

Understanding the safety impacts and opportunities of state highway resurfacings and renewals

As New Zealand grows, the state highway network is critical in supporting our social and economic wellbeing. Our state highways connect people to their destinations, play a significant role in tourism and provide key freight routes connecting goods and services to markets.

The state highway network needs to provide a sustained level of reliable safe access for New Zealanders by providing fit for purpose roads, bridges, tunnels and related safety infrastructure.

During the last 10 years there was a changed approach to road maintenance which led to a period of underinvestment and a decline in state highway renewal work.

While Waka Kotahi NZ Transport Agency has effectively managed the maintenance of the state highway network over this period of funding constraints, previous approaches are no longer sustainable.

A NEW APPROACH

The Government Policy Statement on Land Transport 2018 enabled Waka Kotahi to change our approach and increase state highway maintenance, it also enabled the development of the Safe Network Programme and the Safety Boost Programme, delivering a range of safety improvements on state highways and local roads around New Zealand.

Road to Zero is the government's new road safety strategy for 2020 – 2030. As the first step towards Vision Zero, a Road to Zero Action Plan 2020-2022 has been set. This identifies 15 initial actions for the sector and includes two targeted at road infrastructure; investing in safety treatments and infrastructure improvements, and a review of infrastructure standards and guidelines. Road to Zero, also enables the creation of a specific road safety activity funding class specifically for road safety programmes.

RESEARCH

Waka Kotahi commissioned the research *Understanding the safety impacts and opportunities of state highway resurfacings and renewals*, January 2020, to better understand the safety implications of state highway maintenance.

The study considered all rural state highways in New Zealand excluding motorway sections and considered data collected between 2009 and 2018. The asset condition variables investigated were limited to those for which data was readily available, being skid resistance, texture, rutting, roughness and patching (routine maintenance).

The study showed that:

- There has been a significant increase in crash rate from approximately 2013 to 2017, with a small improvement in 2018;
- There has been a significant increase in traffic since 2009 with a marked increase in traffic growth from 2013/14;
- Between 2013/14 and 2017/18, there has been a small but clear deterioration of the network in terms of almost all of the road condition indicators considered (surface age, roughness, skid resistance, texture depth, rut depth and patch frequency);
- There is an indisputable link between crash risk and road condition. This applies in particular to skid resistance and road roughness, and to a lesser extent to texture depth and patch frequency.

Considered together, the above four findings suggest that the slight but definite deterioration in road condition, coupled with the increased exposure of deteriorated areas to traffic, is likely to have contributed in some measure to the increased number of crashes over the last four to five years. Similarly, this suggests that an improvement in road condition would result in an improvement in road safety outcomes.

This study reinforces Waka Kotahi's stance that increased investment in state highway maintenance is critical, and in the summer of 2019/2020 over \$150m was spent across 2,774 sites from the top of the country to the bottom, resealing nine percent of our total state highway network. In total, we will reseal 2,266 lane kilometres.

THE CHANGING CONDITIONS

When considering light vehicle traffic, there has been a considerable growth between 2009 and 2018, with most of this growth taking place later than 2013. Average growth rates on the analysed 100m segments from 2014 onwards were around six percent per year, with an overall average segment level growth of approximately three percent per year from 2009 to 2018.

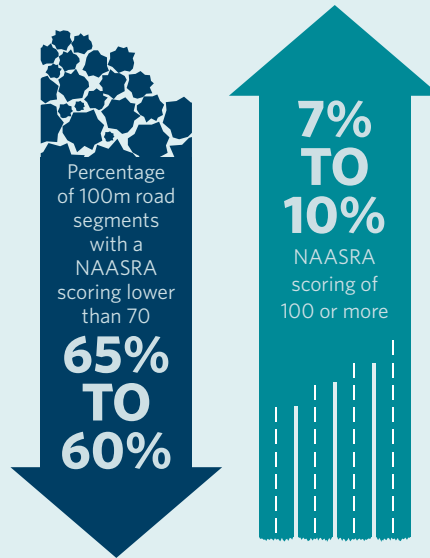
Furthermore, growth in heavy vehicles was significantly higher than the growth in average annual daily traffic (AADT).

The trends in road safety statistics closely reflect the traffic growth trends. Crash trends show, for all crash categories, a downward trend from 2009 to approximately 2013/14, after which there is a marked reversal in the crash trend with a steady increase in crash rate from 2013/14 to 2017. The reversal of the decreasing crash rates around 2013/14 coincides with the increased growth in AADT. However, care should be taken not to conclude that the increasing crash trend is solely or even principally due to traffic increases. When the crash counts per year are normalised to take into account traffic volumes, an increase in the crash rate is still visible. This suggests that the increase in crash rates is not solely due to the increased traffic volume but is most likely influenced by many factors, including road condition.

NETWORK CONDITION

A predominantly large percentage of the rural state highway network has been, and remains, in a good condition. While the road network condition remained relatively stable between 2009 and 2013, there is, for some of the condition indicators considered, a clear deterioration visible between 2013/14 and 2018.

The study concurred with the findings of earlier research in establishing a significant link between road condition and crash rate. Skid resistance and road roughness show a strong and statistically significant correlation with crash rate. Texture depth and the frequency of patching showed less clear but still significant relationships to crash rates.

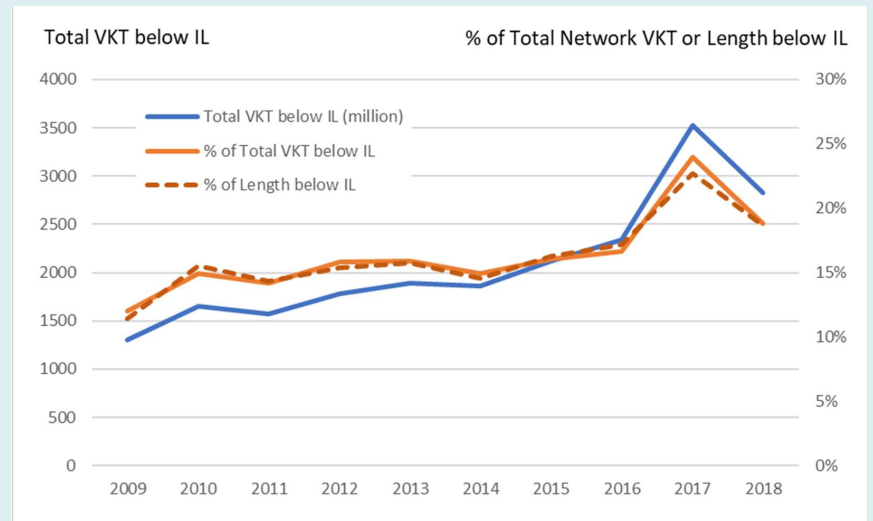


Between 2014 and 2018 there was a decrease in the percentage of 100m road segments with a NAASRA roughness meter scoring lower than 70, from 65% to 60%.

In the same period, there was an increase in the percentage of 100m road segments with a NAASRA scoring of 100 or more from 7% to 10%.

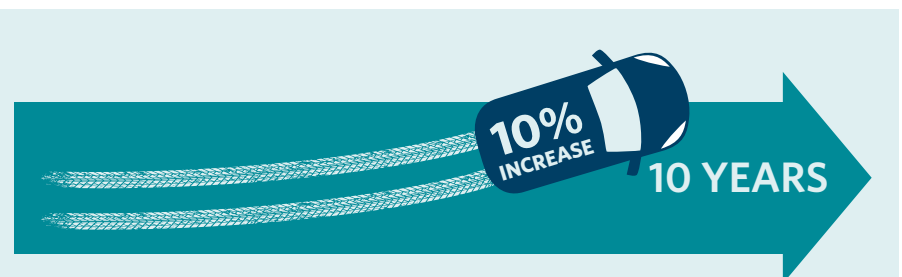
Reference: NZ Transport Agency *Understanding the safety impacts and opportunities of state highway resurfacing and renewals*. January 2020 V4. Page 32, figure 26.

Total vehicle kilometres travelled (VKT) exposed to skid resistance below investigation level (IL) vs time



When traffic increase is taken into account, it's clear that the number of vehicles exposed to skid resistance below IL has increased steadily since 2009.

Reference: NZ Transport Agency *Understanding the safety impacts and opportunities of state highway resurfacing and renewals*. January 2020 V4. Page 30, figure 24.



In the 10-year analysis period, the percentage of 100m segments with more than 15% equilibrium skid coefficient (ESC) below investigation level (IL) increased from 20/25 percent to 30/35 percent.

Reference: *Understanding the safety impacts and opportunities of state highway resurfacing and renewals*. Jan 2020 V4. Page 28, figure 21.

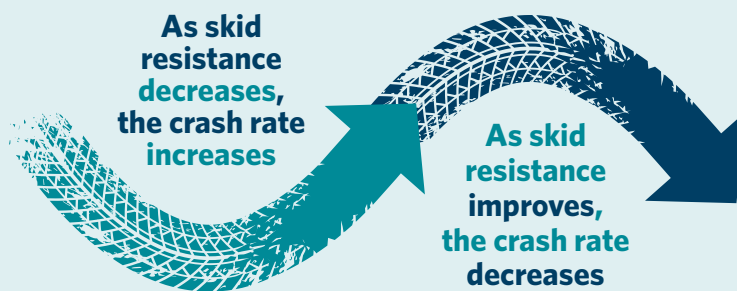
TARGETED MAINTENANCE PROGRAMS

The researchers have carried out an in-depth analysis of crash statistics on pieces of road where the skid resistance was improved over time. This has been compared with a study of segments with deteriorating or consistently poor skid resistance.

This analysis showed that the number of crashes remained stable or decreased on those segments of road with an improvement in skid resistance. On the other hand, on roads with deteriorating or consistently poor skid resistance, the crash counts increased significantly.

The analysis provided the basis for determining the benefit that can be derived from a targeted maintenance program to address poor skid resistance. The results showed that, as a result of fewer deaths and serious injuries (DSI) numbers and their associated social costs, an overall benefit cost ratio of at least 2.5 can be expected from such maintenance work.

While the analysis undertaken in this study focused largely on skid resistance, the data exists for similar analyses to be undertaken on other variables such as roughness, texture and patching. It is believed that these analyses are certain to confirm that improved network condition will result in improved safety outcomes.



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Reference: *Understanding the safety impacts and opportunities of state highway resurfacings and renewals*. Jan 2020 V4. Page 80, figure 67.

MORE INFORMATION

More detailed information can be found here:

- Government Policy Statement on Land Transport 2018 www.transport.govt.nz/multi-modal/keystrategiesandplans/gpsonlandtransportfunding/
- Road to Zero: New Zealand's road safety strategy 2020-2030 www.transport.govt.nz/multi-modal/keystrategiesandplans/road-safety-strategy/
- Safe Network Programme www.nzta.govt.nz/safety/our-vision-of-a-safe-road-system/safe-network-programme/



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