



The role of transport in the future development of the Wellington region

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Abstract:

The transport system is part of the basic fabric of any society. Transport is a derived demand and exists only to satisfy the need for access of people or goods. In this respect transport does not represent an end in itself but serves a role in allowing other ends to be achieved.

The transport system therefore has a fundamental role to play in the development of any region. There are many complex interrelationships between transport and other aspects of a region's development. For instance both economic and land use development increase the demand for transport, but enhancing transport also increases the propensity for economic and land use development in various parts of the region.

The transport system impacts on every aspect of community life. It serves economic and community welfare goals. It has environmental impacts. It impacts on the consumption of resources including the development of land.

This paper examines the role of transport in the development of the Wellington Region. It looks at the relationship of transport planning with economic, community welfare, environmental and land use planning. Several distinctive strategies for developing the region's land transport system in conjunction with land use strategies are examined. A comparison on how they perform against transport efficiency, economic, community welfare and environmental objectives is made. A variety of techniques are used to determine a preferred strategy including a tool that models the community's preferences for the social benefits delivered by the transport system.

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Introduction

Transportation is a key element in any society. Transportation facilitates an urban area's economic development, enables social interaction and the pursuit of leisure activities. The development of an urban area's transportation will invariably result in some impacts on the environment, amenity values and the community. Consequently the benefits of developing the transportation system will have to be traded off against these impacts where they are adverse.

This paper examines the role of transportation in the Wellington region of New Zealand and considers the priorities for development. These priorities are compared against the consequential impacts on the environment, amenity values and the community.

A process to reconcile development priorities against consequential impacts is presented.

Background

The Wellington region is situated at the southern end of New Zealand's North Island. The region's total population was 414,000 people on census day 1996 with 373,000 of these people located in the urban part of the region. The dominant population centre is Wellington city, the nation's capital which has a population of 158,000.

The urban part of the region provides employment for 168,000 full time equivalents. The dominant employment centre is Wellington city which employs 102,000 full time equivalents of which 68,900 are located in the central business district.

The difficult topography of the region provides natural barriers that constrain major transport corridor locations. Two primary transport corridors provide access to Wellington city, its central business district, regional airport and port. Both the northern and northeastern corridor (refer figure 1) provide highway and rail access.

The topography of the region limits the ability to expand highway capacity on both corridors and to provide road connections between the corridors. At peak times bottlenecks exist on each of the corridors, but otherwise run freely.

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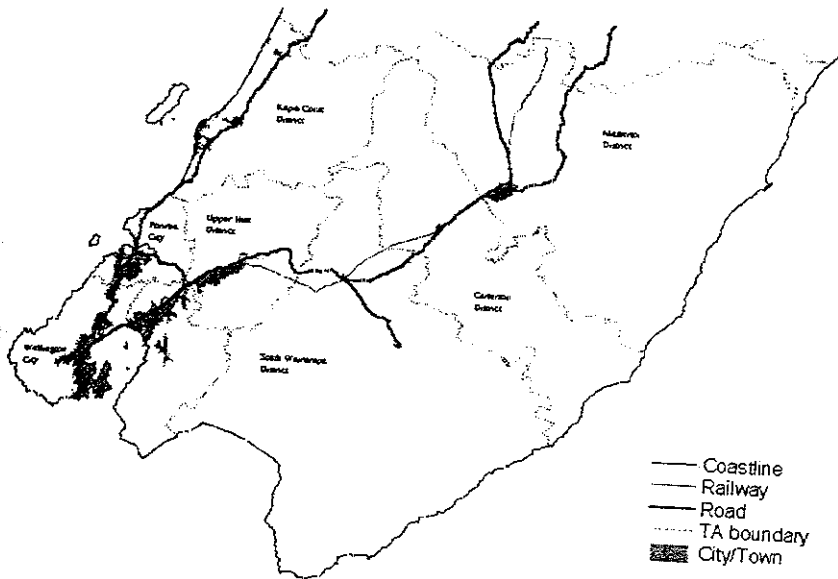


Figure 1 Major transport routes of the Wellington region

Growth expectations in the region

Population Growth

The 1991-96 growth in the usually resident population in the Wellington region was 0.68% per annum compared to 0.40% per annum over the 1981-91 period. Underlying the burst in population growth was an increase in live births reflecting a large population cohort reaching peak child bearing age. In addition there has been an increase in the rate of net in migration of those aged 15-19 years and 30-44 years.

The Statistics New Zealand population projections for the region are:

District	1996 base	2001	2016	2001/1996 Growth pa	2016/2001 Growth pa
Kapiti Coast	39304	41912	48814	1.3%	1.1%
Porirua	46617	47980	45350	0.6%	-0.4%
Upper Hutt	36714	36930	33390	0.1%	-0.6%
Lower Hutt	95889	98340	94820	0.5%	-0.2%
Wellington	157647	168750	177340	1.4%	0.3%
Masterton	22761	22880	20970	0.1%	-0.6%
Carterton	6813	6800	6160	0.0%	-0.6%
South Wairarapa	8943	9050	8440	0.2%	-0.4%
Total	413976	432600	435040	0.9%	0.0%

These projections show steady growth in the region up to the year 2001. This growth, however, is dominated by growth along the Wellington to Kapiti Coast corridor. After the year 2001, total regional growth is projected to be modest. However, this masks real growth in the Kapiti Coast and to a lesser extent in Wellington offset by declines elsewhere.

Economic growth

Forecasts for economic development in the urban part of the region have been provided BERL (1997). In summary they show the following characteristics.

Output \$m	1996 Base	2001	2016	2001/1996 Growth pa	2016/2001 Growth pa
Primary	249	291	447	3.2%	2.9%
Manufacturing	4229	4702	5849	2.1%	1.5%
Services	18149	20699	28904	2.7%	2.3%
Total	22627	25692	35201	2.6%	2.1%

The essential elements are that the regional economy is dominated by the service sector, much of which is located in the Wellington central business district. Only modest economic growth is forecasted in terms of output (2.1-2.6% per annum) and employment (0.9% per annum). The slower growth rate in employment reflects the impact of technology and organisational efficiencies which result in a less intense requirement for labour.

The role of the regional land transport strategy

In New Zealand the Land Transport Act requires Regional Councils to develop and maintain a Regional Land Transport Strategy. This strategy establishes the framework for the development of the region's land transport system as those parties who have a responsibility in funding, maintaining and developing the infrastructure may not act in a manner inconsistent with the Regional Land Transport Strategy.

The legislation requires that the Regional Land Transport Strategy:

- (a) Identify the future land transport needs of the regions; and
- (b) Identify the most desirable means of responding to such needs in a safe and cost effective manner, having regard to the effect the transport system is likely to have on the environment; and
- (c) Identify an appropriate role for each land transport mode in the region including freight traffic, public passenger transport, cycling and pedestrian traffic; and
- (d) State the best means of achieving the objectives referred to in paragraphs (b) and (c)"

Transport needs of the region

It is clear from the demographic and economic information that there will be a growing demand for peak period growth between the Kapiti District and Wellington city, the region's dominant employment centre

With respect to more specific travel needs within the region, the Wellington Regional Council has undertaken considerable research on the subject. In 1997 the Council engaged McDermott Miller Ltd to undertake a survey of the region's population and road freight drivers. This survey was designed to ask what attributes of the transport system would they value and how willing they were to pay for them. The survey included a computer-aided telephone interview of 1,215 households and in-person interviews of a subsample of 180 people selected at random from six targeted transport user groups. Fifty road freight drivers were surveyed. Sampling in both surveys was spread across the region's cities and districts in proportion to population

The household survey was a computer-aided telephone interview and sought to obtain the following information:

- Transport User Definition (according to modes of transport used, place of residence, place of work, etc.) This information is used to segment respondents by commuting style and vehicle ownership.
- Conjoint analysis survey dealing with the social benefits related to transport. Respondents rated and traded-off levels of attributes relating to benefits served by society as a whole from the transport system. These questions considered the relative importance of the transport system providing accessibility, facilitating economic activity, environmental impacts or equity issues
- Conjoint analysis survey dealing with personal benefits of transport. Here respondents rated and traded-off the relative importance of work, education, shopping and leisure trips; the importance of personal safety, travel choice, minimising travel time and reliability.

Demographic details (eg age, occupation, household income, etc)

The face-to-face survey sought to gather data related to the valuation of the benefits. This included the following:

- The effects of travel improvements versus environmental or community impacts
- The value of travel times for different trip purposes
- The relative value of time savings, trip reliability and being able to travel when you want as opposed to avoiding congestion

The completed research shows that:

- Achieving the social benefits of a transport system that provides efficient travel access (ie. minimum travel times over maximum different modes of travel - car, public transport etc.) is the community's first preference and is valued much more highly than other outcomes.
- The research also shows travel-time reliability is a significant social benefit, (that is, users place high value on being able to rely upon travel to work in a predictable time). Most users are reluctant to reduce travel time and delays by leaving for work earlier or later. Most would prefer to pay more for the transport system to be improved so they can continue to leave for work at their preferred time.
- These preferences are similar between districts and cities within the Wellington region.
- On the other hand, preferences and valuation of social benefits varied significantly between different groups of users (eg. retired people ranked reduced time of travel for shopping purposes three times more valuable than any other group of users). In other words, lifestyle has a significant impact on preferences within the community.
- All sectors of the community are prepared to pay more for an improved transport system that reduces the time of travel in all categories of travel (private car/public transport), and some (especially private car commuters) were prepared to pay substantially more in order to reduce travelling times to and from work. In other words, the community places a monetary premium on realising the social benefit of efficient travel access.
- Environmental impacts (from developing and operating the transport system) and safety in using the transport system is important to the community, but not as important to transport users as travel access. The average user is prepared to pay a modest premium for improvements to the transport system that are made with minimal adverse environmental and social effects.
- Freight drivers exhibited similar responses as did the residential population except that they placed much less importance on avoidance of adverse environmental and social effects.

In addition, a number of workshops of business stakeholders were held to examine their needs. This was complemented by research undertaken by Opus International Consultants Ltd (1997). A sector by sector analysis of access needs was developed which is presented below. In addition it was important to consider the impact of rate of land charges imposed to pay for providing these access needs.

Table 1 Primary sector (agriculture, fishing and forestry)

Consideration	Significant?
Rates	low
Access to ports	high
• capacity	
• cost	
• mode choice	
Access to market	high
Access to processing plant	high

Table 2 Manufacturing for the regional market

Consideration	Significant?
Rates	medium
Access to market	high
Access to labour	medium
Access to supplies/inputs	high
Access to services	high

Table 3 Manufacturing for the domestic market

Consideration	Significant?
Rates	low-medium
Access to gateways/ports	high
Access to labour	medium
Access to supplies/inputs	high
Access to services	high

Table 4 Manufacturing for the export market

Consideration	Significant?
Rates	low
Access to gateways/ports	very high
Access to labour	medium
Access to supplies/inputs	high
Access to services	very high

Table 5 Services, transactions in tradable goods

Consideration	Significant?
Rates	high
Access to markets/customers	very high
Access to labour	low
Access to supplies/inputs	high
Access to services	low-medium

Table 6 Services, transactions in information and ideas

Consideration	Significant?
Rates	medium-high
Access to markets/customers	high
Access to labour	
• executives, professionals	high
• clerical	very low
Access to supplies/inputs	low
Access to services	high
Access to gateways, airports	high

Table 7 Tourism and leisure

Consideration	Significant?
Rates	medium-high
Access to markets/customers	high
Access to gateways	very high
Access to attractions	very high
Access to labour	low-medium
Access to supplies/inputs	very-high
Access to services	medium

Table 8 Transport and construction

Consideration	Significant?
Rates	very low
Access to markets/customers	low
Access to sites	medium-high
Access to labour	low-medium
Access to supplies/inputs	very-high
Access to services	low

The choice of residential location is another variable that influences travel demand. Cater (1983) identifies the following as key parameters affecting residential choice:

- the quality of the residential environment
- their social makeup
- access to household services
- home-work travel times and costs

In making decisions on residential location individuals make trade offs between these parameters. In effect they are valuing the quality of the residential environment, the social makeup and access to household services against the value of home-work travel times and costs.

This means accessibility to employment and accessibility to household services may influence relative migration within the region. The attractive lifestyle of the Kapiti Coast is undoubtedly a factor in the growth of population in that district. However, if travel costs continue to grow for peak period journeys between Wellington city and the Kapiti Coast then it is conceivable that future population growth in that district may decline.

This issue of migration rates and accessibility has been investigated in the Wellington region. No meaningful relationship can be developed unless the population is segmented by age group where the following patterns emerge:

- (i) People of the 15-24 age group are generally employment orientated and tend to migrate to areas where employment accessibility is high. Disposable income is likely to be a restriction for this age group
- (ii) people in the 25-44 age group are generally not so employment orientated. This age group possesses the highest level of mobility and tends to migrate to areas with better living conditions or high accessibility to household services
- (iii) people in the 45 plus age group are also not employment orientated. This age group seeks a higher standard of living for families of a higher income, as well as better accessibility to services for retirement

Strategy development process

The development of the Regional Land Transport Strategy seeks to determine the role of each transport mode. Investment programmes follow that deliver the infrastructure and measures are implemented that provide the desired outcome. With respect to these measures and programmes, legislation requires that environmental impact, safety and economic efficiency are considered.

A process for developing the Regional Land Transport Strategy is described by Brennan and Lupton (1997).

In summary generic strategies or 'cartoon' strategies are evaluated against economic performance as well as performance measures that describe wider objectives. This evaluation requires the use of strategic transportation, land use and economic models. These cartoon strategies are broad and include, for example;

1. free flow roading - road capacity is provided to meet demand
2. selected road improvements
3. a modern public transport system
4. enhancement of the existing public transport system
5. low fares public transport
6. decentralisation of land use
7. economically efficient pricing

These performance measures may include environmental objectives, community objectives, economic development aims and safety targets.

A planning balance sheet may be developed as a matrix of each 'cartoon' strategy's performance against the economic performance and agreed performance measures. A preferred strategy may be developed after refining combinations of preferred strategies. Brennand and Lupton developed this process further by using the agreed performance measures as constraints in a mathematical optimisation process to determine the optimal combination of strategies.

Performance measures

The 1998 review of the Regional Land Transport Strategy has determined targets for the performance measures through a classical planning process. A vision and objectives in a narrative form is firstly developed.

In the case of the 1998 review these are:

Vision

- A sustainable Land Transport system that meets the needs of the Regional Community.

Accessibility

To provide a transport system that optimises access to and within the region by:

- Ensuring that reasonable access is provided by the appropriate form of transport to all areas of economic and social activity
- Promoting the development of a land use pattern in the region that leads to effective access.
- Ensuring economic development is facilitated.

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- Addressing equity and wider social needs of the community and the needs of the access disadvantaged.

Safety

To provide a safer community for everyone through a transport system that achieves or improves on the targets of the National Road Safety Plan through the Regional Road Safety Strategy by promoting better:

- safety management
- safety awareness
- safer vehicles for all types of transport
- safer roads and environments

Economic Efficiency

To implement the most efficient options recognising:

- the need to assess the full costs and benefits
- the need to include the full range of transport modes and measures operating on a level playing field
- the synergies that exist between various transport measures
- the interrelationships that exist between demands on various parts of the network
- the relationship between supply and demand

ensure that all users of land transport are subject to pricing and non pricing incentives and signals which promote decisions and behaviour in accordance with efficient use of resources.

Affordability

To plan for a land transport system that recognises funding constraints and ability to pay.

Sustainability

To provide a land transport system that:

operates in a manner that recognises the needs of the community; avoids, remedies or mitigates adverse effects on:

- the quality of coastal and freshwater environments
- local and global air quality
- human health
- iwi values
- public amenity
- ecosystems

- ◆ places, features or buildings with significant heritage or landscape value; and
- uses resources in an efficient way and moderates demand for energy

Targets are developed which are aligned to the vision and objectives. In the case of the 1998 review these targets are:

Accessibility and economic development

- AM peak travel times for motor vehicles from Paraparaumu and Masterton to airport and port of Wellington do not grow by more than 10% by the year 2016
- AM peak total network motor vehicle travel time should not grow by more than 10% by the year 2016
- AM peak total network motor vehicle travel distance should increase by no more than 25% by the year 2016

Transport Safety

Target

- Reduce regional annual casualties to 1,200 or less by December 2001

Fresh Water

Target

- The quality of fresh water is consistent with the water quality management purposes stated in the Regional Freshwater Plan

Coastal Water

Target

- The quality of coastal water is consistent with the water quality management purposes stated in the Regional Coastal Plan

Air Quality

Target

- The quality of air in transport corridors is consistent with the ambient air quality guidelines stated in the Regional Air Quality Management Plan

Human Health

Target

- Noise in transport corridors or from transport sources is acceptable to the communities where the transport activity occurs

Environmentally Friendly Modes

Target

The impact of transport on the environment is reduced through:

- efficient and environmentally friendly vehicle technology
- environmentally benign fuels
- reduced congestion
- greater use of environmentally friendly or low impact modes of transportation

Transport and Land Use

Target

- AM peak total network vehicle travel distance should increase by no more than 25% by the year 2016

It is clear that many of the above targets are easily quantifiable and can be used directly as a measure of a strategy's performance. However, some of the other targets will require a more qualitative examination of a proposed strategy.

These targets are supplemented by a two-tier set of indicators which are summarised in Appendix A. The targets have been selected after a process of consultation with stakeholders, the outcome of the community survey and some technical analysis and relate to what is viewed to be the key transport-related issues facing the region. The remaining indicators monitor the secondary and minor issues.

Conclusions

The transportation network underpins many of society's activities and so the development of a robust transport strategy has an important role in the wellbeing of a society. Previous strategy development work has shown that this is true. The current development of the next Regional Land Transport Strategy is expected to address the following issues.

The transport system is a key facilitator of development in an urban area. This includes economic development and broader community needs.

Decisions on transport investment will impact on the economic well being of a community, residential land use choices, community welfare and the environment

The consequences of transport investment are often complex and interrelated with business and community needs. These investment decisions require careful examination against a broad range of criteria.

Integrated transport strategies provide an excellent mechanism to bring together the competing needs of business, the community and the environment.

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Appendix A Proposed Regional Land Transport Strategy Performance Indicators

Accessibility and Economic Development Performance Indicators

- AM peak travel times for motor vehicles from Paraparaumu and Masterton to Airport and Port of Wellington.
- PM peak travel times for motor vehicles from Airport and Port of Wellington to Paraparaumu and Masterton
- Interpeak travel times for motor vehicles from Paraparaumu and Masterton to Airport and Port of Wellington.
- Interpeak travel times for motor vehicles from Airport and Port of Wellington to Paraparaumu and Masterton
- AM Peak total network motor vehicle travel time
- AM Peak total network motor vehicle travel distance.

Other Indicators

- (i) AM peak public transport mode split for trips to Wellington CBD, Lower Hutt, Porirua CBD and Upper Hutt CBD
- (ii) AM peak cycling mode split for trips to Wellington CBD, Lower Hutt CBD, Porirua CBD and Upper Hutt CBD
- (iii) AM peak walking mode split for trips to Wellington CBD, Lower Hutt CBD, Porirua CBD and Upper Hutt CBD
- (iv) AM peak vehicle occupancy for trips to Wellington CBD, Lower Hutt CBD, Porirua CBD and Upper Hutt CBD
- (v) AM peak and interpeak total road vehicle kilometres compared to regional economic output
- (vi) AM peak and interpeak average motor vehicle trip length
- (vii) Total network motor vehicle-hours below level of service D during am peak
- (viii) annual numbers of business start-ups and close downs in relation to transport in the region
- (ix) assessment of the economic cost of congestion on an annual basis
- (x) satisfaction survey of public transport users and freight forwarders with access to terminals
- (xi) Annual am peak southbound count of persons travelling by car, walk, cycle and public transport on Burma Road, Hutt Road and motorway south of the Ngauranga Gorge interchange.

Transport Safety Performance Indicator

- Annual regional casualties

Another Indicator

- The annual number of each type of traffic collision within the Wellington Region by severity and local authority. Severity will be classified by non-injury, minor injury, serious injury and fatal

**Fresh Water
Performance Indicator**

- Fresh water quality guidelines in the Regional Freshwater Plan (Appendix 8)

**Coastal Water
Performance Indicator**

- Coastal water quality guidelines in the Regional Coastal Plan (Appendix 6)

**Air Quality
Performance Indicator**

- Ambient air quality guidelines in the Regional Air Quality Management Plan (Appendix 2).

**Human Health
Performance Indicator**

Noise in transport corridors or from transport sources is acceptable to the communities where the transport activity occurs.

**Iwi Values, Amenity, Ecosystems, Landscape and Heritage Values
Performance Indicator**

- AM peak and interpeak travel times from Paraparaumu and Masterton to Airport and Port of Wellington
- AM peak total network travel time
- AM peak modal split
- Annual weekday emissions of CO₂ by transport in the Wellington Region

**Transport and Land Use
Performance Indicator**

- AM peak total network travel distance.