

Healthy and Safe Environment Metrics

Backgrounder

Prepared by the Community Social Planning Council for the
September 19, 2019 Healthy and Safe Environments Workshop



COMMUNITY SOCIAL PLANNING COUNCIL
research·insights·solutions

CONTENTS

Healthy and Safe Environment Metrics.....	3
Why What We Measure Matters	4
Climate Change Impacts on Community Health and Wellbeing.....	5
Healthy Buildings and Transportation Systems	8
Transportation.....	8
Residential and Commercial Buildings.....	11
Community Safety and Impacts on Community Wellbeing.....	12
Conclusion.....	13
References	14
Appendices	
Appendix A: Victoria Foundation Vital Signs.....	15
Appendix B: Capital Regional District—Regional Growth Strategy Indicators.....	16
Appendix C: Regional District of Nanaimo—Regional Growth Strategy Indicators.....	16
Appendix D: Victoria Transport Policy Institute —Key Sustainable Transport Goals, Objectives and Indicators.....	17
Appendix E: City of Vancouver—Greenest City Indicators.....	18
Appendix F: Lancet Countdown Climate Indicators.....	19



Supported by a Community
Wellness Grant from
Island Health



Community Social Planning Council of Greater Victoria
216-852 Fort Street – The Joseph Building
Victoria, BC V8W 1H8
phone: 250-383-6166 | email: admin@communitycouncil.ca

Healthy and Safe Environment Metrics

IT IS NOT ALWAYS RECOGNIZED just how much the built and natural environment affects our health. Yet in Canada we are 80% urbanized and we spend 90% of our time indoors — and of course we live 100% of the time within natural ecosystems. Thus the natural and built environment is a key determinant of our health, impacting the physical, mental and social wellbeing of individuals and communities. Research demonstrates that health is influenced by people's behaviours, social lives, economic circumstances, and physical environments; it is essential to include health considerations within community planning and design.¹

Under the Capital Regional District's Regional Outcomes Monitoring Group, the Community Health Network (CHN) has been setting priority

areas to reduce inequities and improve health and is working to establish a related indicator set for strategic monitoring of community health and wellbeing. A healthy and safe environment is one of the priority areas identified by the CHN.

The Community Social Planning Council has worked closely with the CHN to develop shared outcomes measurement frameworks in this and other priority areas of community health. For the priority area of Healthy and Safe Environments, the Community Social Planning Council is using a collective impact approach (see box 1) to support the CHN with engaging in dialogue with municipal and community stakeholders on strategic indicators.

This backgrounder, prepared by the Community Social Planning Council for the September 19, 2019 Healthy and Safe Environments Workshop, focuses on the built environment in relation to climate change, and transportation and housing, and community safety and how environmental health can impact the health and safety of the community members who reside in British Columbia's Capital Region.

Box 1: Collective Impact

Collective impact brings organizations and individuals who are working in isolation from one another together in a structured way, to achieve social change.

Collecting data and measuring results using **a common set of community and program level indicators** is a key condition for collective action and impact.

Other conditions for collective impact include: determining a shared agenda, coordinating collective efforts with mutually reinforcing activities, building trust and relationships, and having a strong backbone (a team dedicated to orchestrating the group).

Source: Collective Impact Forum (2014)

¹ For more on these connections see the Centre for Disease Control's Healthy Built Environment Toolkit, bccdc.ca/pop-public-health/Documents/HBE_linkages_toolkit_2018.pdf.

Why What We Measure Matters

Because the environments we live in play a vital, yet complex role in population health and wellbeing, it is particularly important to track and report the status of and interactions between changes in the physical environment, human health, and public policy.

Indicators influence public policy, in determining which issues get attention, and what policies get developed and adopted. What gets measured is what matters—but conversely, not everything that matters gets measured (see box 2); so if we fail to measure something, or measure the wrong thing, we end up managing the wrong issues (Hancock, 2015). Indicators can even be harmful, undermining desired policy outcomes.

There are many indicators available and it is vital to focus on strategic ones—indicators that improve public health outcomes and serve larger policy goals. To achieve this, indicators used for routine monitoring and reporting should be strategically selected to ensure that they detect changes in the environment and the health status of community members, as well as the effectiveness of local programs, activities, and policies.

Data being collected should also be selected to paint a picture and reflects community stories of key local issues; the data should tell a compelling narrative and speak to a key audience. Indicators are more meaningful when situated within the broader context (Eyles & Furgal, 2002, p. 2). Monitoring and reporting data are meant to provide clues to matters of broader significance, to track progress towards a desired goal, to provide a basis for policy advocacy, and to identify the needs and capacities of community members (Eyles & Furgal, 2002).

Box 2: Useful and Harmful Indicator Examples with examples from the City of Victoria (2018)

Useful Indicators Example:

The City's Climate Leadership Plan sets 2030 goals of increasing the trips taken by public transportation to 25% and trips taken walking and cycling to 55%. Such policy direction provides clear guidance on what types of indicators to adopt, e.g. (increased) percentage of annual transportation budget allocated to sustainable transportation options, and percentage of road allowance allocated to sustainable transportation infrastructures such as wide sidewalks and protected bike lanes.

Harmful Indicators Example:

Indicators chosen by convention (“that is what we have always measured”) can fail to serve public health outcomes and larger policy goals. Indeed, they can suggest budgetary and regulatory actions that undermine health and larger policy goals, e.g. highway traffic measurement metrics (i.e. commute times and traffic flow/volumes) can lead to the construction of expensive highway interchanges (overpasses) that encourage more motor vehicle use and thereby increase congestion in other locations, while undermining climate and health outcomes.

Performance metrics should help to demonstrate how community members, organizations, governments, and networks are moving the needle on desired community health policies and outcomes. When data is collected, managed and analyzed using strategically selected indicators, it generates information and knowledge to influence policies and actions that support the environmental and social determinants of health.

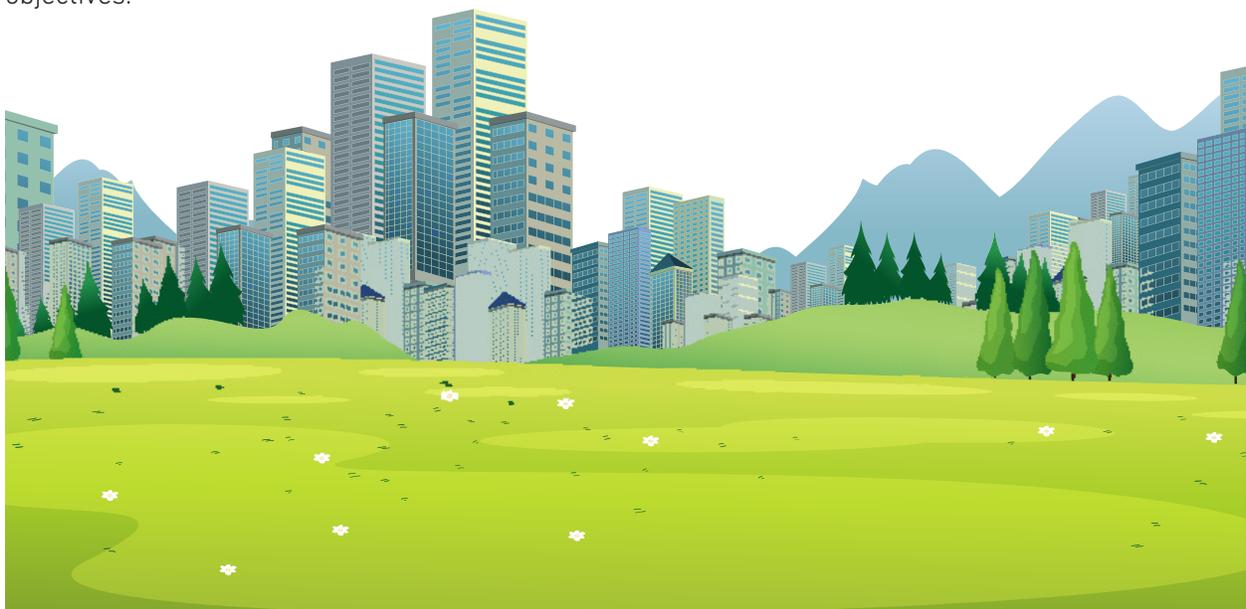
Having a strategic, holistic and standardized set of regional indicators can provide an evidence-driven approach to addressing complex environmental and social factors that prevent individuals, families, and communities in the Capital Region from achieving their optimal health.

The following sections demonstrate the linkages between each of the three selected priority areas within Healthy and Safe Environments—Climate Change, Housing and Transportation, and Community Safety—and their respective impacts on human health. This provides insight on how planners can help the CHN to identify the kinds of policies and indicators most meaningful to their own community’s identified goals and objectives.

Climate Change Impacts on Community Health and Wellbeing

Earlier this year, the CRD identified Climate Action and Environmental Stewardship as a priority for the region and declared a climate emergency along with a large number other local government in the region and a growing number of other cities across the country. With environmental impacts and climate change at the forefront, we must design our cities in ways that minimize greenhouse gas emissions and associated local air pollutants while monitoring and preparing our community for the environmental and health impacts of climate change.

Climate change is the longer-term change in climate conditions, resulting in changes in temperature and precipitation, extreme weather events, and rising sea levels (Ministry of Environment and Climate Change Strategy, 2019).



These global weather changes can threaten the health of Canadians in a variety of ways—some anticipated and some not—and are expected to intensify over the coming years. In British Columbia specifically, recent heatwaves, droughts and wildfires have contributed to adverse health outcomes, including injuries, food insecurity, respiratory disease, increases in insect-borne illnesses, and mental distress (see Figure 1) (Ministry of Environment and Climate Change Strategy, 2019).

Climate change will increasingly impact our communities and our health in complex and interrelated ways, but there are many actions municipal planners and local governments, can take to reduce climate change-related health impacts. Using indicators to monitor and

track environmental and human health is one of the essential tools used in understanding and identifying climate-related problems, predicting future impacts, identifying vulnerable populations, developing and prioritizing responses, and evaluating policy interventions.

Public health-related climate indicators should be “based on a credible link between public health and climate change, sensitive to changes in the climate, and less sensitive to non-climate explanations... and the indicator should provide actionable information to guide policy in a timely manner” (Watts et al., 2018, p. 5). Various regional districts, the City of Vancouver, the provincial and federal governments, and many other government and non-government organizations have established assorted metrics

Figure 1. Ministry of Environment and Climate Change Strategy

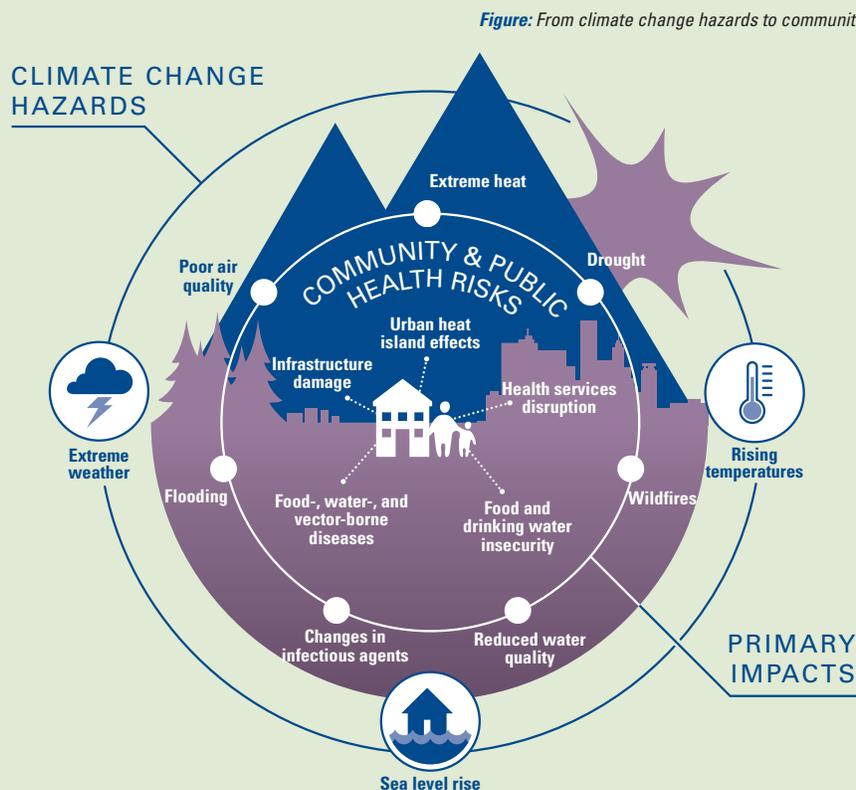


Figure: From climate change hazards to community and public health risks

Source: Ministry of Environment and Climate Change Strategy (2019).
Addressing climate and health risks in BC: Communities fact sheet. Pg. 1

that monitor mitigation activities, climate change impacts, health impacts, and adaptation measures (see appendices E and F for examples of regional and municipal climate-related indicator sets). A selection of health and climate-related changes and policy recommendation/actions that could be tracked by indicators are listed in Table 1.

Table 1 represents *examples* of 'health and climate-related impacts and adaptation measures' that could be tracked by indicators. Other indicators or indicator approaches can also be used (e.g., pressures → actions/interventions → outcomes → state/condition).

Table 1: Health and climate-related impacts and adaptation measures that could be tracked by indicators

Mitigation (GHG reduction)	Climate Change Impacts	Health Impacts	Adaptation Measures
<ul style="list-style-type: none"> Community-wide GHG emissions by full inventory (total & per capita) Number of net new dwelling units built in complete, compact communities (e.g., RGS “in areas where more than 42% walk/bike/bus to work”) Community emissions from Buildings (total & by res/comm/ind) Transportation (total & by vehicle type), and Solid Waste (total & per capita) 	<p>The Capital Region can expect noticeable changes to our climate in the coming decades, e.g. at a high level:</p> <ul style="list-style-type: none"> Warmer winter temperatures Fewer days below freezing More extreme hot days in summers Longer dry spells in summer months More precipitation in fall, winter, and spring More intense extreme events Sea level rise 	<ul style="list-style-type: none"> Mental health impacts such as stress, anxiety and trauma Food & water contamination and/or shortages Increased prevalence of water-borne pathogens and contaminants Decreased air quality due to heat and forest fires in the region Injury, death Exacerbation of respiratory conditions such as asthma and emphysema due to poor air quality 	<ul style="list-style-type: none"> Undertake and understand vulnerability assessments; Provide a public health lens on Regional Growth Strategies and/or OCPs, providing up-to-date health data (incl. vulnerable pops) Expand emergency management plans to include climate-related events Draw on NGO/health prof/academia to generate/share local climate change and health research Integrate info on the health benefits of climate change action into public info. Train frontline health workers to accurately diagnose and treat illnesses commonly exacerbated by climate change (e.g., stress/heat stroke) Integrate climate change-related health outcomes in existing community monitoring programs. Integrate climate change considerations into community planning processes and policies.

Main Sources include CRD RGS (2019); CRD Taking Climate Action; Climate Change Projections in the Capital Region (2017); Ministry of Environment and Climate Change Strategy (2019) Community and Population Health Fact Sheet

Healthy Buildings and Transportation Systems

How we build and design our communities—the layout, structure, and quality of the roads and buildings—significantly contribute to the health and wellbeing of the residents. Not only do urban infrastructure and transportation methods account for the vast majority of greenhouse gas emissions that contribute to climate change, but they can also both, directly and indirectly, impact community health and wellbeing, including mental and social wellbeing. Progressive land-use decisions that work in tandem between the residential and commercial built environment and transportation infrastructure can have positive impacts on community health and wellbeing.

Neighbourhood design is a key determinant of health and can influence factors such as noise pollution, access to water and sanitation systems, safe walking and cycling networks, spaces for social mingling, recreation and physical activity, and much more (WHO, 2019). Healthy built environments are those that are carefully designed to support good health such as those where amenities, and services are located near or among residential areas; connected street patterns encourage active forms of transportation such as walking, cycling, and transit; and housing choices suit people of all incomes, ages, and abilities (BC Healthy Communities).

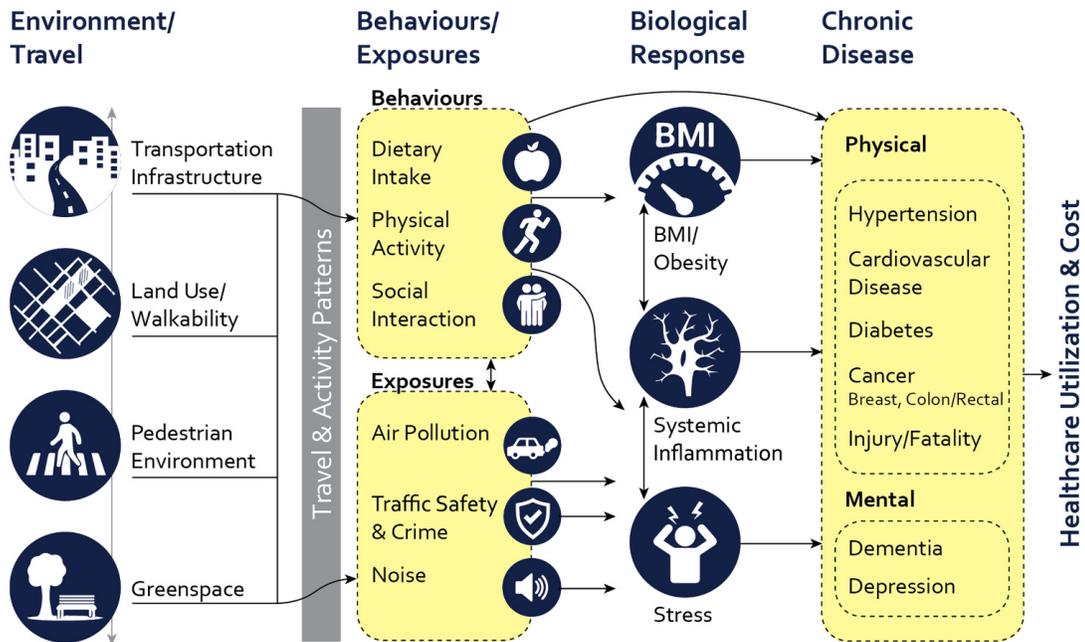
TRANSPORTATION

Transportation methods, infrastructure, and policies have significant impacts on both population and environmental health. Research has shown that transportation land-uses, designs and investments that enhance neighbourhood walkability and provide access to green space and community services, can have a significant impact on physical activity, mental health, exposure to air pollution, traffic safety and crime, and noise pollution (Ngo & Hamre, 2019). Having adequate access to major regional locations (e.g., commercial centres and public amenities), community services, and green spaces has been scientifically linked to increased modes of active transportation such as walking, a stronger sense of community and belonging, and a decreased likelihood of obesity, diabetes, heart disease and stress, compared to individuals who live in car-dependent areas or areas with no parks (see Figure 2) (Ngo and Hamre, 2019).

According to Ngo and Hamre (2019), data and evidence used to inform significant land use and transportation (i.e., built environment) decisions and policies often do not account for the potential health impacts and related costs. To better inform healthy public policy, it is important to identify strategic indicators that link how communities are designed with individuals' transportation mode choices, their levels of physical activity, and their risks of chronic disease. For example, monitoring walkability scores can support planners to design environmentally sustainable communities that support human health by ensuring equitable access to amenities.

The transportation sector may be a leading cause of local air pollution and greenhouse gas emissions; however transportation can impact human health in a variety of complex ways.

Figure 2: Causal diagram linking the pathways from the built environment to chronic disease



Source: Frank, Iroz-Elardo, Macleod, & Hong, A. (2019)

Transportation infrastructure design, walking and cycling networks, and transportation-related noise can create significant burdens to public health by discouraging physical activity, increasing levels of stress, and increasing the risk of traffic injuries (WHO, 2019). Lesser known health risks of transportation include health inequities. Transportation provides access to jobs, education, services, and recreational activities; therefore, a lack of transportation options, or poorly designed transportation infrastructure, can create barriers to vulnerable populations such as low-income groups and seniors, while minimizing people’s mobility and accessibility to essential community services (WHO, 2019). Given that certain groups are disadvantaged in accessing important amenities and resources for their health by reason of socio-economic status, disability, age or other factors, the equity dimensions are of particular importance. Moreover, the principle of proportionate universality should lead to

policies that actually create greater access to amenities and resources and better quality built environments for disadvantaged groups, since they experience a deficit and their need is greater.

When tracking and evaluating transportation planning and outcomes, indicators should be chosen that are strategic in the ways they evaluate the quality of transportation options. For example, some conventional transportation indicators include average traffic speeds, average congestion delays, parking convenience and prices, or crash rates per vehicle-mile. However, Litman (2019) notes that the focus of these indicators are on motor-vehicle travel quality and impacts per vehicle-mile (rather than per capita), which tends to justify policies and activities that increase motorized vehicle travel, thereby increasing vehicle use and congestion. This type of data undermines other modes of transportation such as walking or cycling, and

ignores “vehicle traffic reductions as possible solutions to the transport problem” (Litman, 2019, p. 26) (see appendix D for a sample of Litman’s transportation indicators). This can create further health inequities, as not all community members, especially those of vulnerable populations, drive

their own motor vehicles; many rely on other forms of transportation.

Table 2 is a sampling of ‘Healthy Housing and Transportation Networks’ Indicators organized into three categories for discussion.

Table 2: sampling of ‘Healthy Housing and Transportation Networks

Economic/Infrastructure	Social/Health	Environmental
CRD Regional Growth Strategy Indicators:		
<ul style="list-style-type: none"> • Number of net new dwelling units in areas where more than 42% walk/ bike/bus to work • Percentage of total trips made by walking, cycling and transit in the Growth Management Planning Area (modal split) 	<ul style="list-style-type: none"> • Create safe and complete communities 	
Samples of other indicators examples:		
<ul style="list-style-type: none"> • Combined housing and transportation affordability index • Average number of basic services (schools, shops and government offices) within walking distance of homes — walkability index score • Transit coverage by population (% of people who live within 1 or 2 km of rapid transit) • Public transport capacity (passenger-km) • Per capita expenditures on roads, parking and traffic services; • Percent of budget allocated to pedestrian use, to cycling and to public transit. • Portion of road and parking costs borne directly by users. • Density of population and housing units • Km of cycling and walking infrastructure • Percent of households living in dwellings requiring major repairs • Number of disruptive (non-grid) street designs for cars) 	<ul style="list-style-type: none"> • Per capita crash disabilities and fatalities. • Public transport customer satisfaction (%) • Total passenger trips on public transit • Share of transport facilities with step-free access (%) • Crime rates on public transport • Portion of population that walks and cycles sufficient for fitness and health (15 minutes or more daily). • Degree to which transport activities support community livability objectives (local environmental quality). • Portion of travel to school and other local destinations by walking and cycling. • Portion of travel made by efficient modes: walking, cycling, rideshare, public transit and telework. • Environmental and traffic hazards 	<ul style="list-style-type: none"> • Per capita fossil fuel consumption, and emissions of CO2 and other climate change emissions. • Per capita emissions of “conventional” air pollutants (CO, VOC, NOx, particulates, etc.) • Frequency of air pollution standard violations. • Portion of population exposed to high levels of traffic noise. • Per capita land devoted to transportation facilities. • Average size of roadless wildlife preserves • Kms of bike lanes and sidewalks per capita v miles of road — NB — need to count all lanes on roads — a six lane highway is 3 times as much length as a single two-way bike lane

Main sources include: CRD RGS (2019); Littman’s (2019); RDN RGS (2019); Shah, Manaugh, Badami, & El-Geneidy, (2013)

RESIDENTIAL AND COMMERCIAL BUILDINGS

Thoughtful urban planning and improved building code design can improve access to secure, accessible and safe homes with transportation services and green spaces that support physical activity and positive social cohesion to help improve wellbeing and prevent illness (especially illness that disproportionately affects vulnerable populations) (WHO, 2019). North Americans spend over 90% of their time indoors (whether in their homes, workplaces, or vehicles), with local air quality and other aspects of the built environment impacting both our physical and mental functions (Leech, 1996). In communities where buildings are built using green and sustainable methods and have enhanced ventilation, adequate windows and natural lighting, reduced noise, and optimal indoor air quality, people report fewer complaints about air quality and humidity, productivity and cognitive function, sleep, and respiratory illness (WHO, 2019).

Housing that is poorly built may use inferior materials, contain poor ventilation and heating, or have inadequate lighting. These factors are often associated with increased allergies, risks for respiratory and cardiovascular diseases, and exacerbated mental health disorders, including depression, anxiety, isolation, and social dysfunction (WHO, 2019). Therefore, strategic housing quality indicators can help to both reduce climate change impacts and improve health and wellbeing (WHO, 2019).

Progressive and coordinated local land use and transportation infrastructure decisions complement each other to reduce local greenhouse gas emissions and air pollutants. For example, the proximity of origin and

destinations between home, work, commercial centres and green spaces reduce vehicle kilometres travelled (and thus PM2.5 from vehicles) and encourage active transportation. There are also various regional policies and strategies implemented in the CRD to help create compact communities that promote health and wellbeing. For example, the CRD's Urban Containment Policy Area (UCPA) promotes a climate-friendly, safe, and healthy community by setting aside land to be protected from many forms of development. The CRD's (2019) Regional Growth Strategy includes indicators that support this policy by incorporating various mixed land-use and density indicators (e.g. the number of new dwelling units in areas where more than 42% walk/bus/bike to work) (see appendix B and C for examples of RGS indicators).

Overall, an emphasis on making our built environment healthier and more sustainable can create opportunities for residents to carry out more leisure activities and active lifestyles, for healthier and safer housing options, and for the opportunities to walk, bike or take public transportation to access daily community resources, amenities and services needed for daily living.

Progressive and coordinated local land use and transportation infrastructure decisions complement each other to reduce local greenhouse gas emissions and air pollutants.

Community Safety and Impacts on Community Wellbeing

It is widely acknowledged that communities cannot prosper or enjoy good health unless they are safe, both physically and mentally. Violence, crime, unsafe housing infrastructure, poorly lit green spaces, poor transportation policy and bad transportation design as well as poorly designed social spaces are all safety factors that can increase the risk of poor health outcomes for community members and undermine community supports and conditions needed to promote health and wellbeing. When planning safer communities, it is vital to consider climate change implications, the built environment, land-use zoning, and community design, as these strategies not only improve community safety but also strengthen community network by encouraging social interaction among community members (Prevention Institute Advanced Project, 2015). Crime Prevention through Environmental Design (CPTED) is a decades-old urban planning strategy that integrates a more holistic perspective to community safety highlighting the nexus between urban design, crime, and social conditions (Mihinjac & Saville, 2019). Ideally, sustainable communities not only include environmentally-friendly infrastructure that supports climate initiatives and human health, but also include socially-inclusive, structurally safe

environments where everyone has a sense of belonging, the opportunity to participate, and their needs for education, health care, food, housing income, social networks, and cultural expression being met (Nilson, 2018).

When working on designing safer communities, an important aspect requires solutions that are tailored to the needs of the community. In order to do this, planners and local governments can use local data and indicators to identify, better understand, monitor, and report on those community safety gaps and issues within the

Figure 3: 21 indicators for crime and safety



Source: Figure 3: 21 indicators for crime and safety (South African Cities Network, 2019, p. 18)

region that will require planners, architects, community groups and others to work together to address (see appendix A for examples of local community safety indicators). Collecting community crime and safety indicators (see Figure 3) will allow a platform for stakeholders to continuously review data and interventions to improve program delivery, evaluate community safety planning and design, as well as drive policy and move the needle towards system improvements.

Conclusion

The nexus between climate change, the built environment, and community safety is complex and multi-faceted, requiring significant attention to selecting relevant and strategic regional indicators. This conference is part of an ongoing process by the Community Health Network to establish a regional indicator set for key stakeholders (including local government planners) in order to effectively track and report environmental changes, applicable health and wellbeing trends in the region, and adoption of policies that result in improvements. This process aims to build on and complement the monitoring activities currently employed by various local organizations and municipal governments such as the CRD's Regional Growth Strategy, focusing on strategic priorities, filling gaps, and adding to the narratives needed to contextualize the data.

As natural and built environments are key determinants of population health, planning professionals are in a unique position to improve community health through their work in shaping the environments in which community members live, work, and play. The CHN is hoping that this Healthy and Safe Environments workshop and backgrounder will support municipal planners in hitting their targets and meeting their mandates by demonstrating how clearly identified community health and wellbeing indicators can be incorporated into existing regional planning, tracking and monitoring, to bring a more holistic framework to the Region's policy and planning table.

Implementing a region-wide set of indicators will positively support timely and effective policy and planning interventions which can be strategically applied to 'turn the dial' in the direction of better public health.

As natural and built environments are key determinants of population health, planning professionals are in a unique position to improve community health through their work in shaping the environments in which community members live, work, and play.

REFERENCES

- Alberta Health Services, n.d. *Built Environment Indicator Review: Summary Report* <https://planh.ca/take-action/healthy-environments/built-environments/page/healthy-neighbourhood-design>.
- BC Healthy Communities (n.d.) *Healthy Neighbourhood Design*, Plan H. planh.ca/take-action/healthy-environments/built-environments/page/healthy-neighbourhood-design.
- Capital Regional District. (2017). *Climate Projections for the Capital Region*. https://www.crd.bc.ca/docs/default-source/climate-action-pdf/reports/2017-07-17_climateprojectionsforthe-capitalregion_final.pdf
- City of Victoria. (2018). *City of Victoria climate leadership plan: Strategies and actions for a prosperous, low carbon future*. [https://www.victoria.ca/assets/Departments/Engineering~Public~Works/Documents/City%20of%20Victoria%20Climate%20Leadership%20Plan%20\(1805\).pdf](https://www.victoria.ca/assets/Departments/Engineering~Public~Works/Documents/City%20of%20Victoria%20Climate%20Leadership%20Plan%20(1805).pdf)
- Collective Impact Forum. (2014). *What is collective impact*. <https://www.collectiveimpactforum.org/what-collective-impact>
- Eyles, J., & Furgal, C. (2002). Indicators in Environmental Health: Identifying and Selecting Common Sets. *Canadian Journal of Public Health / Revue Canadienne De Sante'e Publique*, 93, S62-S67. <http://www.jstor.org/stable/41993965>
- Frank, L. D., Iroz-Elardo, N., Macleod, K. E., & Hong, A. (2019). Pathways from built environment to health: a conceptual framework linking behavior and exposure-based impacts. *Journal of Transport & Health*, 12, 319-335.
- Hancock, T. (2015). Measuring what matters: Victoria's Vital Signs. In *Victoria's Vital Signs 2015*. Victoria BC: Victoria Community Foundation
- Leech J.A., Wilby K., McMullen E., and Laporte K. (1996) The Canadian Human Activity Pattern Survey: a report of methods and population surveyed. *Chronic Dis Can* 17 (3-4): 118-123.
- Litman, T. (2019). *Well measured: Developing indicators for sustainable and livable transport planning*. <https://www.vtpi.org/wellmeas.pdf>
- Mihinjac, M., & Saville, G. (2019). Third-Generation Crime Prevention Through Environmental Design (CPTED). *Social Sciences*, 8(6), 182.
- Ministry of Environment and Climate Change Strategy. (2019). *Addressing climate and health risks in BC: Communities fact sheet*. https://www2.gov.bc.ca/assets/gov/environment/climate-change/adaptation/health/final_climate_and_health_backgrounder_communities.pdf
- Ministry of Environment and Climate Change Strategy. (2019). *Climate impacts on health fact sheets*. <https://www2.gov.bc.ca/gov/content/environment/climate-change/adaptation/resources>
- Ngo, V., & Hamre, S. (2019). *Where matters: Health & economic impacts of where we live*.
- Nilson, C. (2018). Community safety and well-being: Concept, practice and alignment. *Saskatoon, SK: Community Safety Knowledge Alliance*.
- Prevention Institute advancement project. (2015). *Community Safety: A building block for healthy communities*. <https://www.preventioninstitute.org/publications/community-safety-a-building-block-for-community-health>
- Shah, Y., Manaugh, K., Badami, M., & El-Geneidy, A. (2013). Diagnosing transportation: Developing key performance indicators to assess urban transportation systems. *Transportation Research Record*, 2357(1), 1-12.
- South African Cities Network. (2019). *State of urban safety in South Africa report 2018/2019*. https://www.saferespaces.org.za/uploads/files/Web_SACN_State_of_Urban_Safety_2018-19_%281204%29.pdf
- Watts et al. (2018). *The 2018 report of the Lancet Countdown on health and climate change: shaping the health of nations for centuries to come*. https://sciencepolicy.colorado.edu/admin/publication_files/2018.14.pdf
- World Health Organization (WHO). (2019). *Health, environment, and sustainable development: Transport, housing, urban health, and health care*. <https://www.who.int/sustainable-development/en/>

APPENDICES

The appendix contains examples of indicators sets used in other communities to monitor environmental and public health changes. All indicator sets include several climate, housing, transportation, or community safety indicators.

APPENDIX A: VICTORIA FOUNDATION VITAL SIGNS

Vital Signs is a data-driven program that provides local social metrics in the areas of health, education, and community safety and other key areas that measure community wellbeing. The various indicators reflect the United Nations Sustainable Development Goals, in the hopes to support evidence-based, locally-relevant solutions to improve communities. The Vital Signs initiative is a nation-wide program

that has been implemented in Victoria by the Victoria Foundation. While the Victoria Foundation's Vital Signs report contains indicators in a variety of social areas, there are some specific indicators in housing conditions, environmental sustainability, transportation, and community safety. A small sample of these indicators is listed below. For more information, review the full report: Victoria Foundation (2018). *Vital Signs: Greater Victoria's 2018 Annual Check-up*. victoriafoundation.bc.ca/vital-signs/

<p>Safety</p> <ul style="list-style-type: none"> • Number of police-reported hate crimes in the Victoria Census Metropolitan Area (CMA), • The number of illicit drug overdose deaths in South Vancouver Island • Overdose deaths for South Vancouver Island per 100,000 population • Crime Severity Index • Overall Crime Rate, 2017 • Profile of police-reported intimate partner violence • 2017 Crime Rates (violations per 100,000 populations), by offence 	<p>Transportation</p> <ul style="list-style-type: none"> • % of Greater Victoria residents using local transit • % of trips by active transportation and transit (on foot, public transit, and bicycle) • Km of cycling infrastructure (including multi-use trails and bike lanes) • Trips daily to, from, and within the Capital Region • % of daily trips made by car (as driver and passenger) for an average auto occupancy rate • The average commute time for all modes of travel in Greater Victoria • Percent of Greater Victoria commuters who travel to work within their municipalities and in another municipality within the region
<p>Housing</p> <ul style="list-style-type: none"> • % of households in Greater Victoria living in dwellings requiring major repair in 2016 	
<p>Environmental Sustainability</p> <ul style="list-style-type: none"> • Annual average concentrations of fine particulate matters • Population density of Greater Victoria in person per square kilometer 	

APPENDIX B: CAPITAL REGIONAL DISTRICT — REGIONAL GROWTH STRATEGY INDICATORS

These indicators demonstrate a robust monitoring program that measures progress towards achieving the Regional Growth Strategies goals and objectives. This indicator set includes a variety of environmental (climate, transportation, housing, and community safety) indicators to help address how municipalities are working to promote communities that are socially, economically, and environmentally healthy. The Regional Growth Strategy Indicator Report 2019 can be found at <https://www.crd.bc.ca/project/regional-growth-strategy>

RGS INDICATORS – AT A GLANCE



RGS Indicator Report - CRD 2019

APPENDIX C: REGIONAL DISTRICT OF NANAIMO — REGIONAL GROWTH STRATEGY INDICATORS

These indicators are used by the RDN to monitor how well the regional social, cultural, economic, and environmental system is working over time. These 23 indicators are meant to measure the region's progress towards or away from the goals and policies of the Regional Growth Strategy. The most recent RDN Regional Growth Strategy report can be found at <https://www.rdn.bc.ca/rgs-progress-reports>

Regional Growth Strategy Backgrounder on Indicators	
Goals	Indicators
Goal 1: Prepare for Climate Change and Reduce Emissions	<ul style="list-style-type: none"> Total Greenhouse Gas Emissions Total and per capita Non-renewable energy use
Goal 2: Protect the Environment	<ul style="list-style-type: none"> Total water consumption (residential and commercial) Surface water quality Amount of land in protected areas
Goal 3: Coordinate Land Use and Mobility	<ul style="list-style-type: none"> Number of households within a set distance (400m) of employment lands, shopping, schools, transit and recreation Per capita transit use
Goal 4: Concentrate Housing and Jobs into Growth Centres	<ul style="list-style-type: none"> Density of population and units inside and outside the GCB Diversity of land use (ratio) inside the GCB
Goal 5: Enhance Rural Integrity	<ul style="list-style-type: none"> The number of new lots/units inside and outside the GCB Number of parcels with Farm Status The amount of land classified as Private Managed Forest Land
Goal 6: Facilitate the Provision of Affordable Housing	<ul style="list-style-type: none"> The total number of affordable rental units The portion of units in each housing type inside the GCB
Goal 7: Enhance Economic Resiliency	<ul style="list-style-type: none"> [Unemployment] Employment rate and Labour Participation rate
Goal 8: Enhance Food Security	<ul style="list-style-type: none"> Number of parcels with Farm Status
Goal 9: Celebrate Pride of Place	<ul style="list-style-type: none"> The amount of publically owned land designated for parks and community use Per capita length of public trails
Goal 10: Provide Services Efficiently	<ul style="list-style-type: none"> Per capita waste disposal Per capita cost to provide water and sewer

www.rgsmonitoring.ca

1-877-607-4111



APPENDIX D: VICTORIA TRANSPORT POLICY INSTITUTE — KEY SUSTAINABLE TRANSPORT GOALS, OBJECTIVES AND INDICATORS

While there is no standardized sustainable transport data or indicator sets, the Victoria Transport Policy Institute has conducted substation research in the area of sustainable transportation and community health, resulting in comprehensive indicator for professionals in the field.

For more information, review the following document: Litman, T. (2019). *Well measured: Developing indicators for sustainable and livable transport planning*. <https://www.vtpi.org/wellmeas.pdf>

Table ES-3 Key Sustainable Transport Goals, Objectives and Indicators

Sustainability Goals	Objectives	Performance Indicators
I. Economic		
Economic productivity	Transport system efficiency. Transport system integration. Maximize accessibility. Efficient pricing and incentives.	<ul style="list-style-type: none"> Per capita GDP Portion of budgets devoted to transport. Per capita congestion delay. Efficient pricing (road, parking, insurance, fuel, etc). Efficient prioritization of facilities
Economic development	Economic and business development	<ul style="list-style-type: none"> Access to education and employment opportunities. Support for local industries.
Energy efficiency	Minimize energy costs, particularly petroleum imports.	<ul style="list-style-type: none"> Per capita transport energy consumption Per capita use of imported fuels.
Affordability	All residents can afford access to basic (essential) services and activities.	<ul style="list-style-type: none"> Availability and quality of affordable modes (walking, cycling, ridesharing and public transport). Portion of low-income households that spend more than 20% of budgets on transport.
Efficient transport operations	Efficient operations and asset management maximizes cost efficiency.	<ul style="list-style-type: none"> Performance audit results. Service delivery unit costs compared with peers. Service quality.
II. Social		
Equity / fairness	Transport system accommodates all users, including those with disabilities, low incomes, and other constraints.	<ul style="list-style-type: none"> Transport system diversity. Portion of destinations accessible by people with disabilities and low incomes.
Safety, security and health	Minimize risk of crashes and assaults, and support physical fitness.	<ul style="list-style-type: none"> Per capita traffic casualty (injury and death) rates. Traveler assault (crime) rates. Human exposure to harmful pollutants. Portion of travel by walking and cycling.
Community development	Helps create inclusive and attractive communities.	<ul style="list-style-type: none"> Land use mix. Walkability and bikability Quality of road and street environments.
Cultural heritage preservation	Respect and protect cultural heritage. Support cultural activities.	<ul style="list-style-type: none"> Preservation of cultural resources and traditions. Responsiveness to traditional communities.
III. Environmental		
Climate stability	Reduce global warming emissions Mitigate climate change impacts	<ul style="list-style-type: none"> Per capita emissions of greenhouse gases (CO₂, CFCs, CH₄, etc.).
Prevent air pollution	Reduce air pollution emissions Reduce harmful pollutant exposure	<ul style="list-style-type: none"> Per capita emissions (PM, VOCs, NOx, CO, etc.). Air quality standards and management plans.
Minimize noise	Minimize traffic noise exposure	<ul style="list-style-type: none"> Traffic noise levels
Protect water quality & hydrologic functions	Minimize water pollution. Minimize impervious surface area.	<ul style="list-style-type: none"> Per capita fuel consumption. Management of used oil, leaks and stormwater. Per capita impervious surface area.
Openspace and biodiversity protection	Minimize transport facility land use. Encourage compact development. Preserve high quality habitat.	<ul style="list-style-type: none"> Per capita land devoted to transport facilities. Support for smart growth development. Policies to protect high value farmlands and habitat.
IV. Good Governance and Planning		
Integrated, comprehensive and inclusive planning	Clearly defined planning process. Integrated and comprehensive analysis. Strong citizen engagement. Lease-cost planning.	<ul style="list-style-type: none"> Clearly defined goals, objectives and indicators. Availability of planning information and documents. Portion of population engaged in planning decisions. Range of objectives, impacts and options considered. Efficient and equitable funding allocation

This table summarizes sustainability goals, objectives and performance indicators.

APPENDIX E: CITY OF VANCOUVER — GREENEST CITY INDICATORS

In recent years, the City of Vancouver has set a goal to become the greenest city in the world by 2020. In order to determine progress made towards identified priority actions and strategies, the Greenest City Action Plan outlines several goals with targets, indicators, and baseline data. The Green City Action Plan is a highly complex plan; therefore, having simple aspirational goals with measurable targets helps to focus what the city and its members are striving for. The following indicators listed in this appendix are just a few of the environmental goals, targets and indicators, presented used to monitor the progress of the action plan. For a list of the entire indicator set and further information on how this action plan supports community health, check out the City of Vancouver’s Green City Action Plan website and supporting documents: <https://vancouver.ca/green-vancouver/greenest-city-action-plan.aspx>

GOAL AND TARGETS	INDICATOR
CLIMATE AND RENEWABLES	
Target: Reduce community-based greenhouse gas emissions by 33% from 2007 levels by 2020.	Total tonnes of community CO ₂ e emissions from Vancouver
GREEN BUILDINGS	
Target 1: Require all buildings constructed from 2020 onward to be carbon neutral in operations.	Kilograms of CO ₂ e per square metre of newly built floor area
Target 2: Reduce energy use and GHG emissions in existing buildings by 20% over 2007 levels.	Total tonnes of CO ₂ e from all community buildings
GREEN TRANSPORTATION	
Target 1: Make the majority of trips (over 50%) by foot, bicycle and public transit.	Per cent mode share by walk, bike and transit
Target 2: Reduce average distance driven per resident by 20% from 2007 levels.	Total vehicle km driven per person
ZERO WASTE	
Target: Reduce total solid waste going to the landfill or incinerator by 50% from 2008 levels.	Annual solid waste disposed to landfill or incinerator from Vancouver ²
ACCESS TO NATURE	
Target 1: Ensure that every person lives within a five-minute walk of a park, greenway or other green space. ³	Per cent of city’s land base within a five-minute walk to a green space
Target 2: Plant 150,000 additional trees.	Total number of additional trees planted
Target 3: Restore or enhance 25 hectares of natural areas between 2010 and 2020.	Total hectares of natural areas restored or enhanced
Target 4: Increase canopy cover to 22% by 2050.	Per cent of city’s land area covered by tree-leaf canopies

APPENDIX F: LANCET COUNTDOWN CLIMATE INDICATORS

In conjunction with the Canadian Medical Association and the Canadian Public Health Association, in 2018, the Lancet Countdown established report that focuses on the link between climate change and health. The Lancet Countdown in a global, interdisciplinary research team that works with inter-governmental organizations that uses a set of 41 global indicators to monitor and report on the state of nation's climate change and public health. A sample of the 41-indicator set is provided to highlight some of the key climate-action indicators. To view the full indicator set or to read the 2018 Lancet Countdown Report for Canada, please review the following documents:

Watts, N., Amann, M., Arnell, N., Ayeb-Karlsson, S., Belesova, K., Berry, H., ... & Campbell-Lendrum, D. (2018). The 2018 report of the Lancet Countdown on health and climate change: shaping the health of nations for centuries to come. *The Lancet*, 392(10163), 2479-2514.

Howard, C., Rose, C., & Rivers, N. (2017). Lancet Countdown 2017 report: Briefing for Canadian policymakers. *Lancet Countdown and Canadian Public Health Association*. <http://www.lancetcountdown.org/media/1418/2018-lancet-countdown-policy-brief-canada.pdf>

Climate change impacts, exposures, and vulnerability

- Indicator 1.1: vulnerability to the heat-related risks of climate change
- Indicator 1.2: health effects of temperature change
- Indicator 1.3: health effects of heatwaves
- Indicator 1.4: change in labour capacity
- Indicator 1.5: health effects of extremes of precipitation (flood and drought)
- Indicator 1.6: lethality of weather-related disasters
- Indicator 1.7: global health trends in climate-sensitive diseases
- Indicator 1.8: climate-sensitive infectious diseases
- Indicator 1.9: food security and undernutrition
 - Indicator 1.9.1: terrestrial food security and undernutrition
 - Indicator 1.9.2: marine food security and undernutrition
- Indicator 1.10: migration and population displacement

Adaptation, planning, and resilience for health

- Indicator 2.1: national adaptation plans for health
- Indicator 2.2: city-level climate change risk assessments
- Indicator 2.3: detection, preparedness, and response to health emergencies
- Indicator 2.4: climate change adaptation to vulnerabilities from mosquito-borne diseases
- Indicator 2.5: climate information services for health
- Indicator 2.6: national assessments of climate change impacts, vulnerability, and adaptation for health
- Indicator 2.7: spending on adaptation for health and health-related activities
- Indicator 2.8: health adaptation funding from global climate financing mechanisms

Mitigation actions and health co-benefits

- Indicator 3.1: carbon intensity of the energy system
- Indicator 3.2: coal phase-out
- Indicator 3.3: zero-carbon emission electricity
- Indicator 3.4: access to clean energy
- Indicator 3.5: exposure to ambient air pollution
 - Indicator 3.5.1: exposure to air pollution in cities
 - Indicator 3.5.2: premature mortality from ambient air pollution by sector
- Indicator 3.6: clean fuel use for transport
- Indicator 3.7: sustainable travel infrastructure and uptake
- Indicator 3.8: ruminant meat for human consumption
- Indicator 3.9: health-care sector emissions



COMMUNITY SOCIAL PLANNING COUNCIL
research·insights·solutions

Community Social Planning Council leads social, economic and environmental planning in BC's Capital Region. We engage community members and organizations, businesses and government to research social issues and create sustainable solutions.

