

Does Zero Road Toll require Zero Roadside Biodiversity?

Jed Gillian

Run off the Road Crashes

One of the more intractable road safety problems involves single vehicles leaving the carriageway and hitting fixed objects such as trees or poles alongside the road, (Federal Office of Road Safety (1995)). A recent comprehensive review of the problem focussing on South Australia by Kloeden, McLean, Baldock and Cockington (1999), found that contributing factors in these crashes included alcohol, excessive speed, fatigue, inattention and typically in rural areas, they occur at night with a single occupant. For Tasmania, the presence of native animals on rural roads is another factor that may also play a role, though at times no tangible evidence of the encounter will remain.

'Run off the road' crashes occur in both urban and rural areas but occur more frequently on rural roads and highways. They are more likely to occur on curves and/or downhill road sections. Trees are the most common objects struck in these crashes. This paper draws attention to the issues in the rural situation where the management of roadside vegetation is generally of most concern for ecological considerations.

Value of Road-side Vegetation

Professionals in any specialised area may have difficulty in knowing how to handle the concerns of other professionals when conflict appears inevitable. The value of the roadside diversity of plant and animal life [biodiversity] appears intuitively to be less important than the value of saving a human life. However, it essential that a serious effort be made to understand just how significant roadside biodiversity is to present and future generations before decisions are made involving wholesale and irreversible modification of the roadside environment in the pursuit of safer roads. Farmar-Bowers has suggested that a large but unknown proportion of Australia's biodiversity occurs on transport corridors. In many rural areas, the transport corridors may contain the only remnant of native habitat and very often these habitats are not protected in established conservation reserves. Overall transport corridors are "*Australia's most diverse but least protected biodiversity reserve*" (Farmar-Bowers 1997).

While the life of an individual person using the road system is of immediate concern there is also a need to be aware that roadsides play an important role in maintaining the ecological life systems that we all ultimately depend upon for our existence. The management of roadsides has an important influence on the health of ecological systems which are the base for our ability to have clean air, clean water and native flora and fauna. The issue should not be simplified to 'biodiversity protection for the long term versus reducing road trauma for immediate benefit' as both are important and both are achievable through careful planning. Meadows et al set out this planning issue in terms of human perspectives of time and space. They noted that people are mainly interested in local issues that affect themselves directly (such as road trauma) while others (for example, government officials) have a wider and longer term perspective (such as the protection of biodiversity for the nation and for future generations) (Meadows 1972)

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Native roadside daisies (*Leucochrysum albicans*) of very high ecological value.

Farmar-Bowers (1999 & 2000) has noted four main reasons for conserving native habitat on roadsides that relate to state and national goals of Ecologically Sustainable Development and the maintenance of Australia's biodiversity.

(1) Road reserves can contain remnants of the native vegetation and habitat for native animals. The vegetation and habitat needs to be identified, its maintenance requirements researched and its future guaranteed.

(2) Road reserves can protect adjacent native ecosystem from damage (especially wetlands by preventing road drainage polluting down-stream aquatic habitats). The reserves' protection functions need to be identified and programs to maintain and enhance their protection role implemented.

(3) Road reserves transect the landscape and incorporate a strip of every natural ecosystem they cross. Thus road reserves provide a unique 'living map' of the original distribution of Australia's biodiversity.

(4) Road reserves occupy a special place in the Australian psyche because maintaining the natural heritage of the countryside provides a sense of place, pride and belonging and 'the bush' seen most frequently is that on the side of the road.



Galaxias johstonii, a native galaxiid of high conservation value; vulnerable to disturbance from road management and construction in Tasmania.

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Not only large areas of vegetation but also individual trees may have habitat significance. For example, some roadside Blue gums (*Eucalyptus globulus*) are of great significance for the conservation of Swift Parrots (*Lathamus discolor*). These roadside trees flower more prolifically than comparable forest trees, are often remnants of more widespread habitat and consequently play a vital role in maintaining connectivity between larger areas of habitat. The creation of habitat 'islands' is a well known precursor to extinction for many species (eg Huston 1994, ch 4 & 11). An individual roadside tree may thus have very high biological value and at the same time be in a location which may prove fatal for the occupant of a wayward vehicle.

While the previous paragraphs have argued on practical grounds that the significance of the roadside environment has been underestimated, it should be noted that recognising the value of biodiversity is also based on international and national direction. In response to its obligations as a signatory to the International Convention on Biological Diversity, the Commonwealth released "The National Strategy for the Conservation of Australia's Biological Diversity" (COAG 1992). The Tasmanian Nature Conservation Strategy is an action plan to protect Tasmania's natural diversity and maintain ecological processes and systems with objectives to *"ensure best-practice environmental management to maintain healthy ecosystems; conserve genetic, species and ecosystem diversity for their intrinsic worth and their value to current and future generations; recognise the importance of natural diversity for scientific, educational, aesthetic and recreational/ tourism purposes; build on, improve and co-ordinate conservation measures; and achieve community ownership of nature conservation programs in Tasmania* (Tasmania Parks and Wildlife Service (2000)).

While a certain amount of biodiversity can be conserved through nature reserves, an important amount of biodiversity must be conserved where it occurs, and this often means conserving biodiversity on land which is used for other purposes. Because of the special characteristics of roadsides and other transport corridors, many have a unique role in preserving the *"variety of life on earth"*.

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Roadside orchids: another rare species vulnerable to the creation of clear recovery zones in Central Tasmania

Clear Recovery Zones

A concept promoted as a precautionary measure in Australia and elsewhere to reduce the incidence and severity of run-off-the-road accidents is that of a '*clear recovery zone*'. The concept has been widely proposed and it has been incorporated into the National Highway design requirements as a 12 metre setback from the edge of pavement to roadside hazards. Other setback distances have been proposed, typically 9 metres being commonly accepted

The USA Caltrans definition of a clear recovery zone is "*an area clear of fixed objects adjacent to the roadway ...to provide a recovery zone for vehicles that have left the travelled way.*" The guide is based upon American studies from which it was concluded that "*a clear width of 9 m from the edge of the travelled way permits about 80 percent of the vehicles leaving the roadway out of control to recover.*"

To implement the clear recovery concept, rural road design should provide for "*items like traversable batter slopes, guard fencing [and] breakaway light standards and sign supports*" Austroads (1989). Obstacles located in the clear recovery zone should be removed, relocated, made breakaway, or shielded by guardrail or crash cushions as appropriate and where justified. The guide however cautions the designer to "*... keep in mind that site-specific conditions such as volume, speed, alignment, side slope, weather, adjacent development, and environmental conditions should be evaluated when determining the clear recovery zone.*"

One of the superficially more tempting measures that might be considered in the implementation of "Vision Zero", would be the widespread grooming of roadsides to eliminate roadside hazards (Tingvall C, and Haworth N, 1999).

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It is my contention that the concept of a clear recovery zones in practice may in many places be ecologically and practically inappropriate and should be abandoned in many cases. I will underline below some of the environmental impacts which could flow from such a program, especially if it were to be adopted widely. However, I do not disapprove of more targeted action to reduce the damage from roadside hazards as proposed in by the National Road Safety Strategy Implementation TaskForce (1996) viz. *"Implement a program for removing or otherwise reducing the danger from potential roadside hazards, including culverts, poles, and trees in particularly dangerous positions."*

What then are some of the deleterious impacts that could eventuate from a wholesale adoption of clear recovery zones?

Environmental and social effects would be likely to include:

- Increased 'footprint' and area of disturbance from construction of wider traversable slopes.
- Increased exposure of erodible surfaces and increased risk of erosion, sedimentation and water pollution
- Increased extent and difficulty of revegetation.
- Loss of function as wildlife corridors and habitat and loss of remnant vegetation (loss of biodiversity).
- Removal of trees may result in:
 - increased exposure of the road formation to the sun and wind
 - increased vigour and area of grasses
 - increased vigour and prevalence of pasture grasses and weeds and consequent increased fire and smoke hazard, and weed seed source for adjacent landholders
 - increased habitat separation and fragmentation leading to increased risk of biodiversity loss in adjacent areas
 - encouragement of pest animal species
 - increased maintenance such as mowing or herbicide use
 - reduced aesthetic value and reduced attractiveness of touring for tourists
 - increased greenhouse gas production from construction and maintenance works and loss of sequestered carbon from vegetation and soils
 - increased occupational and safety hazards for construction and maintenance workers working alongside fast moving traffic.
 - reduced evapo-transpiration in summer and increased risk of dryland salinity in salt prone areas, higher water tables could lead to increases structural damage to road pavements

Road formations often function as solar collectors and will frequently be warmer than the surrounding ground. If the surface is sealed, this also increases the effectiveness of heat acquisition. Some of the consequences of the warmer structure include greater insect activity than nearby; the road may be used by resting and hunting animals and the adjacent warmer ground surface may also be associated with earlier growth of grasses and preferential grazing by native animals. This may lead to more frequent vehicle /animal incidents and greater risk of

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accidents and again to subsequent increased visitation by raptors and carnivores to feed on the roadkilled animals.

While this does not complete a catalogue of the impacts of clear recovery zones, it is sufficient to indicate that complex interactions will occur, and that the advantage of a reduction in severity of collisions with roadside hazards may well be reduced by increased accidents from other effects.

A second area where the implementation of clear recovery zones may have a significant effect is in the management of fatigue. It appears to be well accepted that whatever the prime cause of the accident, the specific behaviour preceding the accident is frequently that of lack of attention to the driving task or of 'falling asleep at the wheel'. The management of fatigue and development of warning methods to avoid this loss of competence are inherently preferable to measures which seek to reduce the severity of a collision once the vehicle has left the carriageway. Within the safety program itself, it is important to assess whether other programs such as installation or upgrading of rest areas at appropriate locations, support of community organisations for provision of 'coffee stops' and profile line marking are more effective methods of reducing the road toll from run-off-the road accidents. Federal Office of Road Safety (1996)

The construction of clear recovery zones will reduce the night-time ability of the driver to accurately perceive the kind of landscape and place that is being traversed. This may encourage greater night-time speeds because of the reduced stimulation and information provided in peripheral vision. In simulated driving trials, Goldley S, Fildes B, Triggs T, and Brown L (1999) found that although the presence of roadside trees did not consistently reduce speeds and could not be regarded as a speed reduction device, the presence of a "*wall of factories ... spaced close to the road*" reduced speed over an "*open, flat and rural roadside*". Removal of trees and the slope grooming of the clear recovery zones may well give the open, flat, rural impression that they found is associated with higher speeds. Perception of the road environment as "safe" and more forgiving may well be associated with increased travel speeds that prejudice the practical achievement of the safety improvements.

The actual importance of the peripheral view landscape in keeping the driver aware and conscious of his location on a trip is difficult to determine although it seems reasonable to assume that greater stimulation and variety is preferable to less. Rockwell (1972) has alluded to its importance when he pointed out that "*... driving is largely a dynamic peripheral vision task. ... visual acuity may be less important in driving than the detection of movement by peripheral visual processes.*" It is my belief that any potential improvement in road safety through widespread adoption of clear recovery zones would be confounded by an increased incidence of night-time driver fatigue and by increased driving speeds.

Some of the other contraindicating factors in the Tasmanian context to any widespread adoption of clear recovery zones include:

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Existing batter slopes are frequently too steep for the driver to have any chance of regaining control of the vehicle.

Collision with a tree may be preferable to a rollover event or continuing off the road to the base of the slope.

On the face of it there are good grounds for adopting 'Vision Zero' and its "... *philosophy of road safety that eventually no one will be killed or seriously injured within the road transport system.*" Tingvall and Haworth 1999. The application of the vision is more problematic when we try to devise practical principles and actions

Ecologically Sustainable Development

Does the Vision Zero principle imply precedence over ecologically sustainable development (ESD)? [It requires that all development must be equitable and advance the social, economic and environmental situation in at least one area while having no detrimental impact on any other] Could we envisage the widespread adoption of clear recovery zones when the environmentally-based Precautionary Principle may require that prohibitively expensive measures be implemented to mitigate the environmental impact of the measure? Does the principle allow for any priority to be given to the health and safety of wildlife? Perhaps the framework for decision making provided by ESD is sufficiently robust to assist the selection of road infrastructure projects to achieve Vision Zero. The environmental and social damage involved with Vision Zero would seem to preclude it from being considered as a 'sustainable development'. However the sentiment that changes should be made so that people are not killed or injured in the transport system is excellent (and is applicable to all other industries and systems). However, the methods currently suggested need to be improved so that they meet the sustainable development objectives.

Thus activities that improve public safety are commendable when they contribute to the enduring welfare of all people, including future generations. Sub-goals such as transportation safety should be specifically designed to make such a contribution. The ideas of sustainable development are an internationally devised attempt to show how such positive contributions can be made. A recent review of sustainable development ideas is about to become available on the Foundation for Sustainable and Economic Development's web site (<http://www.fsed.au>) and could provide an overview that might help all stakeholders in transport safety work towards that goal of enduring welfare.

Specific Discussion Topics

While this paper is somewhat speculative, I would like to propose some specific recommendations for discussion.

1. The prioritisation and implementation of infrastructure projects for safety may benefit from incorporation into the mainstream project planning process rather than treating safety

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programs as a special case. This will provide a mechanism for a more thorough examination of environmental and ecological issues which presently is largely missing.

2. Research and implementation effort should focus on managing fatigue and preventing vehicles from leaving the formation rather than that of minimising the damage once a vehicle has left the road.
3. Blanket adoption of clear recovery zones is likely to be expensive and environmentally unsound and potentially counterproductive, while a targeted program of reducing exposure to roadside hazards may be quite acceptable as long as it does not result in 'death by a thousand cuts'.
4. The achievement of improved road safety has frequently been due to removal of individual choice in areas where the benefits were far greater than the disadvantages such as compulsory seatbelt use. 'Vision Zero' may require much more difficult social, economic and environmental costs if it is to be fully implemented. A wide debate is essential if this is not to be seen as an unacceptable imposition on individual choice.

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