

Safe ... but only if it's efficient

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This item appeared on the programme a few days ago only, after Jürgen Gerlach had to cancel his attendance and give up his presentation spot.

Hypothesis 1

The faster you go, the bigger the mess

- Since 16 November 1997
- Rural; also urban?
- Christine Jeffs:
Spot the difference (LTSA)



Probably not controversial – it's been around for 20 years; first advert Nov 1997
Not just a rural issue; also relevant in urban areas – as seen with Christine Jeffs' road safety video

<http://nzta.govt.nz/roads-and-rail/research-and-data/fascinating-facts/road-safety/>

50
km/h



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Video at <https://vimeo.com/204298049>

Follow the link to watch the video.

Speed limit; or all speeds?

A6.6 Adjusting crash costs to reflect mean speeds

Effect of speed on crash costs

Evidence indicates that injuries per crash and injury severity (defined in Appendix A6.9) increase linearly with speed. To account for this in a crash analysis, the crash costs for the do minimum and the option(s) are calculated using mean traffic speeds.

$$C_V = C_{50} + (C_{100} - C_{50})(V - 50)/50$$

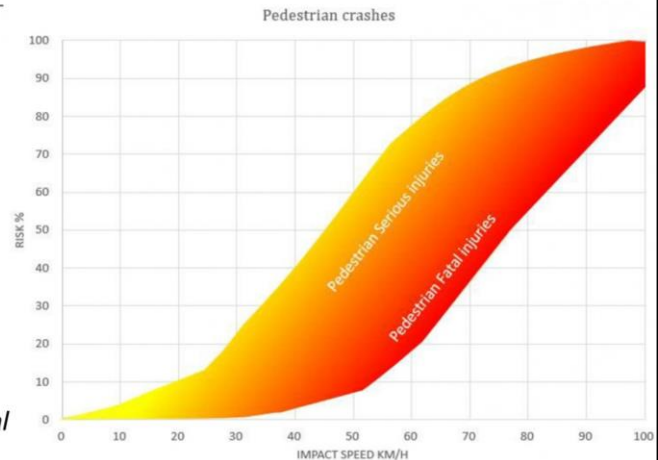
where:

C_V is the cost of crashes for the mean speed V

C_{50} is the cost of crashes in 50km/h speed limit areas

C_{100} is the cost of crashes in 100km/h speed limit area

V is the mean speed of traffic in km/h



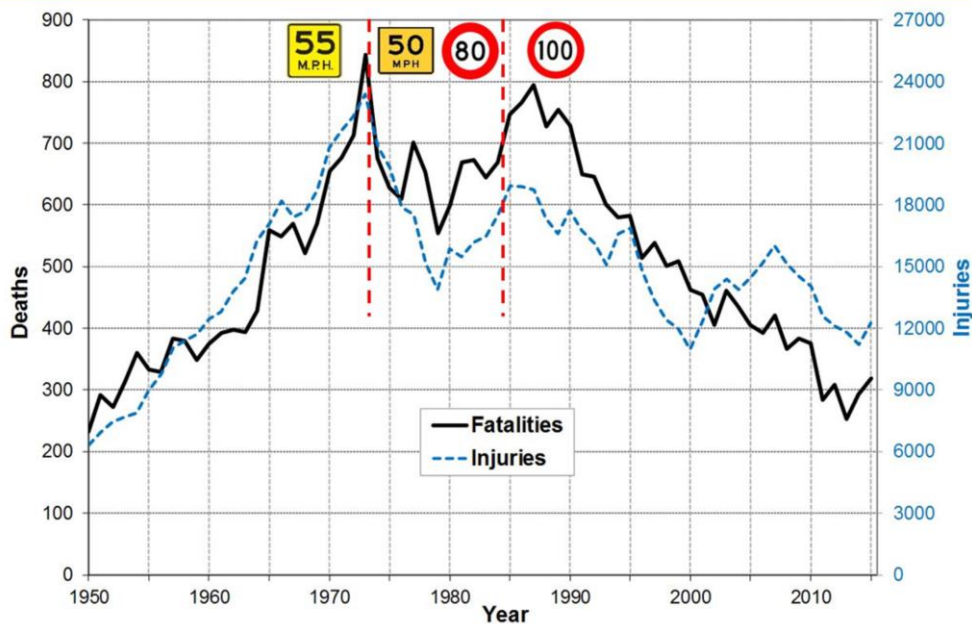
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NZTA (2016): *Economic Evaluation Manual*

Not just about sticking to the speed limit, as per the EEM guidance. The equation is for linear interpolation.

But it's not just the crash costs that increase with speed, but also the likelihood of a crash happening in the first instance. And the probability of road users suffering injury or death is shown in this diagram developed by Hamish Mackie.

Open speed limit changes in NZ



Koorey & Frith (2017): *Changing rural speed limits – learning from the past*

That speed is related to crash outcomes isn't just traffic engineering theory, as we've done field trials if you wish.

In 1973, the open speed limit was reduced from 55mph (88 km/h) to 50 mph (80 km/h), largely as a fuel conservation measure.

Then in 1985, the 80 km/h open speed limit was raised to 100 km/h, partly to reflect prevailing operating speeds.

Hypothesis 1 – recap

The faster you go, the bigger the mess

- Uncontroversial?



Are we all happy with that hypothesis?

Hypothesis 2

Our safe systems thinking is confused

- Transport systems traditionally designed for maximum capacity and mobility, and not for safety
 - Internationally true
 - NZ was certainly no exception
- Focus has changed
 - work in NZ influenced by safe systems thinking



Probably quite controversial, so bear with me while I explain

Safer Journeys 2010–2020

“We need to improve the safety of all parts of the system – roads and roadsides, speeds, vehicles, and road use – so that if one part fails, other parts will still protect the people involved.”

- Four parts to our Safe System approach
 - Safe roads and roadsides ✓
 - Safe road use ✓
 - Safe vehicles ✓
 - Safe speeds ✗



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Our current road safety strategy is Safer Journeys, and time-wise we are most of the way through.

Quote from Safer Journeys

Influencing speeds

- Various ways of influencing speeds
 - Speed limits
 - Speed environment
 - Form of intersection control
 - Design of an intersection
- When speeds go down, road safety will improve



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By way of example, the photo shows give way controlled off-set T intersections. Traffic signals are proposed here.

Balancing safety and economic efficiency

- Crux of the matter
 - Economic evaluation procedures discourage us from slowing people down
 - Travel time is valued quite highly
 - Saving crashes is a benefit
 - Delaying drivers is a dis-benefit
 - Benefits and dis-benefits may cancel each other

Benefits and costs – an example

- Fatal crash: \$4,600,000.00
- Serious injury: \$475,000.00
- Travel time per hour: \$16.27

- Assume
 - 20,000 veh/day
 - 12 sec/veh delay
 - 300 days/year



In case you don't believe me, here's an example. EEM values.

The photos represent the benefits (avoiding fatalities) and dis-benefits (delaying drivers).

How long before travel time equals crash

- Serious injury: 17.5 months (just under 1½ years)
- Fatality: 14.1 years
- In other words
 - It's more economically justifiable to have ...
 - someone killed every 14 years, or
 - someone hospitalised every 1½ years, ...
 - than to delay 20,000 drivers/day by more than 12 seconds

How long will it be before travel time dis-benefits equal crash benefits?

Moral of the story

- What's a good adjective to describe this situation?

stunning *Incomprehensible*
surprising *unintended*
wrong *Unusual* *bizarre*
difficult *weird* *odd*

Un·eth·i·cal (ʌn'ɛθɪk(ə)l)

Not morally correct

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I've tried to think of a good adjective to describe this situation.

Quite a few came to mind.

But what seemed to fit best is described in the Oxford Dictionary like so:

What does this mean?

- Road controlling authorities don't receive govt subsidy when there's a big enough delay component
 - Either projects don't get done, or
 - Project is 100% ratepayer-funded
- Example – installing traffic signals
- There are workarounds
 - Minor safety projects (was \$75k, then \$300k, soon \$1000k)



But the question remains – is there possibly something that should be fundamentally changed?

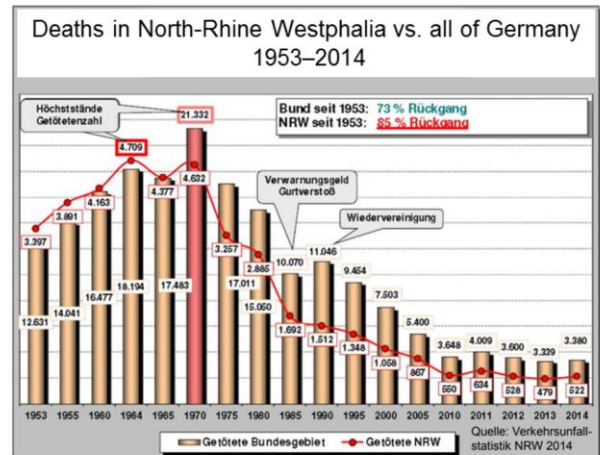
German approach to safety projects

- German approach to road safety has similarities to NZ

- Ranking process to identify projects
- Crash numbers declining since 1970

- Differences Germany / NZ

- Commission responsible for crash reduction (2 public bodies & Police)
- Commission's recommendations are binding
- Below state highway-equivalent level, **travel time is not one of the considerations**

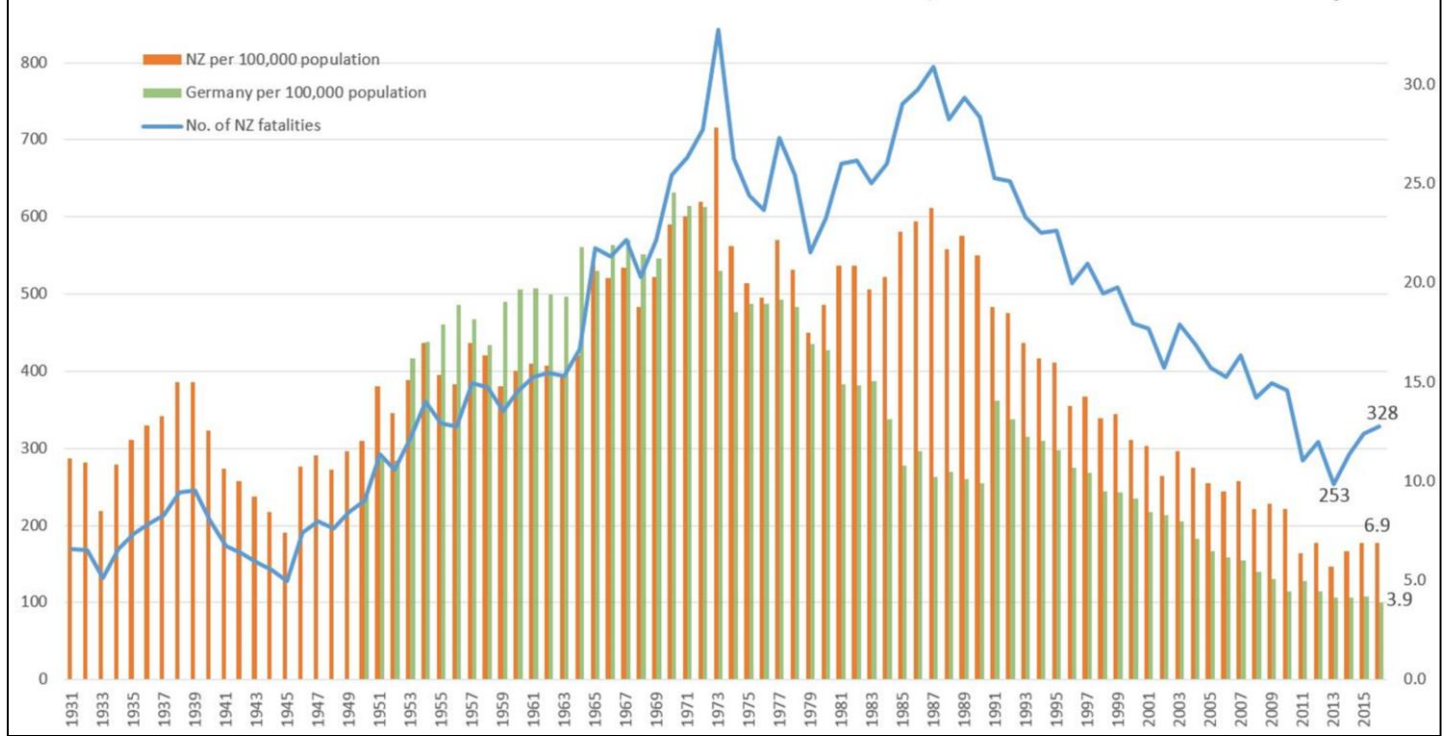


NRW population is 17.9m (2015)

“Unfallkommission” – accident commission

- 1) Straßenverkehrsbehörden für verkehrsregelnde und -lenkende Maßnahmen sowie für Maßnahmen der Verkehrsüberwachung,
- 2) Polizeibehörden für Maßnahmen der Verkehrssicherheitsberatung und Verkehrsüberwachung,
- 3) Straßenbaubehörden für straßenbauliche Maßnahmen.

Road fatalities in New Zealand compared to Germany



843 fatalities in 1973 (27.9 deaths per 100k pop.) was the NZ peak

19193 fatalities (24.6 deaths per 100k pop.) was the German peak in 1970

253 fatalities in 2013 was the NZ low (5.7)

300 fatalities in 2017 as of this morning, so are on our way to have some 340 fatalities in 2017

Economic efficiency impact on road safety

- As yet, we have failed to make inroads with speeds as part of Safer Journeys 2010–2020
- Economic evaluation procedures want us to do the opposite from what is safe (minimise delay vs. reduce speed)
- Fundamentally different approach to delay NZ vs Germany
 - Prevents us from improving safety
 - We can't both be right; chances are we've got it wrong

Hypothesis 2 – recap

Our safe systems thinking is confused

- Do you concur?



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Do you agree with me?

Hypothesis 3

Efficiency considerations embed themselves in design guidelines



I admit that's difficult to see...

Design guidelines

- Not easy to spot, but reasonably straightforward with roundabouts
- German roundabouts
 - It's like coming to a T-intersection before turning in
 - Emphasis is on minimising speed / maximising safety
 - Same in other continental European countries
 - Same principle urban and rural
- NZ roundabouts
 - Beyond some min. deflection, emphasis is on minimising delay

That design guidelines want you to do different things with different safety outcomes is not easy to see with the exception of roundabout guidance.



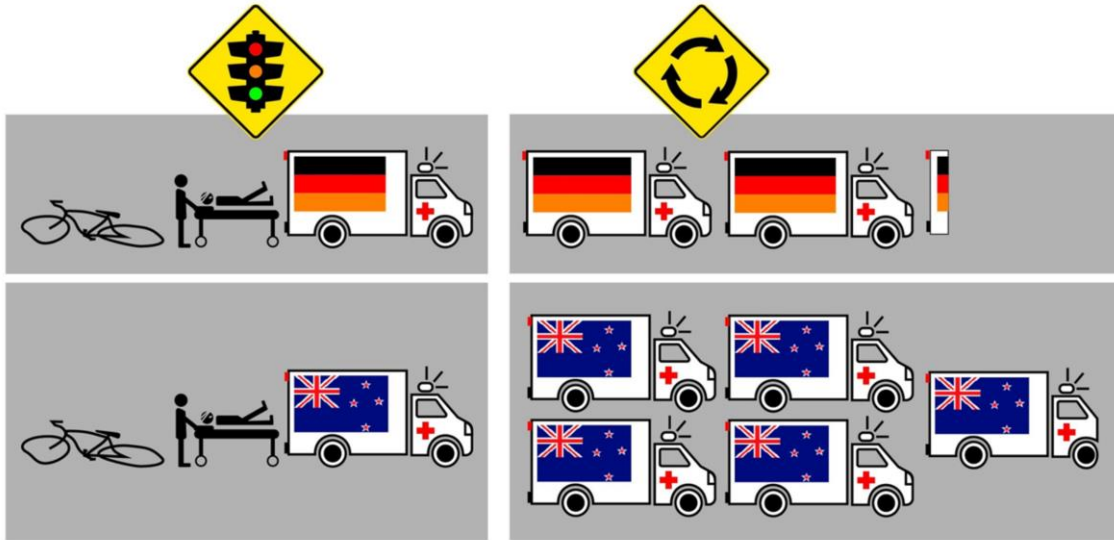
90 km/h road; four-lane median-divided. Merge to single lane and drop the speed limit prior to roundabout.

Relatively slow negotiation speed.

After the roundabout, the speed limit goes back to 90 and the road widens to dual lanes.

Follow the link to watch the video.

Crash rate comparison



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We know that the prevalence of cycling in Germany is very different to that in New Zealand, but let's take the number of injury crashes at signalised intersections to be the base case for each country.

In Germany, the number of injury crashes at roundabouts involving cyclists is 2.1 times that at traffic signals.

The New Zealand equivalent is 4.9 times as many cycle crashes at roundabouts compared with traffic signals.

Something is going on for such a difference to occur. Either we build our signalised intersections much safer than the Germans do, or German roundabout design is fundamentally safer than what we seem to be able to achieve; unfortunately, it's probably the latter.

Minimising delay

- The believe that minimising delay is achieving economic efficiency has embedded itself in Austroads
- We have a better chance of changing design philosophies in Austroads if we first agree on the underlying principles
 - The faster you go, the bigger the mess
 - Having worked with Austroads on roundabouts, suggest we write NZ roundabout design guidelines



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Minimising delay / saving people time is the unspoken objective in our roundabout guidelines. That's the underlying cause for the crash differences that I showed you on the previous slide.

If we all agree that "the faster you go, the bigger the mess", it's easier to question those philosophies that are in the guidelines.

Hypothesis 3 – recap

Efficiency considerations embed themselves in design guidelines

- Do you concur?

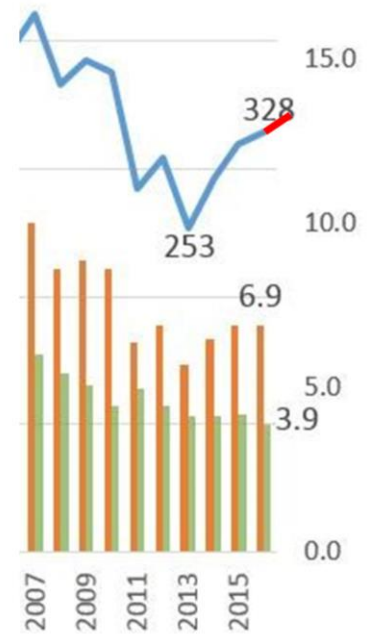


Do you also agree with me on the third hypothesis?

Recommendations

- Remove travel time consideration from road safety project evaluation
 - May exclude state highways from this
- Do this as part of focus on safe speeds as part of Safer Journeys 2010–2020

The reason why this is both important and urgent is the graph on the right



6.9 deaths per 100k population in NZ vs 3.9 in Germany

Thank you

- Questions & discussion please

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