

HOUSEHOLD TRANSPORT TRENDS IN NEW ZEALAND,
1960-2005

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1. INTRODUCTION

Increasing fuel use and the consequent greenhouse gas emissions are of concern to government agencies charged with reducing New Zealand's greenhouse gas (GHG) emissions. New Zealand's Kyoto Treaty target is set at 1990 emissions levels. However since 1990 emissions from transport have steadily risen and continue to rise at 2 to 3% per year, with half of the sector emissions coming from household transport. While agriculture is New Zealand's dominant GHG emission source, the increasing emissions from household transport are of concern because their increase erodes both the gains made in other sectors and the credits from increased forestry planting.

However in this paper we contend that rather than the population's behavior being irrational or reckless, the trends are the logical outcome of several overlaid trends:

- Recent trends are just a continuation of long-term trends but inflated by changing demographics and social change;
- The impact of the 1970s oil shocks on these long-term trends is under-appreciated so recent comparisons are against this lower atypical base.
- Decisions and indecisions around transport, especially rail versus road;

- A change to a more market economy has lowered transport costs which households are taking up as increased transport consumption;
- The importance of the social/recreational travel in impelling car ownership and vehicle purchase decisions is under appreciated.

2. PUBLIC TRANSPORT DECISIONS AND INDECISIONS

The foundations of New Zealand's current transport network were laid in the 1950s. Over 70% of New Zealand's population was living in urban areas and the majority of the population lived in one of the four main centers of Auckland, Wellington, Christchurch, and Dunedin.

Throughout the whole of New Zealand car ownership rates were increasing, but it was realistically only in the four main centers that transport infrastructure decisions for rail-based or road-based cities could have been made that could have affected the continuation of this trend towards a culture of reliance on cars, with its attendant influences on urban form.

Prior to the 1950s each of the four centers used sections of the national rail network to provide a local passenger rail service that connected outlying suburbs with the edge of each center's Central Business District.

By 1955 the Wellington system had been upgraded to an electrified double tracked system with an approximate 30 km reach from the CBD. This system is still New Zealand's only rapid transit style system. In Auckland, despite numerous studies, a comparable system did not proceed. There the rail system that was in place in the 1950s continued to operate with little expansion up until the last decade when a program to provide a much improved system was introduced, though progress is slow. The suburban passenger systems in Christchurch and Dunedin closed in the 1970s, although Christchurch

is now giving serious consideration to re-introducing a train system. In each city, motorways now mimic these rail corridors.

The mid-1950s also saw the first planning of motorways in New Zealand. The *Auckland Master Transport Plan*, 1955, laid out the plans for a motorway system and by 1963, the time of further transport studies, substantial portions of these motorway systems had been built.

In 1963 a further series of both city and regional transportation studies in Auckland, Wellington, and Dunedin occurred. Reports from these studies indicate that a motorway system was forming in New Zealand. The studies advocated reinforcing this system but also recommended upgrading the suburban rail systems in Auckland and Wellington to deliver passengers via a rapid transit system into the heart of the CBD as a complementary system. The studies had noted that both center's systems had a weakness in delivering passengers only to the CBD fringe. For Wellington the increase of "Park and ride" facilities along the full length of the route throughout the system's catchment were strongly recommended. In Auckland they emphasized that without the rapid rail system, supported by feeder buses, the motorway system would have to be much larger.

The Auckland Regional Authority officers in recommending the acceptance of the strategies had a clear vision of the implications of the strategy:

- Without the rapid rail Auckland would move to a dispersed urban form.
- Complementary to plans for a rapid rail system to the CBD, a master plan for the CBD was also needed.
- A rapid transit system built on feeder buses and rail links was a less direct path, and high levels of service were needed to ensure usage.
- A shift to rail was still unlikely unless other modes for getting to the CBD became unattractive.

- A reform of governance was needed to ensure a coordinated operation of passenger transit and that at present governance was spread over about 20-30 agencies.
- They also advised that time was of the essence, that in the absence of action, alternate developments would occur and money and resources needed for the main effort would be increasingly directed to address interim measures.

Neither upgrade proceeded and by the time of a 1976 update of the Auckland Transport Plan pessimism about rail was entrenched. Rail could not be recommended as they had little confidence as to its uptake. Instead they would apply "smart management" to get the best out of their road system, an interesting conclusion given that the same report also recognized that governance was uncoordinated, but coordinated governance was necessary.

The 1976 reports correctly predicted the dispersal of Auckland into a polycentric city and that by about the year 2000 the motorway system would be heavily congested with consequent economic impacts on the city.

Rail and bus patronage levels held up quite well until the late 1960s and thereafter declined steadily until recent years when increases have been achieved. However patronage is still only about 60% of levels achieved in the early 1960s while population has increased by more than 130% in these cities.

3. CURRENT BEHAVIORS

A number of key statistics on household transport from several government agencies are often drawn together so as to indicate the current state of household transport. These indicators show the dominance of car travel, with its attendant fuel consumption, continues to rise, and use of alternate modes falls, despite some encouragement for the reverse to occur.

For example, from 1989 to present:

- Steady rising level of vehicles in proportion to the population;
- Average engine size of vehicles increasing;
- Average trip length by vehicles increasing;
- More trips by vehicles for all destination types, both as passengers and as drivers; and
- Major declines (about 30%) in the numbers walking or cycling.

Given the target of attempting to keep total GHG emissions at 1990 levels these trends are unhelpful.

4. LONG-TERM TRENDS

Cars per population

The rate of car ownership per capita in New Zealand increased from 220 cars per 1,000 people in 1961 to 573 cars per 1,000 people in 2005. However, tracking vehicles numbers against gross population may mislead, as it includes many people too young to drive.

The 20 years and over age group is a reasonable proxy of those eligible to own and drive a car. Since 1966 the number of people less than 20 years old has been almost a constant 1.15 million people, whereas the growth in the older (20+) group matches the growth of the overall population. This results from a combination of the ageing of a young age group bulge and from immigration. The growth of the car-owning-and-driving portion of the population accounts for 65% of the increase in cars over the 40 years since 1966.

Table 1 shows both population trends and the number of cars in the total New Zealand vehicle fleet.

Table 1 Trends of population and vehicle numbers

Year	Population ('000)		Total number of licensed cars* ('000)	Cars/Person		Cars/Household
	Total	20+ yrs		Total	20+ yrs	
1961	2,450	1,450	541	0.221	0.373	
1966	2,700	1,550	766	0.312	0.434	1.07
1971	2,850	1,700	933	0.327	0.549	1.16
1976	3,150	1,900	1,172	0.372	0.616	1.25
1981	3,200	2,000	1,333	0.416	0.666	1.33
1986	3,300	2,200	1,480	0.448	0.672	1.36
1991	3,400	2,300	1,700	0.500	0.739	1.44
1996	3,650	2,510	1,800	0.490	0.717	1.41
2001	3,750	2,600	2,100	0.560	0.808	1.56
2005	4,110	2,921	2,350	0.573	0.804	

* Up to 1976: numbers from Statistics New Zealand. From 1976: numbers from the Ministry of Transport's Vehicle Fleet Model

Cars per household

Data from surveys in Christchurch show both that 1 car per household occurred at about 1965 and how an average ratio of one car per household may be spread. As Table 2 shows, even at a very early stage a significant proportion of households have two cars.

Table 2 Cars per household within Christchurch

Year	% of households with			Average	
	0 cars	1 car	2+ cars	Per household	Per capita
Household survey 1959	33.5	54.0	12.5	0.89	0.25
Household survey 1969	20.5	53.0	26.5	1.09	0.34
New Zealand Census 1971	22.7	52.7	24.6	1.08	0.31

Figure 1 shows trend from 1971 onwards. A baseline level of about 10% of households without access to a car appears to have become entrenched. However 50% of all households have 2 or more cars and

14% have 3 or more. Figure 1 demonstrates that for nearly 30 years a car was a standard feature of the New Zealand household.

Figure 1 Vehicle availability per household

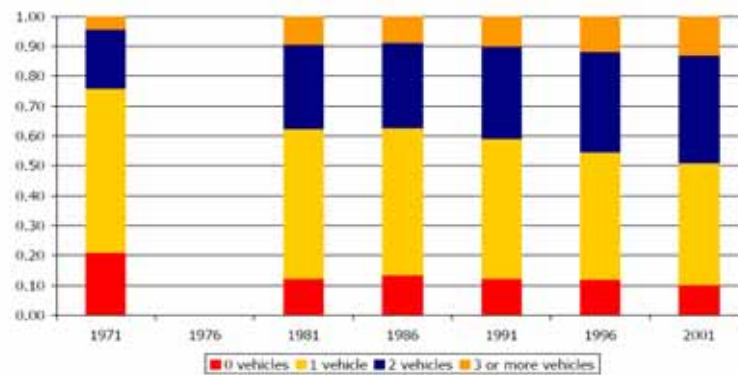
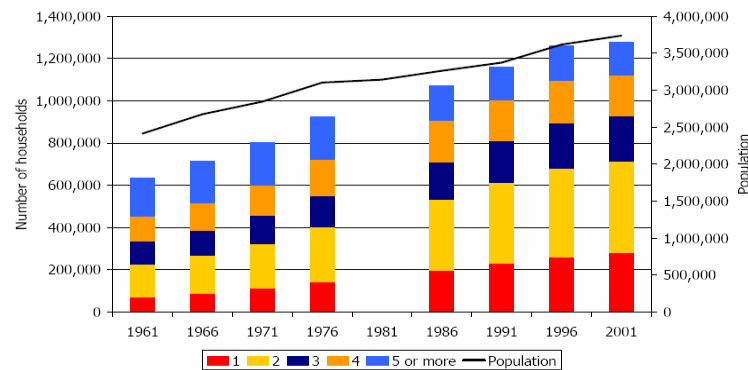


Figure 2 shows another demographic – that of number of households and the number of people per household. The number of small households (1, 2, or 3 persons) has increased disproportionately. The current population would have fitted into about 295,000 less households if the 1961 pattern had been maintained. Figure 2 demonstrated the connection between households and vehicles, so about 266,000 of the extra vehicles arise from the growth in household numbers. However, this growth cannot be considered as additive to the growth attributed to the increase of the 20+ age group as the 20+ age group and household composition will be inter-related.

Figure 2 Number of household occupants and the total New



Zealand population

5. TRANSPORT ECONOMICS

Table 3 shows the trend of transport costs on vehicles and transport. Even though households have more vehicles the amount that they spend on transport is falling.

Table 3 Average household weekly expenditure, for all households (from Household Expenditure Survey)

	1986	1991	1998	2001	2004
Public transport	1%	1%	1%	1%	1%
Vehicle purchase	7%	6%	6%	5%	6%
Vehicle operation	8%	7%	6%	6%	6%
Total transport	20%	18%	18%	16%	14%
Total expenditure	\$418	\$610	\$683	\$758	\$833

Figure 3 Transportation group households expenditure as a proportion of total household expenditure

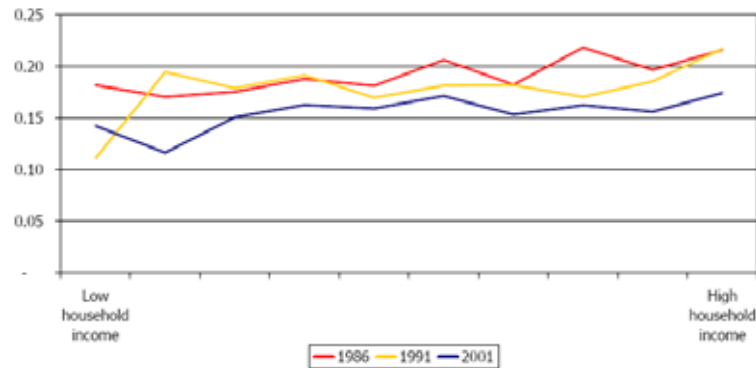


Figure 3 shows the proportion of household expenditure spent on transport versus the household income for three survey periods. The downward trend with time is evident. It is also evident that increased wealth is directly associated with increased transport. A significant impact on transport costs has been the reduction of taxes on new vehicles and allowing imports of used vehicles. As a result new vehicles have decreased in price by about 30% and second hand vehicles by about 50% in real terms compared to 15 years ago.

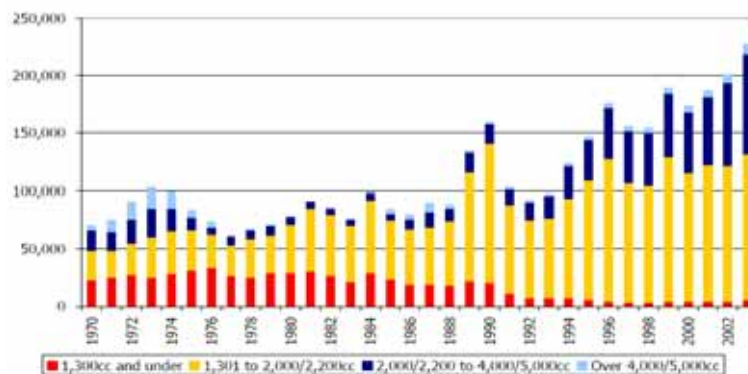
6. THE "OIL SHOCKS" OF THE 1970s

The 1970s was a difficult decade for New Zealand in that the economy already had to adjust to restricted access to its main export market for farm products following the United Kingdom's entry into the European Economic Community. The steep rise in international oil prices following the "oil export embargo/price rises by OPEC" of 1973-75 and further rises at the end of the decade surrounding the Iranian Revolution, resulted in a threefold increase in fuel prices followed by a further doubling of prices. The Government introduced a number of fuel restriction measures, mainly focused around the "oil shock" events (but some imposed for longer periods) including:

- Reduction of open road speed limit from 90 or 100km/h to 80km/h;
- Additional vehicle sales taxes and increased vehicle licensing costs that favored smaller engine sizes;
- Banning of petrol sales on the weekend;
- Carless days where each household vehicle had to nominate one day per week when it was not used (July 1979 to May 1980);
- Allowing Government workers flexible start times so as to spread congestion (late 1970s); and
- Established agencies to identify alternate energy sources, including as CNG, LPG, and biofuels.

The strategy was primarily targeted at conserving fuel and shifting to alternate fuel sources rather than shifting modes or expansion of public transport services. Reports on the effectiveness of the measures are difficult to find but a recent part analysis of data does indicate several significant impacts. The most noticeable is a sharp change in the type of vehicles entering the fleet. As shown by Figure 4 there is a marked shift to smaller engine sizes by 1975 and a complete decline in very large engined new vehicles entering the fleet but now the early pattern has re-established.

Figure 4 **Annual car registrations, by engine size**



Almost all of the fleet was petrol-fuelled, so overall impact of all the measures can also be assessed by determining the average quantity of petrol delivered compared to vehicle fleet size, as is shown in Figure 5.

Figure 5 Oil company deliveries per licensed vehicle (liters annually)



The average fuel delivered per vehicle decreases from 1974 onwards and by 1980 the quantity per vehicle has decreased by almost 20% compared to the 1970-1973 average. Given the slow rate of turnover of the New Zealand vehicle fleet, this degree of reduction would be very much greater than could be expected from improved vehicle fuel-use technology alone.

The impact on public transport was small. Within a downward trend of patronage there are two brief small increases in patronage corresponding to the main oil shocks but the overall downward trend continued.

7. SOCIAL/RECREATIONAL TRIPS

The 1998 New Zealand Household Travel Survey shows that 21% of household trips were for social/recreational purposes and these accounted for 25% of the distance traveled. If trips back to "home" (33%) are excluded, as they are the consequences of other trips, social/recreational trips are almost double the next most common trip "shopping" (12%) but three times the distance (8% for shopping). "Going to work" is only 10% of the trips. This data repeats that for 1989 and continues a long established trend.

A 1975 Driver Exposure Survey (intercepted drivers) and 42% of the total distance by light vehicle was for social/recreational purposes. A 1972 Travel Survey (New Zealand Policy Study) found that (with "to home" trips excluded)

- 40% of personal car travel occurs at weekends and public holidays;
- 50% of personal travel is for social/recreational purposes (includes holidays);
- Urban travel (travel within boundaries of settlement of 1,000 or more) and non-urban travel are of equal magnitude. As 83% of the population were urban, urban people undertake a substantial part of their travel in non-urban areas;
- Two thirds of social/recreational trips are on the weekend.

Household survey data from Auckland regional studies shows that in 1963 17% of all trips were for social/recreational purposes.

A 1966 study of the Wellington region discussed the unusual possibility of having to expand the capacity of the main northwestern highway to accommodate weekend rather than weekday travel.

We have not yet found data earlier than 1963 but clearly by then and since then the social/recreational trip was a major trip purpose and a very significant component (around 50%) occurred in a rural environment.

Other data from the 1975 Driver Exposure Survey also indicates that the social/recreational journey was a possible major factor in vehicle purchase choice (as shown by engine size). This survey also highlights that much of the social/recreational distances are performed outside urban areas.

Coupling the strength of the social/recreational travel with vehicle uptake gives a strong indication of motivation for vehicle purchases.

Surveys in 1963 in Auckland and Dunedin noted the number of cars per dwelling in those cities. The inner suburbs is where public transport is at its best and work and retail destinations should be accessible by public transport or walking yet they already have a substantial ratio of cars to households, as shown in Table 4.

Table 4

	Cars per household	
	Auckland	Dunedin
Inner suburbs	0.71	0.66
Outer suburbs	0.85	0.84

Census information on mode of travel to work shows that even as late as 1971 only 55% of the population (45% as drivers) used a car as the main mode to work which has only increased to 64% by 2001.

Given the quite high rate of vehicle access even for the inner city suburbs and the modest rate of car usage to access work, then having a car appears to have been to satisfy another important household trip and our conclusion is this is the social/recreational trip. Accessing beaches, forest, lakes, rivers, and mountains has for many years been regarded as a key part of the New Zealand lifestyle and the car would deliver this access to a greater range of destinations than public transport.

8. CONFERENCE THEME: COMPETITION DRIVES CHANGE

Household transport trends in New Zealand since 1950 demonstrate that competition does indeed drive change. These trends illustrate the "competition" between public transport and the car. Even though car purchase required an initial high capital outlay versus pay-as-you-go for public transport, in the twenty years from 1945 to 1965 the car had swept public transport aside to the point where it would then decline to a minor role as a transport mode. By 1965 car numbers had increased up to one per household. This change was not primarily caused by adopting North American thinking of freeways (motorways), for the contest was effectively over before the motorway program had barely begun in the major cities in the early 1960s.

Yet we should note that this change occurred not when public transport was at its weakest but at its strongest. Not only were people modally competent, for many people public transport along with walking or cycling were the only modes they had experienced. Urban form had been configured around public transport and it is difficult to believe that such a rapid uptake was needed to access employment. Clearly there was a powerful attraction in what the car provided, and it is our contention that the key that the motorcar provided was access to the social/recreational trip. We have shown that it is the trip that contributes most to VKT and it is the trip most associated with larger vehicles. This is the trip that gives people what they truly seek, that of lifestyle, of access to outdoors (beach, lake, mountain, or forest) and the social contact with friends.

What hope for those who seek to reverse this trend now that public transport is at its weakest, and our cities are configured for cars? The experience of the 1970s gives cause for both optimism and despair. Optimism in that the period shows that it is possible to effect a rapid change from purchasing large engine sizes to smaller engine sizes and also that it is possible to effect some modest reduction in fuel use. However despair could come from considering the small scale of

the change compared to the size of the measures, a 6-fold increase in fuel price, bans on weekend petrol sales and increased taxes on larger vehicles. Yet no mass switch to public transport or walking or cycling occurred, rather, it was business as usual with some minor modification of ongoing reliance on vehicles.

However this lack of large change may have arisen from the circumstances of the 1970s. It appears that no viable alternatives were offered. There was no expansion of public transport services even though it appears there was public sentiment to accept the need for this expansion; but then the expansion could not have been afforded. Instead the measures were presented as short-term measures, until we found a way to achieve self-sufficiency in liquid fuels. Rather than recognize the importance of the social/recreational trip the measures were dismissive of it. This was regarded as discretionary travel, almost frivolous and weekend fuel bans and carless days directly targeted them. The responses of resentment of the measures and efforts to circumvent them, including hoarding fuel or buying a second car to sidestep the carless day, show the extent of this misjudgment. Effecting future changes will need to have as much regards to lifestyle (social recreational trips) as livelihood (work trips).

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