Transit New Zealand Symposium, November 2005 – Planning for Certainty

Planning for Certainty through Sustainable Transportation

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Abstract

Government transportation spending is at record levels – $22 billion is now programmed under the National Land Transport Programme over the next 10 years. The current annual expenditure level is at $1.7 billion, up nearly 80% in the last four years. The lion's share of this is for roading. A major driver of new road construction is congestion levels and travel time variability, particularly in Auckland and Wellington.

How bad is congestion in New Zealand's cities? How are congestion levels changing? How variable are our travel times? Do we know whether these indicators vary by mode? Transit New Zealand has been monitoring motor vehicle congestion levels and travel time variability twice yearly in Auckland and Wellington (since 2002), Tauranga (since 2003) and Christchurch (since 2004).

People desire certainty in planning their trips. They do not want to spend 15 minutes on one day for the trip to work and 25 minutes the next. Do we have the data we need to plan for certainty in transportation journey times?

The theme of this conference is "planning for certainty". Another aspect of our current fossil-fuel based transportation system is fuel price stability and continuity of supply. It will be hard to plan for certainty in such an uncertain global energy context, with New Zealand even less able to control its destiny than most other countries of the developed world. To plan our transportation system for certainty of fuel price and supply would suggest a much smaller reliance on fossil fuels.

This paper looks at available data to understand congestion trends, travel time variability and fuel price and supply and looks at ways to provide certainty for transportation. The paper argues that more emphasis should be put on travel demand management and support for walking, cycling and public transport. In turn, these measures (and sustainable transportation in general) have the potential to make car travel times more predictable, thus enhancing the opportunities for "planning for certainty". The paper also makes recommendations for developing a comprehensive suite of travel indicators that better represents a more sustainable transport system.

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1. Travel Time Performance Indicators

Transit New Zealand began collecting travel time data in Auckland and Wellington in 2002, Tauranga in 2003, and Christchurch in 2004. The data are collected by using "floating car surveys" over fixed routes that attempt to represent the "principal road network" (selected motorways and arterial roads) of each city. Calculations based on the data result in estimates of congestion. The congestion indicator is measured in minutes of delay per kilometre compared with unrestrained travel at the speed limit.

The congestion indicator is valid for tracking congestion levels on main roads from year to year in each city, but can not be used for comparisons between cities. Travel time variability is also calculated by Transit for each of the four cities from these surveys.

The latest Transit surveys were undertaken in March 2005 and reported to the Transit Board in September 2005 (Transit NZ 2005). In Auckland, the route for measuring congestion was changed after the first survey and the third survey (March 2003) was affected by adverse weather in the morning (AM) peak. Congestion levels have been fairly constant since November 2002 (ignoring the rain-affected March 2003 AM peak survey), with a slight increase in congestion for both the AM peak and the all day average evident at March 2005. The data are illustrated in Figure 1:

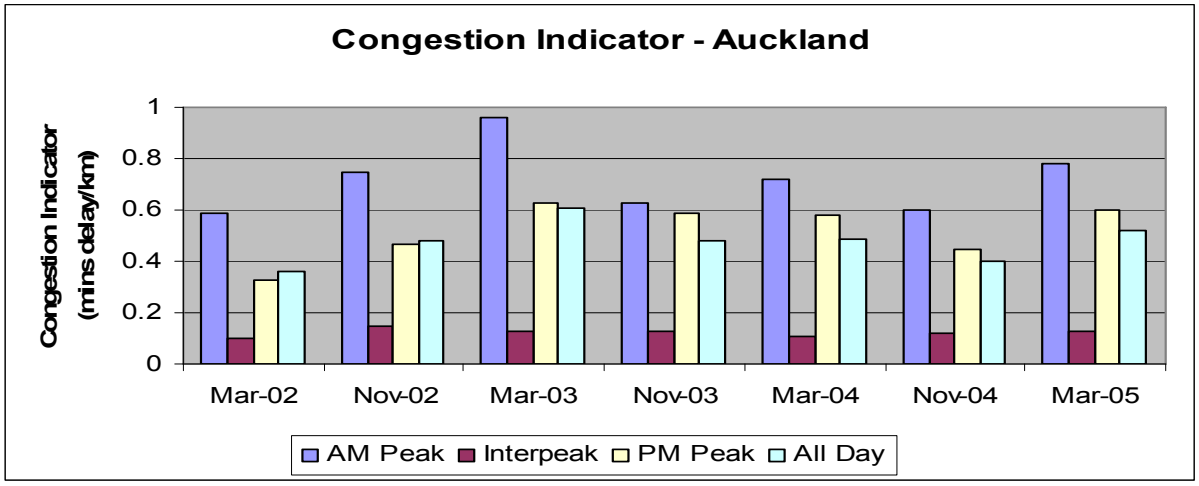

Figure 1: Congestion Indicator – Auckland

In Wellington, congestion levels rose steadily from March 2002 to November 2003 and have been fairly constant since then, with March 2005 showing slightly higher levels than previous surveys. The data are illustrated in Figure 2:

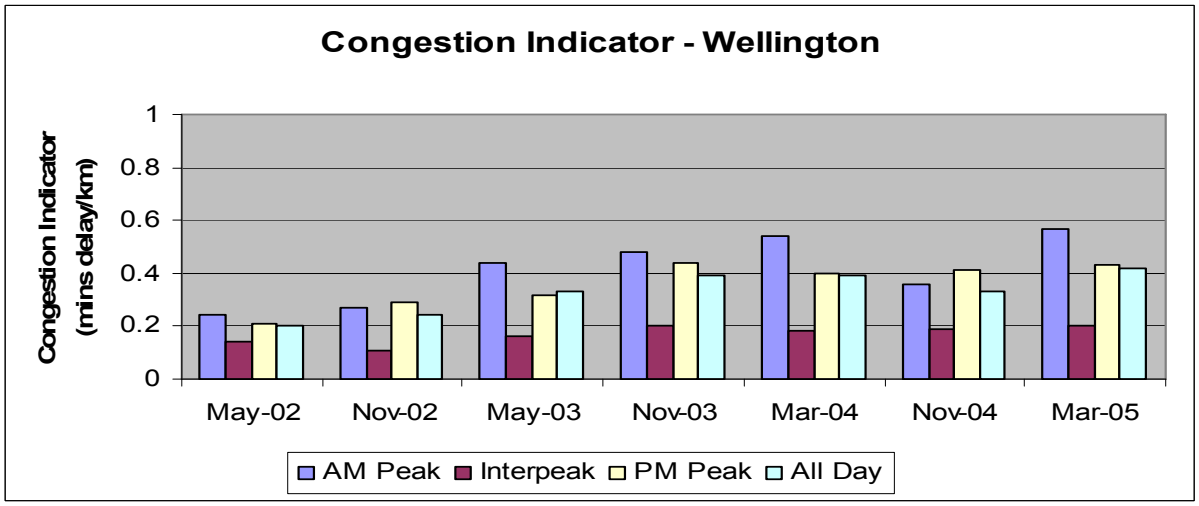

Figure 2: Congestion Indicator – Wellington

In Tauranga, congestion levels have been generally increasing since surveys began in April 2003, as illustrated in Figure 3:

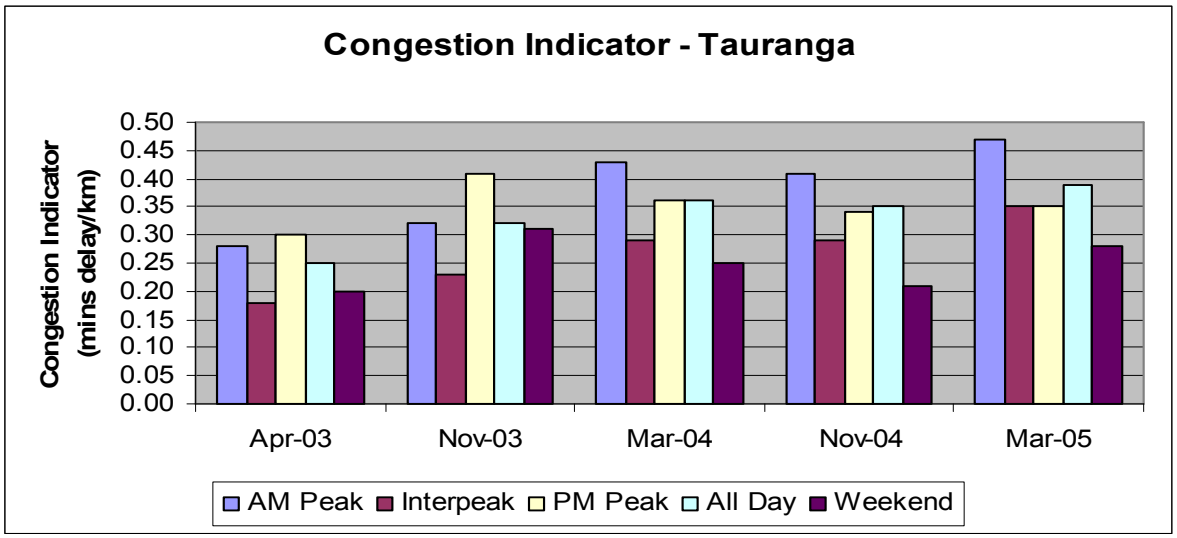

Figure 3: Congestion Indicator – Tauranga

For Wellington there are now three years of data, for Auckland there are 2 ½ years and for Tauranga there are two years of data. These surveys will become more useful as additional years of data are collected. Christchurch has only one year's data and its survey results are not discussed here, as it is still too early to determine any trends with confidence.

Overall, these surveys indicate a slight increasing trend in congestion levels over the last two or three years in the three cities discussed, although more data in future years are required to properly quantify the trends. The trends are not considered alarming at this stage.

Trends in travel time variability are somewhat ambiguous, with possible increases recorded in Auckland but declines in Wellington and Tauranga in May 2005 compared with some earlier years. What is clear is that there are higher levels of congestion and more variability in travel time in peak travel periods (both morning and afternoon) than in the inter-peak period of the day, for each city.

What can we learn from overseas? The best long-running analysis of congestion trends in the United States is the Annual Urban Mobility Report published by the Texas Transportation Institute (TTI 2003). Over more than 20 years, traffic congestion has been measured in 75 urban areas, together with measures of investment in roading and public transportation.

The most recent TTI report looked at the question *"can more road space reduce congestion growth?"* The analysis showed that additional roadways do reduce the rate of increase in the amount of time it takes travellers to make trips in congested periods. However they also noted that the growth in facilities has to be at a rate *slightly greater* than travel growth in order to maintain constant travel times, if additional roads are the only solution used to address mobility concerns. Only five of the 75 areas studied had actually added new road capacity (lane-miles) at about the same rate as traffic growth (or within 10%). Even in these areas there had been an 80% increase in peak-hour travel times.

2. Variability of Travel Time for Other Modes

Travel times for walking and cycling are probably more reliable than other modes of travel, although New Zealand data do not exist. In the spirit of the New Zealand Transport Strategy 2002 (NZ Government 2002) and the Land Transport Management Act 2003 (NZ Government 2003), we should consider measuring travel time reliability and congestion for walking, cycling and public transport, in addition to Transit's current surveys of motor vehicle congestion and travel time reliability.

There is some variability for walking and cycling, however, as pedestrians and cyclists need to wait varying lengths of time from day to day to cross roads, for example. Weather can result in some variability too, with wind, sun and rain all potentially varying travel times for these modes. And pedestrians and cyclists can choose to travel at different speeds on different days for the same trip, resulting in some variability. Typically there is more variation in free speeds between individuals when walking or cycling. For example, most studies of cycling behaviour have found coefficients of variation (the standard deviation divided by the mean) of ~16-20% for free speeds. Contrast this with motor vehicle studies where the coefficient of variation of free speeds is usually more like 9-12% (Koorey 2004).

For cycling, parking tends to be more readily available close to destinations than car parking, so this would be expected to improve reliability for cycle travel relative to car travel when door to door travel time is considered.

The reliability of buses is likely to be compromised when they are stuck in congested traffic. Not only are they delayed along with other motor vehicles because of congestion, but they may experience additional delays getting back into traffic after stopping at bus stops. These impacts can be reduced by the provision of bus lanes and traffic signal bus priority systems to improve the reliability of buses, relative to other traffic. One advantage of buses over cars is that users don't need to search for a parking space, eliminating one potential source of uncertainty and hence improving reliability.

Trains and ferries can be more reliable than travel on congested road networks. This has potential benefits for both passenger and freight travel. Land Transport New Zealand's public transport funding support could be partially based on compliance with scheduled timetables, improving reliability for passengers and helping improve service.

One aspect of public transport is that there is some uncertainty for customers as to whether the service might run ahead of schedule, requiring passengers to be at the stop or terminal prior to the scheduled departure time. This could also be addressed by providing the right pricing signals and rewards through bus, train and ferry contracts. On-board "global positioning systems" (GPS) units provide opportunities to improve information for intending passengers and to improve the reliability of public transport services and hence travel time reliability.

When looking at travel time reliability, a key difference of most non-car modes is that they are usually running at well below capacity for their corridor. Hence their travel times are not largely affected by the modes themselves but by external influences, such as intersection or crossing delays, passenger loading or congestion caused by excessive car traffic. On the other hand, cars are largely delayed by the sheer numbers of them all interacting with each other.

Fairer indicators for congestion and travel time variability (to allow rational inter-modal comparisons by users, suppliers and policy-makers) would be based on door to door travel times, not just on main highway route travel times. Some travellers have certainty at their trip ends, for example, those with dedicated employee parking for the trip to work. In other cases, however, drivers will need to search for a parking space and this could add many minutes to the trip, and much uncertainty in door-to-door trip time. Where public policy or individual mode choice decision-making is concerned, to not use door-to-door travel times discriminates against public transport, walking and cycling in favour of car travel. To be consistent with the New Zealand Transport Strategy, this should be resolved.

Another time cost often not considered in comparing journey times by car with other modes is the time required to refuel. There is likely to be some variability in how long this takes too.

If door to door travel times were reported, through wet weather as well as dry, when crashes occur as well as when they don't, and to include occasional stops for refuelling, there would be a clearer understanding at both the individual and societal level of the travel time uncertainty of driving relative to other modes of travel. Alternatives would be more readily sought by both consumers and suppliers of transport services. Land Transport New Zealand's funding regime should be reviewed to determine whether it adequately supports modes that offer inherently more reliable travel times than privately owned motor vehicles in congested conditions.

3. Methodological Issues

The methodology used by Transit to measure congestion and travel time reliability is documented on the Ministry for the Environment website (see references). The methodology notes that: *"survey weeks should be scheduled to avoid abnormal events such as road closures, special events, road works, school and public holidays and periods of abnormal traffic"* and *"where accidents or wet weather result in abnormally low travel speeds the surveys should be repeated."* (MfE section 7.4).

This method will exclude some of the common problems that frequently affect travel time for motorists. These "abnormal events", such as road maintenance and construction, crashes and wet weather, provide uncertainty in travel time for which people may need to compensate. In many ways these "abnormal events" are very much part of commuting in big cities and should not be excluded from surveys attempting to measure congestion and travel time variability. To allow valid inter-modal comparisons, the methodology should include such events, and involve a larger sample of trips to ensure that a reasonable sample of "abnormal events" is included in the analysis.

In contrast, walking, cycling, trains and ferries are relatively unaffected by these "abnormal events", and thus provide more travel certainty. Given the amount of effort being put into "Intelligent Transport Systems" schemes in Auckland and Wellington to minimise the effects of "abnormal events" for motorists, including these events in the sample methodology would be a good way of testing whether these schemes were working.

The definition of travel time variability notes: "Travel time variability VTT monitors reliability of travel times on the urban arterial road system, and considers routes rather than individual links. Individual routes are comprised of a number of sequential links and should have a total route length of at least 3 km."

There are a number of flaws with this methodology for both congestion measurements and travel time variability. The congestion indicator is useful for monitoring the level of service on the main road network, but the current surveys would not be able to detect deterioration in the living environment associated with "rat-running" though local residential streets. It is possible that the congestion indicator might remain constant over a period of years while more and more traffic infiltrated though neighbourhoods. This should be of as much concern from a public policy perspective as deteriorating levels of service on main roads.

The currently-used congestion indicator would not help us make policy decisions to increase the amount of traffic calming in residential areas to counter rat-running and to maintain quality of life there. Increasing congestion levels could encourage a policy response of increasing funding on the main road network, which may in fact be less worthwhile than other measures. These might include system-wide traffic calming in residential or CBD areas, or the introduction of bus lanes.

However, introducing bus lanes would be likely to reduce the number of existing traffic lanes available for motorists and would consequently increase congestion levels on the remaining general traffic lanes. Overall delay per person might well be reduced by such an intervention, with people in cars suffering increased delays while well-laden buses experienced higher travel speeds. But the congestion indicator would suggest that congestion had increased.

4. Uncertainty of Fuel Price and Supply

Another aspect of certainty in transportation is the concept of "Peak Oil", where the number of barrels of oil extracted per year from oil wells globally will eventually peak and thereafter decline. Peak Oil occurred in the "lower 48" United States in 1970, although the fact that oil production has been declining there since then was not able to be confirmed until several years after the event. Estimates of the year of global Peak Oil range from 2005 to 2010 and beyond. After this time, as production declines, demand is still likely to be increasing, so that shortages and price increases will become prevalent and unpredictable. Peak Oil by global region is illustrated in Figure 4 (Reader Weekly 2005).

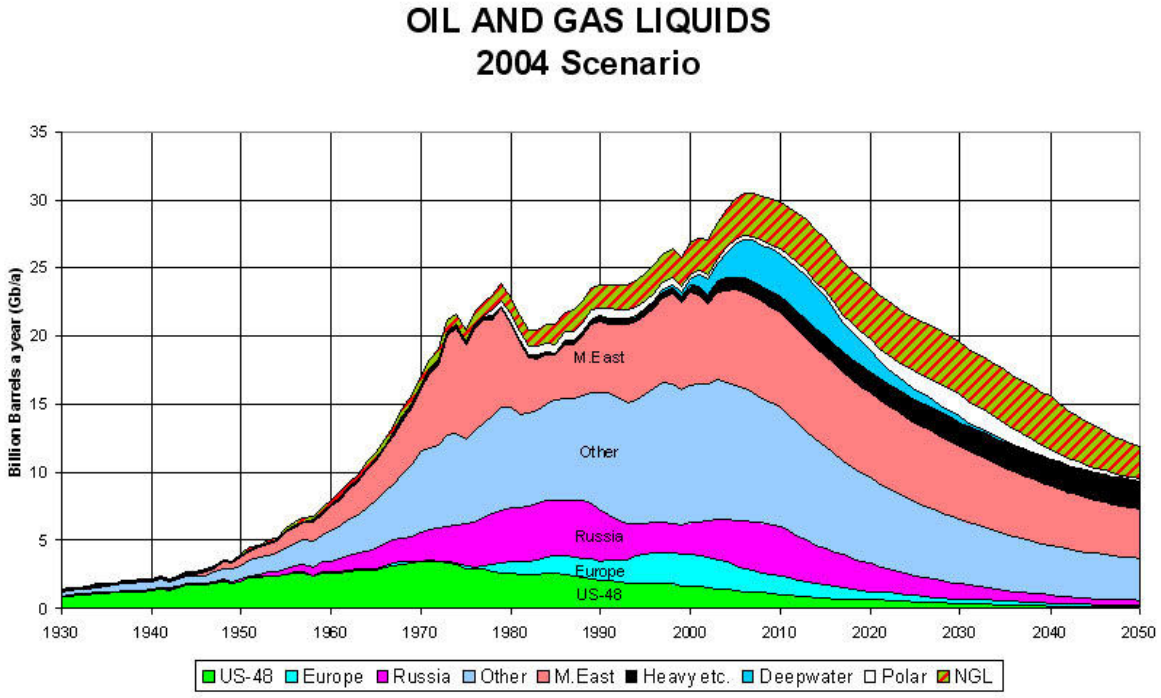

Figure 4: Peak Oil by Global Region and by Year

The recent fuel price increases in New Zealand and globally are probably influenced by the inevitable approach of Peak Oil. The fossil-fuel based transport system on which New Zealand is increasingly dependant will be less certain after Peak Oil. "Planning for Certainty", the theme of this conference, would suggest a need to become less car-dependant.

Figure 5 shows actual versus inflation adjusted crude oil prices over the last 60 years. In real terms, the price of crude oil peaked in December 1979, but is now higher than any time since 1986.

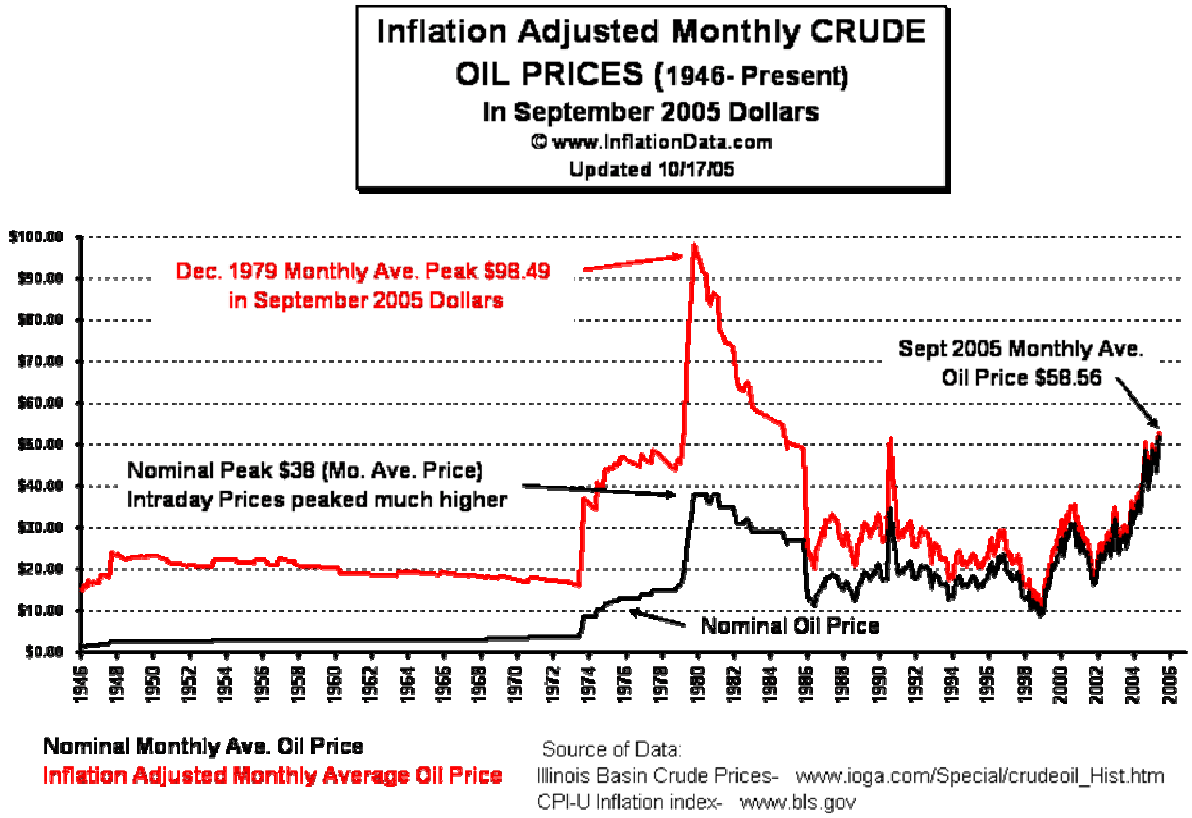

Figure 5: Inflation Adjusted Crude Oil Price, US Dollars

A recent article (One World UK 2005), in discussing China's burgeoning motoring levels and fuel consumption, and consequential supply shortages, notes: "But for taxi-driver Huang, living in a city [Shenzhen] where fuel is rationed to 11 litres a person, barely a splash in the bottom of his tank, the road ahead is winding and uncertain. Ironically, the best thing he could do is probably to make sure he keeps his bicycle well-oiled. You never know when you might need it again." Demand for fuel in China and India is increasing rapidly and will only exacerbate oil supply and price issues globally in future.

5. Transportation Spending

Government transportation spending is at record levels – $22 billion (NLTP 2005) is now programmed under the National Land Transport Programme (NLTP) over the next 10 years. The roading part of the NLTP[1] has steadily increased from $696m in the year to 30 June 1997 to a projected $1,423m in the year to 30 June 2006. This is an increase of 105% or more than 8% per annum since 1997, and roading expenditure has grown 13% per annum since 2002 (Figure 6).

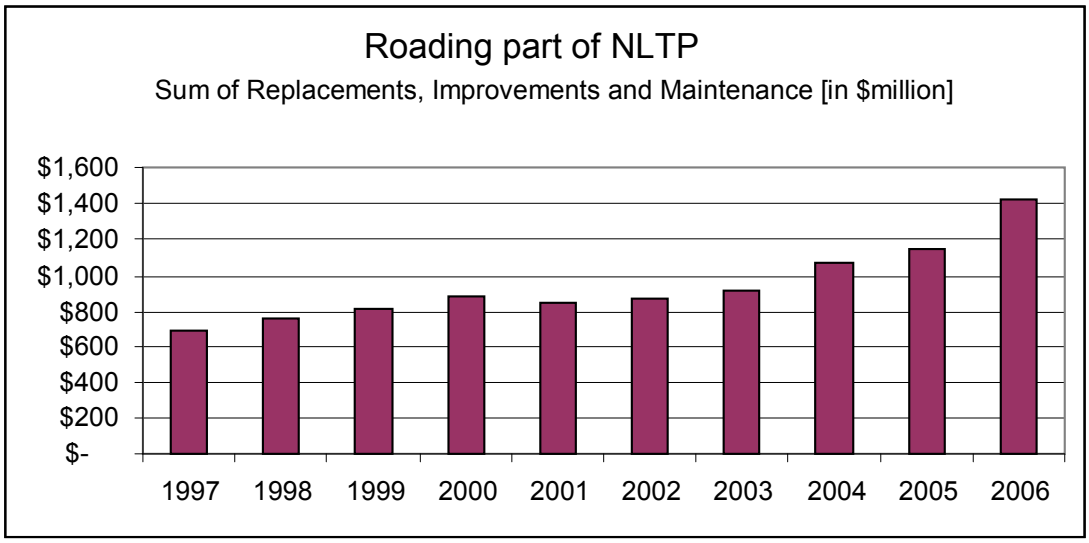

Figure 6: Annual Roading Expenditure

Expenditure on non-roading components of the transport system (walking, cycling, public transport and alternatives to roading) has increased too, now accounting for $268m. In fact, while roading expenditure has been increasing, it now accounts for only 85% of total government transportation expenditure (excluding administration), down from 95% nine years ago.

In discussing expenditure on transport through the NLTP, however, it must be acknowledged that it is impossible to determine what expenditure relates to the needs of motor vehicles and what relates to walking, cycling and public transport. Some roading expenditure improves conditions for walking, cycling and public transport. In addition, public spending on transport is not confined to the NLTP – local and regional councils contribute significantly towards transportation facilities and services.

The New Zealand Transport Strategy (NZ Government 2002) notes that: "this Strategy recognises the increasing international experience showing that the transport sector cannot endlessly build its way out of all its problems ...". Thus New Zealand's transport agencies should increasingly be working towards solutions for congestion that do not fall into the old trap of "predict and provide", where estimates of future traffic were predicted and road space was provided to accommodate it. These days should be gone – but are they? Based on the NLTP expenditure data discussed above, we appear to be still trying to build our way out of congestion.

While congestion appears to have been increasing slightly (based on a relatively short series of congestion surveys by Transit), our roading expenditure has increased 63% (13% per annum) since

[1] defined as the sum of replacements, improvements and maintenance

2002 when the congestion surveys began. Should we continue to increase road network funding levels at the same rate as the recent past, just to hold the tide on congestion? How much more should we spend to tame the congestion monster?

6. Recommendations

It is recommend that:

1. The existing travel time surveys undertaken by Transit NZ be continued but used only as congestion indicators for the main roads. They should not be used to report "travel time variability" as this misrepresents total travel time by ignoring time accessing parking, travel on local streets, delays through adverse weather, traffic crashes or road construction, typically part of many car journeys. The methodology also does not allow comparison with other modes of travel.

2. The Ministry of Transport, assisted by other relevant agencies including Land Transport New Zealand, Transit New Zealand, EECA, Local Government NZ and the Ministry for the Environment, should develop a comprehensive suite of travel indicators that better represents a more sustainable transport system. These should include:

    - New travel time surveys to reflect door-to-door travel times for all modes including driving, walking, cycling, bus, train, ferry and freight. These travel times should include parking where appropriate, and include routine but occasional events such as wet weather, crashes, and road construction and maintenance.

    - A travel time variability indicator based on multi-modal door-to-door travel time surveys.

    - A series of transport cost indicators that track New Zealand fuel price in real terms and national and local expenditure on roads, public transport, walking and cycling.

3. Expenditure on roading through the NLTP should be capped at current levels and projected increases in transportation funding diverted to sustainable transportation modes.

7. Conclusions

Existing congestion and travel time variability indicators are not well suited to the needs of the New Zealand Transport Strategy. Additional indicators, as identified in the recommendations above, should be developed to assist in establishing an integrated, sustainable and reliable multi-modal transportation system.

We are not winning the war against congestion by simply building more roads. Congestion is still increasing, despite considerable increases in funding. We can not build our way out of congestion. Accordingly, as a proportion of the National Land Transport Programme, New Zealand should invest more in sustainable transport – walking, cycling, buses, trains and ferries.

8. References

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