The Western Corridor Transportation Study – A Bold New Step in a Brave New World or Traditional Transport Planning Recycled?

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1 Introduction

The Western Corridor out of Wellington (refer figure 1) has been the subject of many studies and investigations in the past. Despite the number of studies there has been little real progress on resolving the issues on the corridor. There have been a number of reasons for this including the lack of political agreement on the preferred solutions, legislative issues and others. However the most significant impediment to progress has been the chronic lack of funding and a very short term focus. These issues are the subject of papers by Brennand (2003 and 2004).

In 2003 Government passed the Land Transport Management Act and published its New Zealand Transport Strategy. These initiatives were heralded as a new way of thinking about transportation infrastructure investment. In particular, this signalled a departure away from the singular cost-benefit driven decision making process into a new multiple objective decision making framework.

This paper examines the application of the Land Transport Management Act to the Western Corridor Transportation Study. The study process is described and the implications of the Land Transport Management Act on the study process. The lessons learned in this exercise are highlighted. The question is posed as to whether this is really a “brave new world” or simply government’s legislation catching up to what transport planners have been doing for years.

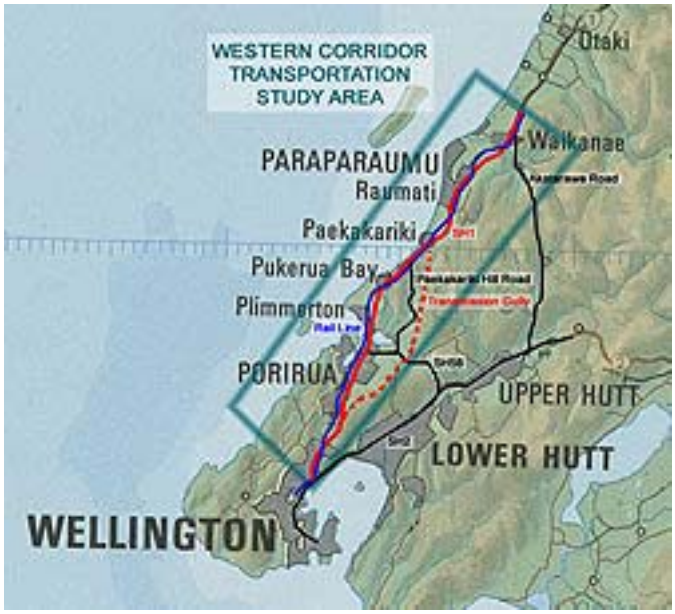

Figure 1 Western Corridor transportation study area

2 Background

The current population in the Wellington region is in the order of 450,000 (refer figure 2). The projections of medium population growth in the Wellington region indicate a peak population of 470,000 in 2026. The current high projection indicates a peak population of 530,000 in 2041. Low and high growth projections show that the likely bounds of growth for the Region is in the order of 5-20% over the next twenty to forty years and then decline from that point forward.

Figure 2 Population growth

The current demographics suggest that it is unlikely that population growth would drive the need for improved infrastructure beyond the level necessary in 2016. In effect, if projects cannot be economically justified in 2016 they may never be justified given the economic acceptance criteria remains the same.

This limited amount of growth also reduces the effects that land use can have on transportation demand along the corridor.

Future population growth is expected to occur predominantly in Wellington and Kapiti. The growth in both Wellington and Kapiti is likely to place additional stress on the Western Corridor as these centres are located at either end of the corridor.

Wellington's geography has led to an efficient regional urban form with communities located along the two key transportation corridors; the Eastern Corridor from Wellington CBD to the Hutt Valley and the Western Corridor from Wellington CBD through the Porirua Basin to the Kapiti Coast. The main centres within this structure of Wellington CBD, Porirua, Kapiti, Lower Hutt and Upper Hutt, are all currently served by rail passenger transport and arterial highways.

Land use policy that moves away from the current plan form could have a detrimental effect on the transport corridor as it may induce greater cross corridor flows. Traffic following one principal axis flows more efficiently than traffic moving in many directions because there are greater delays associated with the increased intersecting movements.

Conversely intensification of residential or business activities around passenger transport nodes would benefit the corridor as developments of this nature have been observed to reduce private vehicle usage for commuting movements when the highway network is

stressed. This is an approach that will be considered within the travel demand management options.

The corridor currently carries up to 75,000 vehicles per day, 11,500 rail passengers and 15 million tonnes of freight, of which 3 million tonnes is on rail. Road freight has been growing at a faster rate than other transportation sectors. Freight growth has a closer relationship with economic growth than population growth. As a result road freight has been growing at about 4% per year and is forecast to continue. Reliable access to the Port, which lies at the most congested part of the corridor, is a major issue and could have an influence on future rationalisation of the roles of New Zealand ports.

The southern part of the corridor experiences the highest levels of congestion at peak hours, however a large part of the corridor is affected at peak weekends. The existing state highway has a high crash rate with the severity of crashes being worst between Paekakariki and Pukerua Bay and north of Parapraumu.

The relationship between land use and transportation and the economic conditions of the region will be a key focus of the work on the Wellington Regional Strategy.

The Wellington Regional Strategy is being developed concurrently with this study and regular liaison has occurred to date. The WRS will generate additional demographic projections that will be used to test the sensitivity of the preferred package to any likely changes.

However, it is important to recognise that the nature of strategic transport infrastructure investments are incremental and generally can accommodate a wide range of outcomes. For example, a two lane road is suitable for traffic flows from 1 vehicle per day to 20,000 vehicles per day, and would retain a LOS D (minor delays) (Maunsell 2004). A four lane road would carry 40,000 vehicles per day with a similar level of service. Changes arising from new strategic directions for the region are likely to fall within these coarse bands rather than span across them.

The Western Corridor Study will help inform the work on the WRS and outputs from the WRS will be used to test the robustness of the emerging corridor plan from this study. This will include the sensitivity testing of different population scenarios and regional land use strategies. Early indications are that strategic transport infrastructure investments will cater for a wider range of possible WRS growth strategies.

3 Methodology

The Land Transport Management Act has changed the framework of project appraisal in New Zealand. Prior to this Act projects were evaluated in isolation and simply were required to achieve a sufficiently high enough benefit-cost ratio to be funded.

The Land Transport Management Act has brought about a regime of thinking about integrated packages of proposals that are designed to achieve a number of objectives. The Act also requires these packages to incorporate travel demand management to ensure the sustainability of proposal benefits.

The Land Transport Management Act does not specify a particular methodology for developing packages. The methodology used in this study is almost identical to that described in Ashley, Brennand and Houghton (1999) with some refinements described later in this paper. The Land Transport Management Act does specify what the national objectives are and outlines key principles such as integration.

The Land Transport Management Act also introduced onerous consultation requirements. Agencies undertaking consultation are required to go to stakeholders and the community in three separate phases. The first phase is concerned with what are the issues? The second phase is concerned with discussion of options and the third is concerned with comment on the proposed package or options.

In the case of the Western Corridor Study there had been many studies on elements along the corridor in earlier years so many of the issues and options were well understood. A sense of consultation fatigue emerged with yet another programme of consultation on the corridor.

Previous investigations had shown that risk assessment was an important issue in determining a strategy for improving the Western Corridor. The analysis of risk became an important component of the study.

4 Study objectives and package assessment

The Land Transport Management Act has enshrined a series of objectives articulated in the New Zealand Transport Strategy. In the Wellington region these objectives have been adopted and slightly modified to reflect better the key issues relevant to the Wellington region.

The regional objectives and objectives that the various proposals for the Western Corridor package is expected to contribute to are:

Assist economic and regional development
Assist safety and personal security
Improve access, mobility and network reliability
Protect and promote public health
Ensure environmental sustainability
Consider economic efficiency and affordability.

Consideration of how transportation initiatives on the corridor might contribute to these objectives in conjunction with an understanding of the issues identified through the first phase of the public consultation enables a suite of performance indicators to be established for each of the study objectives. These indicators need to recognise the multi modal character of the corridor and that it is an important corridor for the movement of people and goods.

In addition, the Western Corridor is more than a corridor of regional strategic significance. It also has national strategic significance. This is because the corridor includes both state highway one and the main trunk railway which in addition to servicing regional activities are part of the national network through both the North and South Islands via the Port at Wellington.

Considerable effort was undertaken to define these performance indicators for these objectives. The first phase of public consultation had confirmed, amongst others, the following issues were of significance:

The economic performance of the region with particular concern about the impact of network performance on freight movements
The vulnerability of both the highway and rail network to closure due to traffic incidents or natural hazards
The impact of transport activities in the corridor on adjacent communities particularly in terms of community severance and noise.

A summary of the performance indicators for each objective is provided in table 1.

Table 1 Study performance indicators

	Indicator
1	Economic and regional development • Average multi-modal user cost (time, vehicle operating costs etc) • Average road freight user cost • Changes to GDP
2	Safety and personal security • Economic cost of crashes • Personal security
3	Access, mobility and network reliability • Multi-modal accessibility and integration • Reliability of travel time for road • Network resilience for road and rail • Mode option choice
4	Public health • Air quality • Noise • Active travel • Community severance and related effects • Community displacement, construction disruption • Crashes
5	Environmental sustainability • Iwi values • Greenhouse gases • Indigenous habitats • Significant ecosystems • Landscape and visual including recreational values • Archaeology and heritage
6	Economic efficiency and affordability • Affordability • Economic efficiency

The above performance indicators are a mix of measures that can be calculated directly from a multi-modal transportation model and those where an expert makes an assessment. A base network of existing or committed projects is defined. Performance of proposals is compared against the base network for each of the performance indicators. A score of 5 means that it has a performance equal to that of the base network. A score less

than 5 means that its performance is inferior to the base network whilst a score greater than 5 means its performance is superior to that of the base network.

5 Evaluation

For the purposes of the Western Corridor study each of the possible projects on the corridor were analysed through this framework. There were a considerable number of projects considered for the corridor and each were subject to this evaluation for a 2016 design year and a further 2026 reference year. A Planning Balance Sheet was produced containing every project on the corridor for each of the future design and reference years. The Planning Balance Sheet is essentially a matrix of scores for each project against each of the six objectives.

In addition, a Planning Balance Sheet was produced for each of five scenarios. These scenarios are themed collections of a number of projects designed to show how different approaches perform against the study objectives. These are in effect the first of several iterations designed to produce a preferred package for the corridor. The five scenarios are:

Passenger transport and travel demand management
Major roads
Improved reliability
Congestion relief
Project efficiency.

This information was provided to the public for the second round of public consultation. Table 2 below shows the Planning Balance Sheet score for each objective for the design year for the five scenarios.

Table 2 Planning Balance Sheet for the five scenarios

Scenario/Objective	Econom & reg demand	Safety & security	Access, mobility reliability	Public health	Environ sustain	Efficiency affordability
PT & TDM	5.2	5.8	5.4	5.0	4.5	5.6
Roads	6.6	7.1	7.5	6.2	4.9	2.8
Improve reliability	6.6	7.3	7.7	5.3	4.2	3.8
Congestion relief	6.0	4.3	6.6	4.5	4.2	5.2
Project efficiency	5.9	4.6	5.8	4.9	4.5	5.8

6 Scenario descriptions

6.1 Passenger transport and travel demand management

This provides for improved passenger transport, particularly suburban rail, and the management of the road network with travel demand management strategies. No highway or local road improvements would be contemplated in this scenario.

This scenario was successful in delivering useful accessibility benefits for public transport users. As a consequence public transport mode split was improved above the base case. This scenario proved ineffective in removing bottlenecks from the highway network unless supported by strong travel demand management.

6.2 Major roads

This scenario would provide highway and local road improvements without rail improvements. The consequence of implementing this scenario is a reduction of rail mode share and highway volumes increase by 20%.

This scenario is successful in removing congestion from the corridor but at significant cost. However, this scenario greatly increases congestion downstream of the corridor in central Wellington.

6.3 Improved reliability

This scenario seeks to provide a safe, reliable and consistent highway and rail network. Improvements seek to provide a balance in road and rail investment. These investments are concerned with providing reliability and resilience in the networks rather than generous capacity.

This scenario provides both road and passenger transport benefits. Only modest travel demand management is required to enable the design year network to operate at a satisfactory level of service. Road and rail reliability and consistency is greatly enhanced by this scenario.

6.4 Congestion relief

This scenario focuses on proposals that relieve current congestion points. The emphasis is very much of targeting bottlenecks. This is a modest cost scenario but analysis shows the removal of existing bottlenecks sees new bottlenecks arising. This scenario does not produce a consistent standard and reliable road and rail network.

In order to ensure that the highway network operates at an acceptable level of service modest travel demand management methods will need to be employed. This will require a small increase in rail rolling stock capacity.

6.5 Project efficiency

This scenario focuses on those proposals that give good economic benefit along the corridor. This is a scenario that delivers a strong return in travel time, vehicles, operating costs and crashes saved per dollar invested.

This scenario includes few rail proposals. Improvements to congested parts of the highway network increases growth in other parts of the network with new locations of congestion arising. Issues of a consistent and reliable highway network are not addressed.

7 Evaluation

The evaluation of these scenarios against the study objectives is shown in table 2. This table identifies the strengths and weaknesses of each scenario. This information in conjunction with the performance of individual projects allows new packages of measures to be developed. These new packages would see measures recombined in order to eliminate the weaknesses of the various scenarios. This will be discussed further.

Application of weights to each of the study objectives allows the performance against objectives to be aggregated into a single score. There are weaknesses in proceeding in this way but they can be addressed.

A single aggregated score can hide poor performance against a particular objective. However, if aggregation occurs after the analysis of performance against individual objectives then this problem should be avoided.

Various interest groups may weight the different objectives differently. This reflects the different underlying values each group holds. This means there are no unanimously agreed weights for a regional community. However a selection of interest groups gives a range of weightings. This will allow the overall performance against objectives to be tested against a variety of perspectives. This enables an examination of the robustness of overall performance to be tested against the perspective of different interest groups.

For the purposes of the Western Corridor Study, four groups were chosen. These groups were:

Regional political decision makers
Government agency officials
Business interests
Environmental and public transport user interests.

Table 3 shows the different weightings of the four groups.

Table 3 Weightings

Objective/Group	Political decision makers	Government officials	Business interests	Environmental & public transport interests
Economic and regional development	19	20	25	20
Safety and personal security	14	20	13	20
Access, mobility and network reliability	16	20	15	20
Public health	11	20	10	20
Environmental sustainability	16	20	15	20
Economic efficiency and affordability	24	Consider separately	22	-

The environmental and public transport interest group also sought modification of some of the objectives and performance indicators to reflect sustainability considerations.

Table 4 shows the aggregated Planning Balance Sheet score for each of the five scenarios.

Table 4 Aggregated Planning Balance sheet scores

Scenario/Interest groups	Political decision makers	Government officials	Business interests	Environmental & public transport interests
PT and TDM	5.3	5.2	5.3	5.2
Major roads	5.6	6.5	5.7	6.5
Improved reliability	5.7	6.2	5.7	6.2
Congestion relief	5.2	5.1	5.3	5.1
Project efficiency	5.4	5.2	5.4	5.2

Major roads and improved reliability scenarios were leading performers. This was true irrespective of which interest group perspective was chosen. This suggests that these two scenarios have performances that are reasonably robust from a variety of interest group perspectives.

8 Risk assessment

Risk assessment was undertaken through a workshop of invited knowledgeable and expert people from throughout the region.

In order to rank the identified risks, each risk was rated with a likelihood of the event occurring, and a consequence should it occur. The risk scores for each category were summed using a statistical average approach to provide an indication of the threat each proposal is exposed to. As a result a risk score for each proposal has been determined, which allows an indicative ranking to be performed.

The analysis of risks considered the following dimensions:

Benefit risks (base travel demand, growth forecasts, assignment, crashes)
Cost risks (commercial, legal, economic, managerial)
Cost risks (community, political, environmental, land and property)
Cost risks (site conditions, engineering, services, natural events).

It should be noted that as a strategy study there is a lack of detailed information which increases the uncertainty inherent in the level of detail. When the projects were combined to scenarios the resulting risk score regresses to the mean which did not produce sharp distinctions in risk between the scenarios. It should be recognised that all the risks identified need to be managed and should be regularly reviewed in order to assess their relative change of probability or consequence as the project proceeds through the various stages from feasibility to design through to project completion.

9 Overall evaluation

All these strands of information can be brought together and summarised as in table 5 and table 6.

Table 5 Overall summary of scenario performance

Scenario	Regional benefits	Expected capital costs	PBS political	PBS officials	Risk
PT & TDM	Low	$410m	5.3	5.2	Moderate
Major roads	High	$2050m	5.6	6.5	Very high
Improved reliability	High	$1760m	5.7	6.2	Extremely high
Congestion relief	Medium	$1070m	5.2	5.1	Very high
Project efficiency	Medium	$950m	5.4	5.2	Very high

Table 6 Overall summary of scenario performance

Scenario	Safety	Reliability	Congestion & level of service	Mode share (car, rail, bus)	TDM required
PT & TDM	Neutral	✓	xx	62:31:6	Strong
Major roads	✓✓	✓	✓✓	66:26:7	-
Improved reliability	✓✓	✓✓	Neutral	63:29:8	Light
Congestion relief	✓	Neutral	Neutral	66:27:7	Light
Project efficiency	✓	Neutral	X	62:30:7	Light

Overall, the major roads and improved reliability scenarios appeared to be the most promising options. However they each had their deficiencies.

The deficiencies for major roads included its high cost, very high risk, and the impact on downstream network congestion and mode share. The improved reliability scenario is an extremely high risk package. The intention is that a set of packages be developed for the next round of investigation which are variants of the major roads and improved reliability scenarios. These variants will be designed to address the deficiencies in the original scenario.

Investigation of variants on these scenarios shows that variants on the improved reliability scenario shows considerable promise.

10 Conclusions

Innovative ways of bringing together disparate data can assist making decisions in a multiple objective framework. Clarity in process is important if the richness of disaggregate information is not going to be lost in aggregation.

A carefully developed process is needed if robustness in decision making is to be achieved. Such a process can be made to accommodate a variety of perspectives from stakeholder interests.

These processes appear to be new in the New Zealand legislative context. In reality these new visionary approaches have been available to and used by transport planning professionals for some years. Instead of bringing in a new age of transport decision making, the current legislative framework is reflecting what we always knew. Transport planning is not a single focused discipline but impacts on a wide range of human endeavours.

11 References

Ashley, D., Brennand, A.W., and Houghton (1999).*Strategic Transport Planning in New Zealand's Two Major urban Areas – Auckland and Wellington.* 23rd ATRF Conference, Perth.

Brennand, A W (2003) *Planning the Transportation System for Economic Development – A Survey of Some of the Initiatives Being Investigated in Wellington*. 26th ATRF Conference, Wellington

Brennand, A W (2004) *Economic Development and Investment in Transportation Infrastructure – An Analysis of Wellington's Predicament*. 27th ATRF Conference, Adelaide

Maunsell, (2004). *Western Corridor Transportation Study Draft Technical report – Stage 1.* A report to Greater Wellington regional Council and Transit New Zealand.