

Vision Zero and the Safe System Approach: A Primer for Canada

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Introduction

Road safety is receiving more global attention than ever, with the Second Decade of Action for Road Safety being declared in 2020 by the World Health Organization and the United Nations. The declaration targets at least a 50% reduction in road traffic deaths and injuries by 2030¹, and positions road safety as a key driver of sustainable development. It supports governments and stakeholders who are prioritizing and implementing the Safe System Approach to achieving Vision Zero – the goal of zero deaths and serious injuries from traffic crashes.

Canadian roads saw 1,745 fatalities and 7,868 serious injuries in 2020², or an average of five deaths and 22 serious injuries every day that impacted families and communities across the country. In response to this unacceptable toll, *Canada's Road Safety Strategy 2025* adopts the Safe System Approach.³ Many provinces, territories and municipalities are also pursuing similar agendas. The objectives of this primer are to establish clear definitions and principles for Vision Zero and the Safe System Approach, to promote greater understanding of these concepts, and to support the development, identification and sharing of Canadian best practices.

Vision Zero and the Safe System Approach: Frameworks for improving road safety

Transportation system owners and operators have the responsibility and knowledge to safely accommodate error-prone and vulnerable users, and to minimize the likelihood of serious injury or death from motor vehicle crashes. In countries around the world, Vision Zero and the Safe System Approach have become accepted frameworks for road safety programs. A related focus on health and environmental issues has led road safety strategies to also encompass new and more sustainable mobility options, and to involve non-traditional partners.

Each jurisdiction will follow a different road safety journey as it adapts shared concepts to suit local needs and priorities. Along the way, collaboration with other orders of government, civil society and industry partners will be fundamental – but requires a shared understanding of core concepts. With this in mind, Figure 1 provides a graphical summary of Vision Zero as well as the principles, elements and key action areas of the Safe System Approach. The subsequent sections of this document offer more details on each of these topics.

Figure 1. Vision Zero and the Safe System Approach



Vision Zero: Definition

Vision Zero is a philosophy that positions deaths and serious injuries as an unacceptable result of crashes and sets the ultimate goal of eliminating them. It reflects two key concepts:

- *Human life and health are prioritized within all aspects of the transportation system* – They can never be exchanged for other societal benefits, and they take priority over mobility and other objectives in the road traffic system.
- *Deaths and serious injuries are preventable* – Crashes are not inevitable, and knowledge exists to both predict and prevent them. The policies, systems and built environments that contribute to crashes can be improved with political will and collective action.

Vision Zero emerged in Sweden then gained momentum in many other countries including Norway and the United Kingdom, which now have some of the lowest road fatality rates in the world. More recently, Vision Zero has gained a strong presence across the United States and Canada. It can also encompass other philosophies (e.g., Towards Zero, Road to Zero) that are consistent with its fundamental goal and key concepts.

Safe System Approach: Definition

Vision Zero and the Safe System Approach are related, but not synonymous, even though they are often discussed together. As noted above, Vision Zero defines the need for a paradigm shift in our approach to road safety. **The Safe System Approach explains how we can dramatically improve road safety through an integrated, comprehensive process that recognizes the fallibility and vulnerability of human beings.**

The Safe System Approach accepts that even the most conscientious people make mistakes, and its goal is to ensure that mistakes do not result in a crash – or if a crash does occur, that its effects are mitigated to prevent deaths or life-changing injuries. The United Nations, World Health Organization, and Organisation for Economic Co-operation and Development consider the Safe System Approach to represent the international best practice in road safety and recommend that all countries follow it regardless of their level of road safety performance.⁴

The Safe System Approach requires that persons involved in the planning, design, operation, maintenance and use of the transportation system understand how its components interact, and that they work to minimize human error and mitigate its consequences. This responsibility is shared by those who are accountable for the system's safety performance (e.g. policy makers, planners, engineers, vehicle manufacturers, fleet managers, enforcement officers, road safety educators, health agencies, and the media) and by all road users regardless of their travel mode.

The Safe System Approach's holistic view of the transportation system simultaneously considers infrastructure, its physical context, travel speeds and road users. It leads to an

inclusive transportation system that provides safety for pedestrians, cyclists, and all vehicle operators and occupants regardless of their abilities. Further, it inevitably aligns with broader ethical, social, economic and environmental goals, and by encouraging collaborative multi-sector partnerships it supports progress on challenges including climate change, noise pollution, and equitable access to safe and connected mobility. Figure 2 summarizes the several differences between the Safe System Approach and traditional approaches to road safety.

Figure 2. Traditional approaches to road safety versus the Safe System Approach⁵

Traditional approaches to road safety	→ Safe System Approach
Focuses on crashes	→ Focuses on injuries
Aims to reduce risk of crashes	→ Aims to eliminate death and serious injury
Road user has primary responsibility	→ System designer has primary responsibility
Change individual road user behaviour	→ Change the environment (safe roads, safe vehicles, safe speeds) to enable road users to tolerate crash forces
Safety is “optimized” once mobility and accessibility objectives have been achieved	→ Safety is a fixed parameter with threshold levels that cannot be exceeded – mobility and accessibility are variables in this framework
Roads are made as safe as reasonably practical	→ Roads are self-explaining and forgiving of mistakes so that road users are protected from crash forces that exceed human biomechanical injury thresholds

Safe System Approach: Principles

The six underlying principles of the Safe System Approach are explained in the following paragraphs.⁶

Deaths and serious injuries are unacceptable.

While no crashes are desirable, the Safe System Approach focuses on crashes that result in death and serious injuries, since those should not be experienced by any transportation system user.

People make mistakes.

People inevitably make mistakes that can lead to crashes, but the transportation system can be designed and operated to prevent death and serious injury by accommodating human mistakes and considering injury tolerances.

People are vulnerable.

There are physical limits to the crash forces that people can tolerate before death or serious injury occur. It is critical that the transportation system be designed and operated in a way that is human-centric and accommodates human vulnerabilities – in

essence, one that manages the human body's ability to absorb the kinetic energy of a crash.

Responsibility is shared.

All transportation system stakeholders (e.g. designers, operators, vehicle manufacturers, users) share the responsibility of ensuring that crashes do not lead to fatal or serious injuries.

Safety is proactive.

Proactive tools can be used to identify and mitigate latent risks in the transportation system, rather than waiting for crashes to occur and reacting afterwards.

Overlapping measures are crucial.

Reducing risks requires that all parts of the transportation system are strengthened, so that if one part fails the others continue to protect people. For example, where there is risk of a collision with an obstacle, signage can warn drivers of its presence, an impact attenuator can shield the obstacle, and a vehicle airbag can protect vehicle occupants in case of a crash. The objective is to avoid having minor flaws in different parts of the system align and give rise to deadly outcomes.

Safe System Approach: Elements

Figure 1 shows the six elements of the Safe System Approach: safe land use planning, safe speeds, safe road users, safe vehicles, safe road design, and post-crash care. These elements are discussed in the following paragraphs.

Safe land use planning

To achieve a truly safe system, road safety policy should be integrated into broader community planning that influences travel patterns and the attractiveness of different modes. Land use planning should enable reduced travel by private cars, create safe conditions for vulnerable users, and adequately separate high-speed roads from mixed land uses. Public transit is associated with substantially lower injury rates than other modes of travel⁷, so planning to support effective transit service is critical.

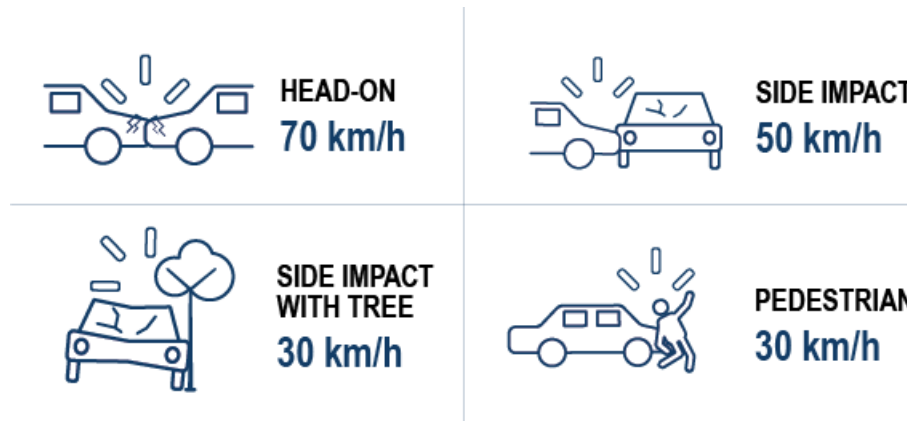
Safe speeds

In the Safe System Approach, speed management is critical for aiding crash avoidance and respecting the human body's limit for physical trauma (see Figure 3). It seeks to:

- *Establish appropriate speed limits* – Speed limits should reflect road features and functions, and the known physical tolerances of road users.
- *Engineer roads for the appropriate speed limit* – The transportation system should be planned and designed for survivable speeds that are appropriate for the context and anticipated road users.
- *Enforce speed limits* – Partnerships with police can develop and evaluate speed enforcement, and automated speed detection devices can help monitor vehicle speeds.

- *Educate road users* – Road users need to understand the impact of travelling at unsafe speeds. Educating drivers can result in increased speed limit compliance.

Figure 3. Maximum vehicle impact speeds to avoid serious injury or death in a crash⁸



Safe road users

Designing and building safe roads to minimize human error is insufficient if road users fail to comply with the rules of the road. The Safe System Approach addresses human behaviours that result in crashes, and focuses on strategies to combat contributing human factors such as distracted and aggressive driving. It emphasizes a philosophy of shared and proportionate responsibility, and considers the needs and vulnerabilities of each road user group including emerging micromobility modes.

Safe vehicles

Vehicles should be regulated, designed and built to minimize the occurrence and consequences of crashes, with an emphasis on crash survivability. Vehicles of different sizes, speed capabilities and operating characteristics have implications for crash outcomes. Technology and roadworthiness are the two main elements of vehicle safety, and vehicles as well as roads will increasingly be managed through intelligent transportation systems including automated driver assistance systems and smart, connected infrastructure.

Safe road design

In the Safe System Approach, roads are designed, operated and maintained to reduce the risk of crashes occurring and the severity of an injury in case of a crash. Road infrastructure can promote safety by:

- *Separating different modes* – Risks arise when road users with different speed characteristics and design envelopes share the same space. A Safe System Approach separates user types and includes safer routes for more vulnerable users.
- *Separating traffic streams* – Traffic moving in different directions or at different speeds is separated (e.g. using barriers to divide higher-speed two-way roads).

- *Designing for safe speed limits* – The road environment is designed to minimize injury severity and protect the most vulnerable road users.
- *Designing self-explaining roads* – Roads are designed so drivers understand what is expected of them and can respond appropriately. Road designs are easy to understand and consistently applied, reducing road user stress and potential error.

Post-crash care

While most injury control strategies focus on primary prevention (i.e. preventing the occurrence of injuries or minimizing their severity), secondary prevention (i.e. providing adequate emergency medical response to enhance treatment) can minimize the harm that follows an injury (e.g. disability or premature death). Prompt delivery of emergency medical care and rapid movement of injured casualties to a hospital can save lives, while effective trauma care and rehabilitation can reduce the incidence of short-term disability and dramatically improve long-term outcomes.

Safe System Approach: Key action areas

The Safe System Approach's six main elements encompass several action areas, as shown in Figure 1. While transportation departments are not responsible for all of these action areas, it is critical that practitioners recognize the need for collaboration with partner organizations including other governments, departments, enforcement agencies, and civil society.

Data, research, and evaluation

The use of reliable safety performance data and multisectoral knowledge for making decisions is fundamental to the Safe System Approach. This includes the use of proactive data sources and advanced analytical methods such as video analysis and artificial intelligence. Regular monitoring and evaluation of road safety interventions are necessary to create a safe system, and the sharing of knowledge gained with other communities and practitioners will help others to improve their own outcomes.

Legislation and policy

Legislation and policy are vital to improving road safety. They establish the institutions needed to administer the road system, and set the standards with which vehicle manufacturers and transportation practitioners must comply.

Cultural change

Real progress on road safety has been demonstrated by other countries, but it requires a transformed way of thinking. Until a favourable culture is created in which road safety is highly valued and rigorously pursued, proven and promising measures may remain unused and desired outcomes may not be achieved. Road safety improvements demand serious efforts that are commensurate with the scope of current challenges.

Financing

Systems and processes cannot be changed without funding, and sustainable long-term investments in road safety are needed to enable better infrastructure and other interventions including capacity building. Existing resources may be reallocated, while new sources of revenue may be created.

Licensing

A critical part of the Safe System Approach is the management of driver licensing. Efforts should focus on both competence and compliance, especially for high-risk drivers. Supporting all drivers with information and education can contribute to their competency and safe use of the system.

Leadership

It is critical that governments demonstrate political commitment and accountability for road safety action at a high level. They are essential to coordinating contributions by partners across multiple sectors including other governments, industry and civil society.

Capacity building

Canada's existing ecosystem of road safety stakeholders is not sufficiently organized or resourced to inspire and implement the changes that Vision Zero requires. The Safe System Approach necessitates strengthening of existing processes and enhanced coordination across silos, which implies the need for additional human and financial resources. Building up the road safety workforce through education, training and professional development is needed to build additional capacity.

Equity and inclusion

Transportation planning decisions can have substantial and wide-ranging equity impacts. Equity in road safety requires the fair distribution of safety benefits and costs, and vertical equity requires that disadvantaged groups enjoy a disproportionately greater share of resources.⁹

Road rules and enforcement

Consistent enforcement gives road users a strong incentive to comply with laws and regulations, and is an important complement to safe road design and education. Over time, enforcement can also contribute to a change in transportation safety culture.

Coordination and cooperation

The Safe System Approach requires the coordination and cooperation of a wide range of stakeholders because no single organization can provide the mandate or resources needed to deliver the diverse range of possible initiatives. Networking and resource sharing among partners will increase the odds of success.

Aligning road safety with other policies and objectives

Aligning objectives and policies for road safety with others related to economic prosperity, environmental sustainability, health, mobility, and accessibility can enhance the impact of multi-sectoral public investments. Programs in the following areas can reduce crash risk and severity without necessarily investing additional resources:

- *Active transportation* – Improvements to facilities for active transportation typically improve the overall safety performance of a transportation system while improving the attractiveness of healthy, sustainable options for people to travel to work, school, or other destinations.
- *Healthy communities* – Collaborative, multi-sectoral initiatives that integrate social, economic and environmental goals can strengthen a community's capacity to promote and sustain health. Higher levels of physical activity in a community boosts health, reduces susceptibility to injury, and improves driver visibility of active mode users.
- *Climate change and sustainability* – Initiatives that reduce the use of fossil fuels for transportation and combat carbon emissions often favour modes like walking, cycling and public transit that reduce overall risk exposure.
- *Accessibility* – Accessibility refers to the objective of providing equal access to everyone, and is a key ingredient of inclusive communities. Poor city planning and design can limit accessibility and marginalize persons with disabilities – a negative outcome of increasing importance in communities where aging populations seek to remain active and independent.

Endnotes

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