Chapter 3
Traffic Safety: The Top Ten Issues

Tony Bliss

3.1 Introduction

Traffic safety is a vital dimension of sustainable transport explored through multiple disciplinary and interdisciplinary lenses. The growing accumulation of scientific evidence concerning the effectiveness and efficiency of interventions provides the bedrock for ongoing global improvements. Traffic safety management practices in high-income countries have successfully leveraged this scientific evidence base and in turn provide a sharper focus on issues concerning the delivery, or implementation, of improved traffic safety.

This focus on the implementation of traffic safety improvements is relevant to India and other low and middle-income countries experiencing growth in avoidable road crash deaths and injuries. While there have been sustained global efforts to promote good practice safety interventions, less attention has been paid to strengthening the management capacity necessary to deliver them. Traffic safety research has a role to play in addressing this, and for the next generation of researchers, ten priority issues have been identified for further consideration. For each issue, questions are posed, without answers, to extend this exploratory process.

T. Bliss (✉)
Faculty of Architecture, Building and Planning, Transport, Health and Urban Design Research Lab, Melbourne University, Melbourne, Australia
e-mail: tonybliss@roadsafetymanagement.com

Road Safety Management Limited, Wellington, New Zealand

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3.2 Issue 1: Production

The first issue concerns how little attention we pay to the way traffic safety is actually produced. It is often sold as something you just take off the shelf and use like a magical potion, with an informed mixture of incantations and exhortations assuring success. Do the right thing in the right place at the right time. An abundance of this form of advice is offered to and by the global road safety community, which leaves the impression that quick success can be simply conjured up.

The reality is more prosaic and much more demanding. Traffic safety is produced, just like other goods and services, and its quality in terms of final results achieved is determined by the quality of the production process. Hence, in traffic safety management terms, it is important to understand the nature of this production process and its multi-faceted, systemic elements.

We can visualize the traffic safety management system as having three key elements, stacked up in pyramid form, comprising institutional management functions that produce interventions that in turn produce results (Bliss and Breen 2009).

At the bottom of the pyramid, we can identify seven institutional management functions, with the most important of these being what we term "results focus." This is a short-hand way of expressing what it is that we want to produce and our strategy for doing so in terms of interventions and targeted results. Six related management functions concern how we coordinate partnership and stakeholder activities to achieve the desired results; how we legislate to achieve the desired results; how we fund and allocate resources to achieve the desired results; how we promote activities to achieve the desired results; how we monitor and evaluate activities to achieve the desired results; and how we undertake research and development and knowledge transfer to achieve the desired results. It is this institutional "engine room" of the production process that so often gets neglected in discussions concerning how to improve national traffic safety performance.

In the middle of the pyramid, we have three categories of targeted interventions: interventions that concern the planning, design, operation, use and maintenance of the road network; interventions that concern the entry and exit of drivers, vehicles and operators to and from the road network; and interventions that concern the recovery of crash victims from the road network and their rehabilitation. These three intervention categories can be further disaggregated into two types: those that set and implement safety standards and rules, and those concerning related compliance regimes which comprise combinations of education, enforcement and incentives.

Finally, at the top of the pyramid, we have the results we wish to achieve which can be measured in terms of outputs, intermediate outcomes, final outcomes and social cost. In low and middle-income countries where final outcomes data quality is poor, sampled intermediate outcome measures, such as network speeds, helmet and safety belt wearing rates, safety rating of core network roads and vehicle safety ratings, can provide reliable indicators of overall safety performance and related trends.

Even with this simplified safety management system framework, we can see the complexity of the traffic safety production process which must operationalize the three identified elements, each of which necessarily breaks down into greater levels of detail. We must also take into account the dynamic nature of this production process and the evolution of its results focus over time.

Through to the 1960s, the results focus of the production process was preoccupied with improving road user attitudes and behavior, what we now term a "victim-blaming" approach (Rumar 1999). During the 1970s and 80s, this shifted to a "matrix" approach, with a more systemic results focus on pre-crash, in-crash and post-crash events engaging road users, vehicles and the road environment (Haddon 1968). By the 1990s, what subsequently become termed the "Safe System" approach was beginning to surface with the Dutch *Sustainable Safety* and Swedish *Vision Zero* strategies (Wegman and Elsenaar 1997; Tingvall 1995).

The Safe System approach aims to manage the impacts of injurious crash forces at the interfaces between road users, vehicles and the road environment, with a results focus seeking to eliminate crash fatalities and serious injuries. This zero-harm goal has become the norm in high-income country traffic safety strategies and is also being promoted to low and middle-income countries.

While high-income countries are struggling to address this level of ambition—with Sweden and The Netherlands leading the way—a new results focus is emerging. In our work at Melbourne University, we have termed this the "Complex System" approach, which encapsulates the Safe System approach within a more holistic set of measures seeking to address new forms of sustainable urban mobility arising from the convergence of information, communications and transport technologies and the exigencies of global climate change policies targeting large-scale atmospheric carbon reductions (Bliss 2015).

The traffic safety production process must be understood and acted upon within a wider set of transport goals seeking improved productivity, competiveness and prosperity, integrated with related goals concerning the environment, energy security, urbanization and public health. We are moving into an era of growing complexity and longer planning and programming horizons that hinge on more highly valuing costs and benefits accruing to future generations. Yet at the same time, we are experiencing powerful resistance to the state playing a strong leadership role in managing fundamental shifts in policy and practice required for sustainable success.

This issue of how road safety is produced raises questions that merit further consideration:

- *Why do we insist on traffic safety as being something simple to deliver?*
- *Why do we focus on interventions alone?*
- *Why do we cling to past traffic safety paradigms?*
- *Why do we view traffic safety as an imposition of the "nanny state"?*

3.3 Issue 2: Sequencing

Like all effective and efficient production processes, the sustained delivery of traffic safety requires proper sequencing. Foundations must be built before later stages of production can be operationalized (e.g., driver and vehicle entry and exit controls and registries underpin effective compliance regimes; high-capacity judicial systems and publicly acceptable administrative penalty procedures underpin feasible speed camera operations; and so on).

It is like building a house where key tasks have a logical ordering. There is little value in specifying the fitting of the roof, without considering the nature of the foundations and walls, let alone their construction. Yet ongoing calls for action to address traffic safety priorities often fail to recognize this reality. Talk is cheap, but the costs of not attending to fundamental requirements for feasible action are high.

Good practice, high-income countries took seventy years of motorization to build up sufficient capacity to be able to implement a more scientific management model, and it has taken a further four decades or so to achieve more acceptable traffic safety outcomes. The basic building blocks for success are visible in high-income countries, and they highlight the long planning and programming horizons required for the delivery of sustainable results.

Achieving comparable success more quickly in India and elsewhere will require a properly sequenced pathway of action to be followed. The next 15 years set for the achievement of the Sustainable Development Goals (United Nations 2015) provides a challenging but achievable time frame for this, providing a rapid start on building country management capacity can be assured. Experience with the delivery of the Millennium Development Goals underscores the importance of moving quickly to build a solid foundation for scaled-up action, if targets are to be achieved.

This issue concerning the sequencing of road safety delivery raises questions that merit further consideration:

- *Why do we say the delivery of substantially improved traffic safety can be achieved quickly?*
- *Why do governments and donors demand immediate success in terms of final results?*

3.4 Issue 3: Inequality

Aside from addressing climate change, inequality is perhaps globally the biggest "big" issue of our times, given the growing disparities in wealth and opportunities. For example, the work of Thomas Piketty focuses critical attention on growing income inequality in high-income countries and inequalities in the global distribution of wealth (Piketty 2014). It cannot be assumed that winners will compensate losers, or that principles of social justice, which point to assisting those worst off first, will prevail in contemporary, macroeconomic regimes, especially those promoting the

virtues of austerity. Remarkable complacency about growing global inequality is evident.

We can see many of the contours of inequality manifested in the delivery of traffic safety measures and their performance. The growing performance gap between high-income countries and low and middle-income countries underpins the call for a Decade of Action for Road Safety and related Sustainable Development Goals. Within countries, worldwide safety inequalities are also evident between urban and rural areas, road types, vehicle types and road users.

Awareness and the unacceptability of these inequalities have been heightened by the promotion of the Safe System approach, with its goal of ensuring safety for all users of the road transport system. Improvements in analytical tools are highlighting the prevalence of unequal outcomes and the systemic means of addressing them. There are growing concerns that rapid technological change in the vehicle fleet and its communications with the road environment could create new inequalities with unintended safety consequences.

A major system failure continues to haunt us. As highlighted by the Global Burden of Disease findings (Murray and Lopez 1996), road crashes rank highly with suicide, drugs and interpersonal violence as a leading cause of death for our young people. Between the ages 15–34 years, this picture is evident across the developed and developing world and there has been little change in the rankings over the last two decades. After more than a hundred years of motorization, traffic safety risks for young people are still not being effectively managed (Bliss 2014).

This issue concerning road safety delivery inequalities raises questions that merit further consideration:

- *Why have we failed our young and our vulnerable road users?*
- *Why do we treat certain roads with differing levels of protection provided for users as being equal, in terms of setting speed limits?*
- *Why does the global donor community continue to ignore traffic deaths and injuries as a development priority in low and middle-income countries?*
- *Why has equity or fairness become subordinate to efficiency?*

3.5 Issue 4: Limits to Performance

Limits to traffic safety performance are set by technical production frontiers and institutional management capacity, with the latter often constraining achievement of the former. For any given road system, technical limits to the level of safety are governed by the protective quality of the infrastructure, vehicles, and safety clothing and helmets, at prevailing speed limits, and the degree of compliant behavior by system users. However, often the management capacity to achieve feasible levels of traffic safety is lacking. Surpassing current safety performance outcomes requires both the technical means and the managerial capacity to deliver it.

Technical production frontiers are determined by safety standards and rules, and desired shifts in results focus may require these standards and rules and

related compliance regimes to be recalibrated and management practices adjusted accordingly to achieve improved safety. Yet implementation of the Safe System approach in high-income countries still provides examples of performance ambition exceeding both technical boundaries and institutional delivery capacity. For example, in Australasian jurisdictions, the desired goal of achieving zero harm will be impossible to attain with prevailing infrastructure designs and related speed limits, although there is little official acknowledgment of this.

This issue concerning road safety performance limits raises questions that merit further consideration:

- *Why do we avoid informed discussion or understanding of what traffic safety management systems are capable of in performance terms?*
- *Why do we call for safety performance way beyond the technical and institutional capacity to produce it?*

3.6 Issue 5: The Road User

Taking a speculative stance and looking to the future, there is value in going beyond the bounds of our contemporary traffic safety dialogue and evidence base. While our paradigmatic shift has de-emphasized victim blaming, we need to reconsider the capacity and agency of road users, in terms of their safety behaviors, and what we can realistically expect of them.

The Safe System approach requires road users to share responsibility for their safety, by complying with system safety standards and rules. However, while the dynamic nature of the traffic safety production process has resulted in sustained improvements in vehicle and infrastructure safety performance, our understanding and expectations of the road user have changed very little, beyond perhaps a sharper recognition of gender, age, physical vulnerability and so on.

We do have ideas concerning "culture" and "consumer behavior" and their potential influences on traffic safety outcomes, though these are loosely shaped and poorly accounted for in evidential terms. We also acknowledge the importance of human factors science, given the rapid rate of technological change and emerging complexities in human–machine interfaces, in terms of the cognitive load our brains can be expected to handle. But overall we still treat the road user as a constant in these matters and are not considering that perhaps a new type of human could be emerging or being shaped.

We must recognize that the human–machine interface is evolving rapidly and artificial intelligence is making progress. Where are we heading as human subjects in this process? Useful account could be taken of the insights provided by Marshall McLuhan on media as extensions of human capacities and identities (McLuhan 2003), and Michel Foucault on the mode of being of the human subject shaped by regimes of knowledge, power and self-formation (Foucault 2005). We must revisit our understanding of road users and their inherent capacities and actions.

This issue concerning the role of road users in the traffic safety management system raises questions that merit further consideration:

- *Why do we treat road users in terms of their human capacities as a constant?*
- *Why do we view information and communications technologies and their convergence with transport systems as neutral enablers of change?*
- *Why do we continue to pin our hopes on improving road user attitudes, behaviors and cultures as the means of improving safety performance?*

3.7 Issue 6: Design

Safe design is integral to achieving safe performance, something that was already becoming well understood in industrial safety a half-century ago. If you want to stop workers being injured by the machines they use, you make the machines safer. If you want to lose less lives in mining disasters, you make the mine systemically safer, rather than viewing and treating mine workers as having suicidal tendencies. This perspective seems self-evident to many traffic safety practitioners today.

Steady progress is being made in vehicle safety improvements, especially for vehicle occupants, yet in the case of road infrastructure, traffic safety has been lagging in its design focus, even with the Safe System approach bringing safe design to the forefront. In particular, the Dutch *Sustainable Safety* strategy sets out rigorous safety design principles and globally more attention should be paid to their application (Wegman and Aarts 2006).

In some instances, the goal of eliminating crash deaths and serious injuries is proactively shaping infrastructure design solutions, replacing reactive measures being taken only when system failures are of sufficient concern to merit intervention. The shift to roundabouts for safer junctions is a good example of this. Likewise, the adoption of low-cost wire rope barriers on high-speed interurban roads is eliminating deaths and injuries from head-on crashes. Aside from this, overall progress in safety design is slow.

Given the professional inertia cloaking current safe infrastructure design practices, there is still a long way to go before speed and safe design are addressed integrally to eliminate predictable road crash deaths and injuries. However, the emergence of a Complex System approach may demand safety performance requirements that designers must comply with, rather than trading safety off and continuing to produce infrastructure designs with a known kill-rate built into them. This requirement is already the case with rail and air transport systems and the growing complexity of road transport systems may dictate a similar ethos.

This issue concerning safe design raises questions that merit further consideration:

- *Why do we tolerate road infrastructure designs that are clearly failing?*
- *Why do we promote safety audit and inspection as the panacea for achieving safe road design, rather than hold operators accountable for safe infrastructure and empower and require infrastructure designers to proactively deliver it?*

- *Why do we resist designing for safe speeds in the road network?*

3.8 Issue 7: Development

Economic development and its sustainability goals provide the broader context for the consideration and promotion of traffic safety in low, middle and high-income countries. In terms of development impacts, we need address the issue of avoidable deaths and disabilities, and the associated health losses and economic impacts, let alone the pain and suffering of crash survivors and their families.

Deepening levels of inquiry exploring the linkages between economic development and human wellbeing are evident. Critical biopolitical perspectives are uncovering and elaborating the primacy of population health in preserving and enhancing life in the formation of modern states and their citizens (Foucault 2007, 2008). Reinforcing this is the macroeconomic view that improved health generates income growth and productivity, a reversal of the conventional understanding that income growth results in improved health (Bloom and Canning 2000). From this perspective, health creates wealth, which changes how we view health losses and investments made to improve health.

These insights resonate with a rethinking of country development priorities that have shifted from a narrow focus on income and spending to paying increased attention to the provision of accessible education and health, and ensuring social, cultural and national inclusiveness and political participation. Development aims to promote higher living standards for all, with an emphasis on improved health, education and peoples' ability to participate in the economy and society. Viewed within the twin pillar framework promoted by Nicholas Stern during his time at the World Bank, it seeks to foster an investment climate conducive to increased growth, productivity and employment, and to empower and invest in people to include them in the development process and ensure that they share its benefits (Stern et al. 2005). Yet the overwhelming impacts of population health and wealth losses arising from road crashes undermine this necessary inclusiveness and reinforce the case being made for their prevention to become a higher development priority.

We must confront the issue that some lives matter more than others: lives that the state is more willing to give away. This is an ethical disposition that Richard Allsop memorably termed "the scandal of tolerance" in his reflections on the findings of the SUNflower project that reviewed road safety development in three of the world's best-performing countries, Sweden, the UK and the Netherlands (Allsop 2002).

Over the first 30 years of the twenty-first century it is projected that the global vehicle fleet will at least double, with more than half of these vehicles entering the road networks of low and middle-income countries (Dargay et al. 2007). These networks include unprecedented numbers of vulnerable road users fated on current trends to become road crash victims. The resulting carnage will be huge. Global road deaths are projected to rise to around 2 million people a year by 2020 and continue growing, unless substantial new initiatives are taken. Making the bold assumption

that the Decade of Action goal of halving 2020 fatalities can be achieved—whereas in reality, halfway through the Decade, time has already run out on this—and accounting for growing road transport demand, more than 50 million deaths and 500 million serious injuries on the world's roads can reasonably be anticipated over the first fifty years of this century (Bhalla et al. 2008).

Historically, only comparable eras of war or genocide have delivered such sustained violence. For example, in the 45 years following World War II, based on estimates made by Robert McNamara, around 40 million people were killed in national and regional conflicts, with 70% of the victims being civilians (McNamara 1992). In the modern parlance of twenty-first-century war, civilian victims have since become euphemistically described as "collateral damage." By way of comparison, the first three decades of road crashes in this century look set to generate fatalities on this scale, with equivalent collateral damage in terms of impacts on vulnerable road users. This is not accounting for the higher injury toll associated with road crashes, which result in at least ten serious injuries per fatality (and much more in road environments like India), a ratio only now being approached for combatants in modern warfare where improved body armor, victim recovery and trauma care services are keeping more battlefield victims alive and often left seriously disabled (Goldberg 2010).

Taking a longer-term view, this picture becomes even bleaker, with roads in certain ways resembling modern battle zones. Urgent and sustained traffic safety measures are required to stem the rising tide of crash fatalities and injuries arising from growing demand for road transport services and related infrastructure investment. Otherwise, sustained violence on the world's roads looks to be inevitable.

This issue concerning road safety as a sustainable development priority raises questions that merit further consideration:

- *Why do road deaths and disabilities on a mass scale go relatively unnoticed as a contradictory by-product of development?*
- *Why do we accept the giving away of lives and the heavy burden of injury resulting from our road transport system?*
- *What is holding us back from urgent, sustained action to address this avoidable carnage?*

3.9 Issue 8: Innovation

Hopes are increasingly being pinned on innovation to address global traffic safety concerns. However, with some notable high-income country exceptions, associated research and development budgets do not reflect this enthusiasm. We are living off the findings of past research and diminishing returns are setting in. New research and development programs are now needed to anticipate and address the growing complexity of urban mobility and related traffic safety issues. We must now commit to the long-term process of building a new evidence base for the twenty-first century.

The successes of traffic safety programs in good practice countries that began to accumulate toward the end of last century were built on the findings of decades of sustained research and development. While it takes considerable time to create and effectively translate an evidence base into action, the benefits achieved justify the research and development investments. Innovation, particularly in terms of piloting and evaluating new measures that theory suggests promise safety benefits, is integral to this process.

Certain traffic safety priorities call for innovative action. These include improving the safety of vulnerable road users in mixed mass, mixed speed environments like those found in India and its neighboring countries. Emerging mobility scenarios of a complex nature must also be addressed, such as vehicle-to-vehicle, vehicle-to-infrastructure and vehicle-to-road user communications, and autonomous driving, to ensure network safety is paramount. This in turn calls for a commitment to long-term research and development (Bliss 2014). In low and middle-income countries, with some possible exceptions, little attention is being paid to investing in these traffic safety priorities.

This issue concerning the promise of road safety innovation raises questions that merit further consideration:

- *Why do we just see innovation as technical applications in search of problems they can solve and related market or business opportunities?*
- *Why are we not seeking innovative infrastructure and vehicle design solutions for unique traffic safety issues in low and middle-income road network environments?*
- *Why have we lost the will for long-term investment in traffic safety research and development?*

3.10 Issue 9: Investment

We now get to a crunch issue that continues to be neglected, perhaps because it concerns finding sources for safety funding. Improving national traffic safety performance requires substantial and sustained investment. Though difficult to quantify—given that safety budgets are often embedded in larger infrastructure, enforcement and regulatory budgets—funding requirements are huge. In public management contexts that require transparent output and outcome linkages, it is possible to gain some insights into the scale of these requirements.

For example, traffic safety enforcement in Australasian jurisdictions requires around 20% or more of total policing budgets. This is at least an order of magnitude higher than enforcement budgets in low and middle-income countries. It is also investment of a proactive nature targeting measurable performance outcomes, rather than being diffused and diluted in traffic management and incident responses, as is usually the case in low and middle-income countries. Much more could be said about this, across the broad spectrum of traffic safety interventions, but the key point is that the successful performance of high-income countries in effect makes a clear

business case for what is needed in investment terms. The complexity of their institutional arrangements alone can also be viewed as a surrogate indicator of success and commitment to sustained investment, and their longer-term goal of fatality and serious injury elimination points to the net benefits that are anticipated.

Significant investment will be required to achieve the Decade of Action targets of saving 5 million lives and avoiding 50 million serious injuries. It was estimated that this would result in gross benefits of more than USD$3 trillion, using a value of statistical life based on International Road Assessment Program estimation procedures (Guria 2009). Assuming that investments made to achieve these fatality and injury targets had an overall benefit-cost ratio of 10:1, which is optimistic though plausible, dividing US$3 trillion by 10 indicates the magnitude of investment that must be mobilized.

On this basis, it could be argued that low and middle-income countries cannot afford to invest in traffic safety, but this is not the case when the sheer scale of road transport investment is taken into consideration. Over the next four decades, global passenger and freight travel is expected to double from 2010 levels, with non-OECD countries accounting for nearly 90% of travel increases. Estimated network length will increase by 60%, with 90% of associated road infrastructure investment being in non-OECD countries. Global road capital construction, reconstruction and operations and maintenance costs are estimated to reach up to US$1.1 trillion annually over the next 20 years, dropping to around US$700 billion a year by 2050 (Dulac 2013). Justifiable savings could be achieved by shifting to more sustainable modes, but even so the overall level of investment in road transport will continue unabated on a huge scale.

From this perspective, it is specious to argue that improved traffic safety is unaffordable for low and middle-income countries. As is the case with high-income countries, the long-term funding required to sustainably improve traffic safety performance could reasonably be sourced and absorbed within projected mobility investments, providing the institutional road safety management capacity is built to deliver this. But in the immediate term, what is urgently required is sufficient international catalytic funding to accelerate this capacity-building process, to help unlock sustainable domestic funding sources targeted to deliver improved traffic safety over the coming decades.

This issue concerning the scaling up of road safety investment raises questions that merit further consideration:

- *Why are we so coy about the level of investment required to achieve sustainable traffic safety?*
- *Why do we promote the view that improving traffic safety is cheap and easy?*
- *Why is the global traffic safety community comfortable with derisory levels of catalytic funding that do not address county capacity-building requirements and are incapable of achieving measurable and sustainable results?*

3.11 Issue 10: Management

The final issue concerns traffic safety management and the associated issues of responsibility and accountability for performance. This brings us back full circle to the first issue of producing safety and the nature of this production process. Taking a "managing for results" perspective, what is measured is managed, and application of the scientific evidence base is fundamental to success.

Management must address production complexities and take responsibility for all elements of the management system comprising institutional functions that produce targeted interventions which in turn produce results. Management must also address all the other issues previously outlined: those of sequencing, inequality, limits to performance, the road user, design, development, innovation and investment. This is a formidable set of tasks.

Management responsibilities also include the less visible tasks of sustaining agency creativity, building teams and partnerships, and ensuring the ongoing creation of traffic safety knowledge necessary to achieve continual improvements in performance. Strategic and visionary leadership are vital to addressing these management priorities, and their general absence at country, regional and global levels remains a fundamental brake on progress.

While a focus on management is prioritized as the first pillar in the Global Plan for the Decade of Action and permeates much of the plan's content, in the main, it is neglected in global road safety dialogue and action. More attention must be paid to developing robust management capacity in low and middle-income countries. Strengthening peer-to-peer relationships with high-income countries would be an important first step in this development process, to help achieve the diffusion and sharing of knowledge vital to improving traffic safety productivity.

This issue concerning road safety management raises questions that merit further consideration:

- *Why do we assume that sufficient management capacity already exists in low and middle-income countries, just waiting to be mobilized?*
- *Why are many governments and their agencies, and international donors, missing in action, when it comes to showing leadership and supporting the strengthening of traffic safety management capacity in low and middle-income countries?*

3.12 Concluding Remarks

To sum up, there are many issues and questions remaining to be addressed, which all serve to illustrate what a rich and rewarding field we are privileged to be engaged in. These issues and questions also underscore the immense challenges we must face and the societal benefits we can help create—the value we can potentially add—if we commit to the pursuit of long-term success. It is appropriate at this point to conclude with the researchers' lament (Bliss 2014):

We do not know enough….

And we do not do enough with what we know.

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