WILL A 4WD STRATEGY WORK IN THE SHIFTING SANDS OF POLICY ?

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Introduction

In several countries there is a concern that road safety progress has stalled. The absolute number of deaths has been (more or less) static for several years while death rates have been declining only marginally. At the same time many countries have been developing new, national, road safety strategies with which to enter the 21st Century.

This paper explores the options for a way forward by examining a sample of such strategies. The strategies considered were those of Australia, New Zealand, the United Kingdom and Sweden. (1 –4)

The critique which follows is of the collective, not of any particular national strategy. Without exception, the strategies, while they purport to plan for the decade, address only today's problems. Secondly, with rare exceptions, the strategies are not truly strategic.

The need for a guiding vision

In most motorised nations road safety is managed as part of the overall road transport system. Such systems have multiple objectives, some of which are, at least in part, incompatible. Thus difficult trade-off decisions are required. A guiding vision is essential to provide both leadership and consistency in the decision making process.

Austroads, for example, lists a number of outcome areas in its current strategic plan (5). It wants to integrate road, rail, air and sea transport. It wants to improve road safety. It wants to facilitate economic development, at both national and regional levels. And it wants each of equity, accessibility, mobility and sustainability in the Australian road transport system.

To make matters more complex, the social and policy context in which trade-off decisions are being made, is rapidly changing. Five key areas of change - the "shifting sands" of the title - are briefly discussed:

1. The domestic freight task will grow faster than the economy. Truck traffic will increase by 70% by 2015 while car traffic increases by only 30% (6). This shift in vehicle mix is related to ongoing changes in the production and distribution chain and involves commercial traffic at all levels, from courier vans to road trains. A major safety impact will be the increased frequency of collisions between vehicles of markedly different masses, with a resultant increase in injury frequency and severity to occupants of the smaller, lighter vehicles. There is no mention in the Australian national road safety strategy of this accelerating trend (there is a section on vehicle compatibility but it does not mention trucks). There is an urgent need to model the expected shift in vehicle mix, to forecast the likely injury impacts and to develop ways of managing these impacts.

2. The BTE also estimates that urban congestion costs will double if not triple by 2015 (6). This must result in both mobility and environmental issues becoming more cogent factors in future trade-off decision making. These matters are not currently factored into road safety strategies. There is a need to examine the interfaces and seek win–win strategic options if safety is not to get swamped in future trade offs.

3. Over the last 50 years Australia's major cities have transformed from the "core and spoke" form that was suitable for public transport, to sprawling low density. The recent appearance of inner city apartments does not (at least not yet) constitute a sea change. What increase in public transport patronage, for what kind of trips, is needed to achieve a meaningful safety benefit? If public transport usage in Melbourne were to double over the next few years, car traffic would still account for almost 90% of urban passenger trips made (6). How much does urban density have to increase by to have a meaningful impact on road travel demand? There are no systematic answers to these questions, yet increased public transport use and urban renewal (via increased density) continue to be put forward as if they were panaceas to the problems of road safety, congestion, pollution, and so on. Unless we start to get answers we cannot make rational decisions about resourcing such strategies or the time frames upon which meaningful effects will be achieved.

4. The median age of the population will increase from its current 34 to 40 by 2020 (6). This forecast has generated substantial research concerning the possible safety impacts and how they might be addressed. There will be key trade off decisions to be taken as the loss of mobility for the elderly can have significant health (and health cost) impacts while the elevated crash risk of the elderly is equally well established (7).

5. Finally, industrial globalisation has two ongoing impacts. Harmonisation in standards will slow down vehicle safety innovations. Such innovations are fundamental not only to improving both primary and secondary vehicle safety - areas of major past advance - but to confronting the rapid worsening of the vehicle mass incompatibility issue. Secondly, because Australia is such a large country with such a small population, transport forms a disproportionate part of production and distribution costs and there will continue to be enormous cost pressures on our transport sector. This will impact on the funds available to address all our problems and make trade-offs even tougher.

These are just a few of the grains in the shifting sands of policy. They are usually mentioned in passing in the introduction to a national strategy and then ignored, or discussed only superficially. For example, the current U.K. strategy states: "As well as reducing car dependency, congestion and local air pollution, walking and cycling can improve people's health and fitness" (3). Unquestionably true, but how much walking is needed to reduce congestion by a meaningful amount and how much cycling is needed to reduce air pollution by a meaningful amount? If we don't know we cannot decide whether or not to promote such changes, let alone decide what level of resource might be required and over what time frame?

The factors in the trade-off equations are going to change markedly over the next few years. We need a vision to drive the decision making process. There were many targets and goals in the national road safety strategies reviewed but only one vision of the form sought. The Swedish National Road Administration states that the road system is to be designed so that no one is killed or seriously injured in traffic (4). In effect, this removes death and catastrophic injury from the trade-off decision equation. It does not say that road safety is paramount, it says eliminating death is paramount and this objective overrides other objectives of the road transport system. So trade-offs would then be made between reductions in **non-fatal crashes**, gains in mobility, gains in sustainability, and so on.

In addition to driving the decision process this form of vision also drives accountability, an element strikingly absent from most of the national strategies examined. The Swedish government explicitly declared that it accepts responsibility for designing and operating a zero death road transport system.

The Australian philosophy appears very different, assigning ultimate responsibility to the individual road user. Ten years ago Australia's first national strategy said "Road safety cannot be delivered, it must be practised by the whole community" (8). The current strategy states, when listing the reasons for the gains that have been made over the past decade or so: "**Most importantly**, people have heeded the call to drive more responsibly" (1, emphasis added). It is perhaps not surprising, then, that Australian strategies do not include safety outcome targets at the individual institutional level.

The need for strategic thinking

The U.K. plan is the least strategic of those examined, at least in its published form (3). The document has ten themes, each with its own chapter. Some themes address a constituency, for example the chapter "Pedestrians, Cyclists and Horseriders"; some address a traditional countermeasure area, for example the training and testing of drivers and riders; some address a traditional problem area as in the chapter "Drink Drugs and Drowsiness". Each chapter is "stand alone", with little discussion of the complex interactions with the issues in other chapters. For example, in the chapter on better enforcement there is no discussion of the need to support enforcement with public education, which Australian research (9) has shown to be fundamental (along with enforcement intensity which is not discussed in depth). Within each theme chapter there is a list of measures that might be considered but with few estimates of potential outcomes or costs.

This is the type of strategy labelled "4WD" in the title of this paper. It has all wheels spinning. Every lobby group can find something that will satisfy them. While it may be politically necessary to package the public document in this way, it provides little leadership or direction and mostly reinforces the status quo.

In addition to a vision to guide the trade off decision making process, the basic strategies need to be made explicit in order to guide countermeasure selection. The Swedish vision is to eliminate death and catastrophic injury. The primary guiding strategy is to minimise energy transfer in crashes. The measures under this strategy include:

- reducing impact speeds by lower speed limits, by engineering measures to constrain travel speeds, by enforcement and by education
- minimising the opportunities for high energy transfer impacts by road design and access control measures to decrease the probability for head on and high speed side impact crashes
- using roadside barriers and other energy absorbing devices to substitute impacts with rigid objects with impacts with more forgiving structures
- improving the secondary safety of vehicles
- and so on

This overarching strategy dictates priority setting and resource allocation. Note that it does not lead only to engineering measures, it simply focuses countermeasure selection in a particular way. Plenty of Swedish countermeasures relate to drink driving legislation, to enforcement, to public education, to education in schools, and so on but in a form which fits the overarching strategy of seeking to reduce energy transfer at impact.

Does Australia have an overarching strategy? Yes, an implicit one based on behaviour change through legislation and its enforcement. Australia mandates self protective behaviour as well as "outlawing" high risk behaviour; leading the world, for example, with legislation for seat belt wearing, for motorcyclist and bicyclist helmet wearing, in random breath testing, graduated licensing, and so on. It is less an overarching strategy than a predominant one. Unlike the Swedes, however, this overarching/predominant strategy was adopted (evolved?) by default. Australia actually has a mixed strategic model, the less dominant strategies being based upon improved vehicle design and road and roadside improvements. There is some tension among the proponents of the strategic options and, unlike in Sweden, no consensus on a direction for the integration of countermeasure programs.

The predominant strategy of legislation and enforcement has proved to be an effective strategy in our culture and the Australian evidence base relating to legislation, enforcement practices and their impacts is second to none. Nonetheless, an explicit examination of the future potential of retaining this as the predominant strategy is urgently needed.

The New Zealand draft strategy is openly debating what its overarching strategy should be (2). It contrasts the legislation and enforcement emphasis with a roading emphasis. The former is the least costly in dollar terms while the latter is the most costly. While cost is a key factor in program decisions, the choice of an overarching strategy is an essentially political decision. Both the US and the U.K. are philosophically opposed to behavior change by decree, thereby explaining why the "Better Enforcement" component of the U.K. strategy places traffic enforcement in the wider crime management context and largely ignores the (now compelling) literature on the factors that make enforcement a highly cost-effective road safety measure. Australia is not philosophically opposed, indeed it is highly consistent with the official assignment of ultimate responsibility to the individual road user. What is missing from all but the Swedish strategy is an explicit analysis of strategic options. There is discussion of countermeasure options but countermeasure choice should follow strategic choice.

Setting and achieving "road toll" targets

The targets one finds have mostly been set politically. The proposed New Zealand target is to match current world best practice by 2010, about 6 deaths per100,000 population (2). A curious target at first blush. New Zealand is aiming to catch up, in ten years time, with where the best in the world is right now. Setting such a target only makes sense if you assume the best are not going to get much better! Australia has targetted a 40% reduction in deaths per 100,000 population by 2010, implying a target death rate of about 5.7 (1), in effect the same magnitude of target as New Zealand. The U.K. has gone for a 40% reduction in absolute deaths and serious injuries (3), probably choosing an absolute, rather than a rate, reduction because it is already the leader in Europe or perhaps because the U.K. government recognises that the public understands absolute numbers.

How valid is the selection of an international "best practice" target, particularly when it is set in terms of deaths per head of population? The number of deaths per100,000 population in any country is intimately related to the level of motorisation. Using this measure, India is safer than the U.K.! (10). This accurate reflection of the relative risk of dying in a traffic crash ignores the vast difference in access to personal road transport.

Table 1 shows the importance of motorisation differences, even among countries all considered as motorised. The U.S.A. with 78 motor vehicles per 100 population is far and away the most motorised nation and it has the highest death rate per 100,000 population. Sweden and the U.K. are far less motorised and have very comparable death rates (currently considered as the best in the world). Australia and New Zealand are in the middle on both measures; here alone the conclusion of a real difference in safety record is valid. If one examines only those countries with motorisation rates in the same bracket as Australia, then Australia already ranks very highly. One has to ask whether, given Australia's level of motorisation, a rate of less than six deaths per 100,000 population is achievable within the time frame. For New Zealand the target is even more demanding.

Table 1

Is 'best practice' valid?

	1999	
	Deaths per 100,000 Population	**Motor vehicles per 100 Population**
U.S.A.	15.3	78
N.Z.	13.3	66
Australia	9.3	65
Sweden	6.6	52
U.K.	6.0	47

In addition to differences in motorisation level, there are vital differences in the nature of the road safety issues. In India, only around ten per cent of road users killed are (four wheel) vehicle occupants, in the U.K. the figure is less than half while, in Australia, it is closer to 70% (11). Immediately, the potential of the different strategies stand in marked contrast.

The current, common method of choosing national targets, from superficial international comparisons, is therefore flawed. Targets have to be realistic if they are to be assigned to institutions in a performance based process. The preferred approach is to set targets "bottom up", aggregated from specific targets set for specific problems.

The draft New Zealand strategy discusses the need to set targets for each local government region, targets for specific road user groups such as motorcyclists, and targets for specific problems such as drink driving. If the specific targets are chosen on the basis of available evidence of potential effectiveness of the measures that would follow from the adoption of a particular mix of strategies, then a realistic aggregate target can be set with the component parts tied to the accountable institutions. For example a road authority might be set a target to reduce the number of fatalities resulting from collisions with roadside objects by x% ; the Police might be set a target to reduce the number of fatalities in urban speed related crashes by x%; and so on. This kind of institutional accountability for specific safety outcomes does not appear in any of the national road safety strategies examined.

Selecting countermeasures and countermeasure programs

One of the most promising developments in the recent round of national planning for road safety is the frequent use of the literature on countermeasure evaluations to estimate the likely effectiveness of various measures. For example, the Australian strategy, which is seeking a 40% reduction in deaths per 100,000 population, estimates that 19% of it will come from road improvements, 10% from vehicle improvements, 9% from behaviour change, and 2% from ITS (1). This gives important, albeit macro, guidance as to relative priorities.

Implied in the strategies, however, is a dependence, for the final selection, on the benefit/cost approach. The Australian strategy states: "all safety measures that can be justified in terms of overall community benefits should be implemented" (1). The New Zealand draft strategy points out that the Land Transport Safety Authority is required by law to promote only activities that produce a net benefit to society (2). So the benefit/cost ratio is, in effect, mandated in New Zealand. It is important to understand the ramifications of this dependence. Fortunately, recent work for the Swedish government provides a valuable insight.

The Swedish government asked the Institute for Transport Economics in Norway to evaluate overall benefits and costs of three possible strategic packages that could be implemented over the decade to 2010 (12):

- The first was based strictly upon the benefit/cost ratio. What happens if we put in place all known measures where the evidence in the literature is that the aggregate marginal benefits (safety, mobility and environment) over the ten year period are predicted to be greater than the aggregate marginal costs?

- Secondly, what happens if you implement the Vision Zero principle of minimising energy transfer at impact, particularly through speed control and road design modifications?

- The third package was the same as the first, but where every measure was to be implemented with the sort of intensity and resource that would be needed to get the maximum potential effect implied in the evaluation literature.

Table 2 contains the results.

Table 2 (from Ref. 12)

Million SEK: 10 years 2002-2011

	Strict c:b	Vision Zero	Max. Potentials
Benefits			
- accident cost savings	81,890	140,542	190,011
- travel time savings	(2,925)	(142,284)	(109,237)
- veh. op. cost savings	2,028	(2,493)	(5,961)
- env. cost savings	4,137	4,129	1,182
- induc. traffic savings	366	(7,854)	(6,025)
	85,496	**(7,960)**	**69,970**
Costs	**68,436**	**384,514**	**667,992**
Benefit/cost ratio	**1.25**	**(0.02)**	**0.10**

The strict benefit/cost program was estimated to lead to an overall benefit/cost ratio of 1.25, with major benefits in accident cost reductions, some added cost in increased travel time, some savings in vehicle operating costs, some environmental benefits and some reduction in induced traffic. However, the Vision Zero program, on a conventional benefit/cost basis was estimated to be negative. Nearly twice the savings in accident costs compared with the strict benefit/cost process of countermeasure selection, but with 50 times the added travel time costs, resulting from the constraining of traffic speeds There was estimated also to be some increase in vehicle operating costs, positive impacts on the environment and negative impacts on induced traffic, resulting, overall, in a negative cost/benefit ratio. Finally, the "maximum potentials" program was estimated to provide larger accident reduction benefits than even the Vision Zero program but also with large increases in travel time, substantial increases in vehicle operating costs, smaller environmental benefits and quite substantial disbenefits in induced traffic. The benefit/cost ratio was estimated at 0.10.

This is compelling evidence that further major gains in safety are available if nations are prepared to pay the mobility cost. The Swedish vision asserts that the price must be paid, that is the reduction of death/catastrophic injury over-rides other considerations. In the other strategies examined the governments would presumably accept the much lower reductions in death in order to avoid the "loss" of mobility. However, this conclusion is tentative because the strategies do not explicity address trade-off decision making.

It is important they begin to do so. Moreover, the planners must anticipate the changing salience of the elements in the trade-off decision equations over the next decade. Congestion is going to get worse in Australia. Truck traffic is going to increase dramatically relative to car traffic making vehicle incompatibility more critical in crash outcomes. And so on. We need also to make explicit our decision making rules; if we wish to continue with the default benefit/cost ratio we need explicitly to say so and to enumerate the consequences.

First, however, it is necessary to ask whether we are measuring mobility, accessibility, sustainability, etc in meaningful, consistent and comparable ways. Mobility, for example, is typically measured in terms of travel time, especially for freight and other commercial operators (sales staff, couriers, etc). With large numbers of vehicles and operators frequently losing very small amounts of time, the aggregate cost quickly mounts and dominates the benefit/cost ratio. However, to what extent are these changes really impacting the achievement of the economic and regional development goals? We need not only to develop comparable measures to aid the decision making process but we need methods to assess the practical impacts on the various objectives.

Conclusion

Strategic planning for road safety, particularly at national level, is essential to provide governments, industry, institutions and the community with a sense of direction and with the means with which to make resource decisions. The current strategies are moving in the right direction, with a focus on the evidence of effectiveness of known measures and programs. Nonetheless, a guiding vision is generally absent and the strategic preferences are frequently implicit.

The context surrounding the trade-off decision process, through which the balance of efforts to achieve the varying objectives of the road transport system are made, is undergoing rapid change. At no time has the need to understand the shifting sands, and to estimate its impacts, been more important. There is an urgent need to make the process more strategic, without losing its current inclusiveness.

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