Maximum speeds have varying effects

A NZ Transport Agency research project has provided evidence that fuel savings and additional travel times, as a result of reduced speeds, tend to be less than might be expected from purely theoretical travel time predictions.

The project, carried out by Malatest International, built on parallel research into drivers' attitudes to and motivations for speeding, particularly in relation to making time savings (see the article on Research report 568: Travel time savings and speed: actual and perceived, also in this edition).

Both projects examine speed in the context of the government's Safer Journeys strategy, and its vision of a New Zealand road system increasingly free of death and serious injury. Hundreds of people die and thousands are injured each year as a result of crashes on New Zealand roads. Speed is a recognised factor in all these crashes, determining both the impact of the crash and the severity of the injury.

The study

The project investigated the effect that setting different maximum speeds had on mean speed, actual fuel consumption and travel time, for six different New Zealand routes in real driving conditions. Although the theoretical relationship between these variables is relatively straightforward, the actual effect, in real driving conditions is less clear.

Drivers travelled six routes multiple times, while recording fuel consumption, location and speed data using a data logger connected to their vehicles. The six routes selected for the study included three short urban routes and three long routes, representing metro driving or open road driving across a variety of road classifications.

- The short urban routes, one in Auckland (12km) and two in Wellington (10km and 6km respectively), were driven at maximum speeds of 40km/h or 50km/h. Each route was driven between 102 and 120 times.
- The long routes, Auckland to Tauranga (211km), Hastings to Levin (197km) and Christchurch to Kaikoura (178km), were driven at maximum speeds of 80km/h, 90km/h and 100km/h. Each route was driven between 40 and 42 times.

The results of the study showed decreasing the maximum travel speed on a route resulted in decreases in mean speed, but by a smaller proportion than might be expected.

Decreasing maximum speed also increased travel time, but again by a smaller proportion.

Fuel consumption decreased on five of the six tested routes as the maximum speed was reduced. The proportion by which fuel consumption decreased was less than the proportionate decreases in mean speed on two of the three short urban routes, but was greater than the proportionate decreases in mean speed on all three of the longer routes.

Some main points in relation to each of these findings are given below. The research report discusses in more detail each area and its ramifications for conversations about the costs and benefits of different speed limits.

Mean speed

- Decreasing the maximum speed on the long routes by 20% (from 100km/h to 80km/h) decreased mean speed by between 8% and 12%.
- The same percentage decrease in maximum speed on the short routes (20%, from 50km/h to 40km/h) decreased the mean speed by between 9% and 14%, depending on the route.
- This difference between the size of the decrease in maximum and mean speeds can be explained by factors such as traffic, road conditions and intersections.

Travel time

- Results across all of the routes demonstrated that decreasing maximum trip speed increased travel time, but by varying amounts.
- Taken together, the results show trip maximum speed limits have a strong effect on travel time. However, the increase in travel time is not equally proportional to the decrease in travel speed.
- Other factors, such as traffic volumes and number of controlled intersections, affect travel time in urban routes to a greater extent than long distance trips.

Fuel consumption

- Fuel consumption was closely related to maximum speed, with higher maximum speeds leading to higher fuel consumption on all but one route.
- Having a lower maximum speed decreased fuel consumption by a smaller proportion than the decrease in mean speed on two of the short routes.

- However, the decrease in fuel consumption was larger than the decrease in mean speed on the long routes.

Variation within and between routes

- The routes had different characteristics and drivers encountered different challenges, leading to variation in results across routes.
- There was more variation recorded in fuel consumption and travel time on the short routes than on the long routes. On the short routes, idle time and traffic ratings were significant predictors of fuel consumption, highlighting the influence of factors other than trip maximum speed.
- The direction of travel was also an important variable.
- The significance of these factors emphasised the effect that small variations in the driver's experience on each trip had on fuel consumption and travel time. Short delays, such as those caused by a traffic light or another driver parking, could have relatively large effects on the measurements for those trips.
- Other factors, not controlled for in the project, may have also explained differences across routes. For example, the different driving styles of the various drivers used could potentially account for large variances in fuel consumption, as could the different types of terrain covered by the routes.

The information from the study recorded in the research report will inform future discussions about the costs and benefits of different speed limits.

The research authors note, however, that any such discussion must take place in the context of the well understood safety consequences of increased speed. In their report they conclude:

'Any discussion of different travel speeds and their time and fuel costs must acknowledge the well-established relationship between travel speed and safety. The relationship has two important aspects: the effect of speed on the risk of crashing and the effect of increased speed on the severity of a crash should one occur. Increasing speed increases both the risk of crashing and the severity of crashes should they occur. The relationship between speed and safety is important in both urban environments and open road environments."