Zealand Coastal Policy Statement and in regional and district plans. This reflects the importance of natural character to coastal ecosystems, to human use and enjoyment, the degradation of the natural character of the coastal environment that has already occurred, and the pressures on what natural character remains.

Activities such as urban development, more intensive rural subdivision of land adjacent to the coast, the development of regional infrastructure facilities such as ports and network utilities, wharfs and jetties, marinas, marine farms and other activities which are dependent on coastal locations for their operation, enable people to provide for their social, economic and cultural well-being.

Although these activities are important to the Auckland region, if inappropriately located, or of an inappropriate form, they have the potential to reduce the overall values of the coastal environment. Inappropriate subdivision, use and development can also result in loss of ecosystems and natural features, and to a reduction in water quality arising from increased run off and sedimentation. These adverse effects, in isolation or combination, affect the natural character of the coastal environment.

In providing for appropriate subdivision, use and development or protection, it must be recognised that the coastal environment is composed of finite resources (e.g. sandy beaches, sheltered harbours, and coastal wetlands) that need to be used efficiently. These areas require protection for inappropriate subdivision, use and development to ensure that their values are maintained or enhanced.



Our Fresh and Coastal Waters

Waves

Storm swell can reach over 6 metres in height.

Waves have a significant impact on the natural features (seabed sediments, reefs, cliffs, beaches) and human-introduced structures and activities along our coast. They are the most important agent of physical change in the coastal environment.

State

Auckland's west coast is a high-energy wave environment, with a dominant south west swell of 1.0 - 3.0m with a 6-10 second wave period. Deep-water wave measurements show that 1.5 - 2.5m high waves dominate in all seasons, and storm swell can reach over 6.0m in height.

The east coast is usually a lee shore (winds blow away from the shore), and therefore typically experiences low to moderate wave heights. Occasionally high waves are experienced, as a result of tropical cyclones or easterly-to-north-easterly storm events. The many islands, peninsulas and headlands of the Hauraki Gulf block and modify waves as they move towards the coastline. Thus significant wave heights decrease from the swell-dominated northern Hauraki Gulf, where the long-term average significant wave heights are approximately 1.5m, to around 1.0m in the mid Gulf (near Little Barrier Island), decreasing to around 0.5m in the more exposed parts of the southern Gulf, with lower values behind islands and headlands.

Significant wave height is the average of the largest 33 per cent of waves. There are individual waves considerably bigger than this.

The Hauraki Gulf wave climate varies over time, with maximum wave heights in winter (June, July, August) and minima in summer (December, January). At longer time scales there are weak positive correlations with the Southern Oscillation[1] , with a tendency to higher wave heights in La Nina periods (westerly-wind regime weakens, favouring increased occurrence of north-easterly winds and the progradation of tropical cyclones into the region, both of which can cause destructive waves on the east coast).

During El Nino events, winds over the Auckland region are predominantly south-westerly, which drive large waves onto the west coast but leave the east coast in shelter.

Implications

Knowing about the wave climate of the Auckland region helps in a range of situations, such as for:

- engineering design, e.g. of seawalls, marinas, beach nourishment,
- environmental studies, e.g. coastal erosion, dispersal of dredged material,
- monitoring, e.g. of beach renourishment projects, coastal change (erosion/accretion),
- planning purposes, e.g. defining areas susceptible to coastal hazards,
- research, e.g. improving and calibrating numerical models,
- maritime activities, e.g. recreational boating.

Wave action is the primary means of suspending sediment, though other factors play a part, such as sediment particle size, and the properties of any sea bottoms and tidal currents.

Average wave conditions are capable of disturbing sediment in only a few areas of the Hauraki Gulf where shallow areas (around 20m water depth) are exposed to swell - off Pakiri Beach, in the immediate vicinity of the seawards sides of exposed headlands and islands, and southern Firth of Thames. In 'storm' conditions the areas where seabed sediments may be transported by wave action become more extensive.

The most dramatic variation in wave energy through the year is associated with the passage of individual weather systems at intervals of several days to a few weeks. For example, a Low in the Tasman sea encountering a slow moving high pressure system, directing northerly or north-easterly winds towards the Auckland coast.

[1] The Southern Oscillation, a Pacific Ocean scale fluctuation in weather patterns that is caused by shifts in the distribution of atmospheric pressure over the Pacific and Indian Oceans.

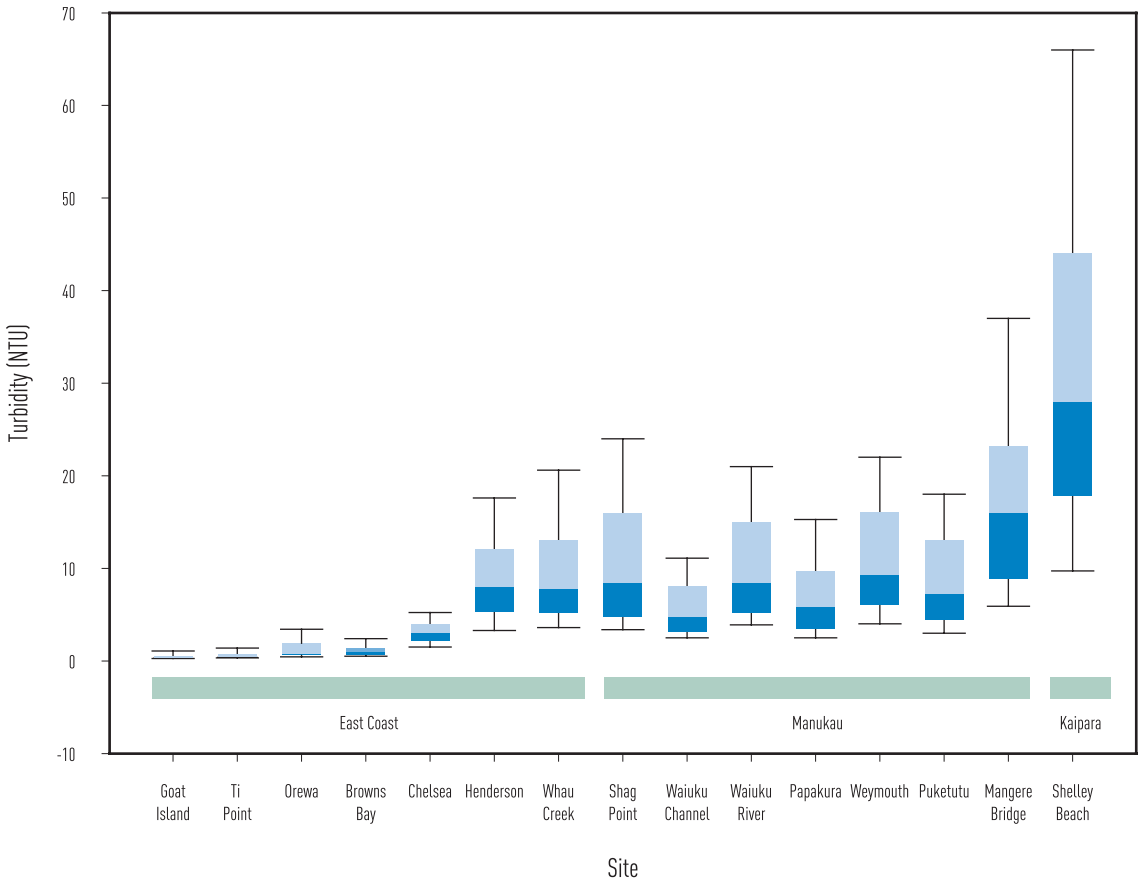
Coastal Water Quality

Urbanisation means that our beaches and estuaries are exposed to more pollution and contaminants. Levels of pesticides such as Chlordane, DDT, Dieldrin and Lindane have decreased in oysters since they were deregistered. However, some persistent contaminants such as PAHs and PCBs have not shown the same consistent decrease.

Auckland has an incredibly diverse range of marine habitats, including exposed west coast ocean beaches interspersed by two of the southern hemisphere's largest harbours, each with their own unique mix of habitats and ecosystems. Our coastal water quality depends on complex interactions between inputs from the land, depth and how exposed the area is to wave energy and mixing.

State

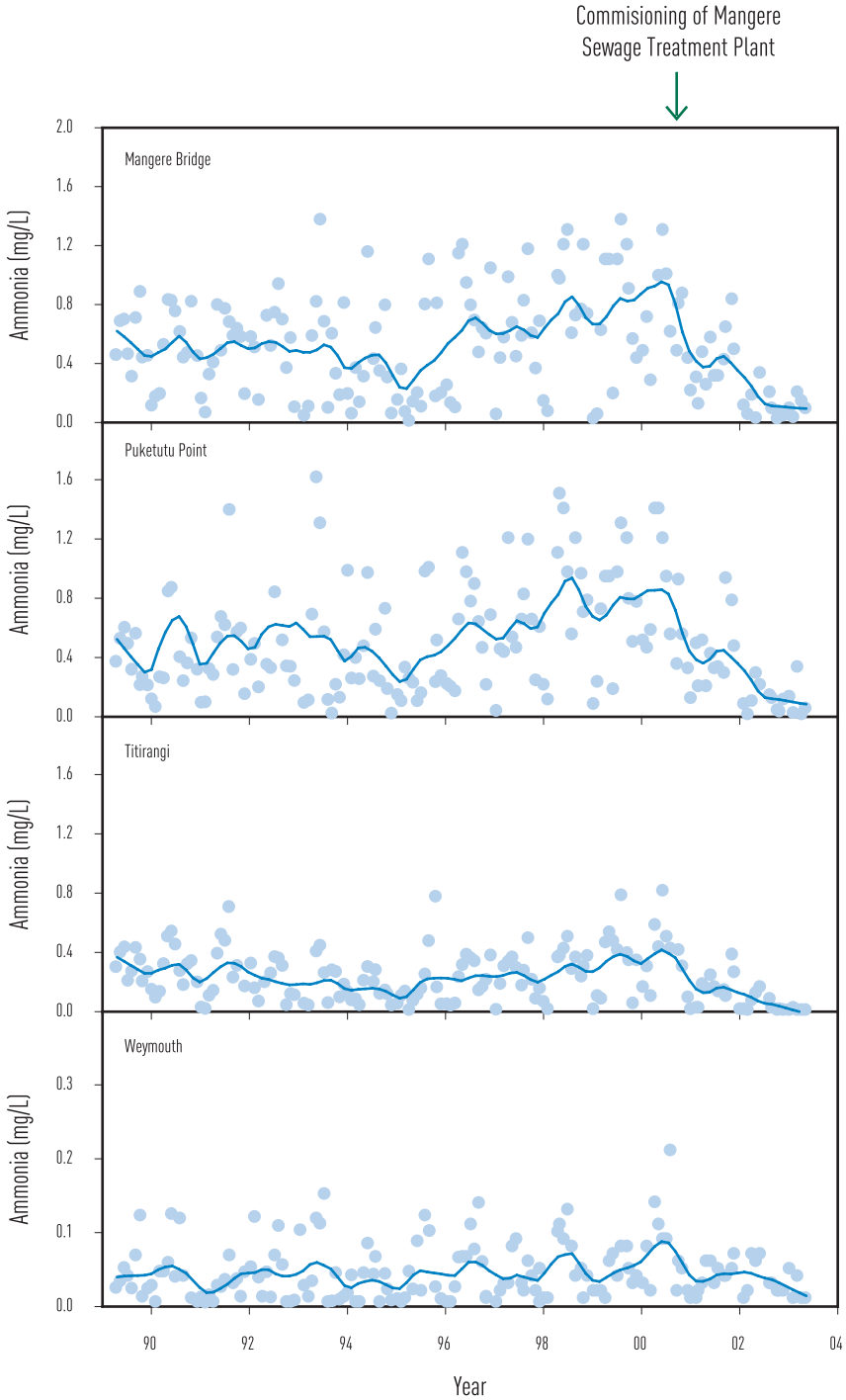
Fig 4.23: Turbidity levels in Coastal Waters



Overall coastal water quality varies throughout the region. In general, water clarity tends to decline as the level of exposure declines (Figure 4.23) with the exposed east coast beaches having generally clearer water compared to estuarine and harbour areas. Conversely, contaminant levels increase as the as exposure declines and the level of adjacent urbanisation increases.

Major point sources of pollution can have a marked influence on water quality. Discharges from the Mangere Wastewater Treatment Plant were increasing the level of nutrients in the Manukau Harbour during the 1990s to the point where concentrations of ammonia were sufficient to present a chronic toxicity threat to aquatic organisms in northern parts of the harbour. Since the commissioning of the new treatment plant, ammonia levels have declined significantly (Figure 4.24). These declines have been most dramatic at sites close to the plant such as Mangere Inlet, Puketutu Island and Titirangi, but sites that are relatively remote from the plant, such as Weymouth, have also shown an improvement in water quality.

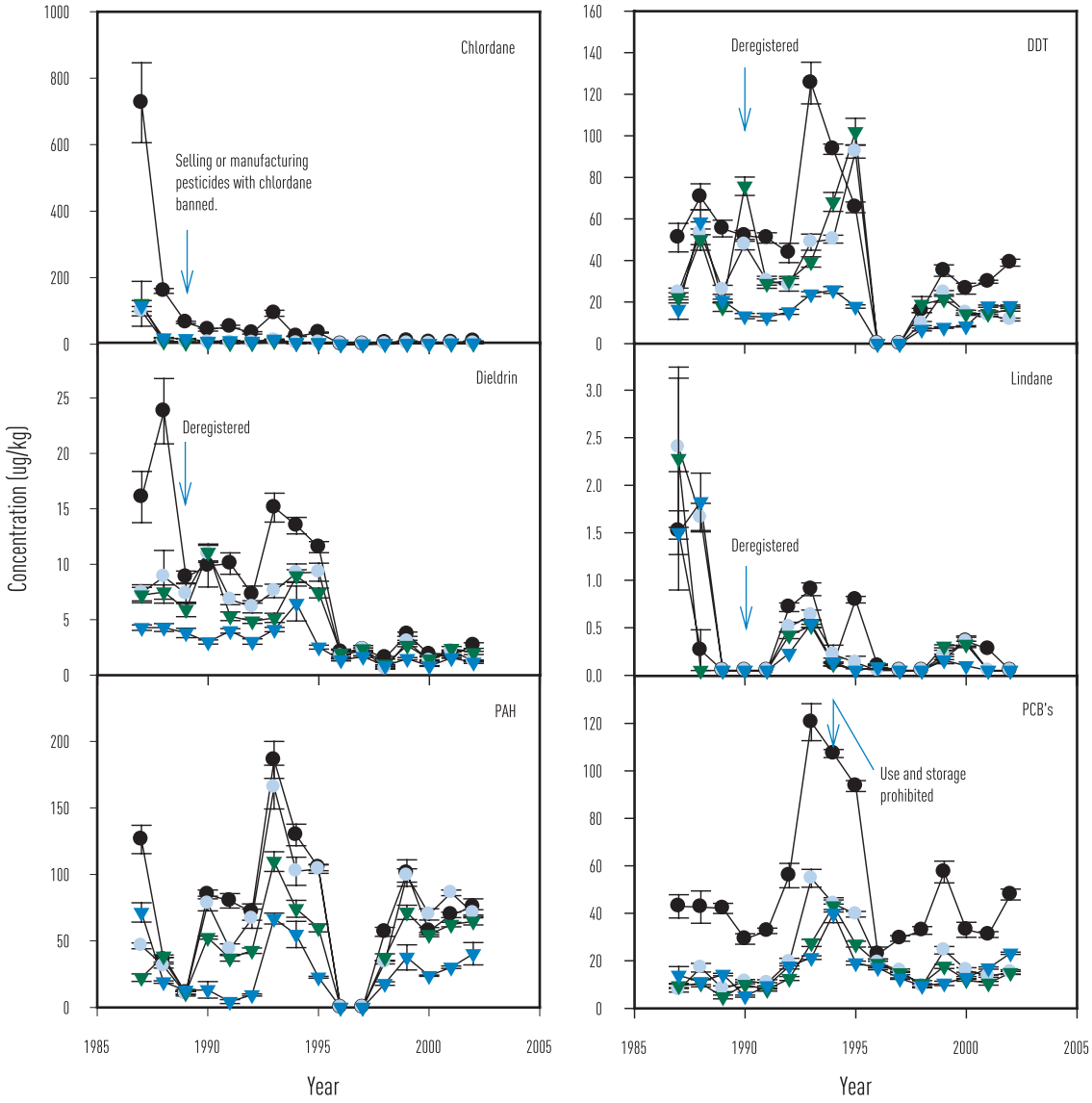
Figure 4.24 Manukau Harbour Ammonia concentrations since the upgrade of the Mangere Wastewater Treatment Plant.



Mussels and oysters obtain their food by filtering large volumes of water and at the same time concentrate contaminants in their tissues. While this may be undesirable from a human consumption perspective, it makes them very effective "biomonitors". Monitoring contaminant concentrations in shellfish tissues enables the ARC to determine how polluted a water body is with respect to chemical contaminants that occur in low concentrations but are potentially problematic because of "bioaccumulation".

Chlordane, DDT, dieldrin, and lindane were active ingredients in many pesticides used up until the 1990s. Oyster monitoring indicates that levels of these contaminants have declined in the Manukau Harbour since their de-registration. In contrast, levels of contaminants such as PAHs (derived from incomplete combustion of hydrocarbons such as petrol and diesel) and PCBs (used as electrical insulators, solvents, paint additives and printing inks until they were banned in 1994) have fluctuated over time, but have not showed consistent downward trends (Figure 4.25). This is likely to be because historical stores of these persistent chemicals exist on and in land and contaminated sediments.

Figure 4.25: Organic Contaminants at various sites in Manukau Harbour Oysters



Stormwater transfers contaminants deposited on the land to the sea. Contaminants bind to sediment and organic material in the water column and settle out in estuaries and harbours, where they become incorporated in marine sediments. The toxicity of contaminants can affect shellfish and other biota living on, or in, the sand, leading to the loss of sensitive species and resulting in benthic communities dominated by pollution-tolerant species.

In the Auckland region, the accumulation of zinc, copper, lead and PAHs are causing the most concern. Vehicles are a major source of all four pollutants, but other factors like roof runoff and industrial discharges also contribute significantly. Zinc is generally found in higher concentrations than lead or copper (Figure 4.26) and is increasing at all long-term monitoring sites: in some cases very rapidly (Figure 4.27). Copper levels are also increasing, albeit more slowly than zinc. In contrast, lead levels are declining as a direct response to removing it as a fuel additive in 1996. At present, PAH concentrations in marine sediments appear to be relatively static.

Figure 4.26: Concentrations of Zinc, Copper and Lead in Sediment Between 1998 and 2001

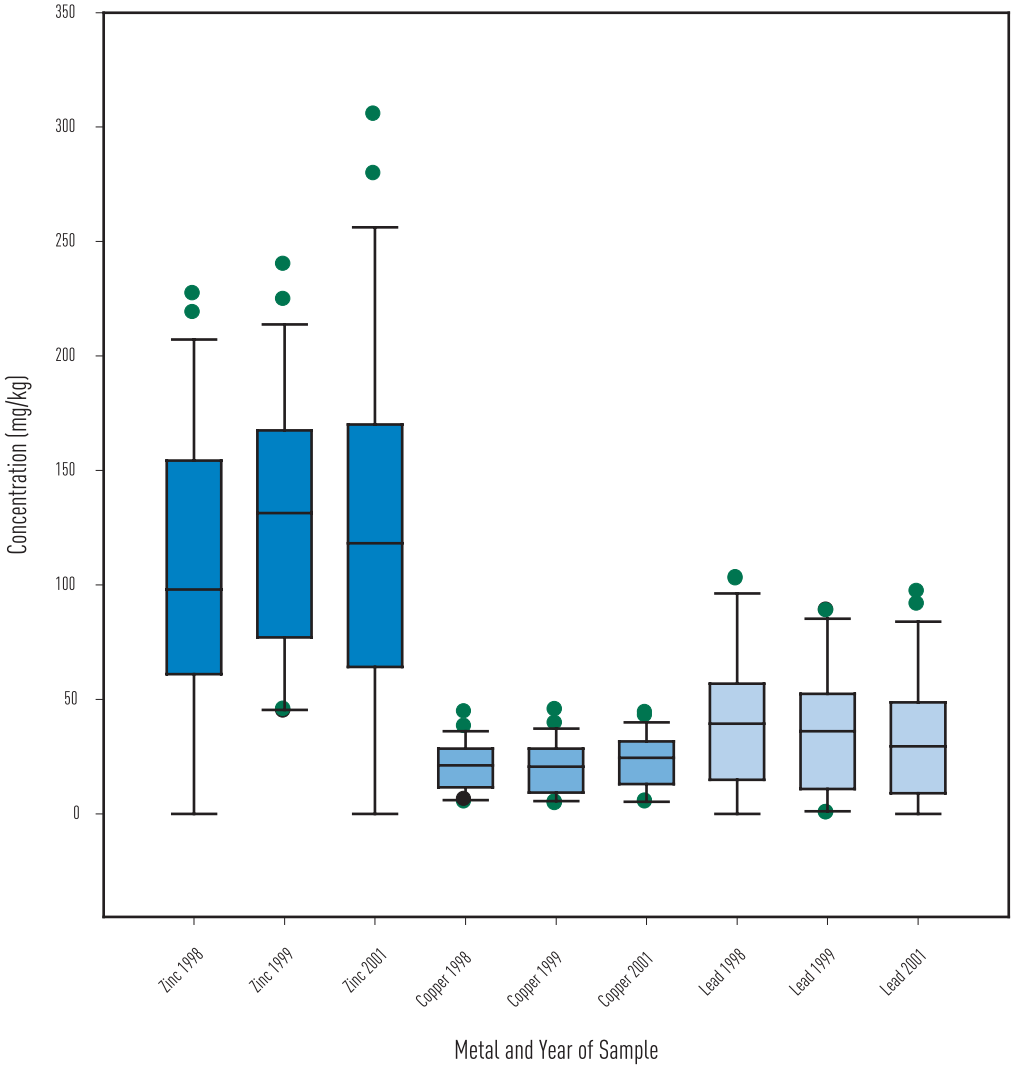
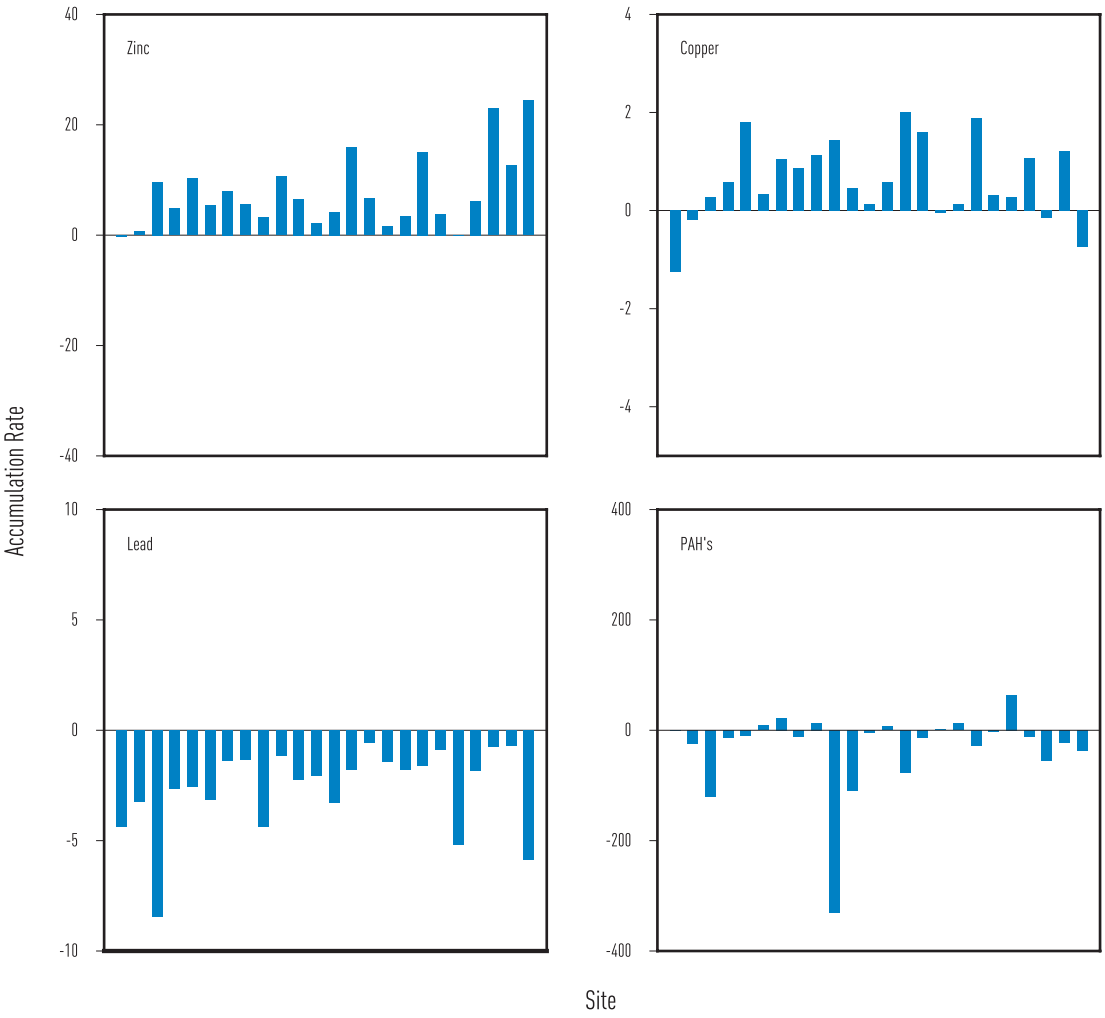


Figure 4.27: Accumulation Rates of Zinc, Copper, Lead (mg/kg/y) and PAH (µg/kg/y).



Implications

Coastal water quality is influenced by inputs, such as sediment and other contaminants from the land, and by the exposure of the system to wind, waves, tides and currents. Coastal water quality affects how we use our coastline, whether we consider it appropriate for bathing or gathering shellfish, as well as the general amenity provided by coastal waters. It also has significant implications for animals and plants living in these waters (see Marine Ecology).

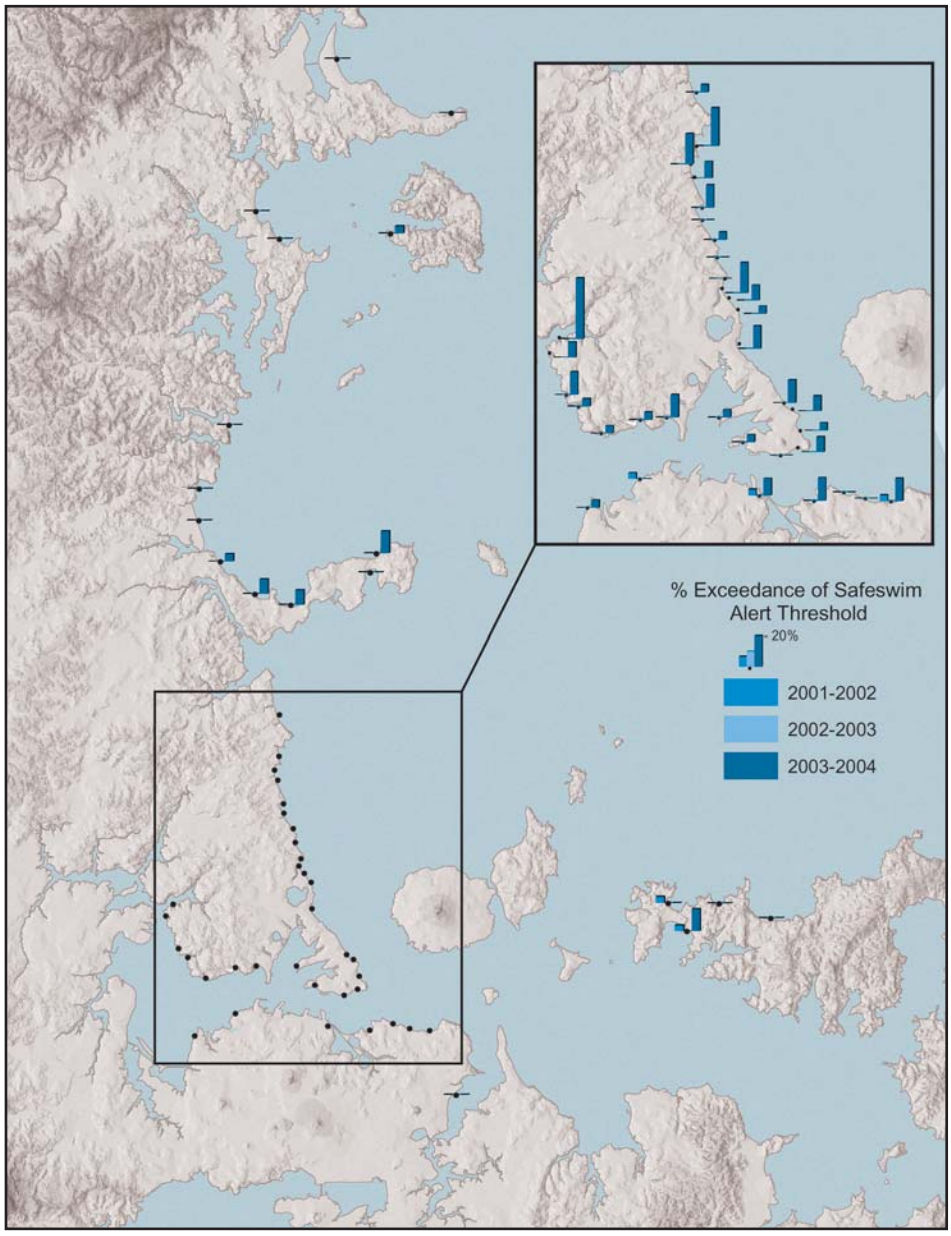
Bathing Beach Quality

Overloaded wastewater systems result in decreased beach water quality. More beaches were closed in 2003/04 compared to 2002/03 due to wetter conditions.

Disease causing microbiological contaminants can enter the marine environment through stormwater runoff, discharges from vessels and wastewater (sewage) overflows.

State

Figure 4.28: Alert Safe Swim Sampling Events during the Bathing Season



Wastewater overflows occur when pipes become blocked, equipment fails and when heavy rainfall overloads the wastewater network. Even if wastewater overflows did not occur, stormwater discharges would still contain microbiological contaminants from dogs, cats and birds etc. Pathogens from human and animal faecal material enter the drainage system through overland runoff, overflows or leakage from sewers (caused by sewage and pumping station overflows, illegal wastewater connections to the stormwater network, blockages or aging of the pipes).

Regular beach quality monitoring is carried out by city and district councils, who warn the public when water quality poses a potential health risk. Rodney District Council, North Shore City Council and Auckland City Council have established a "Safe Swim" programme, which provides consistent data on microbiological contaminant levels throughout central and northern beaches. Enterococci (which do not cause disease themselves) are bacterial indicators of faecal contaminants responsible for gastroenteritis and respiratory illness and are used to determine when a beach should be closed. New Zealand microbiological water quality guidelines recommend the use of two thresholds:

Alert: Greater than 136 enterococci/100ml
Action: Greater than 277 enterococci/100ml
(MfE, MoH, 2002)

Exceedence of the alert threshold triggers a requirement for daily monitoring until enterococci levels drop. Beaches should be closed if the "action" level is exceeded on two consecutive days.

Implications

Safe Swim data from the 2002-03 and 2003-04 bathing seasons, which run from October to April, clearly illustrates patterns in microbiological levels on central and northern beaches in the Auckland region (Fig. 4.31). Exceedence of action levels is greatest on beaches adjoining highly urbanised catchments. Beaches north of Whangaparaoa and on the northern side of Waiheke rarely, if ever, exceed the alert thresholds. In contrast, beaches within the urban area regularly experience levels of microbiological contaminants that are potentially harmful to human health.

Enterococci levels are also closely related to rainfall. This can be seen by comparing data from the 2002-03 bathing season, which was relatively dry, with the 2003-04, which was relatively wet. The number of times that the alert level was reached in 2003-04 was considerably greater than in 2002-03.

The ARC does not directly manage stormwater and wastewater networks, but does have a regulatory role. Regulations such as those aimed at eliminating dry-weather wastewater overflows and reducing the frequency of wet-weather overflows are implemented through setting conditions on the operation of wastewater and stormwater networks. Although occasional wastewater overflows are unlikely to be completely eliminated, water quality can be improved by reducing their frequency and magnitude. Upgrades to stormwater and wastewater infrastructure, improved maintenance and emergency response, and identification of problems such as leaks and illegal connections will also help reduce the level of microbiological contamination on beaches in the Auckland region. However, periodic closures of urban beaches to protect human health are likely to be required for the foreseeable future.

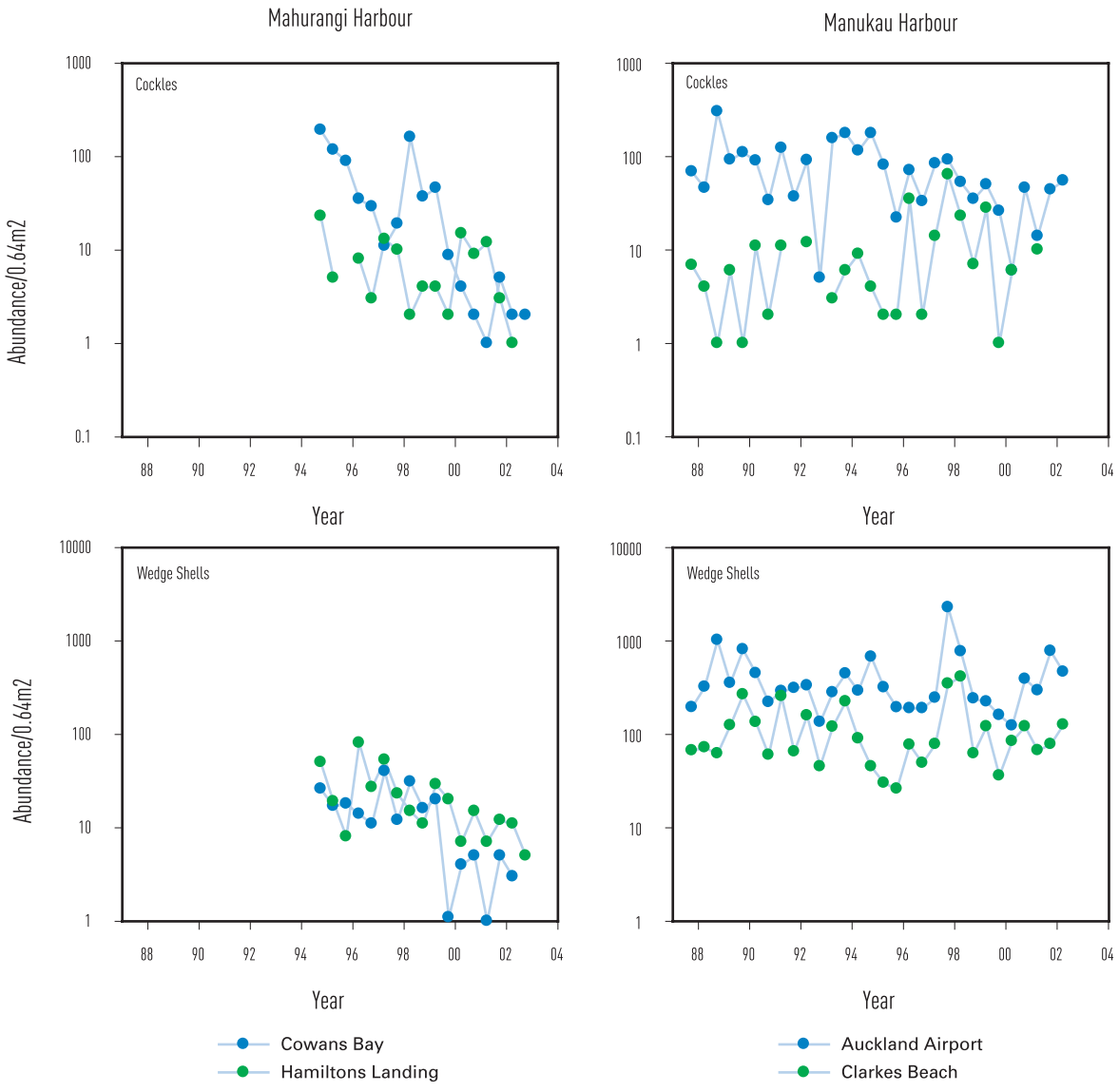
Marine Ecology

Sediment sensitive species in the Manukau Harbour have been relatively stable, but they are declining in the Mahurangi Harbour.

Our marine ecosystems are home to an abundant and diverse range of organisms. They are beautiful and fascinating but also provide food for people, fish, mammals and seabirds. Our coastline is dominated by large shallow harbours and numerous small estuarine inlets, with a mosaic of rocky shore types found in more exposed areas.

State

Figure 4.29: Marine Ecology Indicators in the Manukau and Mahurangi Harbours



Monitoring of coastal ecosystems in the Auckland region is commonly based on measuring the abundance and diversity of benthic (seabed dwelling) species. Such monitoring is showing clear differences in the way that ecological communities in the Mahurangi and Manukau Harbours are changing over time. In the Mahurangi Estuary sediment sensitive species such as cockles (Austrovenus stutchburyi) and wedge shells (Macomona liliana) are declining at some or all sampling sites, whereas populations of the same species are relatively stable in the Manukau. The changes occurring in the Mahurangi Harbour are consistent with ecological responses to elevated inputs of terrestrial sediment to the marine environment.

Sediment erosion in the Mahurangi catchment is relatively high due to the climate, geology and land use practises of the area. It is not possible to change the microclimate or geology, but land use practices may be altered to reduce sediment loss. Improving sediment control measures during forestry clearance, keeping stock out of streams and stabilising stream banks by riparian planting are some of the methods that are likely to assist in preserving the long-term health of the harbour.

Implications

Many of the policies that the ARC develops are designed to maintain the long-term health of marine ecosystems. Ecological monitoring is essential for identifying problems that are not being adequately addressed by current management practises and measuring the efficacy of policy initiatives. All animal populations change through time, so long-term monitoring programmes are essential to enable natural fluctuations to be distinguished from changes due to human activity.

Case Study: Aquaculture

Aquaculture includes the farming of fish, shellfish or seaweed etc. Currently in the Auckland region it includes mainly mussel and oyster farming. Aquaculture largely requires the exclusive occupation of space within the coastal marine area and there are many other uses and values, such as recreational and commercial boating, areas of high ecological value and fishing activities, that compete with this use of space.

Prior to the enactment of the Resource Management Act 1991 all marine farms in the region were authorised under the Marine Farming Act (MFA) 1971. Key areas for the oyster industry traditionally have been the Mahurangi Harbour, Waiheke Island and Wairoa Bay. Mussel farming was limited to Port Fitzroy and Waimaungu Point in the Firth of Thames. Between 1991 and 2000 the ARC received only three applications for small mussel farms at Port Fitzroy. This was in part due to a moratorium over most of the Hauraki Gulf.

However, from mid 2000 to late 2001 the ARC received 17 consent applications for approximately 7000 hectares of water space for aquaculture in four main areas of the region: Firth of Thames, Wairoa Bay, Kaipara Harbour and Great Barrier Island. This amounts to approximately one quarter of the total national area subject to consent applications.

Currently there are 255 hectares of aquaculture in the Auckland region. The following table illustrates the type and location of this aquaculture.

Table 4.2: Aquaculture Areas in the Auckland Region

	Existing MFA Licenses (ha)	Existing RMA Consents (ha)	Total (ha)
Mahurangi Harbour	108	0	108
Great Barrier Island	23	6	29
Firth of Thames	45	0	45
Kawau Island	1.5	0	1.5
Matakana River	0.7	0	0.7
Waiheke Island	39	0	39
Wairoa Bay	14	0	14
Kaipara Harbour	18	0	18

In response to the rapid increase in demand for coastal space for aquaculture activities, central government placed a moratorium on the processing of resource consents for aquaculture activities in March 2002. The purpose of the moratorium was to allow regional councils whose plans did not provide strong policies and defined areas for aquaculture (Aquaculture Management Areas) to do so. The moratorium is due to expire in December 2004.

Implications

The recent increase in demand for aquaculture activities in the coastal marine area has been significant. With a growing population of over 1.3 million people, approximately 100,000 recreational vessels, and with significant commercial fishing, transport and other demands, there is a substantial need to have in place a framework for managing the competing interests within the coastal marine area in the Auckland region.

Such an increase in demand for aquaculture in the Auckland region places pressure on the public's enjoyment and access to, and within, the coastal environment, puts pressure on coastal marine habitats, and pressure on commercial activities. Some activities and values in the coastal marine area can co-exist but others, like aquaculture, are largely exclusive. Given that the coastal marine area is a finite resource, and predominantly public open space, it is critical that a framework be developed that can manage the wide range of activities in a way that will maximize the benefits for both the public and private interests, while protecting the values of the coastal marine area.

ARC Responses

The ARC undertakes a range of functions in relation to the issues discussed in the Fresh and Coastal Waters chapter. These can be summarised as follows:

Key Planning Initiatives

The ARC has several planning initiatives which are focused on maintaining or enhancing the quality of fresh water and the coastal environment. These include the Regional Plan: Farm Dairy Discharges (which controls the discharge of contaminants from Dairy farms) and the Proposed Regional Plan: Coastal which controls various discharges and activities in the coastal marine area.

Furthermore, the Proposed Regional Plan: Air, Land and Water has controls on a range of activities which have the potential to create adverse effects on environment such as industrial activities and contaminated sites.

Key Implementation Initiatives

The ARC manages the allocation of water resources from groundwater aquifers, streams or lakes. In doing this, the ARC ensures that ecosystems retain enough water to remain healthy. In addition, the ARC regulates the discharges of contaminants to land and water, such as from earthworks, contaminated sites, pollution events, or other rural and industrial activities. The ARC runs a water pollution hotline, which members of the public can ring to report pollution events. Again, this is done to ensure that any discharges that do occur have as little impact on the environment as possible.

The coastal marine area is a special resource for the people of the Auckland region, and this is managed to maintain the high value it has for our population, natural character is retained where possible, and people have access to clean healthy beaches and waterways.

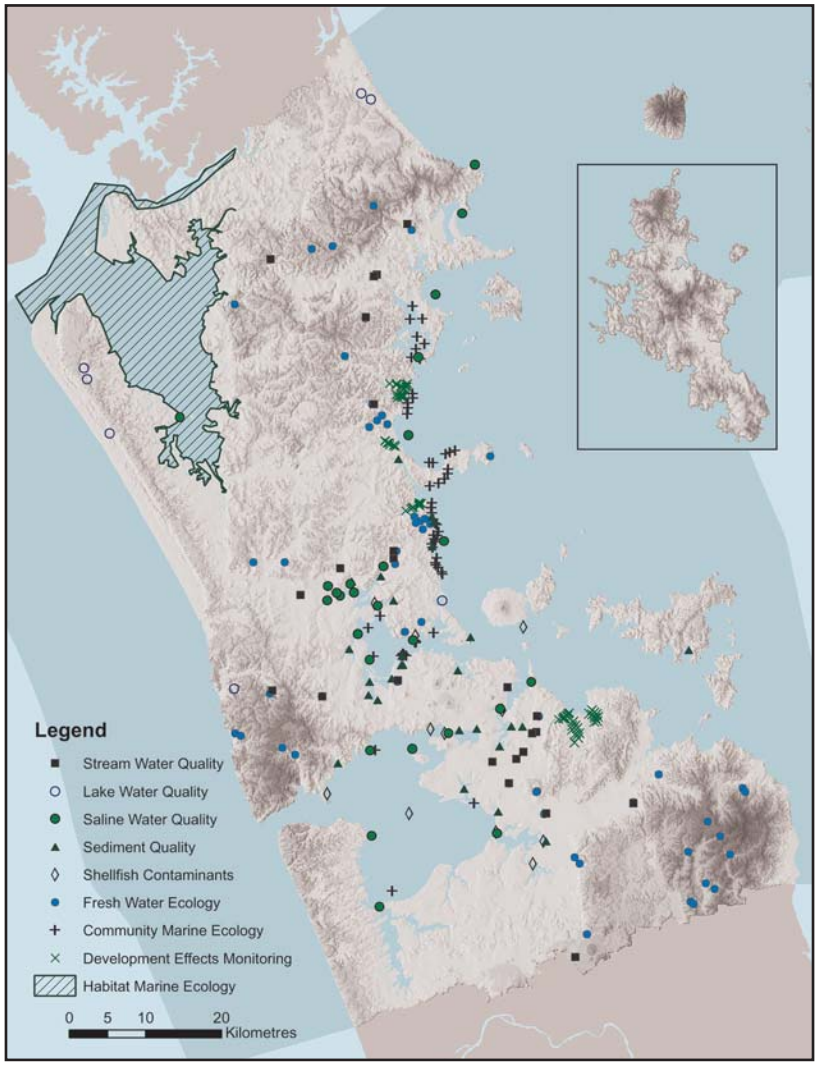
The ARC operates a Maritime Operations Unit, which administers the region's moorings, and helps ensure the safe use of our harbours and coast.

Key Monitoring Initiatives

The ARC monitors a range of characteristics of our fresh and coastal waters to ensure they remain healthy. These include our groundwater resources (both its quality and the amount that is in our aquifers), fresh water (the amount in our streams, its quality, and the health of freshwater ecosystems) and coastal waters (the wave climate, the water quality, sediment quality, benthic ecology and shellfish).

More information on the ARC's functions and activities can be found in the ARC's Long Term Council Community Plan (LTCCP).

Figure 4.30: Fresh and Coastal Water Monitoring Locations



Community Responses

The Auckland Regional Council has a range of responsibilities, primarily outlined in legislation, to help improve our social, cultural, economic, and environmental well-being. However, it's not just up to the ARC - everyone in the Auckland region has a role to play. No matter who you are, or what your age, gender or profession - everyone can do something that can help to make the Auckland region a great place to live, now and in the future.

The ARC works closely with over 100 community groups throughout the region, who have more than 2,300 participants, and there are many more groups active in the community. Some of the partnerships between the ARC and the community are outlined below.

Partner Groups

Care Groups

Active groups include land care, coast care, heritage, biosecurity, waicare, air care and groups. These groups work on a range of environmental and conservation projects to improve water quality, land, the coast and air quality. Planting days, litter clean-ups and beach-care days are just some of the things that people can participate in on a regular basis throughout the region.

ARC staff work with many of these groups to assist with technical advice and support. The ARC administers the www.manawa.org.nz website in partnership with the Auckland Conservation Forum and the Department of Conservation, which provides care groups with access to useful information, and puts them in touch with other groups.

Partners for Parks

The ARC's Partners for Parks programme encourages people to contribute to the care and upgrade of the Auckland Regional Parks network. More than 2,000 people volunteer on parks to help with tree planting, events such as the Ambury Farm Day, administrative support, or helping in one of our parks offices or visitor centres giving almost 53,000 hours of their time.

"It Starts in Parks" is a promotional programme aimed at getting people to join one of the Parks Friends groups which are self-run groups that initiate their own programmes in various regional parks in conjunction with parks management.

Environmental Initiatives Fund

In addition to providing technical staff support to groups, the ARC also has an Environmental Initiatives Fund, which awards both groups and individuals with money to help them continue with the great work they are doing. The fund began in 2000 and over the past four years, the Council has contributed over $620,000 towards a range of environmental initiatives including riparian management, tree planting, water care, pest control, environmental education, and Kaitiakitanga.

Schools

The ARC works with schools from throughout the region and is divided into four key areas: School Parks Programme (Learning through Experience), Enviroschools, Trees For Survival and Walking School Buses.

School Parks Programme (Learning through Experience)

In 2003 more than 28,000 students were involved in the Learning Through Experience in the Auckland Regional Park network. This is aimed at both primary and secondary school students, and is supported by the Ministry of Education.

Enviroschools

Launched in 2002, the Enviroschools programme is an incentive-based scheme that encourages schools to become actively involved in environmental education and environmental initiatives in their local communities. 49 schools are now involved, and there is increasing demand from schools wanting to enter the programme.

Trees for Survival Programme

The Trees for Survival programme involves partnerships between school students - who establish a nursery to grow and plant native trees - and a sponsor, such as the local rotary club, ARC staff or landowners.

In 2003, the Trees for Survival programme planted more than 30,000 trees.

Walking School Bus Programme

The Walking School Bus programme encourages school students and parents to reduce the number of car trips they make.

At the end of 2003, there were over 120 Walking School Buses at 53 schools, walking 1,738 children to and from school in safety each day and taking 5,234 car trips off the road network each week.

Individuals

As well as joining a community group, there are a range of things you and your family can do to help improve the Auckland region. These are outlined in the ARC's Big Clean Up campaign.

The Big Clean Up

The ARC's Big Clean Up programme is designed to encourage people to take individual actions to help improve the region's environment.

Approximately 40,000 people are already involved, and are changing their behaviour in a range of ways that benefit the environment.

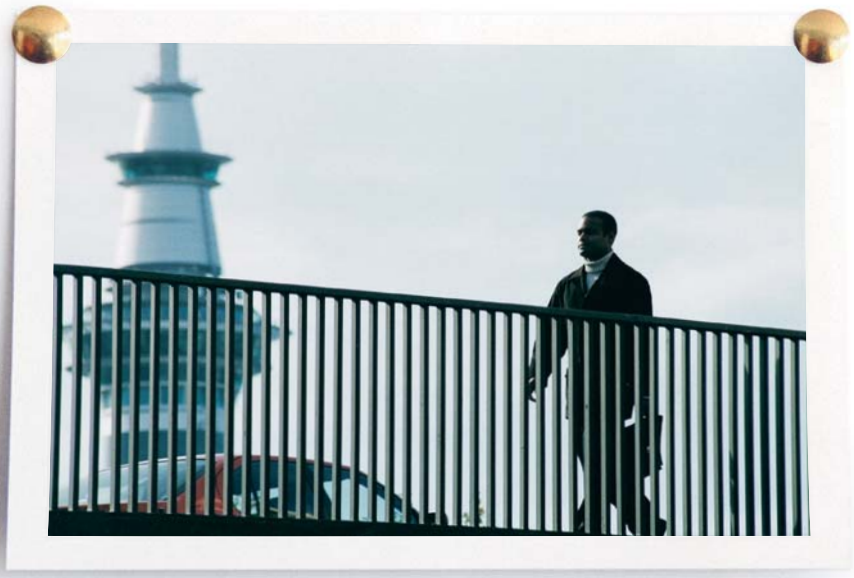
The Big Clean Up promotes things such as:

- reduce, reuse and recycle your waste;
- avoid back yard fires;
- keep pollutants out of the drainage system - wash your car on the grass or at a car wash;
- tune your vehicle regularly;
- reduce your car use by walking, car-pooling, cycling or taking public transport where possible;
- plant native plants at home, and remove plant pests;
- purchase ozone friendly products including fridges and aerosols;
- Make sure your chimney is clean so your fire burns more efficiently; and
- Insulate your house.

Businesses

The Auckland region's business, commercial and industrial community contributes one-third of New Zealand's economic output, and plays a vital role in the overall well-being of the region.

The ARC works with a number of key organisations such as Business New Zealand, the New Zealand Business Council for Sustainable Development, and the Sustainable Business Network. In addition the ARC works with specific industries on regulatory compliance and training, resource efficiency and corporate volunteering.



Conclusion

The State of the Auckland Region Report provides a snapshot of our Region in 2004. It has been five years since the first State of the Auckland Region Report, but the issues first described in 1999 are still very relevant today.

Significant progress has been made in some areas:

- average levels of particulate matter and carbon monoxide in air have generally decreased;
- our cultural heritage resources are better protected;
- important threatened species such as kokako and Hochstetter's frog are benefiting from pest control;
- pollution from Dairy Farm discharges has reduced;
- ammonia in Manukau Harbour waters have decreased since the commissioning of the Mangere Wastewater Treatment Plant; and
- we know much more about our air and water quality, cultural heritage resources, terrestrial and aquatic ecosystems than we ever have before.

Some issues are providing cause for concern, for example:

- Growth continues to place a strain on infrastructure such as roads and drainage, as well as urban land supply;
- We continue to experience new pest incursions;
- Some of our lakes are becoming degraded; and
- Marine ecosystems in the Mahurangi Harbour are showing signs of ill-health.

Many of these issues arise simply as a result of a growing population living, working and playing in a growing metropolitan area, and will remain a challenge in the future.

Towards the Future

Ko papatüänuku te matua o te tangata: the Auckland region - a great place to live. That's the ARC's vision for the Auckland region.

But what really makes a place 'great' to live in? It's a whole range of things:

- It's a world leader; the economy is productive
- It's clean and a desirable place to live
- It's easy to get around
- It's a place with a soul
- Its heritage is preserved
- It has plenty of healthy open spaces
- It's made up of safe communities which are both prosperous and caring;
- Its citizens are happy and healthy, and opportunities abound for all.

So how do we get there? The ARC plays an important role in helping to make the region a great place to live, but to really make a difference, all 1.3 million people of the Auckland region need to play their part. The ARC's mission is "working in partnership with our regional community to achieve social, economic, cultural and environmental well being". As shown by the Community Responses section, the ARC facilitates a wide variety of opportunities for us all to get involved in regionally important issues.

This report gives us an indication of where we are now, and where we are heading. While we have an overall vision of where we want to go - it's also about practical application, hard work, and being able to measure the results and show that they contribute to making the Auckland region a great place to live.

Bibliography

Much of the information presented in this report derives from various ARC environmental monitoring programmes. Other information sources for this document include the following.

Our People

Auckland City Council (2003): "Monthly Petroleum Company Returns".

Auckland Regional Council (2004): "Business and Economy".

Auckland Regional Council & Statistics New Zealand (2003): "Auckland Population, Household and Labour Force Projection Model": Version 6/2000.01.6.

Auckland Regional Council and Transit New Zealand (2002): "Auckland Traffic System Performance Monitoring".

Energy Efficiency and Conservation Authority. (2002): "EECA End Use Database".

Land Transport Safety Authority (2002): "Auckland Region Road Safety Report 1998-2002".

Ministry of Education (2002): "Full-Year Tertiary Statistics".

Real Estate Institute of New Zealand (2004): "Housing Facts".

Sport and Recreation Council of New Zealand (2003): "SPARC Facts - Greater Auckland".

Statistics New Zealand. (2004): "Building Consent Database".

Statistics New Zealand. (1991): "1991 Census of Population and Dwellings".

Statistics New Zealand. (1996): "1996 Census of Population and Dwellings".

Statistics New Zealand (2001): "2001 Census of Population and Dwellings".

Statistics New Zealand. (2003/04): "Inter-Censal Population Estimates".

Statistics New Zealand (2003): "Regional Household Labour Force Survey".

Transit New Zealand. (2001): "Auckland Region Traffic Data".

University of Auckland (2004): "Commission Population Projections".

Air and Atmosphere

Ministry for the Environment and the Ministry of Health. (2002): "Ambient Air Quality Guidelines: 2002 Update." Air Quality Report No 32.

Ministry of Transport (2002): "Health Effects Due to Motor Vehicle Pollution in New Zealand." Fisher, Rolfe, Kjellstrom, Woodward, Hales, Sturman, Kingham, Petersen, Shrestha, and King.

National Institute of Water and Atmosphere (2004): Niwa Website at www.niwa.cri.nz.

The Land

Landcare Research (2004): "Illustrations of Mistflower infestation - before and after Biocontrol Operations".

New Zealand Archaeological Association (2004): "NZ Archaeological Association Site Record File".

Tatton (2001): "Cultural Heritage in the Auckland Region: Priority Areas for Survey and Assessment." Prepared by Kim Tatton for the ARC.

Our Fresh and Coastal Waters

Stark, J. (1998): "SQMCI: a biotic index for freshwater macroinvertebrate coded-abundance data." New Zealand Journal of Marine and Freshwater Research 27.

Wilcock & Stroud. (2000): "Year 2000 summary report - baseline water quality streams, lake, and saline waters". Prepared for the ARC by the National Institute of Water and Atmospheric Research, Hamilton. ARC Technical Publication 132.

Auckland
Regional Council
TE RAUHITANGA TAIAO