Progressing road safety through deep change and transformational leadership

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ABSTRACT

In an earlier paper in this journal, we argued that current road safety programs and thinking are constructed within a paradigm that tends to accept existing cultural arrangements. The current paper is a sequel to the earlier one, and outlines significant policy themes emerging from a research project on a holistic approach to road safety. Two overarching themes include the importance of leadership for policy change and implementation, and addressing the more transformative aspects of intervening in a system. A distinction can be drawn between "deep" sustainable change, which usually requires fundamental redesign of the systems involved, and "shallow" adaptive change. Examples of deep change discussed include the much wider application of mobility management, a strong shift to active travel and public transport, and a reconsideration of how time is structured in society, as with the adoption of "Slow Cities" principles. Transformational leadership can draw on a variety of "knowledge cultures", which can all share in collective decision-making and possible actions for the future. We discuss especially leadership at the worldview, organisational, and community levels. Vision Zero approaches are valuable, but need to be integrated with a common vision for a sustainable transport system developed in conjunction with energy, transport, health, environment, and education agencies. In addition, Vision Zero approaches can be assisted by greater attention to and questioning of embedded cultural practices and behaviour.

1. Introduction

In an earlier paper in this journal, we argued that current road safety programs and thinking are constructed within a paradigm that tends to accept existing cultural arrangements (May et al., 2008). Such programs favour symptomatic solutions and technical and/or physical solutions as a way forward. In an effort to progress road safety policy and practice, the current paper is a sequel to the earlier one, and outlines significant policy themes emerging from our research project on a holistic approach to road safety, again drawing primarily, but not exclusively, on Australian examples (May et al., 2010).

The research included an extensive integrative literature review and synthesis, and also used focus groups exploring sustainable transport and community initiatives such as the walking school bus (WSB) program. The focus group with sustainable transport "experts" took place at the Australian Defence Force Academy in Canberra, Australia on 11 December 2007, and was tape recorded with the participants' permission. It included people from academia, government, and community organisations, with wide ranging interests across road safety, health, sustainable transport, and

environment. Another focus group with parents and practitioners involved with the walking school bus program in Canberra took place on 7 July 2008, again at the Australian Defence Force Academy and tape recorded as before. In addition, we used an evaluation of a TravelSmart travel behaviour change project conducted in 2006–2007 in Canberra (IMIS Integrated Management Information Systems Pty Ltd. and SMEC, 2007). The program involved 11,000 households being contacted, with 43% agreeing to take part.

A final research step involved in-depth interviews and discussions held in Canberra in 2009 with two prominent champions in the areas of sustainable transport and road safety, namely David Engwicht (2005), author of a number of pertinent books, and originator of the "walking school bus" idea that has been taken up in a number of countries; and Professor Ian Johnston (2004, 2010), a former director of the Monash University Accident Research Centre in Melbourne, who is prominent in a number of current national and state road safety initiatives and policy bodies.

Challenges to the current paradigm for road safety are coming from a number of directions, including new thinking on health, ecologically sustainable transport, global environmental change, and the "slow movement". In addition, the slowing trend in reducing fatalities in many countries underlines the need for a new approach or vision. We discussed these issues in our earlier paper, and argued that holistically linking and integrating a number of

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policy and practice objectives is critical for reframing road safety. Thus, improving road safety through reduction in the volume and speed of motorised traffic is integrally related to enhancing health and fitness, reducing greenhouse gas emissions, and improving neighbourhood planning and community cohesion. It is likely that policy and behavioural changes linked to climate change and peak oil will increasingly foster such integration.

Two overarching themes emerging from our research include the importance of leadership, and addressing the more transformative aspects of intervening in a system. Donella Meadows, the systems thinker of the 1972 *Limits to Growth* fame, created a list of "places to intervene in a system" from the least to the most transformative (Parkin, 2010, p. 181). At the more transformative level of intervention is the mindset, paradigm, or worldview out of which the system goals, structure and rules arise.

The paper is holistic in nature and addresses a wide variety of intersecting issues. It begins with a discussion of deep change as compared with shallow change. The Vision Zero approach to road safety is then discussed, as safe system models are typically now put forward as "best practice" thinking. Three sections follow discussing possible examples of deep change, namely mobility management, the role of active transport and public transport in road safety, and the way time is considered and structured in a society. The final substantive section discusses how transformational leadership (drawing on various "knowledge cultures") can be used to progress road safety.

2. Deep change and shallow change

2.1. What is deep change and how is it facilitated?

When considering change, a distinction can be drawn between "deep" sustainable change, which usually requires fundamental re-design of the systems involved, and our relationships with them, and "shallow" adaptive, substitutive and compensatory change, which often unintentionally protects and perpetuates the very structures and processes that are the sources of the problems that we are attempting to solve. From social ecology, Hill (1999) uses an "E-S-R" model to distinguish between "efficiency", "substitution", (shallow) and "redesign" (deep) approaches to change. The model was first developed for re-conceptualising pest control, from the inefficient to efficient (E) use of pesticides, to substitutes (S) such as biological controls, to the integrated redesign (R) of complex agroecosystems to favour crops and natural controls and not the pests. Efficiency and substitution strategies may serve either as stepping-stones or as barriers to the more fundamental redesign approaches. An integrated, whole system approach calls for redesign and innovation at the industrial and business levels, enabled by supportive changes in institutional structures and processes at the political and socio-cultural levels (Hill, 2006).

Another approach for considering change is discourse analysis, as used for example by Dryzek (1997) in analysing a range of environmental discourses. Each discourse is considered in terms of the basic entities recognised or constructed, underlying assumptions about natural relationships, agents involved and their motives, and the key metaphors used to support a particular discourse.

A related approach from futures studies is that of causal layered analysis (CLA). It encompasses a horizontal dimension via a range of scenarios, and a vertical dimension applied to each scenario using four levels of reality (Inayatullah, 2002, 2004). CLA integrates analysis at these four levels, namely:

- The *"litany" level* or official public description of an issue, as might appear in the media. Conventional accounts of reality typically predominate.
- The *social science analysis level* seeks to expose and explain the social causes and factors involved (economic, political, technological, ecological and historical). Technical and economic analyses from policy institutes characterise this level.
- The *discourse analysis/worldview level* goes deeper to the level of assumptions, beliefs, and frameworks. Here, discerning the deeper issues that inform and constitute the discourse/s is what matters. Solutions often centre on consciousness transformation and in rethinking the politics of reality.
- The *myth/metaphor level* goes even deeper, focusing on archetypal stories and the unconscious. It draws on heart rather than head, and engages mythical frameworks of knowing.

The above discussion emphasizes that how one frames an issue changes the policy solution. The various layers lead to varying conceptions of which actors are involved in creating transformations. By moving up and down the levels of analysis, diverse ways of knowing are brought to bear on any issue. For example, leadership and transformational strategies may be considered at a social science level in terms of existing institutions achieving outcomes for newly conceived and innovative policy goals. On the other hand, leadership at the worldview and metaphor levels of analysis involves the unpacking of "storylines" and "practices" to show how a policy discourse that frames a particular view of reality is hegemonic and therefore has paradigmatic influence in a policy area.

Attention to the question of "wicked problems" is also pertinent here (Brown, 2010). Wicked problems are socially complex, being multi-causal in nature with many interdependencies. As such problems rarely sit conveniently with any one person, discipline or organisation, they can have no single solution. An open approach to the construction of knowledge is required, as different knowledge traditions will approach the same issue in differing ways. Specialist thinking focuses on empirical types of questions and reproducible evidence. On the other hand, organisational thinking focuses on strategic types of questions and evidence related to outcomes. Holistic thinking focuses on aesthetic questions and evidence related to meaning.

2.2. Deep change in relation to transport and road safety

With respect to road safety, Whitelegg (1983) raised fundamental issues about the prevailing policy discourse almost three decades ago. He asked: To what extent are our solutions locked into a particular view of technology and society, and therefore tied to producing incremental improvements without any fundamental alteration in the structure of the problem itself? As he argued (p. 153):

In the case of road safety it can be argued that solutions which build on the acceptance of the motor car as a major and immutable technology will reinforce that position and generate a primary paradox: solutions designed to reduce a major negative effect of motorised transport contribute to the perpetuation of the circumstances which lead to road traffic accidents. The lack of policy suggestions outside of this "predominant technology" leads to great confusion in road traffic accident research.

Whitelegg further considered that the categorisation of people, vehicles and roads as the prime dimensions of road safety policy created its own difficulties in relation to road traffic crash research. In his view at that time, progress made in road design, vehicle engineering, and studies of driver and pedestrian behaviour had "not been matched by advances in our understanding of the role and

function of the transport system as a whole and of the needs and susceptibilities of different groups and individuals for whom movement in cities and elsewhere is an integral part of normal existence" (p. 153). The prevailing approach, he suggested, carries with it the strong implication that the original "design" is without major defects, and the answer to problems within it lies in some aspect of quality control of the component elements, namely people, roads or vehicles.

More recent work, however, on the "politics of mobility" (Vigar, 2002) and the relationships between transport, environmental sustainability and public policy, points to a shift beyond a narrowly defined transport policy approach to encompass a much wider set of health, social and environmental concerns. Travel by private vehicle (and also air travel) is widely considered to be more damaging to the environment than by other modes of travel. Motor cars are considered to be less efficient than mass transit both in terms of individual journeys, and in terms of the energy used in their manufacture and maintenance. Consequently, Vigar (2002, p. 190–193) demonstrates how the "predict and provide" paradigm was increasingly questioned during the 1990s particularly in relation to road building, with a gradual perceptual shift occurring from "roads as solution" to "roads as a problem". Thus, where the "predict and provide" model sees "changes in travel demand as an expression of underlying social and market dynamics" and as being inevitable without serious consequences (particularly economic), a "new realist" approach argues that "travel demand can be influenced by public policy" and that travel demand management is an appropriate policy response. The nature of a deep change for road safety policy and practice is summarised in Fig. 1.

Banister (2008) similarly argues for a more flexible sustainable mobility paradigm rather than the conventional approach to transport planning. The contrasting features of each approach are shown in Table 1. In relation to the necessary conditions for change, he argues for the high-quality implementation of innovative schemes, and gaining public confidence and acceptability through active involvement and action. As many of the problems for the transport system do not come from the transport sector, a more holistic perspective is needed to integrate decision-making across sectors and to widen public discourse.

3. Vision zero and deep change

3.1. Vision zero vis-à-vis the politics of mobility

The Swedish Vision Zero policy is often now put forward as a model for progressive shifts in road safety policy and practice. We argue there is also a need to integrate a sustainable transport approach with road safety policy and practice. The Vision Zero approach is a philosophy of road safety that eventually no one will be killed or seriously injured within the road transport system, and it assumes that it can never be ethically acceptable that people are killed or seriously injured when moving within the road transport

Table 1
Contrasting approaches to transport planning (Banister, 2008).

Conventional approach to transport planning	Sustainable mobility approach
Physical dimensions	Social dimensions
Mobility	Accessibility
Traffic focus, particularly on the car	People focus, either in or on a vehicle or on foot
Large scale	Local scale
Motorised transport	All modes of transport including pedestrians and cyclists
Forecasting traffic	Visioning on cities
Modelling approaches	Scenario development and modelling
Economic evaluation	Multi-criteria analysis including social and environmental concerns
Travel as derived demand	Travel as valued activity as well as a derived demand
Demand based	Management based
Speeding up traffic	Slowing movement down
Travel time minimisation	Reasonable travel times and travel time reliability
Segregation of people and traffic	Integration of people and traffic

system. In this way, the Vision Zero policy requires a paradigm shift in addressing road safety by having fatalities and serious injuries reduced to zero (Tingvall and Haworth, 1999).

It is true that the policy is radical in its approach as compared with previous initiatives, as shown by its basic strategic principles:

- The traffic system has to adapt to address the needs, mistakes and vulnerabilities of road users
- The level of violence the human body can tolerate without being killed or seriously injured is the basic road transport system design parameter
- Vehicle speed is the most important regulating factor for safe road traffic

Nevertheless, we consider that road safety policy and practice can be improved more substantively and quickly by considering to a much greater extent the *politics* of mobility. The Vision Zero framework is still tied to a mindset of "drivers, vehicles, and roads". Moreover, some of those interviewed for a Stockholm Environment Institute study on Vision Zero, including experts and those in focus groups, consider that the zero target is "idealistic", "unrealistic", and "unattainable", and that a big stumbling block is changing people's attitudes (Whitelegg and Haq, 2006, p. 29). One participant, Helmut Holzapfel (Professor of Traffic Planning, University of Kassel), suggests that the concept of Vision Zero is valuable, but considers that Sweden has done little to counter the spread of car dependent lifestyles that result in more kilometres driven. The opportunity and imperative therefore exists to bring sustainable transport and road safety together much more in order to facilitate better environmental and road safety outcomes.

3.2. Shallow change can still be valuable

The discussion above, of course, does not mean that a shallow, adaptive level of change cannot be of value. For car travel, it means travelling less far, in more energy efficient ways, and at slower speeds. Rationalising car design, regulation and driver education should be at the forefront of policies to reduce road transport emissions (Anable et al., 2006, p. 28). These researchers quote research from the Netherlands showing that a combined approach of downsizing power and speed, enforcing speed limits,
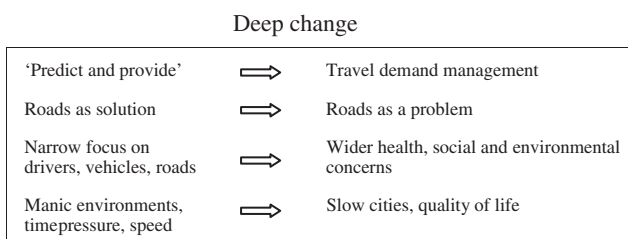
Deep change

'Predict and provide'	⟹	Travel demand management
Roads as solution	⟹	Roads as a problem
Narrow focus on drivers, vehicles, roads	⟹	Wider health, social and environmental concerns
Manic environments, timepressure, speed	⟹	Slow cities, quality of life

Fig. 1. Deep change and road safety.

and in-car guidance of drivers' behaviour could reduce CO_2 emissions by 50%. Such measures are associated with the term "ecological driving".

The synergies between road safety objectives and reducing greenhouse gas emissions are supported by research showing that the management of driving speeds in particular is an effective carbon abatement policy. The authors (Anable et al., 2006, p. 31) argue that:

> A policy of current speed limit enforcement and, better still, lowering speed limits, would bring significant, certain, immediate, equitable and highly cost-effective reductions in carbon emissions.

Anable et al. (2006) also examine the relationships between reducing speed and a number of other related factors, including reducing casualties, reducing CO_2, reducing travel demand, and improving traffic flow. They found that the traffic smoothing effects of a 60 mph limit on motorways in the UK would help to reduce harsh driving styles and overtaking which can cause flow breakdown, disruption, and crashes. The findings indicate that a properly enforced 70 mph speed limit would cut carbon emissions from road transport by nearly 1 million tonnes of carbon per annum, while a new 60 mph limit would nearly double this reduction, reducing emissions by an average 1.88 million tonnes per annum.

Other social benefits flow from reducing speeds. A report on road traffic noise in the UK suggests that road traffic is the biggest cause of noise pollution in the UK, and that reducing speeds and also traffic volumes are effective ways of reducing noise (UK Noise Association – Paige Mitchell, 2009). The report argues that reducing speed, and thus traffic noise, would cut the cost that noise imposes on the economy, and improve the health and well-being of millions of people in the UK.

Deep change is explored further in three approaches discussed below, namely mobility management, the role of active transport and public transport in road safety, and the way time is considered and structured in a society.

4. Mobility management

Mobility management (also called travel demand management) is currently not integral to road safety considerations. It provides a good example of working towards deep change. There is a strong case for mobility management strategies that reduce per capita vehicle travel (exposure) being of value in reducing overall crash risk. That is, the *volume* of motorised traffic is a critical factor to consider in addition to speed. Litman (2009, p. 35) puts the case for change in how road safety is considered as follows:

> Current transport planning practices give little or no consideration to safety impacts of changes in vehicle mileage. This tends to overvalue roadway and vehicle improvements that increase vehicle mileage (such as highway capacity expansion which induce vehicle travel on a particular roadway, and vehicle fuel efficiency and safety improvements that increase per capita vehicle mileage), and undervalues mobility management programs that reduce vehicle mileage.

When comparing the traffic characteristics of streets where injured children lived with a group of non-injured children selected from the general child population, Roberts (2010, p. 35) observes that the main determinants of injury risk are the volume and speed of the traffic. The injury risk increased steeply with rising traffic volume. Children living in the busiest streets were fifteen times more likely to be injured than children living in the quietest streets. Moreover, in New Zealand at the time of the energy crisis in the 1970s, high petrol prices and "car-free days" meant that child pedestrian death rates fell sharply, with a 46% reduction between 1975 and 1980.

There is acknowledgement of increasing travel as an issue in official documents, but not of travel demand management as a strategy for dealing with the problem. For example, in Australia, the *National Road Safety Action Plan 2009 and 2010* (Australian Transport Council, 2008, p. 55) states:

> Australia has had an extended period of economic growth. Studies have shown that increased economic activity and discretionary income are generally associated with higher levels of road trauma due to increased travel, including more travel during high-risk periods in the 24-hour cycle.

The reason that mobility management is given little or no significance is that distance-based analysis treats mobility (the amount that people travel) as being outside the scope of policy interventions. In contrast, Litman makes the case for distance travelled being a significant risk factor, and therefore mobility management being an appropriate way to reduce crash risk.

This approach contrasts markedly with the conventional engineering wisdom on the safety benefits of "improving" highway facilities and achieving higher standards of design (Noland, 2003). For example, the Hume Highway in Australia is considered as one of the "safest" roads using a prominent motoring organisation's (RACV) criteria. The RACV promotes the benefits of road investment with road engineers assessing a road for features deemed to be "safe", e.g., dual carriageways, wide lanes. Roads can be given a "dangerous" rating even if they have recorded no crashes in years. Yet the "safest" roads, such as the Hume Highway, tend to record the highest crash rates because they are the ones that carry the highest volumes of traffic (Public Transport Users Association, 2010).

Further, many experts and individual drivers prefer to focus on reducing the small percentage of high risk driving by other motorists, rather than vehicle travel in general, or their own vehicle travel in particular. While not underestimating the value of "targeted" programs directed at high-risk driving, the safety value of reducing average-risk travel has been underestimated (Johnston, 2010). The value of a population strategy of prevention being necessary where risk is widely diffused through the whole population has similarly been put for preventive medicine in general (Rose, 1992). In contrast with a high-risk strategy of prevention, the population strategy is based on the idea that a large number of people exposed to a small risk may generate many more cases than a small number exposed to a high risk. Rose suggests that because so many people drive their cars every day and nearly all return home safely, no one really expects to have a crash on any particular occasion. Therefore, few feel any personal responsibility for the major problem of death and injury on the roads. Although high-risk strategies are valuable (for example, those targeting drinking drivers and illegal street racers), Rose argues that the major public health impact arising from a small but widespread risk is left unaddressed, unless a population strategy is adopted. Johnston (2004) argues for a population-based speed reduction preventive strategy, based predominantly on the mismatch between extant speed limits and levels of infrastructure safety.

Mobility management strategies are consistent with wider principles adopted for sustainable transport (May, 2006). These include access to goods, services and social opportunities, rather than mobility *per se*, and less movement of goods and services, for example by appropriate urban design and access through telecommunications. Litman (2009, p. 3) uses the following broad categories for various mobility management strategies:

- Improved transport options, e.g., transit improvements, walking and cycling improvements, telework, flextime
- Pricing initiatives, e.g., congestion pricing, fuel tax increases
- Land use management, e.g., smart growth communities[1], new urbanism, car-free planning
- Implementation programs, e.g., commuting reduction programs, freight transport management, tourism transport management

Litman asserts that because many strategies have synergistic impacts, mobility management programs using a variety of strategies (e.g., road and parking pricing, improved travel options, and smart growth land use policies) can be expected to reduce per capita crashes by 20–30% or more when applied.

In terms of moving towards a post-carbon policy regime as a result of the twin forces of climate change and peak oil, higher fuel prices are the simplest and most straightforward way to undercut the strength of the entrenched political monopolies (Dunn and Perl, 2010). A sharp increase in fuel prices has been proven to reduce vehicle kilometres driven, which in effect introduces a mobility management program with its attendant safety benefits. Thus peak oil can be considered as a road safety enhancer, whereas the era of cheap oil, combined with the road lobby, is in effect a road safety inhibitor (May et al., 2008).

5. The role of active transport and public transport in road safety

Recent public policy reports on road safety, and those on climate change and peak oil, typically encourage a shift away from default car use to walking and cycling (active transport), as well as to public transport. The active transport modes deserve closer analysis in terms of how they can become part of road safety strategies, how their uptake can be facilitated, and what limitations typically apply. The multiple health, environmental, economic, transport and community liveability benefits of active travel are now well established in the research literature (Garrard, 2008). However, although pedestrians and cyclists are legitimate road users, they are frequently overlooked in urban transport systems that are shaped by the dominance of car travel, as in Australia.

Active transport modes are closely associated with the ways in which the environment is planned and designed. Walkable communities tend to have higher measures of "community health" and well-being, given their higher levels of interaction and "social capital". There are also reductions in damaging vehicle emissions, fewer crashes and greater space for children's play (Cavill, 2001). A review of Central Sydney undertaken for the City of Sydney by Danish urban planner Jan Gehl found it to be dominated by cars, and not geared to the needs of pedestrians (Capon, 2007; *The Gehl report – a blueprint for greener, more vital, connected CBD*, 2007). Pedestrian walking routes are unconnected, and pedestrians wait too long at traffic crossings.

Encouraging public transport usage is beneficial for the environment and from a road safety point of view, whereas freeway expansion is environmentally harmful and likely to be disadvantageous for road safety. Other advantages for public transport include congestion management, social inclusion, and energy security. The Gehl report and a study of work travel modes in Australian capital cities (Mees et al., 2008) both suggest that policy and funding priorities need to be directed away from urban motorways

towards more environmentally friendly modes, particularly public transport and walking. There also needs to be a reorientation of road space and road rules to give pedestrians priority over motor vehicles. Mees et al. refer to good international evidence suggesting that walking and public transport complement one another.

A related issue concerns the safety of cycling. In spite of the fact that Australia has been seeking to increase cycling to improve the overall sustainability of urban transport, concern about the danger of road cycling is a serious deterrent to getting more people to cycle—particularly for children, women, and older adults. Improving the safety of cycling is therefore important for encouraging its wider adoption. In cases where cyclists and cars cannot be separated, the principle of "safety in numbers" means that cycling becomes safer as levels of cycling increase. The explanation appears to be that large numbers of cyclists are more visible and command more respect from motorists. Further, if an increase in bicycles on roads is accompanied by a reduction in the number of cars, the potential for serious injury from collision decreases (Pucher et al., 2011).

In Australia, the revitalisation of Perth's public transport system through rail expansion and a strong focus on the integration of rail and bus services provides a good model for progressive multi-modal transport planning and implementation (Newman et al., 2009). In addition to Perth, other cities in Australia that stand out at both national and international levels in terms of the growth of public transport, are Brisbane and Melbourne (Stanley and Barrett, 2010, p. 16). Brisbane is rolling out an international best practice example of Bus Rapid Transit. In Melbourne, very strong growth in Business District employment has supported growth in train use in particular.

To overcome obstacles in the way of sustainable visions, forward-thinking political leaders are needed, as well as an aware and politically active citizenry demanding better options for safe and sustainable transportation, and related programs to address climate change and peak oil. Increased funding is also necessary to address the requirements of effective public transport such as: a transit system that is faster than traffic in all major corridors; service quality (frequency of service, ease of interchange, comfort, safety); integrated timetabling and route planning; and responsiveness to customer needs. Stanley and Barrett (2010) emphasise the pivotal role of the Australian Government in driving national land transport improvements, especially through much increased investment in public transport.

6. How time is considered and structured in society

Another example of an issue that has an important bearing on road safety, is the way time is considered and structured in a society. Thus, so-called "time pressure" is emerging as a modern malaise (Strazdins and Loughrey, 2007). It is linked to changes in working life, with longer work hours and faster work pace. In many families both parents must combine working with caring. Time costs shape travel choices and behaviours.

Relevant here is the 2005 survey by the insurance company AAMI entitled "Congestion rage: symptoms of a busy, over-stressed society", with 60% of drivers admitting that if they are in a hurry, they are more likely to lose their temper with other drivers. The report concluded that "the symptoms of road rage by drivers and passengers are often associated with pressures on their time, given all the competing demands" (AAMI, 2005, p. 6). AAMI's research suggests that traffic congestion is a major source of aggression on Australian roads. Since 2005, the *AAMI Crash Index* found a more than tripling of the number of drivers who say it takes them 30 minutes or more to drive to work—from 8% in 2005 to 30% in 2009. Moreover, in the same period the research

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[1] Smart growth concentrates growth in the centre of a city to avoid urban sprawl, advocates transit-oriented and walkable communities, and has mixed-use development with a range of housing choices.

identified an 18% increase in the number of drivers who attribute aggression and road rage to traffic congestion—from 70% in 2005 to 88% in 2009 (AAMI, 2009, p. 5).

Stazdins and Loughrey argue that many public health policy issues have an unacknowledged time dimension, which is vital to consider in bringing about the changes needed. The availability of free time has declined, and if interventions are to be successful, they must avoid adding to time burdens. Policies and interventions in relation to road safety need to take account of this time dimension. Although it does not cover road safety, a report from the Australia Institute (downloadable at www.tai.org.au) discusses the costs of overwork and time poverty in Australian workers (Fear et al., 2010). Costs include one in two Australians being prevented from spending enough time with family, one in two who said work had prevented them from doing physical exercise, one in three where work prevented them from eating healthy meals, and one in five who were prevented from walking or cycling to work because of their job commitments. The report addresses the changes required on a number of fronts, including the need for governments to introduce a cap on working hours, as has occurred in Europe.

Further, using the concept of "effective speed", Tranter (2010) demonstrates that any attempt to "save time" through increasing the speed of motorists is ultimately futile. Effective speed is a holistic measure of speed calculated on the basis of the total amount of time consumed by a particular mode of transport, including the time spent earning the money to make the car, bicycle or bus travel possible (Tranter, 2004). Illich (1974, p. 30) summarised the issue succinctly in his book *Energy and Equity*:

> The typical American male devotes more than 1600 hours a year to his car. He sits in it while it goes and while it stands idling. He parks it and searches for it. He earns the money to put down on it and to meet the monthly instalments. He works to pay for petrol, tolls, insurance, taxes and tickets. He spends four of his sixteen waking hours on the road or gathering his resources for it … The model American puts in 1600 hours to get 7500 miles: less than five miles per hour.

A heavy reliance on cars as a supposedly "fast" mode of transport consumes more time and money than a reliance on supposedly slower modes of transport (walking, cycling and public transport). Paradoxically, if planners wish to provide urban residents with more time for healthy behaviours (such as exercise and preparing healthy food), then, support for the "slower" active modes of transport should be encouraged.

The need for fundamental redesign is also reflected in the Slow Cities movement, a movement favouring local, traditional cultures,

Whole of community change involves:

Fig. 2. Whole of community change draws on various knowledge cultures (Brown, 2008).

a relaxed pace of life and conviviality (Knox, 2005). As suggested in our earlier paper, surprisingly little attention has been paid to this movement by road safety researchers. Yet it may provide considerable potential for improvements in road safety. Engwicht (2005, p. 159) in discussing such an approach refers to the "Great Civility Outbreak"—a cultural revolution where it becomes the social norm to be "civilized" and "a good citizen". At the shallow, adaptive level, the use of flextime and telework can reduce peak-period travel by shifting travel time, or reduce commuting trips. At a deeper, more fundamental level, adoption of the slow cities principle promotes a more human, less frenetic way of life. Although the issue of time is complex, and usually outside the scope of environmental and public health policy, the need for a deeper cultural shift suggests that time use and time pressure should be addressed as part of road safety policy.

7. Leadership and transformation for road safety

7.1. Leadership and transformation using a variety of "knowledge cultures"

In Section 2.1 above, we referred to the need for an open approach to the construction of knowledge, as different knowledge traditions approach the same issue in differing ways. Leadership for policy change and implementation can draw on this variety of "knowledge cultures", which can all share in collective decision-making and possible actions for the future (Brown, 2008, 2010). These include individual commitment (personal lived experience), community support (mutual place-based experience), specialised advice (from academic disciplines and professions), organisational direction (providing strategic agendas and regulations), and holistic purpose (collective vision and metaphors that span divisions) (Fig. 2). To achieve whole-of-community change, Brown suggests that rather than focusing on divisions between silos, the ground rules for collective decision-making are best served by integrative webs and networks offering opportunities for synergy and collaborative action.

7.2. Leadership and transformation at the worldview level

Leadership at the worldview and metaphor levels of analysis involves the unpacking of "storylines" and "practices" to show how a policy discourse that frames a particular view of reality is hegemonic and therefore has paradigmatic influence in a policy area. Writers and artists often adopt this holistically oriented purpose, as it is concerned with questions of meaning. Paradigm shifting analyses such as those mentioned earlier by Whitelegg (1983), Vigar (2002), and Banister (2008) also draw on this kind of knowledge. In a society where the metaphor "time is money" applies, Tranter (2010) likewise addresses fundamental issues such as how time and speed are considered by a society. Similarly, Johnston (2010) argues that critical elements of the safe system approach (as with Vision Zero for example) are in discord with the behavioural mores in the cultures of western motorised nations, with this hampering the adoption of the most effective safety programs within key institutions and within political systems. Given that injury reduction is a matter of limiting the potential transfer of kinetic energy, Johnston laments the lack of action by governments worldwide and by the automobile industry to limit the power, top speed and acceleration capability of cars and trucks. More broadly, what has not been done, at least systematically in his view, is to address the cultural mores that underpin behaviour. Such fundamental research on cultural issues ties in well with leadership at the worldview level.
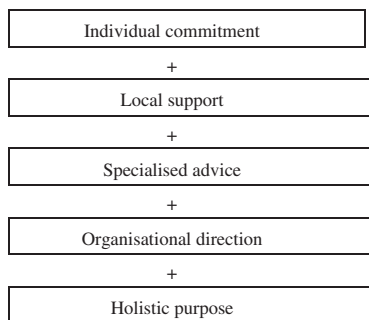
7.3. Leadership and transformation at the strategic and organisational level

Organisational knowledge is typically favoured over contributions from other knowledge areas. Nevertheless, addressing complex issues with a high environmental and social impact necessarily calls for innovative organisational responses that deal with the political and administrative realities involved. The ecological lessons for progressing road safety are perhaps most keenly felt in the area of implementation. Road safety policy needs to be considered in the context of wider policies, such as those linked to climate change, improving people's safety and health, enhancing quality of life, and promoting greater equality of opportunity (Broughton et al., 2009). For a more holistic perspective that integrates decision-making across sectors, systems theory helps thinking about horizontal, vertical and diagonal relationships between people, organisations and the environment and across policy and special interest boundaries (Parkin, 2010, p. 183).

On the other hand, with respect to organisational direction and integrative management, policies can frequently fail if responsibility is shared among too many players. As more agencies become involved, the complexity of coordination overwhelms the original policy intent. Successful implementation is therefore associated with a single agency or at least a dominant one (Bridgman and Davis, 2000, p. 117). This observation ties in with recommendations from parliamentary committees in the UK, suggesting that a high level body or independent road safety commission be established to work across the whole of government to integrate efforts from fields such as health, environment, sustainable transport, and behavioural change (House of Commons Transport Committee, 2008; Parliamentary Advisory Council for Transport Safety (PACTS), 2007).

Major organisational factors identified as important for the success of road safety initiatives are the necessary political will, proper organisation, and knowledge. Broughton et al. (2009) provide support for such principles by noting that experience in Sweden, the Netherlands and New Zealand underlines the importance of securing parliamentary commitment on grounds that are hard to refute, demonstrating that there are cost-effective measures through which a vision can be pursued, and obtaining the engagement of stakeholders and the public using readily understandable concepts on lines of action. A celebrated example of the importance of political will and commitment was a major initiative in 2002 by French President Jacques Chirac to improve France's safety record compared with other countries. A change in culture and practice of the enforcement of traffic law, using widespread implementation of speed cameras and electronic breathalysers, resulted in substantial reductions in fatality numbers. Between 2001 and 2004, the number of road deaths in France fell from 7720 to 5232, a reduction of 32.5% (Gerondeau, n.d.).

Of particular relevance for integrative implementation are lessons learned from a case study of road safety in Victoria, undertaken for the Federal Highway Administration in the USA (US Department of Transportation: Federal Highway Administration, 2006). A significant element of Victoria's success was the way in which the diversity of institutions involved in implementation came together in an integrated and coordinated way. The catalyst for this came in part from a public outcry over the number of deaths on Victorian roads being 10% greater in 1989 than the levels in 1988 and 1987. As a result, the Minister for Transport demanded action. The key agencies involved in various aspects of road safety—VicRoads, Victoria Police, Department of Justice, and the Transport Accident Commission—were charged collectively with the task of reducing deaths on Victorian roads. Accountability mechanisms for each agency and between agencies were instituted, and cooperative relationships among senior staff in the various agencies were forged. This approach contrasts with the traditional model in which each agency was responsible only for matters under its immediate control.

7.4. Leadership and transformation at the community level

As well as "top down" reforms, much greater attention and support should also be given to community-based travel behaviour change initiatives. This draws on the re-emergence of the idea of community as a fundamental underpinning for public policy, with people and places providing a central organising map for policy making and implementation (Adams and Hess, 2001). Mutuality, partnership, and community building are key themes, with "leaders" and "followers" being better considered as collaborative agents in the transformation of social reality (Reicher et al., 2005).

Typically, community-based programs are rated as being of low effectiveness in the range of possible road safety programs. However, with proper support, TravelSmart travel behaviour change programs and walking school bus (WSB) programs have significant value for road safety and deserve to be expanded. Their advantages include modal shifts and reduced car use.

TravelSmart programs in particular have the explicit aim at the household level of switching individual travel behaviour from the use of cars to public transport, walking and cycling (Transport WA, 1999), indirectly providing road safety benefits. Newman et al. (2009, p. 111) suggests that the importance of the TravelSmart program in bringing about a transition to more resilient cities should not be underestimated. In the TravelSmart Belconnen project run in Canberra in 2006–2007, car travel was reduced by 12.7%, in terms of vehicle kilometres travelled (ACT Commissioner for Sustainability and the Environment, 2007). A study of Adelaide in 2005–2006 showed even better results. In this case, TravelSmart succeeded in an overall decrease in car travel for participant households on weekdays of about 22% (Stopher et al., 2009). This is significant in road safety terms when travel demand management is accepted as a valid road safety objective.

The road safety benefits of walking school bus programs for children, parents and local residents are numerous (Kingham and Ussher, 2007; May et al., 2010). These encompass not only the road safety learning and independent mobility for children, but also reducing the need for car trips as well as creating an environment that increases the care that local drivers take (through psychological traffic calming).

8. Conclusions

We argue in this paper for the integration of a sustainable transport approach with road safety policy and practice. In particular, the combination of two major global issues—peak oil and climate change—is increasingly likely to affect transport and travel behaviour. Although road safety and environmental concerns are both important areas of concern, they are often considered separately with the advocates of each area tending to operate separately. The opportunity and imperative exists to bring sustainable transport and road safety together in a more integrated way in order to facilitate better environmental and road safety outcomes.

Two overarching themes emerging from our research include the importance of leadership for policy change and implementation, and addressing the more transformative aspects of intervening in a system. Leadership can draw on a variety of "knowledge cultures", which can all share in collective decision-making and possible actions for the future. These knowledge cultures include those applying at individual, community, specialist, organisational, and holistic dimensions. There is also a need for a deeper level of change, as in addressing the worldview out of which the system

goals, structure and rules arise. Examples include the much wider application of mobility management (also called travel demand management), a strong shift to active travel and public transport, and a reconsideration of how time is structured in society, as with the adoption of "Slow Cities" principles.

Safe system model or Vision Zero approaches to road safety are valuable, but need to be integrated with a common vision for a sustainable transport system developed in conjunction with energy, transport, health, environment, and education agencies. Even at a shallow, adaptive level of change, there is research showing that the management of driving speeds in particular is an effective carbon abatement policy. However, Vision Zero approaches are hampered by the lack of attention to embedded cultural practices and behaviour. Leadership and transformation at the worldview and community levels can therefore assist organisational responses in facilitating deep change.

Acknowledgement

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