COMPLIANCE OF SAFER SPEEDS WITH VARYING LEVELS OF ENGINEERING AND OTHER INTERVENTIONS

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ABSTRACT

A key element of the Safer Journeys national road safety strategy is safer speeds. In most cases this means lower speeds, both urban and rural. This research considers the level of compliance of reduced speed limits and forms part of a NZTA research project on the compliance and acceptance of safer speeds. It examines information from a number of speed limit changes around the country, including 30kph speed limits in town centres and along strip shopping, 40kph speed limits on suburban streets and 80 and 90kph speed limits on mountainous and flat State Highways and local road. The before and after assessment reported in this paper considers some or all of the following; change in mean speed, 85%ile speeds, speed variance and the number of drivers over the speed limit. Working with Councils and NZTA three new speed limit case studies are to be selected and monitored before and after treatment in the ongoing research programme. In addition to infrastructure changes and the new speed limit signs, the impact of police enforcement and speed trailers will be assessed. A web survey is also being undertaken to understand drivers acceptance of reduced speed limits. This paper outlines the findings of the literature review and the before and after studies of speed limits changes undertaken by other transport professionals. The paper then outlines the work that is proposed during the rest of the research.

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INTRODUCTION

Achieving a road network with safer speeds, or one where the travel speeds are unlikely to cause serious or fatal crashes, is one of the four elements of a safe system approach. The power models developed in Europe by Elvik (Elvik et al, 2004) has shown a strong link between reduced risk of serious and fatal crashes and lower travel speeds. Given the high head-on impact speeds that typically occur on undivided 2-lane rural roads with a 100km/h speed limit (and high operating speed) it is apparent that much of the New Zealand rural roading network, does not meet safe system requirements at its current posted speed limit. It is not affordable to upgrade (eg. median divide) in the short to medium term most of the national roading network to achieve an environment where the current open road speed limit of 100kph is adequate. Similar issues occur in urban environments with high volumes of pedestrians and cyclists where survivable speed limits are 30km/h, less than most speed limits of 50km/h. Hence for the foreseeable future New Zealand will need to rely on speed management interventions, primarily reduced speed limits, to achieve safer speeds for the road infrastructure we already have.

It is acknowledged that it is unlikely to be acceptable to the public to reduce speed down to the levels where the serious and fatal risk is low statistically e.g. less than 70km/h on undivided rural roads. Hence, the focus will be on reducing speeds to levels that drivers will be willing to accept and comply with, to which, a significant reduction in serious and fatal crashes can be achieved. Overseas research indicates that high reductions in risks can be achieved (based on power models by Nilsson, 1982 and Elvik et al, 2004) by reducing speed by 5 to 10km/h at higher speeds (at the top end of set speed limits).

Reducing speed limits alone, especially on straight and flat rural routes and wide shopping and residential streets, will have limited effectiveness without other interventions. These interventions being increased enforcement, focused education and changes to the road environment. The last can be further divided into low-cost perceptual changes or more significant changes. Urban examples of low cost measures include enhanced signs and marking. More significant cost measures may include self-explaining road type measures (or traffic calming measures), such as kerb extensions, planter boxes and mini-roundabouts.

The overall purpose of this research is to assess both the effectiveness and cost-effectiveness of education, enforcement and perceptual changes to the road and road environment in achieving compliance with, and acceptance of, lowered speed limits in both rural and urban environments across New Zealand. The NZ Transport Agency is looking for research outcomes that are practical and able to be readily applied.

The study has two distinctly different elements. Quantification of compliance with lowered speed limits which is an objective exercise, and able to be validated with speed surveys. The issue of acceptance is perhaps more of a secondary issue, since provided desired levels of compliance can be achieved and maintained, acceptance by road users is not strictly necessary, albeit certainly desirable. Furthermore, user acceptance of new rules can be both intrinsic and extrinsic, with the balance between these two determining to what extent compliance will be maintained when enforcement and behavioural campaigns are changed or removed.

LITERATURE REVIEW

The literature review found that there have been few studies published internationally documenting the acceptance of and compliance with reduced speed limits, with similar studies addressing existing speed limits being far more prevalent. Some of the earliest work found originated in the US in the mid- to late 1980s (Parker, 1997 and Rossy et al. 2011), where speed limits were raised or lowered on a variety of non-freeway roads in 22 states,
with reductions of up to 20 mph (32 km/h). Perhaps not surprisingly, with no accompanying enforcement or awareness campaigns, little change was found in post-change mean speeds and driver compliance was poor both before and after the speed limit revisions. Another study found more support for a residential area speed limit reduction accompanied by more emotive publicity, although no explanation was made of some background effects that may have been present but not acknowledged by the authors.

In Europe, the fundamental benefits of speed limit reductions have been acknowledged and understood for many years. An early study looked at variable speed in a motorway environment and found good awareness and compliance. A more general attitudinal study in the Netherlands (Coesel and Reitfeld, 1998 and Rienstra and Rietveld, 1996) found greater acceptance of lower speed limits in urban residential areas compared with extra-urban high-speed roads, where compliance with existing limits was lower already.

A study into 80 km/h rural roads by Goldenbeld and van Schagen (2007) also in the Netherlands demonstrated, in isolation from any knowledge by drivers of the social consequences of higher speeds, the importance of ensuring that road characteristics are a better match for drivers’ perceptions of an appropriate speed limit. Road curvature and sight distances were most strongly correlated with speed perception. The authors concluded that although there would never be a speed limit on a particular road section that would be credible for all drivers, there would be a speed limit that would be more credible for everyone.

Studies by the Swedish Road Administration (Anund and Svensson, 2009 and Forsberg et al. 2011) showed that, while people often disagreed with lower speed limits, a significant proportion of respondents did travel more slowly subsequent to the changes and less than a fifth felt that the lower limit had impeded the accessibility of the road. Another study concluded that the setting of speed limits needed also to include the dissemination of the effects of speed limits on safety, mobility and the environment.

From an organisational viewpoint, the local authorities responsible for implementing speed limit changes prescribed by the central organisation needed to be supported with post-hoc demonstrations of the benefits of the changes they had made in order to gain support from local politicians and the local community by completing the causal chain between speed and its outcomes.

Similarly in Australasia, a survey conducted by the automobile clubs (Excell, 2005) demonstrated low acceptance levels of speed limit changes in the absence of background information and justification being provided to the community. In contrast, a more definitive survey study (Lahausse et al. 2010) showed that, in contrast to Europe, acceptance of lower speeds on some classes of rural road (undivided two-lane roads and gravel roads) was quite good, with lesser support for urban arterials and residential roads. When presented with some of the facts regarding the benefits of speed reductions, however, acceptance was higher although likely compliance without matching enforcement levels might be less forthcoming.

Overall, it could be concluded that while the driving public might not yet be ready to accept lower travelling speeds without question, the compelling arguments for their implementation are likely to help drivers rationalise the changes and justify their acceptance, backed up – as with practically all road safety messages – by levels of enforcement to ensure compliance in the short to medium term until such time as the majority of road users accept the new regime as the norm.

BEFORE AND AFTER CASE STUDIES

A number of road controlling authorities around New Zealand have reduced speed limits in urban and rural areas. The site types that have been treated can be categorised as follows.
Urban commercial shopping streets (30 & 40 km/h speed limit)
Suburban streets (40 km/h speed limit)
Mountainous (slow speed) state highway (80km/h speed limit)
High volume/high crash state highway (80 & 90 km/h Safe Speed Areas)
Local authority rural road (80km/h speed limit)

Councils and the NZ Transport Agency have used a combination of engineering, education and, to a limited extent, enforcement measures, to support the reduced speed limits. In the engineering area this has ranged from just installing speed limit signs, sometimes with parallel road markings, through to highly modified self-explaining road layouts.

Before and after data on speeds and traffic volumes have been collected for many of the sites where a reduced speed limit has been introduced. This section discusses a number of the speed limit reduction programs/locations that have been put in place around the country and the findings from these programs. The following programs have been profiled in this paper

- Hamilton City Area Wide Treatments
- Mount Maunganui Shopping Area
- Ponsonby Road, Auckland City
- State Highway 2 (from SH1 to SH25)

**Hamilton City Area Wide Treatments**

In 2010 Hamilton City Council (HCC) started conducting a demonstration project to evaluate the installation of permanent 40km/h speed limit for local residential streets (see Figure 1 for examples of installation). Works to install the 40 km/h speed limit were completed in late 2011 in nine neighborhoods around Hamilton. This demonstration project was considered a success and an extra nine neighborhoods were proposed to have the speed limit reduced to 40km/h in 2012/2013 (Hamilton City Council, 2012). A map of the existing demonstration areas and those proposed is shown in Figure 2.

There were two distinct phases in implementing these lowered residential speed limits. The first phase was the installation of engineering devices to slow traffic down to a mean speed within 5km/h of the installation of a 40km/h speed limit to help encourage compliance with the Setting of Speed Limits Land Transport Rule. The second phase was the installation of the signs and road markings and reduced speed limits. To evaluate the effectiveness of the demonstration project HCC conducted a series of speed counts before the scheme was implemented, after the engineering works were completed and after the signs and road markings were installed.(see Table 1 for results). In the majority of cases the counts were collected at the same mid-block location at each stage of the project (the NZTA research report will specify where this was not the case)
Safer road use in the demonstration sites for safer speed areas was supported by a marketing and education and engagement with key stakeholders. Hamilton City Council monitored their marketing campaign by monitoring the internet traffic generated by online messaging, website traffic to ‘Safer Speed Areas’ website, a questionnaire for residents within the Safer Speed Areas and a brand recognition survey to assess the other marketing devices.
### Table 1– Traffic speed statistics on Hamilton City Streets (km/h)

The key points which can be taken from this case study are:

- Engineering measures generally have a larger effect on traffic mean speeds and 85\textsuperscript{th} percentile speed than lowering the speed limit. Engineering lowered the mean speed and 85\textsuperscript{th} percentile speed by on average 4.4km/h and 4.6 km/h respectively. The reduction in mean speed varied from 0.4km/h to 11.8 km/h and the reduction in 85\textsuperscript{th} percentile speed varied from 0.7 km/h to 12.2 km/h
- The introduction of the lower speed limit after engineering generally resulted in a small reduction in the mean speed and 85\textsuperscript{th} percentile speeds. The sites which experienced an increase in mean speed tended to have the ‘before speed limit change’ mean speed already close to the new 40 km/h speed limit. This is called speed targeting.

#### Mount Maunganui Shopping Area

In 2011 Tauranga City Council (TCC) decided to install a 30 km/h speed limit in the main shopping area of Mount Maunganui. The speed limit change was a reduction from 50km/h to 30km/h encompassing all of the streets north of Salisbury Avenue (see Figure 3 for typical cross-sections). The area where the speed limit reduction occurred is shown by the blue area in Figure 4. Prior to the reduction in speed limit the area already had traffic calming treatments in the majority of the area where the speed limit change was implemented.
Figure 3 – Example of speed limit signs and road marking entering 30 km/h speed limit area –strip shopping with some residential areas included

Figure 4 – Location of reduced speed limit area and traffic count stations used for before and after comparison

To evaluate the effectiveness of the reduced 30km/h speed limit Tauranga City Council collected speed counts before and after the scheme were implemented. Table 2 and 3
shows the results of the before and after speed surveys on The Mall and Maunganui Road respectively.

<table>
<thead>
<tr>
<th>Direction of Travel</th>
<th>Before and After</th>
<th>Mean Speed</th>
<th>85th Percentile Speed</th>
<th>Speed Variance</th>
<th>Percent Exceeding 50km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northbound Before</td>
<td>37.5 km/h</td>
<td>47 km/h</td>
<td>85.00 km/h</td>
<td>9.2%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>38.8 km/h</td>
<td>48 km/h</td>
<td>78.32 km/h</td>
<td>10.1%</td>
<td></td>
</tr>
<tr>
<td>Southbound Before</td>
<td>38.5 km/h</td>
<td>46 km/h</td>
<td>64.16 km/h</td>
<td>6.3%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>38.5 km/h</td>
<td>46 km/h</td>
<td>61.31 km/h</td>
<td>6.2%</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 – Traffic speed statistics on The Mall

<table>
<thead>
<tr>
<th>Direction of Travel</th>
<th>Before and After</th>
<th>Mean Speed</th>
<th>85th Percentile Speed</th>
<th>Speed Variance</th>
<th>Percent Exceeding 50 km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northbound Before</td>
<td>23.6 km/h</td>
<td>30 km/h</td>
<td>44.49 km/h</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>23.6 km/h</td>
<td>30 km/h</td>
<td>45.29 km/h</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>Southbound Before</td>
<td>23.8 km/h</td>
<td>30 km/h</td>
<td>43.30 km/h</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>23.6 km/h</td>
<td>30 km/h</td>
<td>42.25 km/h</td>
<td>&lt;0.1%</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 – Traffic speed statistics on Maunganui Road

The lowering of the speed limit at these sites generally did not have a significant effect on the mean speed or 85th percentile speed of traffic. The only exception being for northbound traffic on The Mall where there was an increase in the mean speed and 85th percentile speed. This may be due to speed targeting as the before mean speed is below the speed limit. The introduction of the lower speed limit has in three out of four cases resulted in a small reduction in the variability (variance) of speeds (that is the range in speeds observed over a day or period at the count site).

**Ponsonby Road, Auckland City**

In 2009 the entire length of Ponsonby Road had its speed limit reduced from 50km/h to 40km/h after several pedestrian crashes; which included one fatality in 2006. Ponsonby Road is 1.5 km long and is located within the Auckland suburb of Ponsonby, close to the Auckland CBD. A photographic cross-section of part of the street is shown in Figure 5. A plan view of the area which has had a speed limit reduction is shown in Figure 6.
Figure 5 – Example of signage and road markings used entering Ponsonby Road lowered speed limit. Road markings have since changed to include a painted background.

Figure 6 - Ponsonby Road speed limit reduction area and traffic count locations
While traffic volume and speed data were collected at a number of locations (as shown in Figure 6), speed data was only available before and after the change at one location; between Franklin Road and Collingwood Street. Table 4 shows the speed data collected. A modest reduction was observed in the mean speed and a slightly larger reduction in the 85th percentile speed at this location. In this case the new speed limit was close to the operating mean speed so the bigger reduction in the higher speeds (85th percentile) is a good outcome for this section of the route.

<table>
<thead>
<tr>
<th>Direction of Travel</th>
<th>Before and After</th>
<th>Mean Speed</th>
<th>85th Percentile Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northbound</td>
<td>Before</td>
<td>40 km/h</td>
<td>49 km/h</td>
</tr>
<tr>
<td></td>
<td>After</td>
<td>39 km/h</td>
<td>47 km/h</td>
</tr>
<tr>
<td>Southbound</td>
<td>Before</td>
<td>40 km/h</td>
<td>50 km/h</td>
</tr>
<tr>
<td></td>
<td>After</td>
<td>39 km/h</td>
<td>48 km/h</td>
</tr>
</tbody>
</table>

**Table 4 – Traffic speed statistics on Ponsonby Road**

**State Highway 2 Safe Speed Area (from SH1 to SH25)**

In 2011 three sections of State Highway 2 had a speed limit reduction from 100 km/h to 90 km/h. The safer speed limit was introduced as a safety measure to help address deaths and serious injuries which are over represented along this section of highway. This stretch of road has an AADT of approximately 13,000 vehicles per day over the last five years. There are 12.8% heavy commercial vehicles and holiday peak flows can reach 25,000 vpd with one way peaks of 15,000 vpd. The majority of this route is in a rural environment with most of the adjoining land use being farming. The three sections of road with the speed limit reduction are:

1. State Highway 1 & 2 interchange to Mangatawhiri Bridge (start of the Mangatawhiri deviation/bypass)
2. Golf Road (end of Mangatawhiri deviation) to Western Maramarua (beginning of the urban 70km/h speed limit)
3. Eastern Maramarua to State Highway 2 & 25 Intersection (Thames turn-off)

A plan view of the route and the key locations are shown in Figure 7. The safer speeds signage and marking introduced is illustrated in Figure 8. The route starts at the SH1/SH2 interchange on the southern side of the Bombay Hills. The Mangatawhiri deviation is a relatively recent section of highway, that bypasses the smaller village of Mangatawhiri, which was located on a poorly aligned section of highway, with a 100km/h speed limit. It includes passing lanes, grade separation of side-roads and no direct property access. The remainder of the highway generally follows the traditional route alignment, although there have been extensive improvements to the route, including shoulder widening, guardrail of bridges and installing of passing lanes. However geometrically it still has a number of deficiencies, that require changes to the vertical and/or horizontal alignment to address. The traffic volumes, especially during the weekends and on holidays, can be very high for a two-lane rural highway increasing the risk of head-on crashes.
To evaluate the effectiveness of the reduced speed limit, speed counts were collected at 4 sites; one in each of the first two sections and two counts in the third section (route positions 0/4.6, 0/16.10, 18/5.89 and 18/8.44) where the speed limit was reduced to 90 km/h. Floating car surveys were used to select these sites, so that the speeds were representative of each section.

Only ‘free speeds’ were recorded and analyzed at each site. A free speed is one where a driver is not influenced by a driver in front. In this case speeds were recorded of vehicles when the headway between vehicles was greater than 4 seconds. Table 5 shows the before and after speed data.
<table>
<thead>
<tr>
<th>Direction of Travel</th>
<th>Before and After</th>
<th>Mean Speed</th>
<th>85th Percentile Speed</th>
<th>Speed Variance</th>
<th>Percent Exceeding 100 km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Position 0/4.6 (approx. 4.6km from SH1/2 interchange)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northbound Before</td>
<td>95.2</td>
<td>105.1</td>
<td>113.5</td>
<td>29.9%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>89.3</td>
<td>96.5</td>
<td>60.4</td>
<td>7.1%</td>
<td></td>
</tr>
<tr>
<td>Southbound Before</td>
<td>91.5</td>
<td>99.0</td>
<td>62.8</td>
<td>12.3%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>89.7</td>
<td>96.8</td>
<td>59.0</td>
<td>7.7%</td>
<td></td>
</tr>
<tr>
<td>Route Position 0/16.10 (south of Mangatawhiri Deviation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northbound Before</td>
<td>95.8</td>
<td>103.0</td>
<td>69.7</td>
<td>26.9%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>90.9</td>
<td>98.3</td>
<td>68.4</td>
<td>10.7%</td>
<td></td>
</tr>
<tr>
<td>Southbound Before</td>
<td>97.4</td>
<td>104.8</td>
<td>70.8</td>
<td>34.7%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>94.5</td>
<td>101.9</td>
<td>66.8</td>
<td>21.8%</td>
<td></td>
</tr>
<tr>
<td>Route Position 18/5.89 (south of Maramarua)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northbound Before</td>
<td>96.0</td>
<td>103.3</td>
<td>60.9</td>
<td>29.3%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>90.9</td>
<td>99.4</td>
<td>80.9</td>
<td>14.0%</td>
<td></td>
</tr>
<tr>
<td>Southbound Before</td>
<td>92.4</td>
<td>100.4</td>
<td>64.4</td>
<td>16.6%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>85.3</td>
<td>93.2</td>
<td>71.5</td>
<td>3.6%</td>
<td></td>
</tr>
<tr>
<td>Route Position 18/8.44 (north of Thames Turn-off)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northbound Before</td>
<td>100.3</td>
<td>108.7</td>
<td>79.8</td>
<td>51.2%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>97.0</td>
<td>104.8</td>
<td>65.5</td>
<td>33.9%</td>
<td></td>
</tr>
<tr>
<td>Southbound Before</td>
<td>94.2</td>
<td>101.5</td>
<td>65.2</td>
<td>20.8%</td>
<td></td>
</tr>
<tr>
<td>After</td>
<td>91.9</td>
<td>99.0</td>
<td>64.7</td>
<td>12.8%</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 – Traffic speed statistics on SH 2 Safer Speed Route (in km/h)

The typical mean speed reduction of between 3 – 6 km/h is quite large compared with the other case study sites, especially given there have been no changes made to the road layout. This reduction in speed is in part likely to be due to the increased presence of police enforcement of the ‘safer’ speed limit. This is a section of road the police target due to the high historic level of crash trauma (fatal and serious crashes). All sites experienced a reduction in the percentage of vehicles exceeding 100 km/h, with the sites with highest mean speeds experiencing the largest reduction in vehicles exceeding 100 km/h. The 85th percentile speeds for all but two sites are less than 100 km/h. All sites also have a more consistent speed variance of around 60-80 km/h with most variances being 60-70 km/h.
NEXT STEPS

This paper outlines the first two stages of the Safer Speeds research (ART19); the literature review and compilation of speed compliance (before and after) data for reduced speed sites across New Zealand. Two further stages are to be undertaken in late 2013 and early 2014; 1) reduced speed limits acceptance surveys and 2) targeted speed compliance case studies of safer speed limit sites.

**Stage 3 – Acceptance Surveys**

A quantitative web survey canvassing levels of acceptance of lower speed limits and the ‘levers’ for influencing future acceptance has already been prepared. The survey examines the public’s attitudes to speed limits, reductions in both rural and urban speeds and what factors influence their acceptance of lower speed limits e.g. proximity to a school or a very windy rural road. The survey is available on SurveyMonkey and is currently being promoted. Results of this stage will be available by the conference dates.

**Stage 4 – Speed Compliance Case Studies**

The purpose of the final stage of the study is to undertake a further two or three case studies of routes which are to have a speed limit reduction and examine elements of education, enforcement and engineering not previously or well covered by the currently available case studies. It became evident during our review of the other case studies (in Stage 2) that there is limited information available on the effectiveness of enforcing of reduced speed limits. So a key focus of Stage 4 is to look at enforcement.

Given the limited number of sites for which speed reductions are planned (by road controlling authorities) during the course of the study the team decided to look at enforcement levels on a route that has already had a reduced speed limit introduced, the SH2 safer speed (90km/h) project. With the help of both the Manukau and Waikato Police the research team will be examining how ‘active’ police enforcement along this route impacts on speed. Speed data will be collected with and without speed camera enforcement.

Two other case study sites, with recently reduced speed limits are also being monitored both before and after the change. This includes the 70km/h speed zones being introduced on the Otago Peninsula, to replace 80 and 100km/h speed restrictions. The routes to be treated generally have a very poor and low speed geometric layout. The other route is Gordontown Road, a relatively higher volume rural two lane road on the fringe of Hamilton, within a residential development area (but with limited direct access). This route is flat and straight and the speed limit is being reduced from 100 to 80km/h. For both studies the effect of speed trailers will be examined in the ‘after’ period, due to the low priority such routes will receive for police enforcement. In addition to point speed counts, a speed profile is being collected using floating car surveys both before and after the speed limit change.
FINAL REMARKS/SUMMARY

The key findings and conclusions for the research project so far are:

- There is minimal research internationally on the compliance and acceptance on lowering speed limits. The best international research is from Sweden and Netherlands, who have some of the safest roads in the world. There is also some research on this topic from Australia.

- European research indicates greater acceptance of lower speed limits in urban residential streets, rather than on higher speed roads. The limited Australian research indicates that there is some acceptance of lower speed limits on some rural roads, including gravel roads and some sealed 2-lane rural roads.

- A study of 80km/h rural roads in the Netherlands demonstrated the importance of ensuring road characteristics are a better match for driver’s perception of appropriate speed limits. Road curvature and sight distance are strongly correlated with speed perception.

- A Swedish study concluded that the setting of speed limits needed to also include dissemination of the effects of speed limits on safety, mobility and the environment. This is something many New Zealand road controlling authorities are doing as part of their education campaigns. Surveys of automobile clubs across Australasia demonstrated low acceptance of speed limit changes without background information and justification. This can be challenging on State Highways where it is difficult, without national campaigns, to target the right road users.

- The compliance data collected from across New Zealand shows that there is a limited effect of applying speed signage and markings on their own. The notable exception is SH2 where speeds reduced by 3 to 6 km/h. This is thought to be due to high levels of passive and active enforcement, press coverage of the high crash rate and regular campaigns using billboards and targeted education of professional truck drivers. This is a matter that is to be studied further in the next stage of the research.

- Where applied, engineering measures in most cases seem to be more effective in driving down speeds. The exception being in areas which already have low speeds due to narrow road widths or intensive adjoining land-use or side friction.

REFERENCES


