Road Safety Improvement: Identifying a Reasonable Goal

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ABSTRACT

The 1987 Institution of Highways and Transportation publication, “Guidelines for Accident Reduction and Prevention” triggered the development and adoption of formal, comprehensive strategies to address growing concerns about road safety. The guidelines, designed to maximise the effectiveness and efficiency of road safety strategies, included setting specific targets for road safety improvement.

NZ adopted its first formal, comprehensive road safety strategy in 1991, which was revised in 1995, 2003, and 2010, the last moving away from specific targets.

Other countries adopted road safety strategies, including ‘sustainable safety’ in the Netherlands and ‘Vision Zero’ in Sweden. One principle of ‘Vision Zero’, that traffic deaths are preventable and therefore none are acceptable, has encouraged the view that they can and should be eliminated. It is argued that this is not realistic, as it ignores the fact that humans face a range of risks and do accept risk associated with activities (e.g. travel) from which they derive benefit.

This paper argues that much can be learned from risk management literature, especially in relation to the factors affecting the acceptability of risk, to help set reasonable and specific road safety goals for road safety improvement.

INTRODUCTION

As noted by Trinca et al. (1988), traffic accidents and the associated injuries are "a by-product of motorisation". They noted that from a public health viewpoint, the standard measure of 'personal safety' is the number of injuries per person. They noted that traffic planners/engineers commonly assess traffic safety using the number of injuries per vehicle or the number of injuries per veh-km; both allow for the level of motorisation, while the latter also allows for the level of vehicle use. Given the uncertainty regarding estimates of veh-km, they proposed the following 'model':

personal safety (injuries/person) = traffic safety (injuries/veh) x motorisation (veh/person)

Trinca et al. collected data for about 30 countries. Analysis of that data for developed countries (Nicholson, 2009) revealed a general trend for personal safety to get worse and traffic safety to improve as the motorisation increases from a low to a medium level, but as motorisation increases further, both personal safety and traffic safety tend to improve, due to personal safety having reached an intolerably bad level and action being taken to reduce death and injuries.

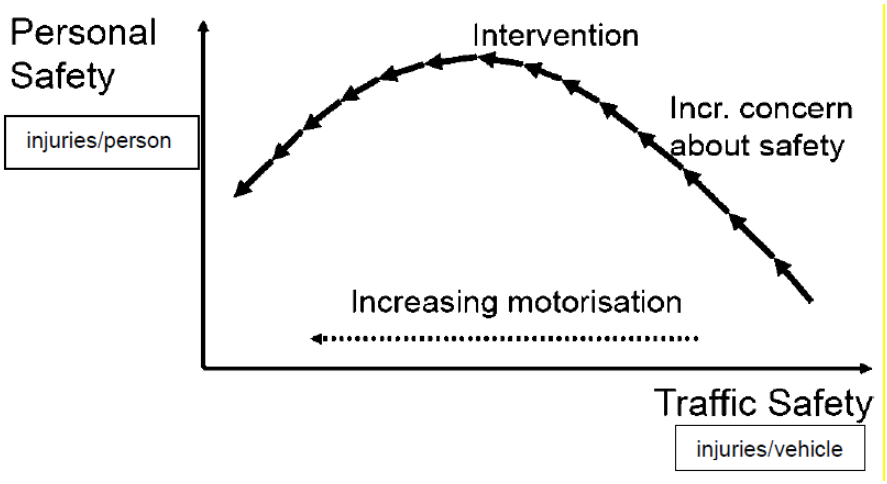

Figure 1: Personal Safety, Traffic Safety and Motorisation

Traffic accidents have for many years been considered to result from the interaction of factors relating to the user, the vehicle and the road environment, with several studies, including those by Sabey and Staughton (1975) and Treat (1980) categorising accidents according to the factors deemed to be involved in their occurrence. Activities to improve traffic safety commonly categorised according to whether they addressed user, vehicle or road environment factors (Sabey and Taylor, 1980). Improvements in both traffic safety and personal safety have been achieved by improvements in all three areas.

In NZ, deaths and injuries peaked at 843 and 23,385 respectively in 1973, before decreasing to 554 and 13903 respectively in 1979, and then increasing to 795 and 18,728 respectively in 1987. While there had been substantial efforts by some traffic planners/engineers to address the road safety problem prior to 1987, primarily via changes to the road environment, there was no concerted effort until after the publication of the Guidelines for Accident Reduction and Prevention (Institution of Highways and Transportation, 1987), arguing that a comprehensive strategy was required.

The first comprehensive strategy was adopted by the United Kingdom (Department of Transport, 1987), with comprehensive strategies being established a few years later in New Zealand (Ministry of Transport, 1991) and Australia (Road Transport Authority, 1992). Other countries (including Sweden and the Netherlands) subsequently adopted comprehensive strategies.

The Institution of Highways and Transportation (1987) stated that a comprehensive strategy should include:

- defining overall objectives and setting quantified targets;
- determining what resources are required and ensuring they are available;
- identifying what data are required and ensuring they are available;
- establishing appropriate procedures for the analysis and interpretation of data, and the development of effective remedies and a programme of works;
- implementing the programme, monitoring the effects, and checking that objectives and targets are being achieved.

The first NZ strategy (Ministry of Transport, 1991) was quite closely aligned with the above recommendations, but there has subsequently been a reduction in level of alignment with these recommendations.

The last 60 years has seen major developments in managing risk, and one of the earliest references to risk in road safety was in Chapman (1967), who proposed the following 'model':

number of collisions = number of exposures x risk

where risk is the probability of collision given an exposure has occurred. Haight (1986) argued that defining risk as a probability is not appropriate, and argued that it would be more appropriate to use the definition universally accepted and used in risk management:

risk = sum of products of probabilities and consequences.

The term 'risk' is widely used in various road safety documents in NZ, including those describing the 2003 NZ road safety strategy (Ministry of Transport, 2003) and the NZ Road Assessment Programme (NZ Automobile Association et al., 2008, 2010 and 2012), where 'collective risk' is based on the number of fatal and serious injury crashes per kilometre and 'personal risk' is based on the number of fatal and serious injury crashes per vehicle-kilometre. These and other definitions of risk used in road safety documents in NZ are not consistent with the definition universally accepted and used in risk management.

Risk management to deal with physical and commercial risks has been practised for a long time. For example, the Code of Hammurabi (c.1800 BC) specified that if a building collapsed and the owners' son was killed, then the builder's son could be executed. Risk management methods have improved considerably since development of the theory of probability in the 17th century, and especially in the last 60 years, leading to the adoption of an international standard (Standards Australia & Standards New Zealand, 2009). There are now at least 30 techniques for risk assessment (Standards Australia & Standards New Zealand, 2013). In addition, a major focus of risk management is the willingness of people to live with a risk (i.e. the acceptability or tolerability of risk) and how to engage in a dialogue with people regarding the level of risk and their willingness to live with risk.

The remainder of this paper is devoted to reviewing how road safety strategies in NZ and elsewhere have developed over time, and discussing how concepts and methods used in risk management can be applied in road safety, with a particular emphasis on identifying a reasonable goal for road safety improvement.

NZ TRANSPORT STRATEGY DEVELOPMENT

1991 Road Safety Strategy

This first road safety strategy (Ministry of Transport, 1991) had as its long-term goal or vision "a level of safety … equivalent to … the safest countries in the world".

Four major principles were specified:

- coordination of ideas, resources and activities, nationally and locally, across all sectors;
- creation of a database containing descriptions of all existing programmes, freely accessible to any agency with an interest in road safety;

- definition of target areas for road safety programmes, to achieve best results for least cost;
- plans and targets to be revised annually.

The plan defined four themes or priority areas:

- safer people ~ alcohol and speed control, restraint use, cycle helmet use, etc.;
- safer roads ~ accident reduction plans, divided highways and motorway extensions;
- safer vehicles ~ higher crashworthiness and lower aggressivity;
- safer systems ~ land use planning, crash data and research, emergency services.

Short-term goals or targets were specified for the subsequent three years:

- reduce deaths, injuries, hospitalisations and property damage accidents by 10%;
- include road safety statements in all statutory documents required of local authorities;
- develop a process for communities to share ownership of road safety objectives.

The 1991 strategy recognised that to achieve the target reductions in deaths, injuries, etc., it would be necessary to change the behaviour and the underlying attitudes of road users. The strategy set the following targets for changing behaviour:

- reduce proportion of drivers killed at excessive alcohol levels to 30%;
- reduce average and 85th-percentile rural and urban speeds by 1%;
- increase seat belt use to 95% (front seat) and 80% (back seat);
- increase child restraint use to 90%;
- increase cycle helmet use to 85%;

and the following targets for changing attitudes:

- continual hardening of attitudes toward excessive speeders and drunk drivers;
- increase acceptance of value of protective equipment;
- increase acceptance of need for responsible road user behaviour.

The strategy stated that behaviours and attitudes should be assessed via periodic surveys and/or observation studies.

1995 Road Safety Strategy

The vision of the 1995 strategy (Land Transport Safety Authority, 1995) was unchanged from that in the 1991 strategy, but two new major principles were added to the four in the 1991 strategy:

- value for money;
- monitoring and evaluation.

The new strategy also included four priority areas:

- safer people (broadened to include creation of a ‘safety culture’);
- safer vehicles;
- safer roads (broadened to include safety auditing or accident prevention);
- safety management (in place of safer systems).

Targets for deaths, injuries, hospitalisations were expressed as target numbers, while targets for behaviours remained as specific numbers or proportions.

2003 Road Safety Strategy

While the consultation document (Land Transport Safety Authority, 2000) proposed continuing with the traditional approach of considering interactions between users, vehicles and the road environment, the strategy (Ministry of Transport, 2003) moved away from the traditional approach, and emphasised engineering, education and enforcement (the three Es). This reflected the view that in terms of implementation effort and funding, more enforcement might give better value-for-money than more engineering.

The strategy retained the emphasis on having specific targets:

- targets for deaths & hospitalisations were numbers not to be exceeded;

- targets for behaviours (speed, alcohol, restraints) were numbers not to be exceeded;
- targets (not to be exceeded) were specified for pedestrian & cyclist hospitalisations.

It is worth noting that it was felt necessary to specify targets as numbers not to be exceeded (i.e. upper bounds), to emphasise that having fewer deaths, etc. would be viewed favourably.

The study considered two approaches for achieving the target for 2010:

- a greatly increased emphasis on enforcement;
- a greatly increased emphasis on engineering.

It was decided that the funding required to achieve the target via the first approach would be much less than that required via the second approach, but that the difficulty of implementation would be much greater for the former than the latter (Figure 2), and it was decided to adopt a mixed approach.

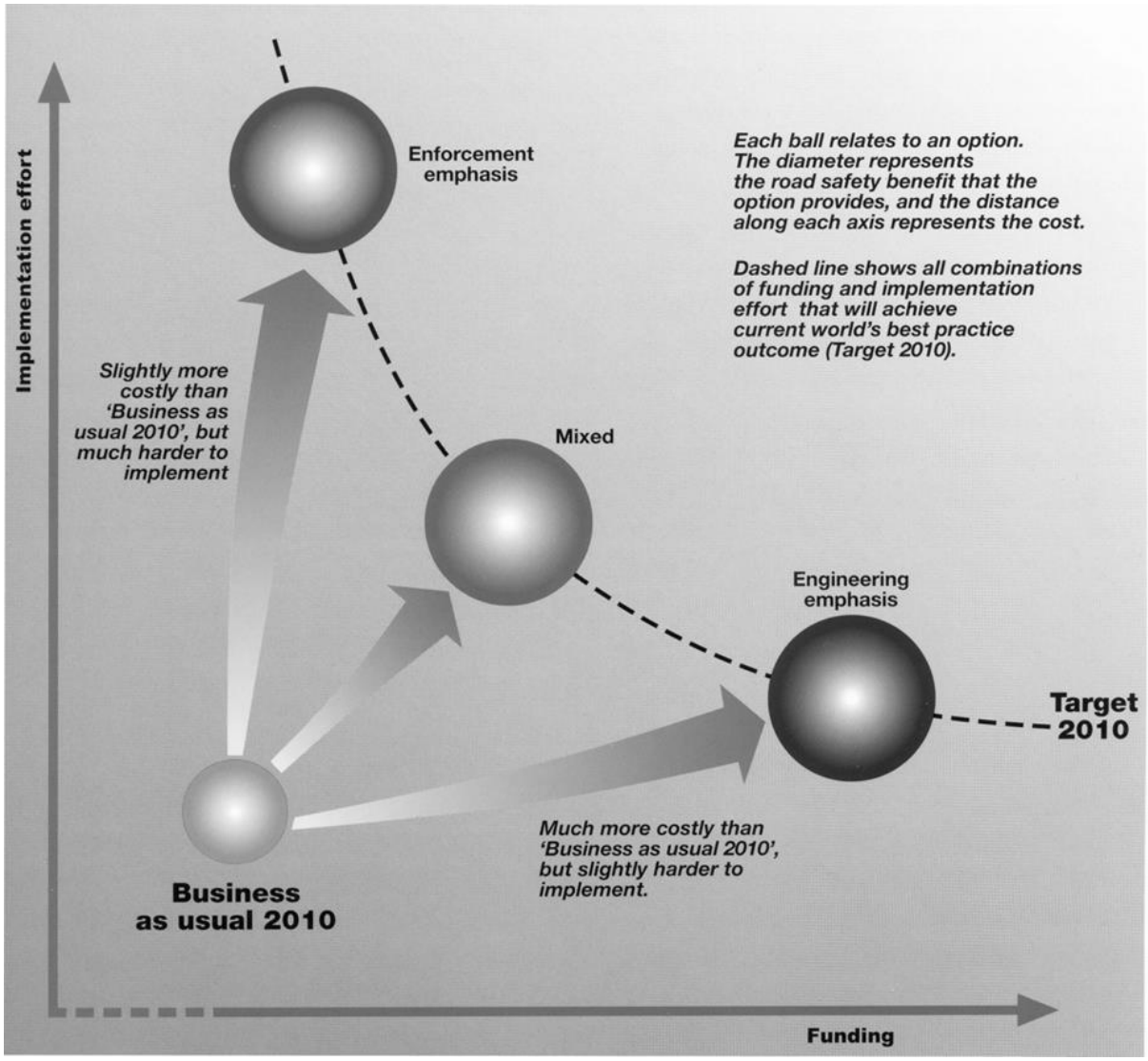

Figure 2: Engineering Versus Enforcement (Land Transport Safety Authority, 2000)

There was no target for injuries, but the strategy placed a strong emphasis on reducing the social costs of collisions and specified a target for social cost. It introduced the concepts of social cost of collisions per veh-km (termed 'risk') and the social costs of accidents per km (termed 'cost density'), and it was argued that safety improvement efforts should be focused on:

- roads with a high 'risk' (for equity reasons);
- roads with a high cost density (for economic efficiency or value for money reasons, as the benefits of accident reduction are likely to exceed the costs by the greatest margin).

An analysis of the annual social costs for roads with different daily flows revealed that:

- the cost density increases from about 0.1 $million/km at very low flow rates to about 0.5 $million/km at 50,000 veh/day (Figure 3);
- the risk decreases from about 0.10 $/veh-km at very low flow rates to about 0.03 $/veh-km at 50,000 veh/day (Figure 3).

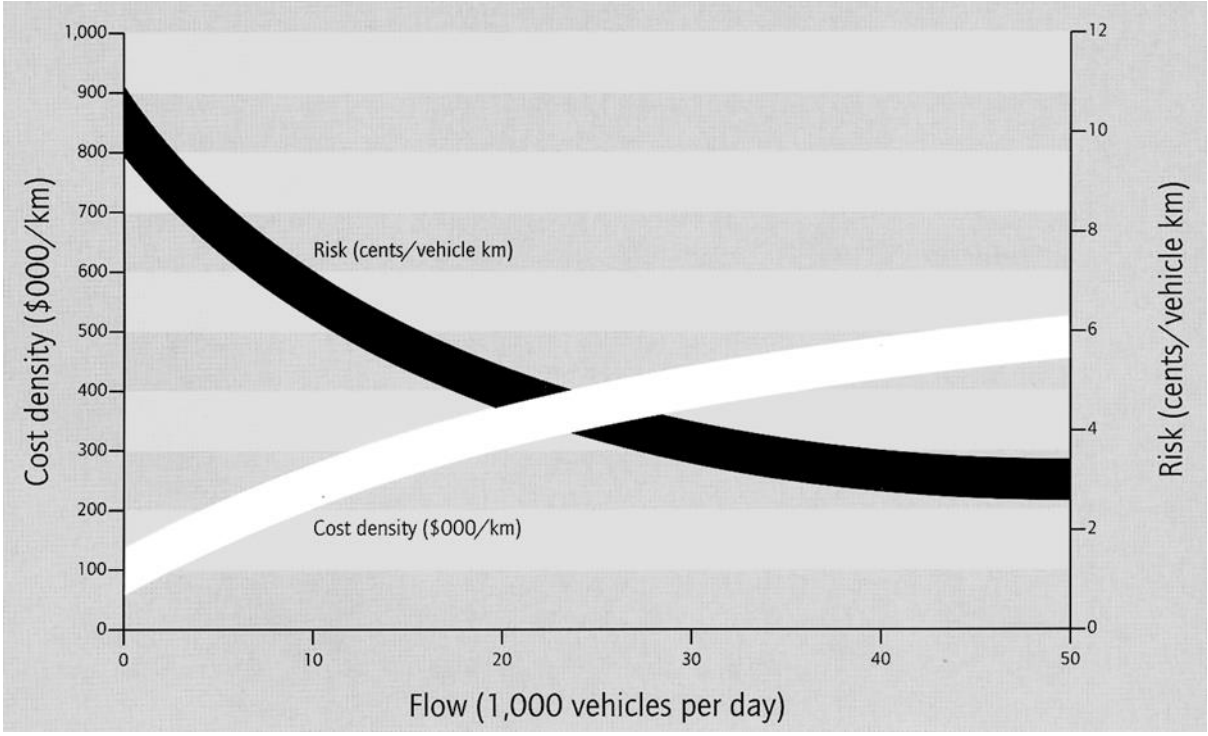

Figure 3: Cost Density and Risk versus Daily Flow (Land Transport Safety Authority, 2000)

Analysis of the data revealed that the bulk of roads, comprising 85% of the total length, contributed less than 1% to the total social cost of collisions, while a small proportion, comprising only 8% of the total length, contributed 83% to the total social cost (Table 1). Another small proportion, comprising only 6% of the total length, contributed almost all of the remaining 17%. The analysis showed very clearly that efforts to improve road safety should be focused on these two categories, especially the 'high cost density, high risk' category.

Cost Density ($/km)	*Risk ($/veh-km)*	*Length (% of total)*	*VKT (% of total)*	*Cost (% of total)*
low	low	85	46	<1
low	high	1	<1	<1
high	low	6	38	16
high	high	8	16	83

Table 1: Social Cost Contributions of Each Road Category

2010 Road Safety Strategy

This strategy (Ministry of Transport, 2010) proposed a 'safe system' approach, which "differs from traditional approaches to road safety." In reality, it is very similar to the traditional approach (i.e. addressing the interactions between users, vehicles and the road environment), unlike the 2003 strategy, which adopted an unconventional approach.

The difference between the safe 'system' approach and the traditional approach is the elevated importance attached to speed, which is given similar importance as the user, vehicle and road environment (Figure 4). In placing greater emphasis of speed, the 2010 strategy is following World Health Organisations 'systems approach to road safety' (World Health Organisation, 2009), which focused on 'safe speeds' (in place of 'safe users'), 'safe vehicles' and 'safe roads and roadsides'.

The 2010 strategy specifies the vision or long-term goal as being "a safe road system increasingly free of death and serious injury". It notes that "while we could never prevent all road crashes from happening, we could ultimately stop many of them resulting in death and serious injury".

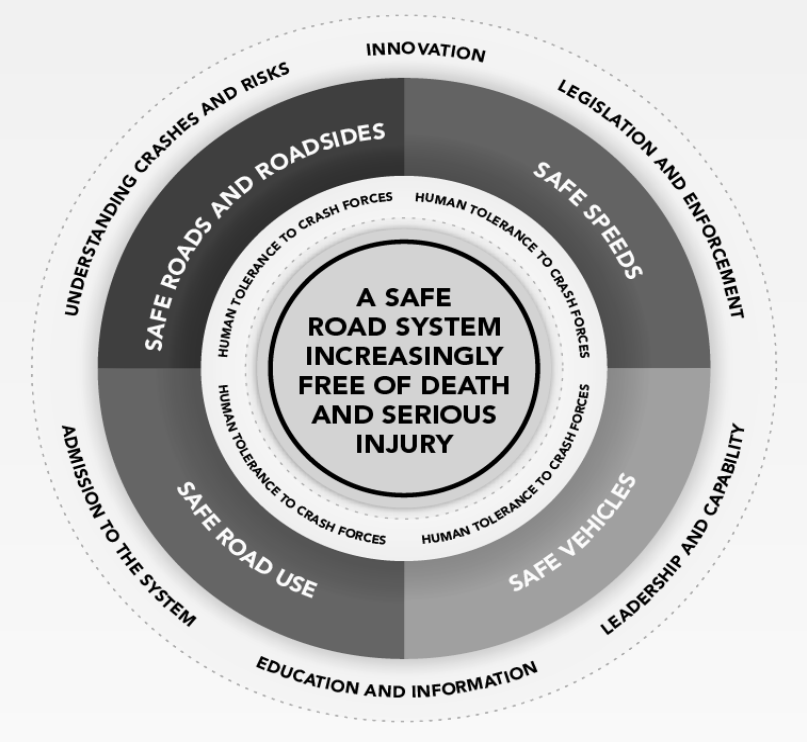

Figure 4: The 'Safe System' Approach (Ministry of Transport, 2010)

The strategy specifies three 'areas of concern' as follows:

- areas of high concern
    - reducing alcohol/drug impaired driving;
    - increasing the safety of young drivers;
    - safe roads and roadsides;
    - safe speeds;
    - increasing the safety of motorcycling.
- areas of medium concern:
    - improving the safety of the light vehicle fleet;
    - safe walking and cycling;
    - improving the safety of heavy vehicles;
    - reducing the impact of fatigue;
    - addressing distraction;
    - reducing the impact of high risk drivers.
- areas of continued and emerging focus:
    - increasing the level of restraint use;
    - increasing the safety of older drivers.

The 2010 strategy differs greatly from previous strategies, which contained specific quantitative targets, in that in the 2010 strategy, the aims are less specific and are generally of the form reduce (something undesirable), increase or achieve (something desirable), or improve (something). Hence, the 2010 strategy is not well aligned with the first recommendation of the Institution of

Highways and Transport (1987) regarding "defining overall objectives and setting quantified targets", the purpose of which is to place an onus on those responsible for road safety to perform well (i.e. achieving the targets) or have a good reason for failing to achieve the targets.

NZ Road Assessment Programme

The NZ Road Assessment Programme (NZ Automobile Association et al., 2008, 2010 and 2012) has three objectives:

- "to reduce deaths and injuries on NZ's roads by systematically assessing risk and identifying safety shortcomings that can be addressed with practical road improvement measures";
- "to have risk assessment as a key factor in strategic decisions on road improvements, crash protection and standards of road management";
- "to provide meaningful information on where the greatest levels of risk are faced, and in turn, to influence driver and rider behaviour".

The programme involves rating the NZ State Highway network according to the 'collective risk', based on the average (fatal + serious injury) crashes per km per year, and the 'personal risk', based on the average (fatal + serious injury) crashes per veh-km per year. The rationale is that road controlling authority should focus their efforts on sections of road with a high 'collective risk', and road users should exercise extra caution on sections of road with a high 'personal risk'.

Whether road users will access the information on 'personal risk', and adjust their driving behaviour accordingly, depends upon their attitude to risk (i.e. their appetite for risk). This is an important aspect of risk management, and has received much attention in the risk management literature.

ROAD SAFETY STRATEGIES IN SWEDEN AND THE NETHERLANDS

The 'sustainable safety' vision was adopted in the Netherlands in the early 1990s. It is based on five key principles (Wegman et al., 2006):

- mono-functionality: roads should have one function, either flow or exchange, with through roads having the flow function, access roads having the exchange function, and distributor roads having the exchange function at intersections and the flow function between intersections;
- homogeneity: where road users/vehicles with large mass differences use the same space, the speeds should be so low that the most vulnerable road users do not suffer severe injuries in a collision, and where there is high speed traffic, road users should be physically separated from each other as much as possible and be protected by their vehicle;
- forgivingness: road surroundings should be designed so that the consequences of errors are limited, especially where speeds are high (e.g. obstacle-free zones, crash barriers or cushions around obstacles);
- predictability: ensure consistency and continuity in road design, so road users know what to expect (i.e. are not surprised);
- state awareness: this involves road users adjusting their task capability (e.g. by driving slower) according to the competence, to cope with the task requirements, which are determined by environmental factors (e.g. traffic flows, weather conditions).

The first four principles relate primarily to the planning and design of roads and the design of vehicles, while the fifth principle relates to driver education and enforcement. The 'sustainable safety' concept is thus closely aligned with the traditional approach, based on the interactions of users, vehicles and the road environment. The 'sustainable safety' concept has had a substantial effect in the Netherlands; Weijermars and Van Schagen (2009) estimated that during the period 1998 to 2007, there was a greater than 30% reduction in deaths due to road crashes in the Netherlands.

The Swedish 'Vision Zero' concept, when it was adopted in 1997 by the Swedish Parliament, was based on four principles (Peden et al., 2004):

- ethics: human life and health are paramount and take priority over mobility and other objectives of the road traffic system;
- responsibility: providers and regulators of the road traffic system share responsibility with users;
- safety: road traffic systems should take account of human fallibility and minimize both the opportunities for errors and the harm done when they occur;
- mechanisms for change: providers and regulators must do their utmost to guarantee the safety of all citizens and must cooperate with road users, and all three must be ready to change to achieve safety.

Other principles were subsequently added, to ensure that motorists fully understood the purpose of the 'Vision Zero' concept (Johansson, 2009):

- traffic deaths and injuries are preventable; therefore, none are acceptable;
- people will make mistakes and the transport system should be designed so those mistakes are not fatal;
- safety is the primary consideration in transport decision-making;
- safety problems must be addressed holistically.

It can be seen that there are similarities between the 'Vision Zero' and 'sustainable safety' concepts (e.g. both emphasise decreasing deaths and serious injuries, via changes in road environment design and vehicle design, rather than decreasing crashes. A major point of difference is that the Swedish 'Vision Zero' concept, unlike the 'sustainable safety' concept, is based on the premise that human life and health are non-negotiable, and that it is not appropriate to trade-off benefits associated with motorization and mobility against disbenefits associated with traffic deaths and serious injuries (Tingvall, 1997). Tingvall and Haworth (1999) even state that "Vision Zero is an expression of the ethical imperative that it can never be ethically acceptable that people are killed or seriously injured when moving within the road transport system."

Some people interpret the term 'Vision Zero' very literally, and argue that the goal of road safety strategies should be the complete elimination of deaths and serious (or enduring) injuries resulting from road crashes. For instance, the agenda for a recent conference (National Highway Traffic Safety Administration, 2016) states that the purpose of the conference is "to lay out countermeasures and behavior-change strategies that will cut traffic fatalities and put the United States on the road to zero traffic fatalities. McCarthy (2016), refers to a new initiative of the National Highway Traffic Safety Administration as an initiative "aimed at ending all fatalities on US roads in the next 30 years". Here in NZ, the Brake Aotearoa New Zealand have called for "Government and Local Authorities to adopt a 'Vision Zero' approach to road safety – aiming for zero road deaths and injuries" and "that life and health can never be exchanged for other benefits within society" (Brake Aotearoa New Zealand, 2016). The Cycling Action Network has also recently called for 'Vision Zero' to be adopted in NZ (Cycling Action Network, 2016), and have adopted the slogan "Vision Zero – No More Traffic Deaths" (Figure 5).

Such a literal interpretation of the term 'Vision Zero' is encouraged by the statement "Vision Zero is the Swedish approach to road safety thinking … it can be summarized in one sentence: no loss of life is acceptable" (Vision Zero Initiative, 2016). However, Allsop (2016) has suggested that the widespread talk of "eliminating death and lasting injury from road use" could distract from the "more imminent challenge … to keep on reducing them". Allsop suggests that long term goals "should reflect realistic expectations" and even suggests that "it seems unethical to offer decision-makers or the public the prospect of such elimination before we know how to deliver it affordably and in ways acceptable to the public, or indeed whether it can be delivered at all, even through autonomous vehicles".

Figure 5: Cycling Action Network Slogan (Cycling Action Network, 2016)

Allsop notes the ratio of the probability of death during travel on roads (per hour of exposure) to the probability of death during all other everyday activities (per hour of exposure) is much greater than one. He also notes that the ratio (i.e. the 'relative risk of road travel') has been fairly steadily declining in the UK (Figure 6), i.e. travelling on roads has become less dangerous compared with the rest of everyday life. He also suggests that as the ratio approaches one, "people will look harder at the cost and intrusiveness of further reducing death and injury on the roads" and "road safety will be competing for resources and public attention … with other areas of preventable death and injury".

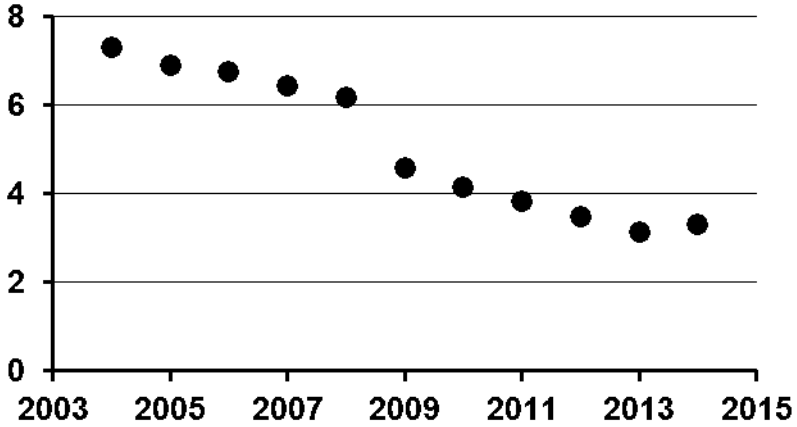

Figure 5. Relative Risk of Road Travel in the UK (Allsop, 2016)

Allsop also stated that "Vision Zero is based on the misconception that it cannot be acceptable to trade life or limb for the benefits of road transport – at odds with the everyday reality that individuals and society do accept just this trade-off". It is not surprising that his comments have provoked a strong response from advocates of Vision Zero (Local Transport Today, 2016).

RISK MANAGEMENT AND ROAD SAFETY

Many people treat "acceptable risk" and "tolerable risk" as identical, but the UK Health and Safety Executive (HSE) has argued that they are not identical, saying "tolerable does not mean acceptable … (tolerable) refers to a willingness by society as a whole to live with a risk so as to secure certain benefits in the confidence that the risk is one that is worth taking and that it is

properly controlled" (Health and Safety Executive, 2001). A risk might not be acceptable to an individual, in which case that individual will not take that risk, but it may be acceptable to a large proportion of people and be tolerated by society. The tolerability of risk to society is likely to be affected by the acceptability of risk to individuals; the former is likely to decline as the latter declines.

The UK Health and Safety Commission (1991) classified risks according to the annual frequency (F) of events involving N or more deaths, as follows:

- risk is negligible if F < (0.0001/N);
- risk is not negligible if (0.0001/N) < F < (0.01/N) and should be reduced 'as low as reasonably practicable' (ALARP);
- risk is possibly unjustifiable and should be scrutinised if (0.01/N) < F < (0.1/N);
- risk is intolerable if (0.1/N) < F.

These limits are shown in Figure 6 (note the logarithmic scales).

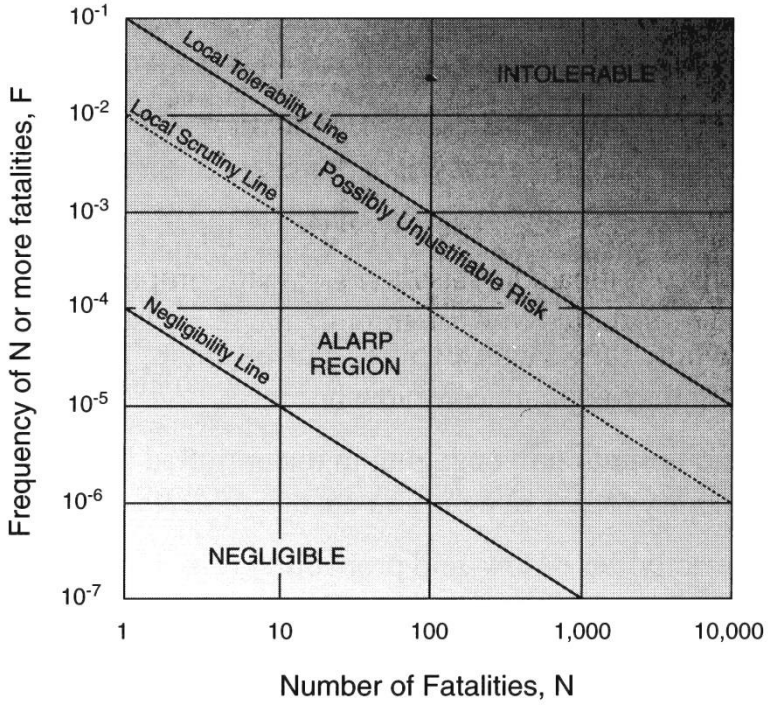

Figure 6: The Health and Safety Commission (1991) Risk Classification Method

All activities can be assessed in terms of their FN curves (or profiles), showing the annual frequency (F) of events involving N or more deaths, and the results of an assessment (Evans, 1994) for road, rail and air travel in the UK, are shown in Figure 7. It can be seen that road travel has a different profile (very many events involving a few deaths and zero events involving more than 10 deaths) to both rail and air (many events involving a few deaths and a few events involving 10-150 deaths). It should be noted that all three FN curves (or profiles) lie well outside the 'tolerability threshold'. It is not surprising that concern about the frequency of deaths and injuries associated with travel has increased substantially in recent decades, as a result of a decrease in the acceptability of risk to individuals and the tolerability of risk to society.

Interest in the acceptability of risk is not new, with Lowrance (1976) identifying 10 factors that affect the acceptability of risk:

- risk assumed voluntarily or borne involuntarily;
- effect delayed or immediate;
- alternatives available or unavailable;
- risk known or unknown;
- exposure essential or non-essential;

- encountered occupationally or non-occupationally;
- hazard is common or uncommon ('dread');
- affects average people or sensitive people;
- effect is reversible or irreversible;
- risk due to intended use or misuse.

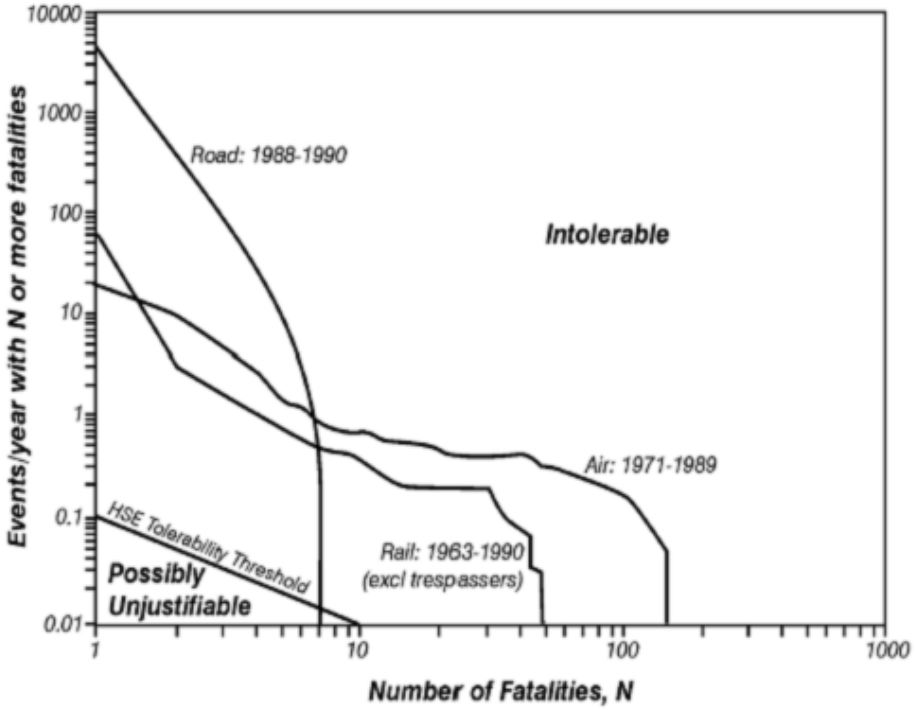

Figure 7: FN Curves for Road, Rail and Air Travel in the UK

More recently, Sandman (1993) identified 12 factors that increased the acceptability of risk:

- voluntary rather than involuntary;
- natural rather than industrial (man-made);
- familiar rather than 'exotic';
- non-memorable rather than memorable (subject to dramatic media coverage);
- not dreaded (e.g. asthma) rather than dreaded (e.g. cancer);
- chronic (e.g. car crashes) rather than catastrophic (e.g. plane crashes);
- risk known rather than unknown;
- risk controlled by person rather than someone else;
- risk is distributed fairly rather than unfairly;
- risk not morally relevant rather than morally relevant;
- risk assessed by trusted source rather than untrusted source;
- risk assessment done transparently rather than non-transparently (secretively).

There is considerable similarity between the two sets of factors.

Several of the above factors can easily be related to the acceptability of road crash risks. For instance, driving a car or riding a cycle is voluntary for many road users, while most road users are familiar with the hazards on the roads along which they drive or ride.

It should be noted that the eighth of Sandman's factors (whether the risk is controlled by the person rather than someone else) is relevant when considering the risk for cyclists and pedestrians when exposed to collisions with motor vehicles. The pedestrians and cyclists, but not the occupants of motor vehicles, are vulnerable to death or injury. To address this issue, it would be necessary to collect and analyse data for each mode of travel (motor vehicle, cycle, foot) separately, rather than in an aggregate form.

The last two factors on Sandman's list are also worth noting. It is common practice for road safety strategies to be developed by Government officials, sometimes with the aid of selected experts and/or interest groups. Given that the strategies invariably involve achieving a change in the behaviour of all types of road user, there might well be a greater acceptance and 'buy-in' by all types of road user if the development of the strategies involved obtaining the views of a broad and representative section of the community.

While lists of factors, such as those produced by Lowrance and Sandman, are useful, they do not provide information on the relative importance of the factors. Such information might well be helpful in developing a road safety strategy that receives greater acceptance and 'buy-in' by road users.

It is interesting that whether the risk is distributed fairly or unfairly is a factor in risk acceptability. Defining what is fair is fraught with difficulties, but estimating 'personal risk' (as done in the NZ Road Assessment Programme) is a step towards addressing the issue. If road users in one area learn that the levels of 'personal risk' for the roads in their area are much greater than in other areas, it might prompt them to question the fairness of the situation.

CONCLUSIONS

There needs to be a 'tightening-up' in the use of the term 'risk' in relation to road safety. The range of definitions in use, and the discrepancy between those definitions and that universally accepted in the area of risk management, is conducive to miscommunications, misunderstandings and confusion.

There appears to be substantial scope for adapting and applying risk management concepts and methods in the area of road safety. An evaluation of the numerous risk assessment techniques used in risk management, in terms of their usefulness in road safety, would also be worthwhile.

The current NZ road safety strategy, unlike its predecessors, does not follow the recommendation in the "Guidelines for Accident Reduction and Prevention" that strategies include setting quantified targets. Having such targets would place an onus on those responsible for road safety to perform well and achieve the targets, or have a good reason for failing to achieve the targets, and having quantified targets should be reinstated.

A recent report (OECD, 2016) has argued strongly for having quantified targets, stating:

> "To counter criticism of a strategic vision like "zero road fatalities" as being unrealistic, it must be supported by concrete operational targets. These serve as milestone markers while managing the journey to a Safe System. The short-term targets must be backed by a package of interventions based on evidence for the results they can be expected to produce."

It is important that targets be realistic and reasonable. If they are too ambitious or are unrealistic, those responsible for achieving them will be less likely to make the effort required to achieve them than if they were realistic and reasonable (May, 1997). Excessively ambitious targets are a disincentive and are counter-productive. In addition, the public credibility of a road safety strategy and public support can be undermined if it includes excessively ambitious targets (OECD, 2016).

In setting targets, it would be sensible to recognise that the occurrence of crashes is somewhat random, and care should be taken in interpreting fluctuations in counts of deaths and injuries. This is especially important when dealing with counts for short periods, but is also important when considering annual counts. Hence, specifying target ranges would be sensible.

The term 'Vision Zero' encourages unrealistic expectations on the part of some people, and it would be unfortunate if this led to the rejection of the whole concept, which does have a number of good features that have led to substantial improvements in road safety.

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