The Unsafe System: How we make road safety harder

Shaun Helman

The dominant paradigm in which road safety professionals now work worldwide is the Safe System approach. However the context in which this paradigm is being delivered is essentially the opposite; it is unsafe. It is almost as if the components of the road transport system 'as it is' have been designed to make Safe System application harder. This blog serves as a summary of my current thoughts on the issue of how to improve our application of Safe System thinking, given this starting point.

The Safe System as a set of principles

The Safe System approach rests on what I call its 'foundational principles'. The first of these is the reason for its existence in the first place; within the Safe System it is seen as unacceptable for anyone to be killed or seriously injured using the roads. Specifically, the roads should be made safe in this sense, before any 'trade-offs' between safety and other network benefits such as mobility, are considered.

Three further 'foundational principles' help to set what the Safe System is trying to achieve.

First, it is accepted that human beings make mistakes. What is meant by a mistake can vary, but this principle is probably what most separates the Safe System from previous ways of thinking about danger on the roads. The often cited statistic that '95% of road collisions are due to human error' based on and frequently mis-quoted – as above – from work undertaken by TRL and others in the 1970s used to be an easy segue into blaming victims for their own deaths. In the Safe System approach mistakes are seen instead as a limiting factor and something that needs to be addressed by the design of the system as a whole; system design should mean that inevitable mistakes do not result in death or serious injury.

Next, it is accepted that the human body has limited survivability given the kinds of forces experienced in motor vehicle crashes. The Safe System focuses on measures that reduce these forces.

Finally, there is a principle that multiple parties are responsible for designing and implementing the road system to be safe; users have certain responsibilities, as do road authorities, governments, and other organisations.

None of this is new. The paradigms on which the Safe System is built (Vision Zero and Sustainable Safety) are both over two decades old.

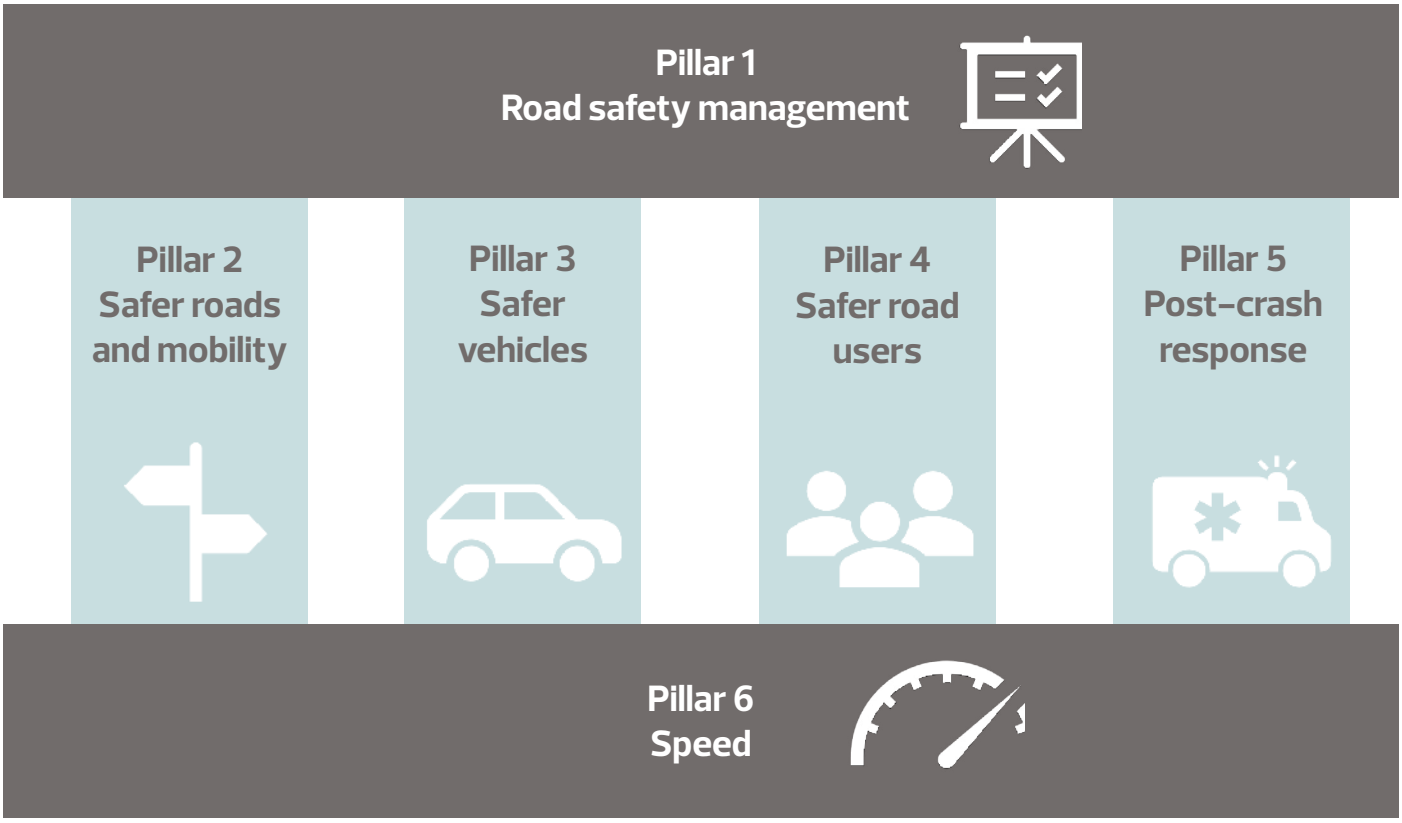
The Safe System as a set of action areas

Descriptions of the Safe System all mention a set of pillars (roads, vehicles, speeds, users, and post collision care and road safety management) as areas in which safe design and action should be practised:

- We should design and build our roads and vehicles such that they protect users in the event of a crash.
- We should ensure that vehicle speeds result in no more than the tolerable crash force limits mentioned above, should collisions occur.
- We should ensure that users know what they're expected to do in terms of their behaviour in the system, and do their best to achieve this.
- And we should ensure that in the event of a crash occurring, people receive good quality and timely care to limit the severity of their injuries.

These pillars or 'action areas' interact. For example, setting speed limits appropriately based on human survivability can result in different limits depending on the traffic interactions that are likely, but also the road and vehicle measures that are put in place. This paper from The Road Safety Foundation gives examples.

Importantly, the Safe System approach works. For example Elvik and Nævestad (2023) analysed data in Norway and showed patterns of changes in outcomes that suggest effectiveness. They note that more research is needed to confirm findings and make causal inferences more plausible, but broadly the evidence supports the idea that if you can do 'more Safe System stuff' you get fewer deaths and serious injuries.



The Unsafe System

The Safe System approach works, has clear principles that policy-makers accept, and appears to have public support. It has, however, taken a long time for us to understand what Safe System implementation really looks like; the principles on which this system is based are sound, but putting them into practice is difficult.

I have spent the last decade of my career working within this area. I have thought about it a lot. I've come to the conclusion that applying the Safe System is hard partly because the environment into which we try to apply it is not neutral. It is arguably intrinsically unsafe, and misaligned with the very principles on which the Safe System is based, and the outcomes it is trying to achieve. Therefore to eliminate fatal and serious injuries in road collisions, we don't just need to use the best evidence we have to design things; we also first need to overcome existing designs and ways of working that are directly opposed to the principles we are trying to apply.

It's like trying to fill a bucket with water, but putting a few good sized holes in the bucket before you turn the tap on.

In the remainder of this blog, I'll provide examples of what I mean, under the Safe System 'action areas' (or if you prefer 'pillars'). I'll then suggest some ways we might try to change things.

Vehicles

Perhaps the most obvious example of a design feature at odds with Safe System principles is the humble vehicle speedometer. Most of these display speeds that are far beyond legal limits, arguably normalising the idea that such speeds are achievable. I am not aware of any serious research into how speedometer design might be used to nudge behaviour, but it seems likely that the status quo is not optimal; descriptive norms are a known influence on behaviour.

Another obvious issue related to vehicle design is in increased distraction from connectivity and infotainment systems. Modern vehicles integrate touchscreens, apps, and other digital products that can divert attention from driving. Evidence shows that different interaction modalities can be advantageous for different tasks, with simple buttons preferred for everyday driving tasks such as changing temperature on the climate system. Other work has shown that voice control, while better than touching screens for some tasks, is still distracting. Those driving for work face business models with risks such as distraction arguably 'baked in'. Drivers face navigation apps that constantly try to use them as a source of real-time data on speed cameras and roadworks while they are driving, causing distraction and arguably risking prosecution. It is almost as if our vehicles are becoming providers of content as much as providers of mobility.

A final example is that cars are getting larger. Large vehicles increases crash forces in collisions, undermining work focused on the principle that crash forces should be reduced to be survivable. Some examples come from this 2025 paper. This trend doesn't only affect vulnerable road users. For example crash survival curves for vehicle–vehicle impacts assume similar masses; if a larger mass vehicle hits a smaller one, the asymmetry could result in more severe injuries to some parties.

Examples such as these show that even with fantastic advances in vehicle safety technology such as intelligent speed assistance and autonomous emergency breaking, rightly being talked about positively in Road Safety Week, there are elements of vehicle design that are fundamentally opposed to Safe System thinking. The car industry today is hopefully more forward in its thinking to the one exposed in the US in the 1960s by Ralph Nader's seminal publication 'Unsafe at Any Speed', but we still need to remove some outdated ways of thinking about vehicle design and safety.

Speeds

There is perhaps no area of road safety policy so controversial as vehicle speeds. I would argue that there is also no area more important as we attempt to change the way society thinks about what is normal. Simply, if we wish to attain the Safe System goal of controlling crash forces so that any collisions that do occur are survivable, in the absence of any other major changes, motor vehicle speeds are going to need to be much lower than they are today. That paper from The Road Safety Foundation is again relevant here.

Again, I would argue that the current approach is at odds with what we're trying to achieve. For example this BBC article notes that speed limits historically have been set on various criteria, sometimes not based on evidence at all. Now we have a better idea of what is survivable in different types of collisions (whether a pedestrian being struck, a head on collision between two cars, or a side impact) we are better placed to set limits against this more objective criterion.

One problem baked into the road transport system, at least in terms of the perception of its users, is that more speed equals more progress. People do understand the importance of speeds being controlled below 'extreme' values, something I have written about before in Road Safety Week. However our habitual experience of the speeds we are 'used to' driving at (when they are not perceived as extreme) is something we need to challenge.

Roads

One of the unheralded (outside of road safety circles) tools in public health is iRAP. This tool is used by road authorities to rate their roadsides against a range of criteria relating to crash safety. For example roads without a median barrier (more likely to have head-on collisions) or roads with unprotected unforgiving roadside objects such as trees (which are risky to crash into) score low on safety, enabling road authorities to identify and enact necessary improvements. iRAP scores range from 1 (least safe) to 5 (most safe).

One organisation that uses iRAP to great effect in improving the safety of its network is National Highways, which is arguably a class leader in this area. In the latest report on the Strategic Road Network's iRAP scores however, over a third of roads score 3 or lower. This is testament to the scale of the challenge in making roadsides safe even for those authorities demonstrating good practice. The roads we have are in need of serious improvement, but this takes time.

Another way in which roads seem set up to fail is the relative lack of segregation between motorised and vulnerable modes, or other measures to improve the experience of vulnerable users (such as traffic calming). We know a lot about this. For example, we know that segregation is safer for cyclists. We know that if we build good infrastructure for active travel, people will use it. We are also beginning to understand in more detail how the transport systems we build physically can change people's attitudes and travel choices directly; behaviour changes attitudes (just as attitudes can change behaviours).

In short, we have tools and knowledge to help design roads to Safe System principles, but progress is slow.

Post-crash care

Even medical care is not immune from Unsafe System thinking. The best example of this is the Exit Project delivered by Tim Nutbeam and colleagues to challenge decades of dogma around how to safely extricate people from crashed vehicles. The work showed that the traditional approach of focusing on spinal stabilisation – often involving cutting the roof off a crashed vehicle to bring the patient out on a stretcher – led to longer extrication times, ***and more (not less)*** spinal movement than simply allowing patients to extricate themselves if possible. Procedures are now changing, but change takes time, and the established norm in this case is proving difficult to dislodge. The fact that people are still being cut out of police cars in which they are waiting (having self-extricated from their own vehicle after a crash) demonstrates this with a rare level of absurdity.

Another example is provided by eCall. This system is designed to automatically alert emergency services after a crash, making it easier for them to attend quickly, especially when crashes happen in remote areas and drivers are incapacitated. It has been questioned whether eCall is meeting its road safety promise and some of the causes for concern relate to systemic issues. For example, the eCall in many existing vehicles is designed to work on the 2G network, and without some retrofitting will cease to function when this network is switched off (2033 at the latest, according to the report). No system is perfect, and cars do not last forever. Having eCall in some of the fleet is likely better than having it in none, but again the implementation of Safe System thinking is held back by the wider context.

Post-crash care is improving, and new projects like Pre-hospital Research and Audit Network (PRANA) are aiming to improve our understanding of the consequences of collisions through linking datasets for combined insights. Examples like those above remind us, however, that as well as innovation, we need to improve existing practice.

Users

Given that one foundational principle of the Safe System is to accept that people make mistakes, one would expect this to be the one 'pillar' we can rely on. Unfortunately as noted in this excellent paper when road authorities adopt the Safe System they often do so from a perspective of old ways of thinking about the role of 'human error'. Again from personal experience, I have heard decision-makers state that if road users don't follow the rules, they cannot be expected to benefit from system design. This way of thinking is fundamentally anti-Safe-System: ''We accept that people will make mistakes. Also, people should not make mistakes!''

Beyond thinking about human error, it is only relatively recently that we have begun to improve our understanding of behavioural science and research in road safety. The embracing of science specifically about behaviour change techniques is one example of this. Even with stronger theoretical underpinnings however, we still see interventions targeted at users, arguably based on intuition instead of formal theory, that are not only ineffective but in some cases actually harmful. This study from 2022 for example showed that emotional messages about numbers of road casualties, presented on roadside signs and designed to 'grab attention', actually increased subsequent crashes (presumably by distracting passing drivers by...'grabbing their attention').

Outdated thinking about the 'human factor' in driver training, testing and licensing has also held us back. For example the idea that drivers can simply have some training, pass a driving test of some kind, and be safe to drive unsupervised has been shown to be wrong over nearly a century of research. Newly-qualified drivers remain at much higher risk of a crash when they pass their test than before. The group at a greater risk of harm (men) pass the test at a higher rate than those at a lower risk (women) (see this TRL report for some early ideas as to why). Despite all this, resistance to reforming the licensing system in the UK to one based on graduated driver licensing principles persists, even with all the evidence indicating that this is clearly the best way to align the licensing system to the way people learn how to drive. (See this website for extensive references on this, collected from professionals across the road safety sector – myself included – as a resource for parents and other interested parties.)

Ultimately, users may be the most difficult part of the Safe System to influence, which is ironic, since they are the only part which the Safe System really exists to serve. An individual user does not have the overview of the road system in the way that those managing the roads do. Authorities see almost every major incident on their network, and usually need to control these as part of targets; almost every road user on the other hand goes about their day to day travel without ever coming across any hint of

the risks they face, or the ways in which the road system has this risk built in by design.

Another issue is that our culture has a romanticised relationship with unsafe driving. Media portrayals of driving are such that the 'Fast and Furious' franchise has 11 (yes, eleven) instalments; I remain unaware of any blockbusters about careful and considerate driving.

All this means that serious injuries and fatal collisions on the roads remain, arguably, socially accepted by the very users the Safe System is designed to protect. The exceptions are people who lose loved ones to road collisions, or those who experience life-changing injuries themselves.

Conclusion

This is a blog, not a peer-reviewed paper. If you wish, it can be dismissed on this basis as just my opinion. However, I do at least have an *informed* opinion. I'm also not the only person noting that the road transport system (and specifically the role of motor transport within it) is essentially a 'blindspot' in society when it comes to accepting harm. The paper on 'motonormativity' by Walker, Tapp and Davis (2023) is probably the best contemporary example, and is actually based on data. Further back, three decades ago Roberts and Coggan (1994) were noting that system thinking was being ignored in preference for blaming even children for their own deaths, when they were run over by motor vehicles.

In my two and half decades working in road safety, I have seen improvements in many areas. The way we use evidence has improved, especially in areas like behaviour change as noted above. The old narratives are still here though. I have sat in multiple meetings with senior representatives of various road authorities, and heard talk of "the need to balance mobility and safety" immediately after smiling announcements that "we are committed to the Safe System approach", and no accompanying awareness that these statements are completely contradictory.

So what do we do? One thing is probably to keep on doing what we are already doing. Working within 'the Unsafe System' to keep improving it *is the least* we can do. As I enter the latter years of my career though, I am more convinced than ever that there are two things we need to do differently, to really accelerate the pace of progress. Ironically for those who remember my early work in road safety, these both involve the thing I have historically tended to de-prioritise: education. I am not, however, making the case for road safety education in the traditional sense; we know that even modern approaches to behaviour change can only effect relatively minor changes, with much more to be gained by removing systemic barriers to desired behaviours. Instead, I propose that we need two very specific types of 'education'.

First, we need education and then discussion that includes the public, to bring them into the conversation about what is being done to them by poor system design, to find out what is acceptable and what is not, to society. This

will need time, and the discussions will likely challenge some established norms and habits. The purpose of this though should be to allow the public access to the facts as they are, not just as they are delivered through the media, and to define a set of expectations around how we should approach road safety in a civilised society. Getting the Safe System 'foundational principles' tested in this way will be critical in achieving some levels of perceived legitimacy about the measures we enact to achieve the aims.

Second, and perhaps more urgently, we need education of policy makers about the consequences of certain policy decisions in road safety. I may sound jaded when I say this, **but I care less about the actual policies implemented than I do about them being based on sound evidence of effectiveness**, and whatever public-included expectations we discover. Currently, as demonstrated in the recent discussions around graduated licensing, evidence is ignored, and public expectations are simply assumed. The conversation here should be more nuanced, and should include an acknowledgement that the policy direction in this case (avoiding changes to the licensing system that have been shown to work very well in multiple other countries, and much better than the alternatives being considered) means we are offsetting lives lost against hypothetical mobility issues for some drivers. This, to me, seems like the very opposite of the Safe System approach. The 'Unsafe System approach', perhaps.

I remain convinced that no-one should die or experience a life-changing injury just because they need to use the roads to get around. The Safe System approach seems to me to be the best paradigm in which to work to move towards this goal. The Unsafe System approach in which we also find ourselves working is just the reality we need to overcome along the way.

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