

Impacts of Socio-Demographic Changes on the New Zealand Land Transport System



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A note to the audience

- This presentation is based on research report *Impacts of socio-demographic changes on the New Zealand land transport system*.
- While the NZ Transport Agency provided investment, the research was undertaken independently, and the resulting findings should not be regarded as being the opinion, responsibility or policy of the Transport Agency or indeed of any NZ Government agency.
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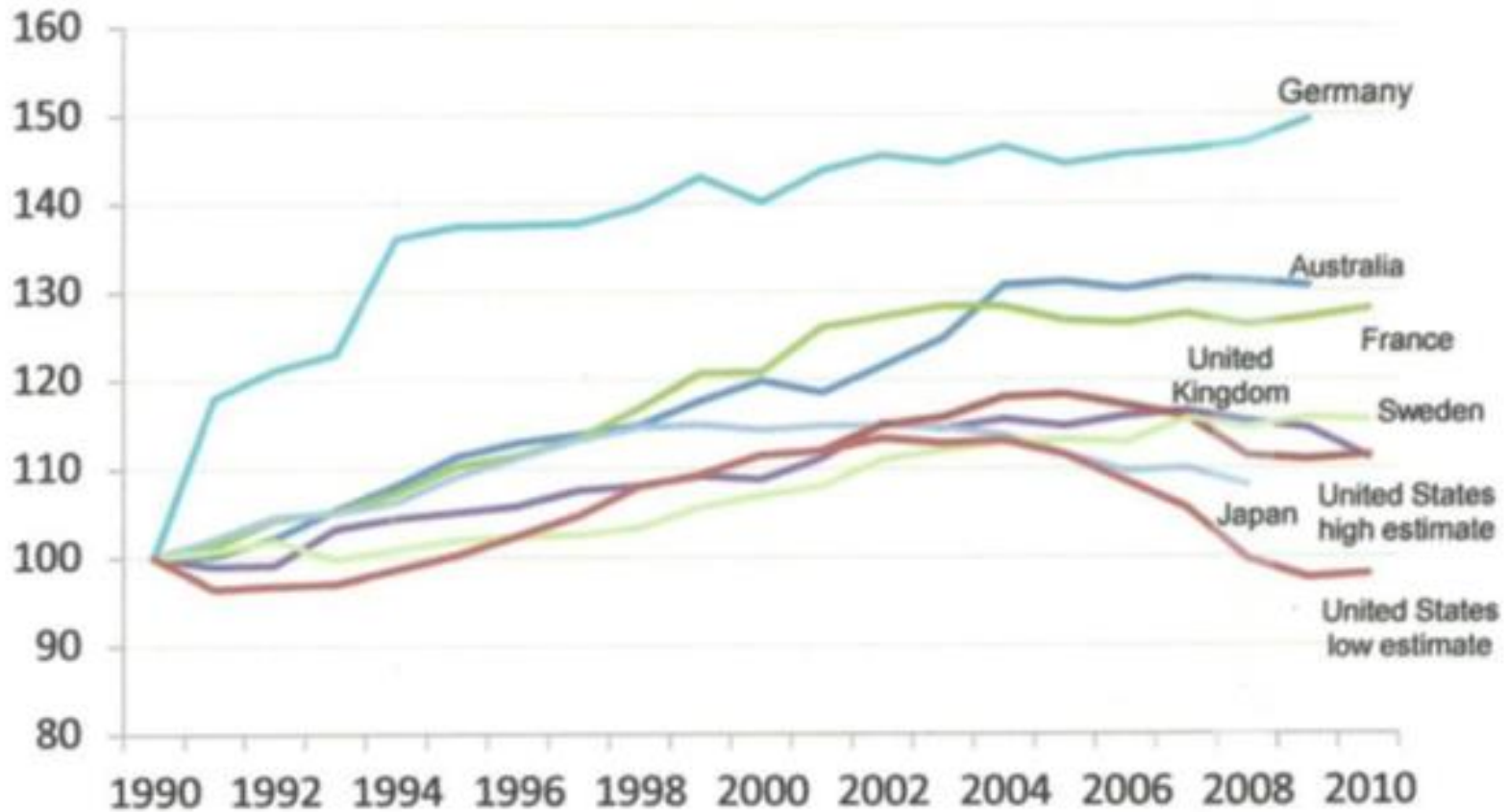
Scope

Very wide-ranging report:



- Review of international literature on peak car and travel saturation.
- Historical NZ evidence
- Decomposition of recent changes in NZ light vehicle travel
- Projections of travel demand to 2050 using a stochastic model with allowance for:
 - Population size, age, migration
 - Household income
 - Regional labour force & employment
 - Number of households per region
 - GDP/GNP

Travel Saturation?



Source: International Transport Forum statistics.

Travel Saturation?



The 'Marchetti Wall': mean travel time (commuting) tends to be confined to a maximum of about one hour per day. Thus cities are roughly 'one hour wide'.

Physical accessibility increases roughly with the square of travel time (for a given speed), but choice exhibits diminishing marginal utility. (Eg value of access to another supermarket).

Some exceptions: holiday travel

Interrupted growth: GFC, higher fuel prices, parking and driver licenses. Higher unemployment, casual employment, costs of education and housing. Young people especially affected.

Peak car: a complex set of inter-relationships in which driving propensity is affected by (and affects) social, environmental and technological factors:

- Growth of cities relative to rural townships,
- Communications technologies (on-line shopping),
- Improvements in public transport (price, speed, quality, real time information),
- Access for walking and biking,
- Congestion.

Travel Saturation ?

1. Vehicle miles travelled (VMT) per capita (in the USA) peaked in 2004, before the GFC. Total miles driven peaked in 2007.
2. Between 2001 and 2009 young people (16-34 year-olds) reduced their VMT, raised their use of public transport, biked more and walked more.
3. The prevalence of those without driving licences also increased. This is partly caused by tougher and more expensive graduated licensing laws.
4. Technology provides the means to substitute away from transport or change transport mode. Eg, Skype, Facebook, real time PT information.
5. More young people than any other age group reported conscious efforts to replace driving with alternatives to transport.
6. Relatively more young people (although also those aged over 60) prefer to live in places that are close to amenities and public transport access points.
7. Higher real fuel prices reduce the frequency and distance of car travel.

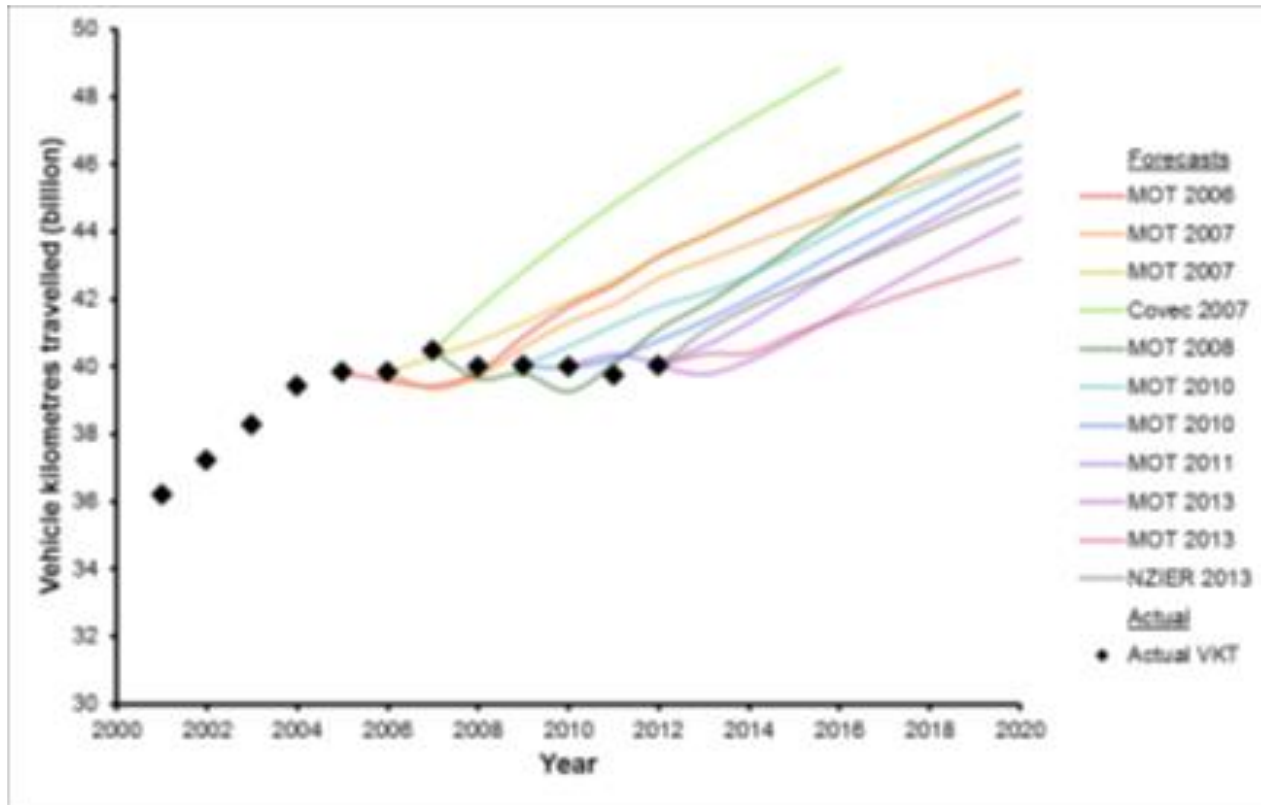
Travel Saturation?

UK DfT (2015) – 10 factors that affect VKT:

1. GDP, incomes and employment: a strong historical link that is still positive, but perhaps declining in strength. For younger people labour income has not yet attained pre-GFC levels.
2. Costs of driving: licence acquisition, insurance, fuel etc. (age related)
3. Company car taxation.
4. Population growth, population density and urbanisation: more people => more VKT, but less driving and less travel in urban areas.
5. Migration: (new) migrants travel less by car and tend to live in urban areas.
6. Technology: telecommuting substitutes for physical commuting but the effect is small. Autonomous vehicles could increase the travel time budget, implying more travel.
7. Deferred adulthood: more time in education, later household and family formation. Gaining a partner and having a child are associated with a higher likelihood of acquiring a car.
8. Environmental concerns have not been a major factor in the decline in VKT per person.
9. Market saturation? Car ownership continues to rise.
10. Network effects: Inadequate road capacity => congestion, also raise variance of travel time. Parking scarcity and bus lanes.

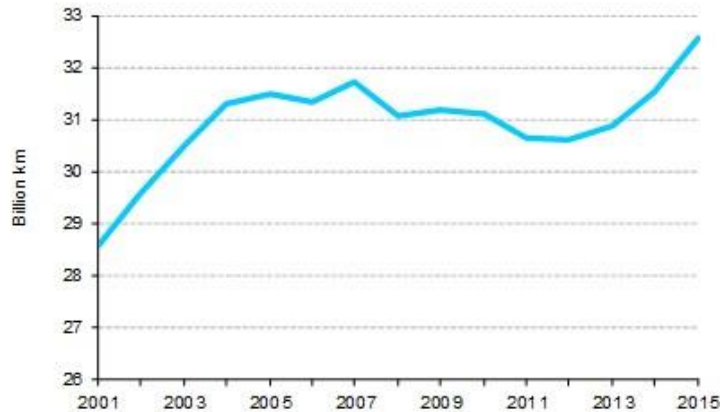
NZ Evidence

Historical light vehicle VKT forecasts and actual

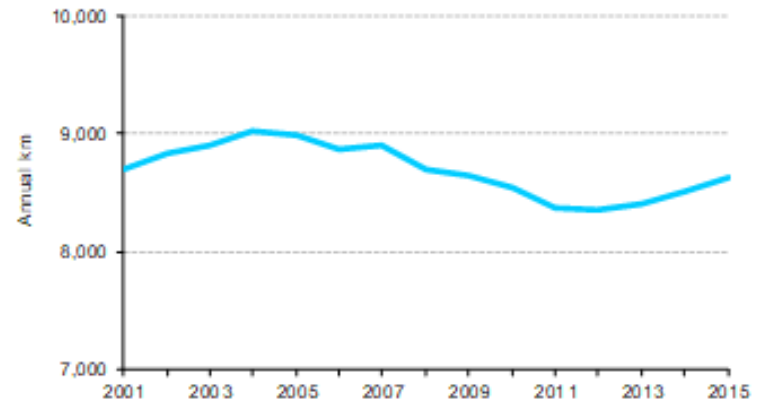


NZ Evidence

Total Light vehicle travel



Light vehicle travel per capita

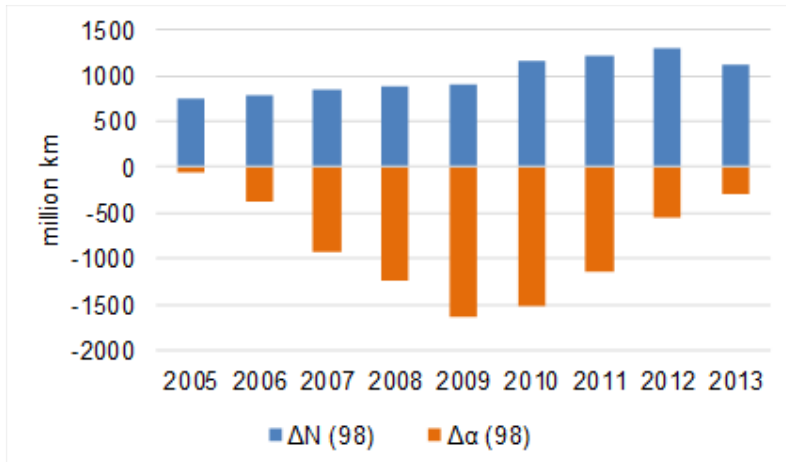


The situation since the GFC looks rather different – strong upturn.

Not much robust NZ research since GFC.

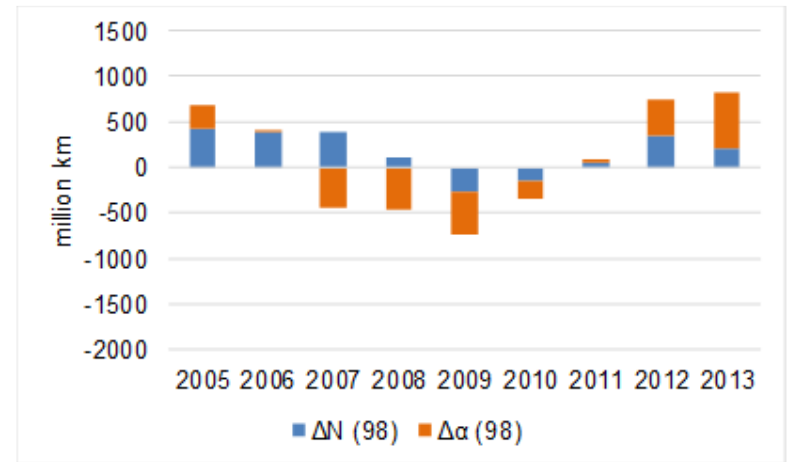
Decomposition of Light VKT

Using only age and employment



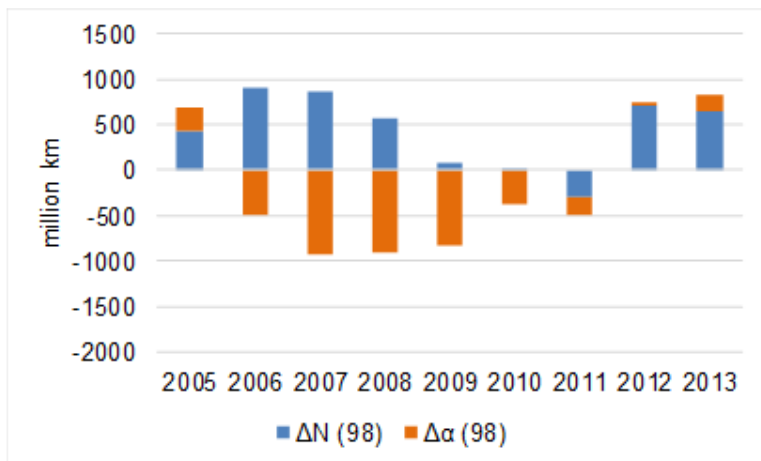
Age and employment would have led to more travel, but didn't. So a change in propensity?

Using age, employment & nominal income



Allowing for changes in nominal income explains much of the apparent change in propensity.

Decomposition using age, employment and real (1998) income

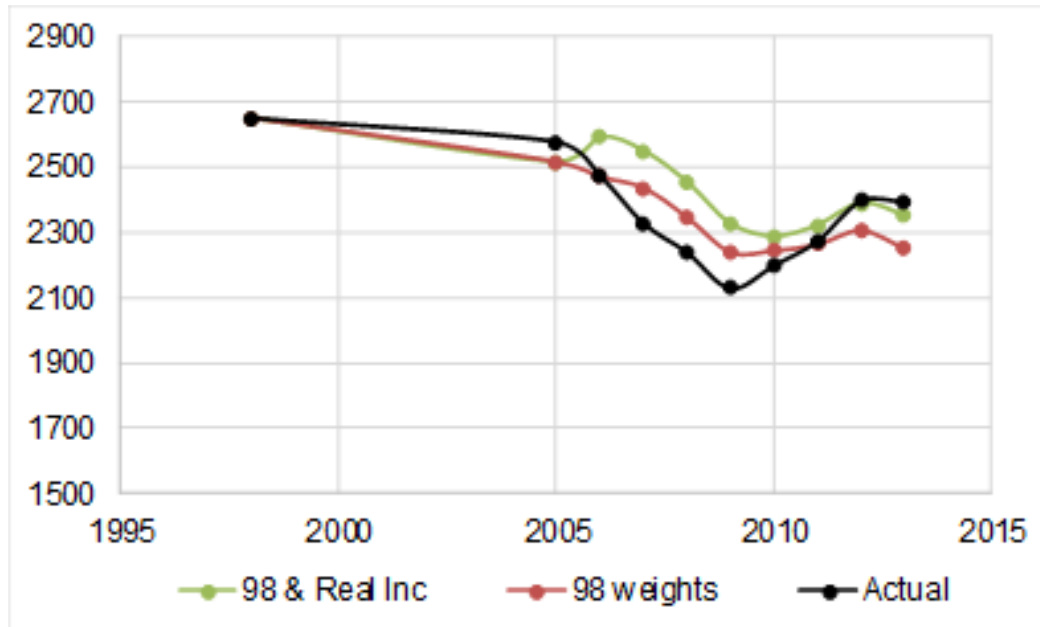


Some movement back the other way 2007-09:
high fuel prices, more PT etc?

Viewed over the whole period 1998 - 2013 there is no evidence of a sustained decline in total private vehicle travel, nor in the propensity for such travel.

Decomposition of Light VKT

Decomposition of mean per capita private vehicle travel



- Changes in the composition of the population and in nominal income (red line) would have explained most of the decline in mean travel over the years of the GFC and up to 2010
- Since then the recovery in mean travel has been stronger than age and employment changes suggest.

- With the inflation adjustment to the income bands, implied mean travel still declines sharply during the GFC, although not by as much as without the income adjustment.

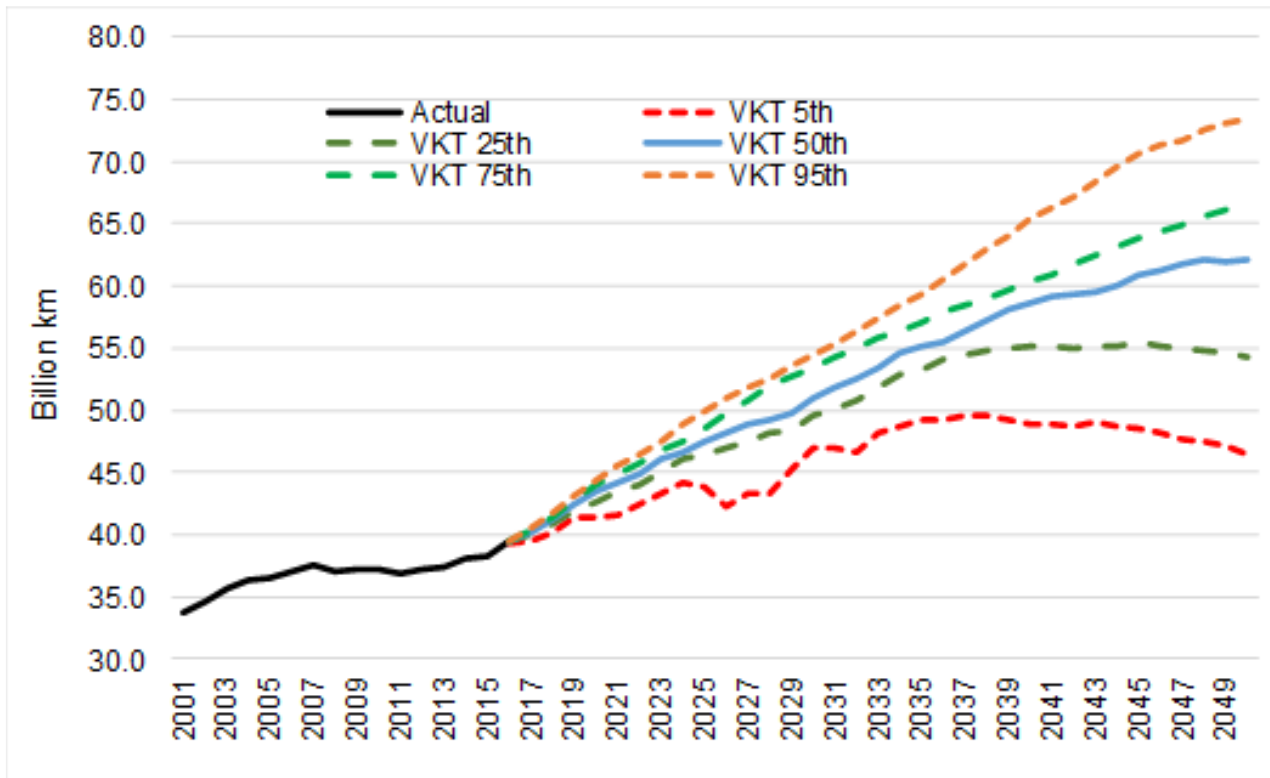
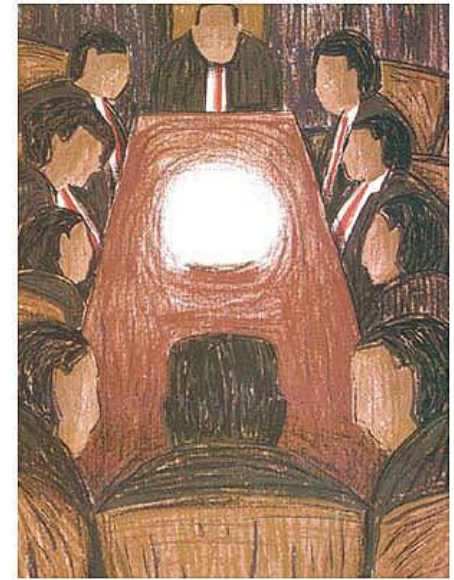
Over 2006 to 2010 there is a strong suggestion of a decline in travel propensity. But it was short-lived; from 2010 changes in demographics and real income predict mean travel very closely.

NZ VKT Projections

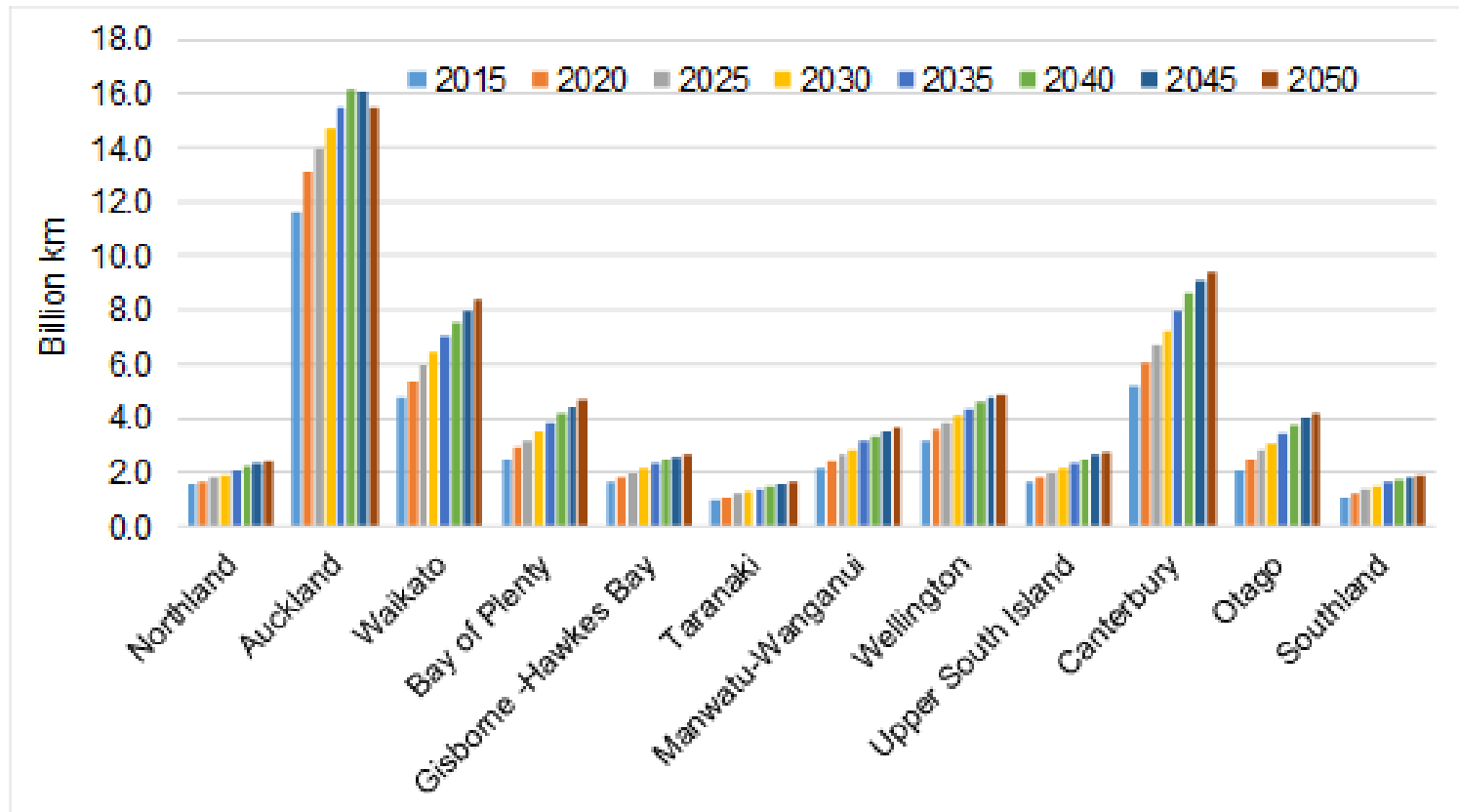
Regional Land Transport Demand Model

Developed by NZIER (NZTA research project)

- Probabilistic projections using
 - Population size, age, migration
 - Household income
 - Regional labour force and regional employment
 - Number of households per region
 - GDP/GNP



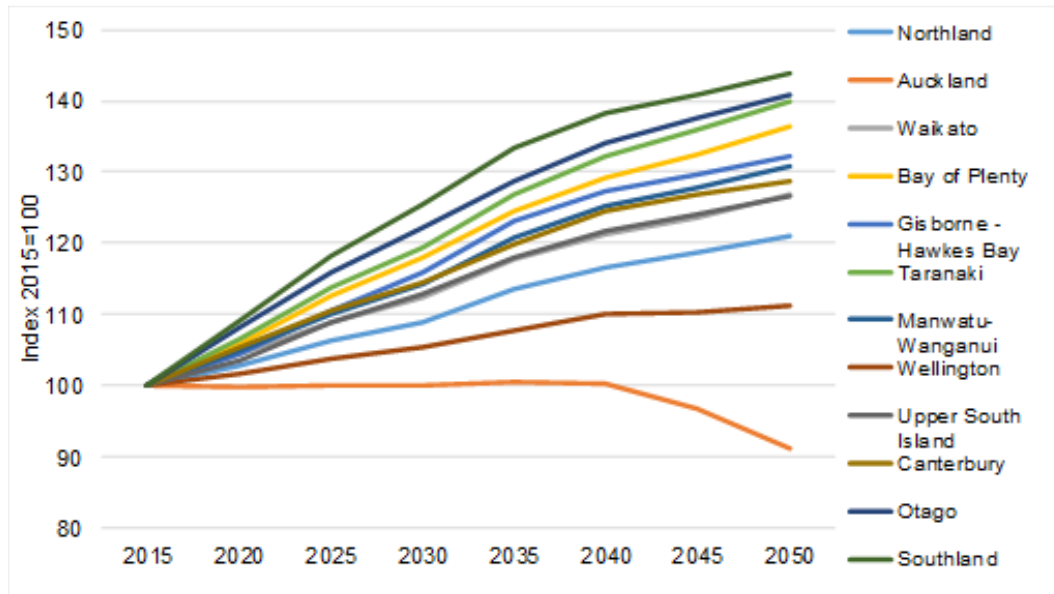
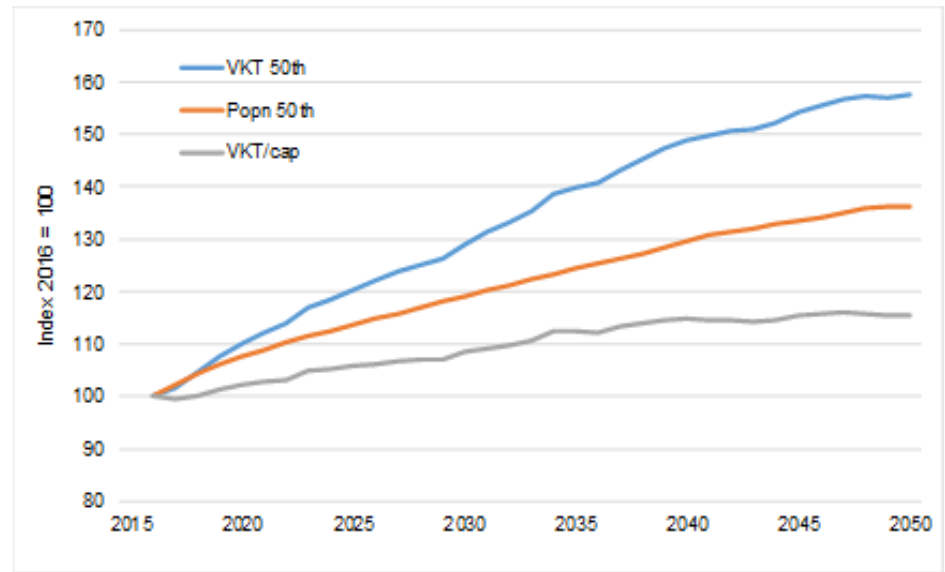
NZ VKT Projections



- Decline in Auckland after 2040
- Strong growth in Waikato and Canterbury

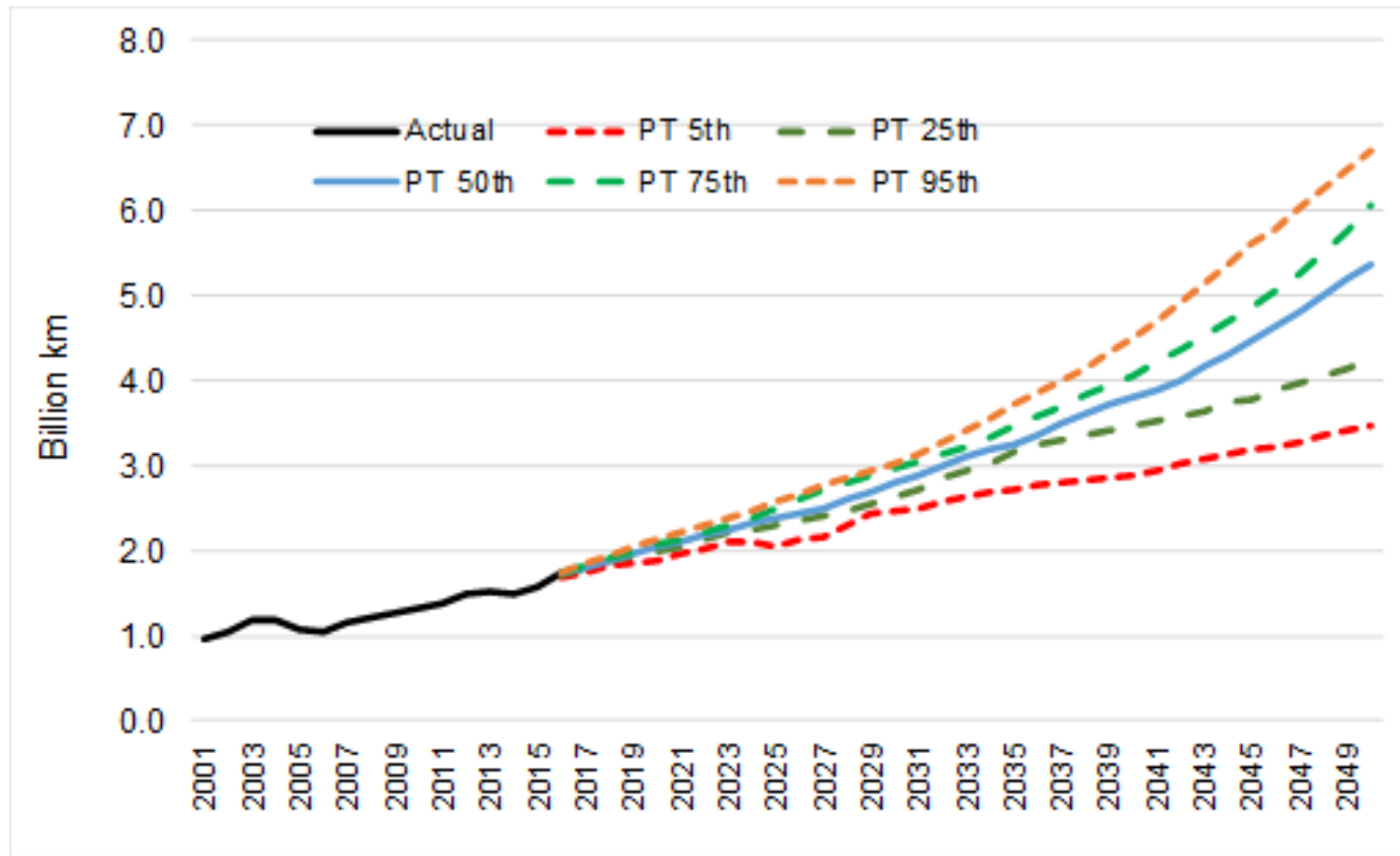
NZ VKT per Capita Projections

- Uses median population growth and median VKT.
- Little change after 2040



- Strong decline in Auckland
- Flat in Wellington

NZ Public Transport Projections



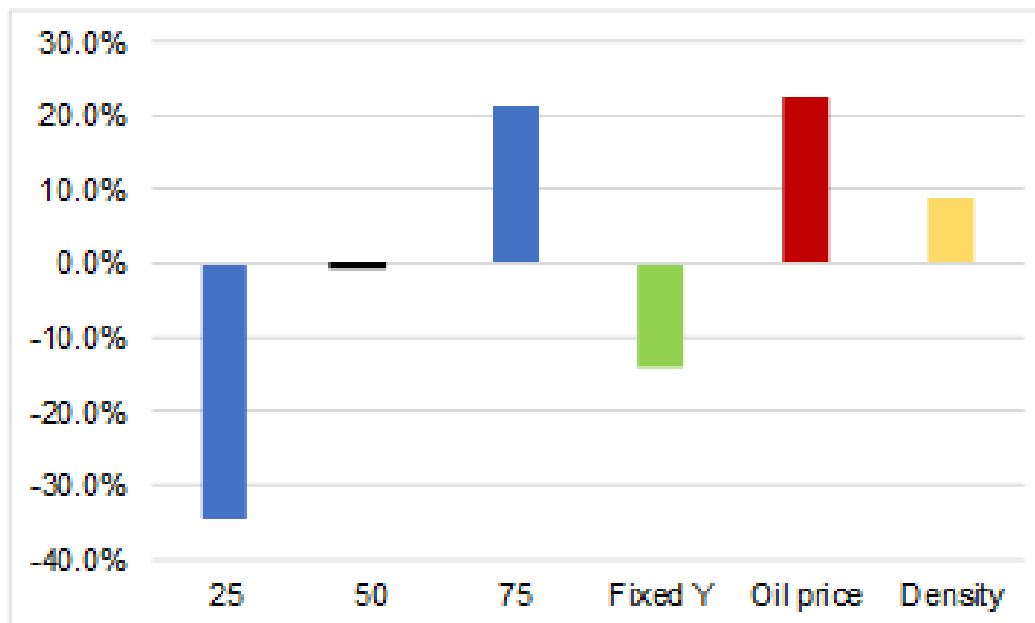
- Much faster growth than VKT in private vehicles

NZ VKT Projections

Alternative Scenarios:

- Household incomes fixed at 2015 levels. (Normally stochastic)
- Oil price unchanged from 2015. (Alter an exogenous assumption)
- A change in urban density in Auckland and Wellington. (Alter an equation)

Relative increase in VKT 2016 to 2050



NZ VKT Projections

Historical variation in the effect of demographic and economic factors on VKT are captured in the base scenarios. Interquartile range roughly $\pm 28\%$ of median increment between 2016 and 2050.

- Constant household income: lowers the increment in median VKT by 41% of the stochastic interquartile range.
- Constant oil price: raises increment in median VKT by 107% of the interquartile range.
- 10% lift in density in Auckland & Wellington: increases the increment in median VKT by 42% of the interquartile range – higher income & employment. (PT to 75th percentile.)

Impossible to decompose future VKT growth into discrete causative factors - too much interaction and uncertainty about how VKT might evolve and to what level (Eg people self-select to where they can use their preferred transport mode.)

But, of the variation in the interquartile range of VKT growth 2016-2050 that could be expected on the basis of historical changes in demographic and economic factors....

the split between demographic & economic factors is around 50/50.

Other effects could be important.

Concluding Thoughts



1. Decomposition could be enhanced by using an econometric approach with unit record data from the NZHTS.
2. Scenario approach is essential to planning future investment in land transport infrastructure, but
 - Not necessarily help one to decide which scenarios are most likely to eventuate.
 - => monitor other (non-transport) indicators of travel demand.
3. Our scenarios are weak with respect to the effects of new technology, eg ride sharing 'apps', driverless cars.
4. Investment programmes need to be robust, flexible and minimise the chances of producing stranded assets. Use Dynamic Adaptive Policy Pathways (DAPP) and Real Options Analysis.

