



BRITISH
COLUMBIA

B.C. Community ROAD SAFETY TOOLKIT



**Introduction to the BC Community
Road Safety Toolkit**

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Introduction to the B.C. Community Road Safety Toolkit

The BC Road Safety Strategy Safe Roads and Communities Working Committee [conducted a survey in 2015](#) to gather information on the types of road safety issues and actions in British Columbia's municipalities. The purpose of the survey was to provide an overview of municipal road safety actions in B.C. and to identify the common challenges that may be limiting collective progress. The survey found that many municipalities experience issues related to vehicle speeds, pedestrian safety, distracted driving, winter driving, cyclist safety, commercial vehicles, and intersection design, among others. Another important finding was that many municipalities have a desire for more knowledge on road safety planning and interventions. The municipalities also told us there was a serious lack of resources, both human and financial.¹

This Toolkit is an easily-accessible and electronically-searchable knowledge source that addresses many of the local issues that provincial municipalities experience. It was designed to help close the knowledge gap by providing a wide-ranging resource on both proven and innovative interventions that municipalities can undertake. It will also help strengthen capacity in the area of road safety by outlining several overarching implementation tools and strategies, which can improve the application of the Toolkit measures. Individual municipalities will be able to use this Toolkit to develop road safety efforts and programs tailored to their local context.

The BC Community Road Safety Toolkit is a synthesis of road safety measures compiled from various road safety publications and literature search rather than to provide technical knowledge. It is not intended to prescribe specific guidance or standards. A strong effort was made to find and incorporate the most valid and reliable research about the various strategies in the toolkit. However, the nature of road safety research is such that knowledge on road safety continues to change, and therefore any claims drawn from the research should be approached with a critical mind. Local road authorities wishing to implement any designs, strategies, and devices in this toolkit should do so under the guidance of professional engineers and trained experts.

The Role of Local Governments in Road Safety

The [BC Road Safety Strategy](#) conveys that responsibility for improving road safety in British Columbia is shared between all three levels of government, the insurance sector, and various governmental and non-governmental stakeholders. Within this group, municipal governments play a strong role in improving road safety in communities because of their responsibility for designing and building vital safety infrastructure. They are also in close contact with residents and neighbourhoods and are well-placed to identify and respond to local road safety needs, challenges, and opportunities.

By working according to the framework of the Safe System Approach, municipalities are pivotal partners in the BC Road Safety Strategy's *Vision Zero* goal of having the safest roads in North America with zero traffic fatalities and zero serious injuries.

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What is the B.C. Community Road Safety Toolkit?

This BC Community Road Safety Toolkit provides information on measures and strategies to improve road safety outcomes. It does this in three ways.

Firstly, it consolidates knowledge on over 60 specific measures that are either proven in research, or are innovative and promising. This Toolkit is a source of knowledge to which local governments in British Columbia can turn.

Secondly, it organizes these measures based on a 5-part conceptual framework.² The purpose of this framework is to provide a way of thinking about how the measures work in a general way. This will help municipalities to identify locations for implementing and combining the measures in the Toolkit, and better equip them to identify other potential measures or develop new ones.

Principle One is *basic and innovative infrastructure design and maintenance*. Road safety interventions must start from a solid foundation which consists of well-designed and well-maintained infrastructure.

Principle Two is *reducing speeds*. Vehicle speed is one of the basic risk factors in road safety, and reducing it is one of the most effective ways of minimizing crashes and crash trauma.

Principle Three is *greater separation of different road user movements and types through space and time*. This involves reducing or eliminating the likelihood for conflicts between road users.

Principle Four is *highly supported and 'nudged' decision-making*. Its purpose is to simplify decision-making in the road environment and to guide road users in making correct judgments.

Principle Five is *modal shift*, which is reducing motor vehicle-related risk by having fewer private vehicles on the road. This involves making walking, cycling, and public transit safer, easier, and more desirable to use. It also means helping to shift practices and thinking; too often, walking and cycling are considered as "alternatives" to driving. Instead, driving should be considered as the alternative to walking and cycling.

Thirdly, the Toolkit outlines several implementation tools and strategies designed to help local governments apply the safety measures strategically and more effectively. Their purpose is to make it easier for municipalities to make effective change. This part of the Toolkit offers guidance on how to develop and use performance measures to evaluate progress; how to complete road safety audits and create road safety plans; how to consult, engage, and communicate with the public; how to reduce costs; and how to use the Toolkit's measures strategically in order to implement Safe Routes to Schools, accommodate skateboarders, longboarders, and inline skaters, and improve safety on commercial vehicle routes.

Vision Zero

A cornerstone of the BC Road Safety Strategy is the *Vision Zero* philosophy, which seeks to eliminate all motor vehicle fatalities and serious injuries (defined by hospital stays of one or more nights).

Vision Zero is not only a prerogative of national or provincial governments – it also calls for direct local government involvement. Many cities have deeply embraced this philosophy. For example, Vancouver³, North Vancouver, Edmonton⁴, Seattle, San Francisco, Boston, and Chicago⁵ have all adopted *Vision Zero* as their ultimate goal. New York City is an excellent example of how a proactive city-led road safety strategy can achieve significant improvements. In locations where the city's Department of Transportation undertook road safety improvements since 2005, crash fatalities decreased by twice the rate as other locations.⁶ New York further strengthened its efforts by adopting *Vision Zero* in 2014. Since then, overall motor vehicle fatalities were reduced by 15%, and pedestrian fatalities decreased by 27%.⁷

But there is no need to look far for examples of towns and cities that have made commitments to road safety improvement; there are excellent examples in British Columbia. RoadSafetyBC's report [*Moving to Vision Zero: Road Safety Strategy Update and Showcase of Innovation in British Columbia*](#) highlights numerous road safety efforts implemented by municipalities in the province. This Toolkit intends to strengthen municipalities' efforts to improve safety on their road systems.



The Safe System Approach

Central to *Vision Zero* is the Safe System Approach, which is a framework to guide road safety policies and programs. This approach views safe road networks as holistic systems consisting of four elements: safe speeds, safe roads and roadsides, safe vehicles, and safe road users. Each of these elements contributes to overall safety by helping to reduce crash forces so they are in line with human tolerance to them. However, each element also has inherent weaknesses that are compensated for by the others. The four components do not stand alone, but interact with one another such that the risk of a fatal or serious injury crash is multiplied as failures appear in each of the elements, and greatly minimized as more potential failures are addressed.

The Safe System Approach also maintains that road safety is achieved through collaboration between multiple stakeholders. This is because different stakeholders can contribute in specific ways to improving one or more of the elements, even if they may not contribute to all of them.

The Safe System Approach also insists on the need for a comprehensive road safety management process involving several elements. Firstly, the Safe System Approach demands that road safety agencies conduct robust crash analysis and work to continually develop their understandings of crash causes. Secondly, the Safe System approach requires adequate road rules and sufficient enforcement of those rules to achieve high levels of road user compliance. Thirdly, an adequate driver licensing system and an informed, aware, and supportive community is necessary to foster an increasingly safe road transport system.



With these points in mind, it is important to situate this Toolkit's contribution to a Safe System Approach in the Province. Many of the measures contained in this Toolkit contribute to safe speeds. Many of the other measures contribute to safe roads and roadsides. Well-planned road environments contribute significantly to the safe movements and decisions of all road users. For example, principle four, which is greater separation between different road user movements and types, creates a safer road environment by reducing or eliminating conflicts between and amongst pedestrians, cyclists, and drivers.

The Public Health Perspective

The BC Road Safety Strategy couples the Safe System Approach with a public health perspective. The public health perspective, in this case, emphasizes that road safety need not be narrowly focused on preventing crashes and reducing crash trauma. Rather, it can simultaneously contribute to population health and disease prevention by promoting public transit and forms of active transport, namely walking and cycling. This not only reduces crash risk by reducing the number of private vehicles on the road, but also improves overall health and well-being by increasing the amount of exercise that people do, and by reducing air and noise pollution.

The public health perspective expands the way in which road safety is approached while connecting it to a wider array of issues. In doing so, it invites more actors to advocate for the importance of road safety. The potential for a public health perspective to generate interest in road safety is evident in British Columbia: in 2016, the Office of the Provincial Health Officer published a major report, titled [Where the Rubber Meets the Road: Reducing the Impact of Motor Vehicle Crashes on Health and Well-being in BC](#). The report explicitly acknowledges the public health benefits of walking and cycling and the need to ensure the safety of pedestrian and cyclists. The report points to numerous measures that will not only protect those who currently walk and cycle, but will encourage more people to do so as their primary mode of transport.⁸



Improving Road Safety for Pedestrians and Cyclists in British Columbia

A road safety approach that incorporates a public health perspective requires that those who choose to walk and cycle are well-protected. The most vulnerable road users in British Columbia, as elsewhere, are pedestrians and cyclists because they do not benefit from vehicle protections like crumple zones, airbags, and the vehicle frame. The report [Moving to Vision Zero](#), shows that, like many other jurisdictions, overall road safety gains in British Columbia have mostly benefitted motor vehicle occupants. Pedestrians and cyclists have not had decreases in annual fatalities from 2005 to 2014, and they have actually had increases in the annual number of serious injuries.⁹ The

BC Road Safety Strategy maintains that *Vision Zero* can only be achieved if stronger efforts are made to protect these road users.

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Pedestrian and cyclist safety is also an important issue affecting British Columbian children in particular. The BC Coroners Service Child Death Review Panel [published a report](#) in June 2016 analyzing the deaths of 81 child pedestrians, cyclists, and boarders over the 10-year period spanning 2005-2014. Among the report's recommendations was that the Ministry of Public Safety and Solicitor General, together with the Ministry of Transportation and Infrastructure, work collaboratively to expand crosswalk safety through encouraging the use of dedicated signal phasing for pedestrians and leading pedestrian intervals, and that efforts be made to improve cycling safety infrastructure. The recommendation also called on these ministries to encourage municipalities to adopt these measures.

This Toolkit aligns itself with the BC Coroners report's recommendations by including many measures for pedestrians, cyclists, and vehicle occupants. It advocates for the importance of designing roadways with the most vulnerable road users in mind. This will help ensure that road safety planning is effective, equitable, and ethical. There is also strong evidence that designing roads for the most vulnerable users results in the greatest safety benefits for *all* road users, including motor vehicle occupants.



Active Transport, Equity, and Road Safety

The issue of active transport intersects directly with questions of social equity because certain groups either have more barriers to walking and cycling on a regular basis, or are placed at significantly greater risk when they do so. For example, in Canada and the United States, women are half as likely as men to cycle in order to run errands or commute to work. In the Netherlands and Germany, in contrast, both sexes are equally likely to cycle for these purposes.¹⁰ In the British Columbia context, the highly gendered difference in rates of cycling is tied to local factors that discourage many women from choosing to bike. For instance, an opinion survey in Metro Vancouver found that women were more likely than men to be deterred by the absence of protected bicycle lanes, or by the lack of routes on calm streets.¹¹ These findings were corroborated in a recent TransLink report on safe and equitable road use in Metro Vancouver. In examining the potential to increase the rates of cycling, the report's survey found that 7% of

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Metro Vancouver's population had "high interest" in cycling, meaning they would consider cycling more. This group, moreover, was more gender-balanced than the population of high-frequency cyclists. This suggests that there is an untapped potential to generate more women cyclists.

The issue of equity and active transport also relates to people's socio-economic status. Research from British Columbia¹² and the United States¹³ shows that people with low socio-economic status have higher rates of motor vehicle crash fatalities and injuries. One of the reasons for this is that people with lower incomes are more likely to cycle and walk, which are modes of travel with higher mortality and injury risks when measured on a per-trip basis.^{14,15} Indeed, Metro Vancouver neighbourhoods with low socio-economic scores have higher rates of pedestrian crash trauma compared to more affluent neighbourhoods.¹⁶ Ensuring that all people are protected when they choose to walk and cycle is one step that will help make British Columbia safer, healthier, and more equitable.

Age demographics also have a great deal to do with active transport, public health, and road safety. Older pedestrians in British Columbia, as elsewhere, have a disproportionately high rate of fatalities and injuries compared to younger age groups. In 2001 in Metro Vancouver, people aged 65 and over had more than double the incidence rate of pedestrian trauma than younger people.¹⁷ Among the reasons for this is that seniors have greater exposure when crossing the street because they often walk slower and take longer to complete the crossing. Senior citizens may also have reduced sensory acuity, and may have greater difficulty in judging vehicle speed and distance, and gaps in traffic. Seniors also tend to be more physically vulnerable, and are therefore more likely to be killed or seriously injured when they are involved in a crash.¹⁸ A number of measures in this Toolkit, for example pedestrian medians, shorter crossing distances, and reduced speed limits, can be used to help address the problem of senior citizen pedestrian safety.

Municipalities in British Columbia are already at work in helping people to choose active and public transport by improving the safety and desirability of these modes of travel. The City of Vancouver's Transportation 2040 Plan, for example, aims to have 50% of trips in the city done on foot, by bike, or on public transit by 2020, and wants to increase that proportion to at least two thirds by 2040.¹⁹ This Toolkit intends to contribute to efforts of making walking and cycling the principal way that most people get around in all parts of the Province.

How to Use this Toolkit

This Toolkit helps municipalities to develop a tailored approach to address local road safety needs and capitalize on local opportunities. It includes a brief description and an explanation of how each measure works. It also gives a brief summary of research on the measure's effectiveness in improving road safety for different road users and for different crash types. Also, each measure in

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the Toolkit includes a number of typical implementation considerations, and points to technical resources for the measure's implementation.

The last part of the Toolkit, the implementation tools and strategies, focuses on some general issues surrounding road safety management. It recommends strategies for: identifying road safety problems; developing overarching plans; facilitating road safety projects; consulting, communicating, and engaging with the community; and integrating specific measures into parallel plans, for example by implementing Safe Routes to Schools.

Evidence of Effectiveness and Crash Reduction Factors

This Toolkit presents road safety measures that are either proven to reduce fatalities and serious injuries, or are innovative and promising. Two of the most robust forms of evidence are Crash Modification Factors (CMFs) and Crash Reduction Factors (CRFs). CMFs and CRFs are scores based on a careful assessment of the quality of a research study's methodology and findings. They are used to calculate the expected change in the number of crashes after a given measure is implemented at a specific site.

The expected number of post-implementation crashes is calculated by multiplying the CMF by the pre-implementation annual crash average. For example, a particular uncontrolled crosswalk on an urban road has an annual average of 4.5 crashes involving pedestrians and vehicles. A raised median with a marked crosswalk has a CMF of 0.54 for all crash severities.²⁰ 4.5×0.54 means the expected total annual number of vehicle/pedestrian crashes is lowered from 4.5 to 2.43.

CRFs express the percentage reduction in crashes after a measure is applied. The CRF for the raised median with marked crosswalk is 46, which means that this measure can be expected to reduce pedestrian-vehicle crashes of all severities by 46%. This Toolkit will only make reference to CRFs.

A negative CRF score, or a CMF score greater than 1, indicates that the measure is predicted to increase the number of crashes.

When using CMFs and CRFs to select measures for a given site, local planners should ensure that the site's characteristics correspond to the profile of the CMF/CRF. A specific measure might have a different CMF/CRF for urban, suburban, and rural environments; for crashes between vehicles, pedestrians, or cyclists; and in some cases for different numbers of vehicle lanes. Local governments should also take note that some CMFs/CRFs may predict increases in property-damage only crashes, and decreases in fatal and injury crashes. An approach that is in line with *Vision Zero* would not disqualify such measures, given that they reduce the more severe crashes.

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The CMF Clearinghouse is an online repository containing many CMFs/CRFs and supporting research. This Toolkit encourages local governments to explore the CMF Clearinghouse and identify measures that may not be found in this document. The CMF Clearinghouse also continuously adds more CMFs/CRFs as research advances, and so it is a good idea to visit the website periodically to learn more about proven measures.

The CMF Clearinghouse website may be found here: <http://www.cmfclearinghouse.org/>

Other Resources

This document is not an exhaustive resource. There are many other road safety guides that municipalities can use to supplement the knowledge provided in this Toolkit. Below is a list of high quality knowledge sources for road safety measures and strategies.

- The National Association of City Transportation Officials (NACTO) has three documents with road safety guidance:
 - a. Urban Street Design Guide: <http://nacto.org/publication/urban-street-design-guide/>
 - b. Urban Bikeway Design Guide: <http://nacto.org/publication/urban-bikeway-design-guide/>
 - c. Urban Transit Street Design Guide: <http://nacto.org/publication/transit-street-design-guide/transit-lanes-transitways/>
- The Canadian Council of Motor Transport Administrators (CCMTA) published a road safety guide titled “Countermeasures to Improve Pedestrian Safety in Canada”:
http://ccmta.ca/images/publications/pdf/CCMTA_Pedestrian_Report_Eng_FINAL.pdf
- Austroads maintains an online “Road Safety Engineering Toolkit”. This Toolkit allows users to search for measures that specifically address different crash types, safety deficiencies, and road users: <http://www.engtoolkit.com.au/>
- The World Resource Institute published a guide for promoting road safety through street design: http://www.wrirosscities.org/sites/default/files/CitiesSaferByDesign_final.pdf
- The Federal Highway Administration publishes a “Pedestrian Safety Guide and Countermeasures Selection System”:
<http://www.pedbikesafe.org/PEDSAFE/countermeasures.cfm>
- The Federal Highway Administration also publishes good practice information on various road safety topics: <http://safety.fhwa.dot.gov/>

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