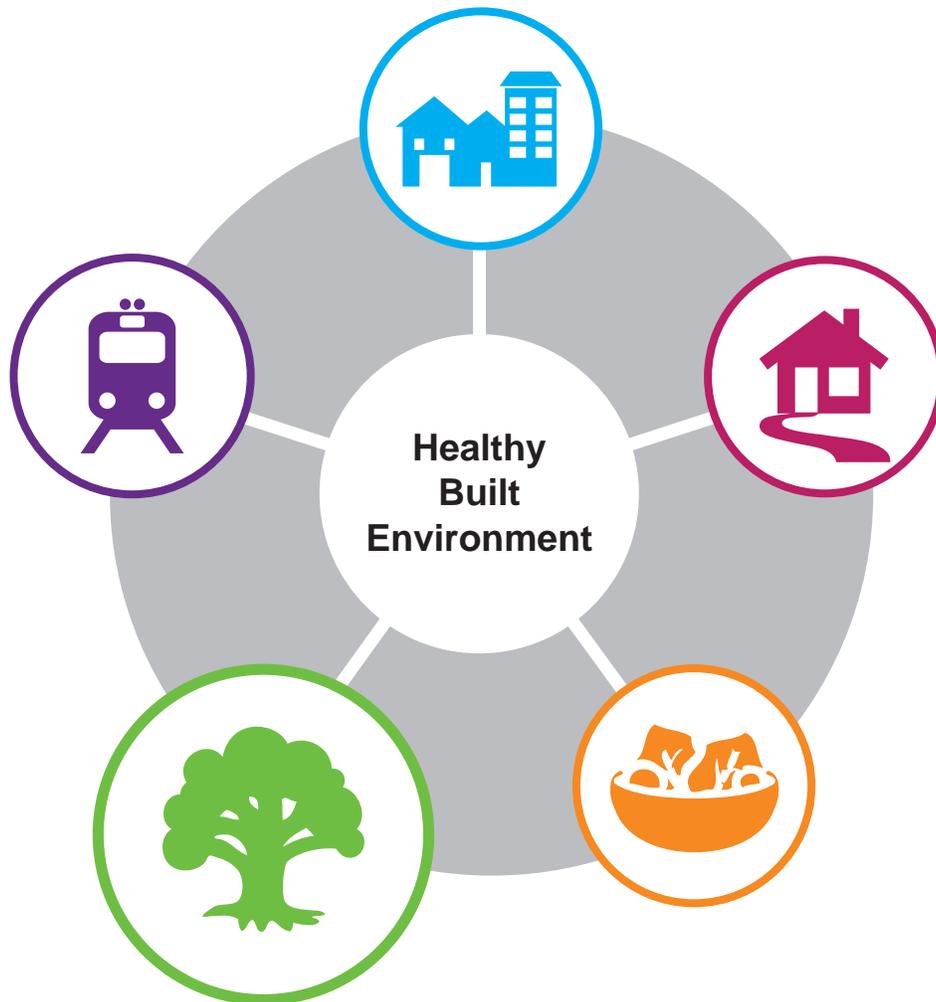


# HEALTHY BUILT ENVIRONMENT LINKAGES A TOOLKIT FOR DESIGN • PLANNING • HEALTH

## HEALTHY NATURAL ENVIRONMENTS



PROMOTING EQUITY • ACCESS • DESIGN FOR ALL AGES

Prepared for Tannis Cheadle, Provincial Manager,  
Population & Public Health and Andrew Tugwell,  
Provincial Director, Population & Public Health  
by: Erik Lees, Heidi Redman and Lukas Holy of  
LEES+Associates

This toolkit is a project of the PHSA Population  
& Public Health team under the leadership of the  
Healthy Built Environment Alliance (HBEA).

For more information contact:

Tannis Cheadle, MSW  
Provincial Health Services Authority  
700 – 1380 Burrard St.  
Vancouver, BC  
V6Z 2H3 Canada  
604.675.7421  
pph@phsa.ca

Andrew Tugwell, MPH, B.Ed  
Provincial Health Services Authority  
700 – 1380 Burrard St.  
Vancouver, BC  
V6Z 2H3 Canada  
604.875.7356  
pph@phsa.ca

[www.phsa.ca/populationhealth](http://www.phsa.ca/populationhealth)

## **What is the built environment?**

The phrase “built environment” refers to the human-made or modified physical surroundings in which people live, work and play. These places and spaces include our homes, communities, schools, workplaces, parks/recreations areas, business areas and transportation systems, and vary in size from large-scale urban areas to smaller rural developments.

# TABLE OF CONTENTS

The toolkit is organized into different “layers” as follows:

<b>Project Overview</b> .....	<b>6</b>
Overview of the project including the toolkit purpose, who might use it, and how.	
<b>Approach</b> .....	<b>10</b>
Description of the methodology used to review the evidence and inform the toolkit content.	
<b>User Guide: Will it Work in My Community?</b> .....	<b>14</b>
Important questions to keep in mind when using the toolkit, in order to determine whether or not (and how) particular planning principles could be applied in your community. These questions are related to context, quality of evidence, urban vs. non-urban considerations and equity and access.	
<b>Physical Features of a Healthy Built Environment</b> .....	<b>15</b>
Visual depiction of the five physical features of a healthy built environment.	
<b>Planning Principles</b> .....	<b>16</b>
List of planning principles for a healthy built environment, organized by each of the five physical features.	
<b>Fact Sheet</b> .....	<b>17</b>
More information about how planning principles can impact health related outcomes. In some cases the evidence is described in more detail, and in others more detail is provided about the planning principles themselves.	
<b>Linkages Summary</b> .....	<b>21</b>
Summary sheet for the natural environments physical feature. For each planning principle, vision statements are identified, and impacts and associated health related outcomes are indicated.	
<b>Health Evidence Diagram</b> .....	<b>22</b>
Diagram based on the collective evidence review visually depicting the linkages and strength of evidence and direction of effect between planning principles, impacts and health related outcomes. It is an intermediate step to bridge the collective evidence base with the linkages summary and fact sheet.	
<b>Glossary of Terms</b> .....	<b>23</b>



# ACKNOWLEDGEMENTS

## Who developed this resource?

This resource is one of a series of products developed under the leadership of BC's Healthy Built Environment Alliance (HBEA) – a network that brings together public health professions, design professions and land use planning professional organizations to better understand the impact of the built environment on health and well-being, and to provide leadership for healthier, more livable communities. Additional resources can be found at:

[www.phsa.ca/populationhealth](http://www.phsa.ca/populationhealth)

This toolkit draws on many sources for which we are grateful. In particular, members of the HBE Linkages Toolkit Working Group and Advisory Groups provided invaluable feedback and advice at all stages of the work.

## HBE Linkages Toolkit Working Group

- Tannis Cheadle, PHSA
- Dr. Lisa Mu, Medical Consultant
- Dr. Helena Swinkels, Fraser Health
- Claire Gram, Vancouver Coastal Health
- Pam Moore, Interior Health
- Gary Stephen, City of Kelowna
- Dr. Karen Rideout, BC Centre for Disease Control
- Dr. Catherine Elliott, BC Centre for Disease Control
- Dr. Sophie Verhille, National Collaborating Centre for Environmental Health
- David Widdis, Regional District of Central Okanagan

## Healthy Neighbourhood Design and Healthy Transportation Networks - Advisory Group

- Dr. Lisa Mu, Medical Consultant
- Tina Atva, Urban Systems
- Hazel Christy, Canadian Institute of Planners, Christy & Associates Planning Consultants
- Lauren Klose, Metro Vancouver
- Pam Moore, Interior Health
- Dr. Meghan Winters, Simon Fraser University
- Peter Truch, Opus Consulting
- Alan Callander, Ministry of Transportation
- Heather Evans, Heather Evans Consulting
- Dr. Luisa Giles, BC Centre for Disease Control, National Collaborating Centre for Environmental Health
- Michelle Sandsmark, MPH Student, University of Victoria

## Healthy Natural Environments - Advisory Group

- Dr. Lisa Mu, Medical Consultant
- Erin Embley, Metro Vancouver
- Ben Finkelstein, Ministry of Environment
- Matt Herman, Ministry of Health
- Murray Kopp, RD of Central Okanagan
- Dr. Patrick Mooney, University of BC
- Helene Roberge, Ministry of Environment
- Mary Storzer, Ministry of Community, Sport & Cultural Development
- Narissa Chadwick, Ministry of Community, Sport & Cultural Development
- Dr. Larry Frank, University of BC
- Lauren Klose, Metro Vancouver
- Bryan Melnyk, Ministry of Health
- Kris Ord, Ministry of Environment
- Ted Sheldon, Ministry of Environment
- Oonagh Tyson, Fraser Health
- Winnie Yu, Ministry of Health



## ACKNOWLEDGEMENTS

### Healthy Food Systems - Advisory Group

- Dr. Karen Rideout, BC Centre for Disease Control
- Jen Casorso, City of Kamloops
- Claire Gram, Vancouver Coastal Health
- Maren Luciani, City of Kamloops
- Luke Sales, Town of Qualicum Beach
- Kristina Bouris, City of Victoria
- Janine de la Salle, Urban Food Strategies
- Melanie Kurrein, PHSA
- Naseam Ahmadi, MSc Student, University of BC

### Healthy Housing - Advisory Group

- Dr. Lisa Mu, Medical Consultant
- Dr. Atiya Mahmood, Simon Fraser University
- Lori Bowie, City of Surrey
- Margaret Eberle, Metro Vancouver
- Breann Specht, Vancouver Coastal Health
- Linda Dix-Cooper, BC Centre for Disease Control
- Victoria Domonkos, MPH Student, University of Victoria

# PROJECT OVERVIEW

## **This foundational document is intended to:**

- Facilitate conversations between public health practitioners, planners and others involved in land-use and transportation planning.
- Assist toolkit users in applying health evidence.
- Inform built environment decision-making processes.
- Be a navigational tool to the literature, directing people to further information.

## **What are we trying to do?**

We want to link community design, planning and health. Public health, community planners, and others involved in the design of, and decision making for communities share a responsibility to promote active living approaches and to shape healthier built environments.

The Linkages Toolkit provides consistent evidence-based and expert-informed messages for use in communications and discussion around health and the built environment. It provides a roadmap for emerging and innovative evidence.

The toolkit content is grouped by five physical features of the built environment: neighbourhood design, transportation networks, natural environments, housing, and food systems. For each physical feature, evidence has been assessed and the information is organized according to vision statements, planning principles, impacts, and health-related outcomes.

## **Who might use this resource?**

The primary audience for the Linkages Toolkit is public health practitioners involved in healthy built environment work, planners, design professionals and land-use and transportation planning professionals such as architects and engineers, and others involved in the design of communities such as decision-makers in municipal and regional governments. We intend for this resource to serve as a conversation-starter between public health practitioners and these various audiences.

## **How might this resource be used?**

We anticipate that different individuals or groups might use different layers of this toolkit for various purposes depending on the audience and setting. For example, the Healthy Built Environment Linkages diagram and planning principles (pg.15-16) are communication pieces that could be used to articulate the many ways in which the five physical features contribute to health and to show others how they have a role to play, by highlighting intersections between different sectors and stakeholders. The Health Evidence Diagrams that articulate the strength of evidence (pg. 43-47) might be of most interest to health and planning professionals who want to dig deeper into, and potentially add to the evidence base.

## PROJECT OVERVIEW

More specific examples of how this tool might be used:

- As a framework for organizing information and presentations at workshops, webinars or conferences on the healthy built environment.
- As a starting point for informing the development of funding proposals, briefing documents or background papers to obtain support for healthy built environment work.
- To provide and organize background information in staff reports on certain policy and program issues (e.g., new community gardens, new subsidized housing developments, and support for the development of transit networks).
- As a framework to help guide the creation of, and content for long-range plans and strategies (e.g., Official Community Plans, Neighbourhood Plans, Park Master Plans, and Transportation Plans).
- As a basis for partnership in order to carry out activities that are important to the community but fall outside the direct role of local governments (e.g., new school programs, delivery of community food security programs).

Note: We recognize that there are some planning principles over which certain audiences have no direct control. We felt it was important, however, that this toolkit include the entire range of planning principles necessary for healthy built environments.

### **How did we decide what information to include in the resource?**

This is a foundational document. Our intention was to develop a core set of principles that would ideally be addressed in any planning process. The principles were not intended to be a prescriptive list which dictates HBE principles to planners and local government. They are at a high enough level that some of the elements can be applied differently in different settings (i.e., rural, suburban, and urban).

The following criteria helped us make decisions about which principles to include in the toolkit:

- Concentrate on principles for which the evidence is strongest, however, at the same time be mindful of groupings or elements which might be unfairly rejected due to a lack of evidence at this time, or are difficult to study with traditional epidemiological methods.
- Include information that is relevant to planners and developers and is relevant at the municipal level.
- Focus on areas where health can bring value in terms of information and evidence to the planning table.
- Aim to be short, digestible and clear.
- Avoid being prescriptive.
- Avoid being overly specific to particular settings or types of communities.
- Avoid micro-level elements such as specific design targets or performance measures.

## PROJECT OVERVIEW

### How is this different from other planning toolkits out there?

This resource works through the entire pathway of tracking what happens between planning principles and health outcomes. In some cases this toolkit may highlight principles or relationships that are already commonly included in planning processes, but it adds the weight of health evidence behind them. The content is evidence-based and expert-informed.

This resource is essentially a communications toolkit that identifies and describes linkages and relationships, and provides a framework for thinking and talking about health and the built environment – it will not tell you how to do the work – there are many other tools and resources available that provide that information. This resource is intended to be a conversation starter regarding “what” to do. To learn more about “how” to best implement these principles, see resources like:

[planh.ca](http://planh.ca)

PlanH supports local government engagement and partnerships across sectors for creating healthier communities and provides learning opportunities, resources, and leading-edge practices for collaborative local action. The PlanH website complements the Linkages Toolkit by providing information about available resources (e.g., publications, links, videos, action guides), training & support, funding opportunities, success stories and events. The website is a gateway to more resources.

[www.uphn.ca/CLASP/](http://www.uphn.ca/CLASP/)

With funding from the Canadian Partnership Against Cancer’s “Coalitions Linking Action and Science for Prevention (CLASP)” program, the Healthy Canada by Design CLASP initiative is uniting existing and emerging cross-sector efforts in six health regions across Canada to promote healthy built environments. This website provides an overview of the CLASP projects, and tools & resources to support policy-makers, public health officials, planners and developers in facilitating the creation of more health promoting communities across Canada.

## PROJECT OVERVIEW

[www.cip-icu.ca](http://www.cip-icu.ca)

The Canadian Institute of Planners (CIP) is a collaborative national federation working on behalf of planners and the planning profession to serve as the national voice for Canada's planning community. The CIP website outlines its 2012-2014 Strategic Plan, and provides links to CIP publications (e.g., CIP Professional Practise Manual) and national and international projects (this section highlights some of the projects that CIP members are currently involved in as well as summaries on completed projects). National projects include collaborative work with First Nations' communities and organizations to enhance land use planning within First Nations' communities, and the launch of the Climate Change Impacts Adaptation program funded by Natural Resources Canada. The CIP has been engaged in various international projects for over 20 years as a way to build education and awareness, develop employment and business opportunities, and assist in international cooperation and development.

[www.ncceh.ca/en/additional\\_resources?topic=89&subtopic=159](http://www.ncceh.ca/en/additional_resources?topic=89&subtopic=159)

The National Collaborating Centre for Environmental Health (NCCEH) is one of six collaborating centres across Canada created for the purpose of fostering linkages within the public health community. The built environment is currently one of NCCEH's major project areas. The NCCEH has developed an annotated inventory of resources on the built environment developed in partnership with the Canadian Institute of Planners, the Urban Public Health Network (UPHN), and the Canadian Partnership Against Cancer's CLASP initiative. These resources include readiness assessment tools, fact sheets, case studies, as well as evidence reviews.

# APPROACH

## GENERAL DESCRIPTION

We conducted a literature review process for each of the five physical features. Please see the Evidence Review Methodology section for an overview of the steps. Key information gathered from individual studies was organized into a spreadsheet that included details such as: study design, target population, independent and dependent variables, and reviewer assessments made about the studies such as confidence in findings, and a quality assessment of the source.

We established advisory groups consisting largely of planners, but also including content experts (e.g. academics) for each of the physical features. During the literature review process, advisory group members provided advice and guidance on planning principles on which to base initial evidence searches, highlighted areas requiring further research, provided feedback on the emerging research links, made suggestions for key resources to access, and provided guidance regarding appropriate language.

We used data from the individual studies to create a collective evidence base by systematically clustering together study findings. A grading system developed by PHSA (see the Grading System description for more detail) was then applied to the collective evidence base to assess the strength of the study findings supporting the various links between planning principles, impacts and health outcomes. The results formed the basis for all the toolkit resources. The strength of the evidence is depicted in the Evidence Summary graphics using different types of lines (see the legend in each of the graphics on pg. 43-47).

It is important to note that in many cases the evidence is indirect – there is sometimes little evidence showing that a particular planning principle is directly associated with a specific health outcome. In these cases, we were more effectively able to make the links between the broad planning principles and the health outcomes indirectly (i.e. via the impacts).

The concepts of equity, accessibility and design for all ages are addressed to varying extents in this toolkit. The literature on whether and how planning principles promote equity is scarce but was considered where it was available. Accessibility was addressed in the housing and neighbourhood design sections. Evidence is still emerging in these areas, and future reviews could consider looking more systematically at all of these concepts.

## EVIDENCE REVIEW METHODOLOGY

An overview of the evidence review for each of the five physical features is as follows:

1. Conducted an initial scoping literature review to gain a sense of the breadth and depth of the available research related to planning principles, impacts and health outcomes.
2. Drafted an initial set of planning principles from which to work.
3. Used the draft principles on which to base a more thorough literature review using multiple academic databases – this search was focused on attaining peer-reviewed, systematic reviews from reputable scientific journals.
4. Consulted other types of recently published high quality, primary research (e.g., peer reviewed journals and grey literature) when an insufficient number of systematic reviews was available for a specific topic.



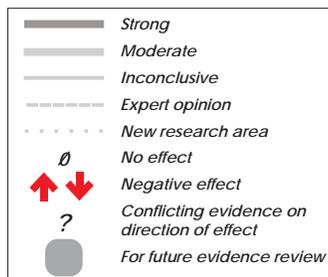
# APPROACH

For a more thorough description of the evidence review methodology, please connect with the project leaders. Their contact information is available on pg.2.

## GRADING SYSTEM

Once the collective evidence base was created, a grading system developed by PHSA was applied to assess the strength of evidence for the links between planning principles, impacts and health outcomes. This system was informed by existing grading systems and tailored to suit the needs of this project. It classified the evidence links according to criteria such as the number, type and quality of included studies, consistency between studies, and degree of confidence in the collective findings. Where evidence was limited, the expert knowledge of the advisory group members was also factored into the link strength and used to identify additional areas of study that should be reflected in the toolkit. The following link strengths appear in legends on the Health Evidence Diagrams (pg. 43-47).

### Health Evidence Diagram Legend



*Thicker, darker lines indicate stronger relationships. Coloured bubbles around the impacts and outcomes (as compared to grey bubbles) mean the evidence is clearer about this effect. Below are explanations of the symbols used in the legends.*

- Strong:** Consistent findings from good quality research.
- Moderate:** Link is supported by research, but is lacking in terms of quality or consistency.
- Inconclusive:** Inconsistent findings, often from a limited number of studies. No conclusions can be drawn from the research we reviewed.
- Expert opinion:** We found no or a very limited number of studies, but the link is supported by expert knowledge.
- New research area:** A search has been undertaken, but there is insufficient research to indicate “moderate” or “strong” strength of evidence because the research topic is new and the evidence is still emerging.
- Negative effect:** Red arrows indicate an undesirable change.
- No effect:** Null symbol indicates the research shows no change in the impact or outcome.
- Question marks:** Indicate that direction of change is not known because there is either insufficient or inconsistent evidence, or because we have not yet searched for evidence.
- For future evidence review:** Grey circles indicate that we have not yet searched for evidence, but inclusion of the impact or outcome is recommended by expert advice or a search has been done, but we have not yet had the time to thoroughly review the evidence.

# APPROACH

## Linkages Summary Legend

	Positive effect
	Negative effect
	No effect
	Conflicting evidence on direction of effect
	For future evidence review

*The legends included in the Linkages Summaries (pg. 38-42) summarize the directionality of the impacts and health related outcomes as related to the planning principles. The Linkages Summaries are different from the Health Evidence Diagrams in that they don't graphically depict the strengths of evidence, but rather focus on the directionality of the impact and health related outcome relationships. Below are explanations of the symbols used in the legends.*

- Positive effect:** Coloured circles indicate a desirable change.
- Negative effect:** Red circles indicate an undesirable change.
- No effect:** Null symbol indicates research shows no change in the impact or outcome.
- Up arrow:** Indicates an increase in the effect.
- Down arrow:** Indicates a decrease in the effect.
- Unknown direction of effect:** Question marks indicate that direction of change is not known because there is either insufficient or inconsistent research, or because we have not yet searched for research.
- For future evidence review:** Grey circles indicate that the effect was predicted by expert knowledge, to be confirmed by future research review, or that the effect was predicted by some review of the evidence, but we did not have time to thoroughly review the evidence to confirm this effect.

# APPROACH

## SCOPE AND LIMITATIONS

While we acknowledge that policy strongly influences the built environment, there was a careful decision made to focus on the physical features of the outdoor built environment and their respective health related outcomes. Physical features were generally restricted to larger scale elements.

We were limited by time and resource constraints in our evidence review and therefore focused primarily on systematic reviews. One limitation of this strategy is that more recent primary studies have not yet been included in published reviews. In other cases, we think there is probably evidence out there but we either couldn't find it, didn't have time to find it, or research hasn't yet been done in the particular area. There may be evidence in case studies, qualitative evidence or promising practices that were not explored in our search. As such, we view this toolkit as an initial stage in building a comprehensive evidence base for links between the planning principles and health related outcomes.

Even with these limitations, we are confident that the toolkit is a good representation of the most important elements of a healthy built environment. We used information from the evidence review combined with expert input from the advisory groups to guide the content. The toolkit is therefore evidence-based and expert-informed.

# USER GUIDE

## WILL IT WORK IN MY COMMUNITY?

### PLANNING YOUR COMMUNITY

#### When using the toolkit, keep the following in mind:

##### **Context is key: is it right for my community?**

When deciding if interventions are right for your community, it is important to consider factors such as the location and population of your community, existing community health issues, community preferences, as well as the context of the research supporting the interventions<sup>1</sup>. These considerations will help to determine if the planning approach is applicable or transferable to your community, and if they can be successfully implemented. Rather than a prescriptive set of rules, the material in this toolkit provides a starting point to ***ask the right questions in your local context.***

##### **Quality of evidence: how much do we know?**

Academic research regarding links between the built environment and health has increased at a rapid rate over the last five to ten years. However, a number of methodological issues and gaps still exist in the literature. This resource is intended to facilitate ***evidence-informed decisions*** that take into account the context in which decisions are made.

##### **Non-urban areas: what new opportunities exist?**

Much of the research linking community planning and design with health has focused on the urban environment. ***Ways in which the physical environments of non-urban areas affect health is less well known.*** Strategies that have worked in urban environments may be successful in non-urban settings; however, it is important to make evidence-informed decisions and consider the local context when planning to implement new strategies. As such, strategies to support or improve health in non-urban communities may be different.

##### **Equity and access: who will be included?**

Care must be taken ***to ensure the community's most vulnerable members are supported.*** Apply an "equity lens" with an emphasis on age- and child-friendly design, and supporting vulnerable populations, such as those with low incomes, mental illness or disabilities.

##### **Why link community design, planning and health?**

Public health practitioners, community planners, designers and decision-makers in municipal and regional governments share a responsibility to promote active living, and to shape healthier built environments in order to promote good health.

##### **What is the built environment?**

The phrase "built environment" refers to the human-made or modified physical surroundings in which people live, work and play. These places and spaces include our homes, communities, schools, workplaces, parks/recreations areas, business areas and transportation systems, and vary in size from large-scale urban areas to smaller rural developments.

<sup>1</sup>Contextual considerations identified in this user guide were informed by work conducted by Nicholas Smith in 2012 for Dr. Helena Swinkels, MHO, Fraser Health.

# PHYSICAL FEATURES OF A HEALTHY BUILT ENVIRONMENT

## Healthy Neighbourhood Design

**Vision:**  
*Neighbourhoods where people can easily connect with each other and with a variety of day-to-day services.*

## Healthy Transportation Networks

**Vision:**  
*Safe and accessible transportation systems that incorporate a diversity of transportation modes and place priority on active transport (e.g., cycling, walking and transit) over the use of private vehicles.*

## Healthy Housing

**Vision:**  
*Affordable, accessible, and good quality housing for all that is free of hazards and enables people to engage in activities of daily living while optimizing their health.*



## Healthy Natural Environments

**Vision:**  
*a built environment where natural environments are protected and natural elements are incorporated, and are experienced by and accessible to all.*

## Healthy Food Systems

**Vision:**  
*A built environment that can support access to and availability of healthy foods for all.*

PROMOTING EQUITY • ACCESS • DESIGN FOR ALL AGES



# PLANNING PRINCIPLES FOR A HEALTHY BUILT ENVIRONMENT

## Healthy Neighbourhood Design



1. Enhance neighbourhood walkability
2. Create mixed land use
3. Build complete and compact neighbourhoods
4. Enhance connectivity with efficient and safe networks
5. Prioritize new developments within or beside existing communities

**Vision:** Neighbourhoods where people can easily connect with each other and with a variety of day-to-day services.

## Healthy Transportation Networks



1. Enable mobility for all ages and abilities
2. Make active transportation convenient and safe
3. Prioritize safety
4. Encourage use of public transit
5. Enable attractive road, rail and waterway networks

**Vision:** Safe and accessible transportation systems that incorporate a diversity of transportation modes and place priority on active transport (e.g., cycling, walking and transit) over the use of private vehicles.

## Healthy Natural Environments



1. Preserve and connect open space and environmentally sensitive areas
2. Maximize opportunities to access and engage with the natural environment
3. Reduce urban air pollution
4. Mitigate urban heat island effect

**Vision:** A built environment where natural environments are protected and natural elements are incorporated, and are experienced by and accessible to all.

## Healthy Food Systems



1. Enhance agricultural capacity
2. Increase access to healthy foods in all neighbourhoods
3. Improve community-scale food infrastructure and services

**Vision:** A built environment that can support access to and availability of healthy foods for all.

## Healthy Housing



1. Increase access to affordable housing through provision of diverse housing forms and tenure types
2. Ensure adequate housing quality for all segments of society
3. Prioritize housing for the homeless, elderly, low income groups, and people with disabilities
4. Site and zone housing developments to minimize exposure

**Vision:** Affordable, accessible, and good quality housing for all that is free of hazards and enables people to engage in activities of daily living while optimizing their health.

The order in which the physical features and principles are listed is not necessarily an indication of their priority or strength of evidence.

# HEALTHY NATURAL ENVIRONMENTS FACT SHEET



## SUMMARY

Natural environments contain the ingredients that enable life as we know it. **The way we design our lives to fit within the natural environment is fundamental in determining our health and well-being.** Our health stands to improve when land use decisions enhance the ability of natural environments to mitigate negative health impacts associated with development. Consider for instance, the capacity of a park to cool and filter the air in a dense neighbourhood, or the ability a greenway has to inspire active transport and access to nature; such interventions foster a livable environment, help encourage physical activity and promote better mental health.

### Vision:

*A built environment where natural environments are protected and natural elements are incorporated, and are experienced by and accessible to all.*

## WHAT DO HEALTHY NATURAL ENVIRONMENTS LOOK LIKE?

Planning Principle:

### 1. Preserve and connect open space and environmentally sensitive areas



Ensure natural areas protect the ecosystem services that we depend on.

- The preservation of open space and environmentally sensitive areas protects biodiversity. Current evidence supports a relationship between biodiversity and measures of ecosystem functioning such as improved water quality, soil health, and pollination.
- Although the relationships between ecosystem services and human health are indirect and difficult to study through traditional methods, the importance of this relationship should not be overlooked as these services make human life possible.
- A loss in biodiversity and biological productivity can result in direct negative impacts on human health, such as the loss of the physical and mental benefits of being in and viewing nature.

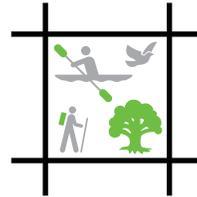


# HEALTHY NATURAL ENVIRONMENTS FACT SHEET



Planning Principle:

## 2. Maximize opportunities to access and engage with the natural environment



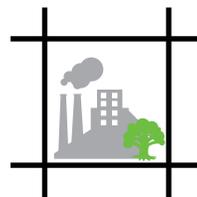
Enable natural environments to be experienced and accessed by all.

- Research supports a strong relationship between exposure to nature and the reduction of stress, chronic disease, depression, anxiety, improved concentration and cognitive functioning.
- Even a brief interaction with nature such as a ten minute walk, or a view of green space can have restorative effects.
- Young children in rural communities are more physically active, likely due to their access to natural open space.



Planning Principle:

## 3. Reduce urban air pollution



Careful community planning can limit production of, and exposure to air pollution.

- Current research indicates that vegetation has the potential to clean the air of a significant amount of air pollutants, such as particulate matter and ground level ozone (smog). Breathing clean air can help prevent the onset of cancer, cardiovascular disease and respiratory difficulties.
- The degree to which air is cleaned by vegetation depends on the type of plants used, how they are distributed, and the local climate. Planting species appropriate to the site and environmental conditions will maximize the positive effects vegetation can have on air quality.

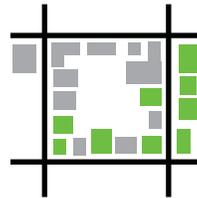


# HEALTHY NATURAL ENVIRONMENTS FACT SHEET



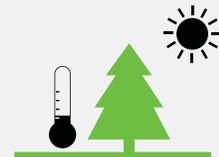
Planning Principle:

## 4. Mitigate urban heat island effect



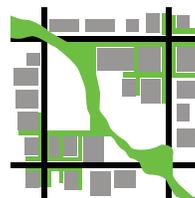
Expand the use of vegetation in the urban environment to mitigate the formation of heat islands.

- Preliminary studies indicate that the cooling effects of vegetation can be significant. Such effects are greater from larger parks, urban agriculture and bodies of water.
- Current research is limited to studies which examine the effects of green spaces on their immediate neighbours, while only a few studies test for community-wide effects.
- Extreme heat events are strongly linked to cardiovascular, respiratory and cerebrovascular mortality. The potential mitigating effects of vegetation on these outcomes deserves further study.



Planning Principle:

## 5. Expand natural elements across the landscape



Increase vegetation across the built environment including in developments, neighbourhoods and transit hubs.

- Expanding natural elements across the built environment increases human access to and interaction with green space. This expands opportunities for positive health outcomes associated with exposure to nature.
- By expanding green spaces across the landscape, the positive effects of vegetation are spread throughout the built environment, thereby increasing the role vegetation has in mitigating air pollution and the urban heat island effect.



# HEALTHY NATURAL ENVIRONMENTS FACT SHEET



## REFERENCES

- Bowler, D. E., L. M. Buyung-Ali, T. M. Knight and A. S. Pullin. "A Systematic Review of Evidence for the Added Benefits to Health of Exposure to Natural Environments." *Bmc Public Health* 10, (2010): 10.
- Bratman, G. N., J. P. Hamilton and G. C. Daily. "The Impacts of Nature Experience on Human Cognitive Function and Mental Health." *The Year in Ecology and Conservation Biology*, edited by R. S. Ostfeld and W. H. Schlesinger, 1249, 118-136. Oxford: Blackwell Science Publ, 2012.
- Carinanos, P. and M. Casares-Porcel. "Urban Green Zones and Related Pollen Allergy: A Review. Some Guidelines for Designing Spaces with Low Allergy Impact." *Landscape and Urban Planning* 101, no. 3 (2011): 205-214.
- De Vries, S. *Contributions of Natural Elements and Areas in Residential Environments to Human Health and Well-Being. Vol. 13 Farming for Health: Green-Care Farming across Europe and the United States of America*, Edited by J. Hassink and M. VanDijk. Dordrecht: Springer, 2006.
- Frumkin, H. "Healthy Places: Exploring the Evidence." *American Journal of Public Health* 93, no. 9 (2003): 1451-1456.
- Holick, M. F. "Sunlight and Vitamin D for Bone Health and Prevention of Autoimmune Diseases, Cancers, and Cardiovascular Disease." *Am J Clin Nutr* 80, no. 6 Suppl (2004): 1678s-88s.
- Jim, C. Y. and W. Y. Chen. "Ecosystem Services and Valuation of Urban Forests in China." *Cities* 26, no. 4 (2009): 187-194.
- Jorgensen, A. and P. H. Gobster. "Shades of Green: Measuring the Ecology of Urban Green Space in the Context of Human Health and Well-Being." *Nature + Culture* 5, no. 3 (2010): 338-363.
- Keniger, L. E., K. J. Gaston, K. N. Irvine and R. A. Fuller. "What Are the Benefits of Interacting with Nature?" *International Journal of Environmental Research and Public Health* 10, no. 3 (2013): 913-935.
- Konijnendijk, C., M. Annerstedt, A. Busse Nielsen and S. Maruthaveeran. *Benefits of Urban Parks, A Systematic Review*. Copenhagen: IFPRA, 2013.
- Krueger, H. *BCRPA Recreation and Parks Performance Measurement Project*. BCRPA, 2013.
- Lee, A. C. K. and R. Maheswaran. "The Health Benefits of Urban Green Spaces: A Review of the Evidence." *Journal of Public Health* 33, no. 2 (2011): 212-222.
- Roy, S., J. Byrne and C. Pickering. "A Systematic Quantitative Review of Urban Tree Benefits, Costs, and Assessment Methods across Cities in Different Climatic Zones." *Urban Forestry & Urban Greening* 11, no. 4 (2012): 351-363.
- Sugiyama, T. and C. Ward Thompson. "Older People's Health, Outdoor Activity and Supportiveness of Neighbourhood Environments." *Landscape and Urban Planning* 83, no. 2-3 (2007): 168-175.
- Thompson, C. W. "Activity, Exercise and the Planning and Design of Outdoor Spaces." *Journal of Environmental Psychology* 34, (2013): 79-96.
- Tzoulas, K., K. Korpela, S. Venn, V. Yli-Pelkonen, A. Kazmierczak, J. Niemela and P. James. "Promoting Ecosystem and Human Health in Urban Areas Using Green Infrastructure: A Literature Review." *Landscape and Urban Planning* 81, no. 3 (2007): 167-178.



# HEALTHY NATURAL ENVIRONMENTS LINKAGES SUMMARY

PLANNING PRINCIPLE	IMPACT	HEALTH RELATED OUTCOME
--------------------	--------	------------------------

## 1. Preserve and connect open space and environmentally sensitive areas



Ensure natural areas protect the ecosystem services that we depend on.

- ↕ soil nutrient concentration
- ↕ biodiversity
- ↕ water quality
- ↕ crop pollination
- ↕ ecosystem functioning

↕ ecosystem services required to sustain life

## 2. Maximize opportunities to access and engage with the natural environment

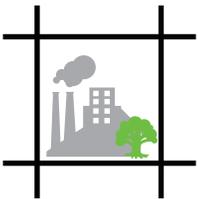


Enable natural environments to be experienced and accessed by all.

- ↕ physical activity
- ↕ stress
- ↕ social interaction
- ↕ spiritual inspiration
- ↕ biodiversity
- ↕ attention restoration

↕ physiological health  
↕ cognitive health  
↕ psychological health  
↕ social well-being  
↕ spiritual well-being  
↕ vitamin D mediated health outcomes

## 3. Reduce urban air pollution

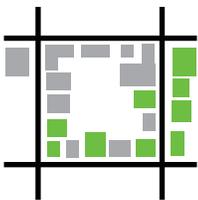


Careful community planning can limit production of, and exposure to, air pollution.

- ↘ particulate matter
- ↘ ground-level ozone
- ↘ harmful emissions (NO<sub>x</sub> SO<sub>x</sub>)

↘ hospitalization for respiratory illness  
↘ cardiovascular mortality

## 4. Mitigate urban heat island effect

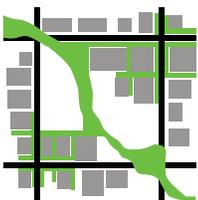


Expand the use of vegetation in the urban environment to mitigate the formation of heat islands.

- ↘ ambient air temperature

↘ heat related mortality and morbidity

## 5. Expand natural elements across the landscape



Increase vegetation across the built environment including in developments, neighbourhoods and transit hubs.

This planning principle was studied in the context of principles **2 3 4**

↕ ↘	Positive effect
↕ ↙	Negative effect
↕	No effect
?	Conflicting evidence on direction of effect
↕ ↘ ?	For future evidence review



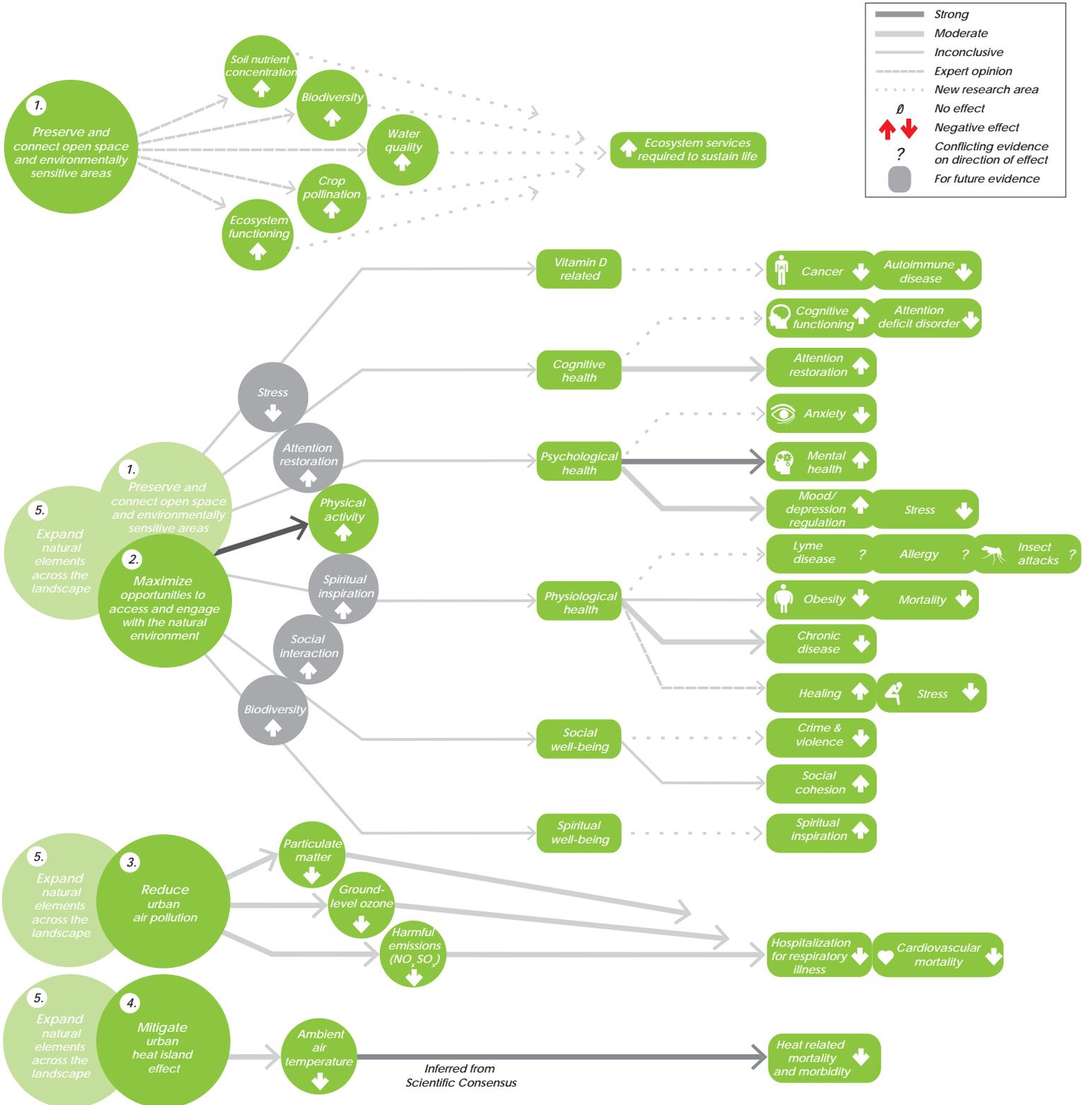


# HEALTHY NATURAL ENVIRONMENTS EVIDENCE DIAGRAM

## Planning Principle

## Impact

## Health Related Outcome



## GLOSSARY

**Active transportation:** Active transportation refers to any form of human-powered transportation such as walking, cycling, using a wheelchair, in-line skating or skateboarding. People often combine the use of active transportation with public transit as a complementary means of getting around (Public Health Association of Canada and Montréal Urban Ecology Centre).

**Agricultural capacity:** The potential for agriculture based on class ratings for various types of land (e.g., Class 7 is considered non-arable, with no potential for soil bound agriculture) (BC Agricultural Land Reserve).

**Biodiversity:** The short form for biological diversity, which is the diversity, or variety, of plants and animals and other living things in a particular area or region (California Biodiversity Counsel).

**Biological productivity:** Also known as bioproductivity, it is the rate and amount of production which occurs in a given ecosystem over a given time period (Michel Serres Institute).

**Body Mass Index (BMI):** A simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres ( $\text{kg}/\text{m}^2$ ) (World Health Organization).

**Brownfields:** Usually former industrial lands that are now vacant or underused but have the potential to be redeveloped for new uses. Brownfields may be contaminated due to past or present activities. Examples of brownfields include: closed factories, gas stations, and waterfront lands formerly used for commercial port operations (Ontario Ministry of the Environment).

**Cardiovascular disease:** Also referred to as heart disease, or heart and blood vessel disease, it includes numerous problems, many of which are related to a process called atherosclerosis. Atherosclerosis is a condition that develops when a substance called plaque builds up in the walls of the arteries. This build-up narrows the arteries, making it harder for blood to flow through (American Heart Association).

**Chronic disease:** Also referred to as non-communicable disease, is not passed from person to person, but rather they are of long duration and generally slow progression. The four main types of chronic disease are cardiovascular diseases (e.g., heart attacks and stroke), cancers, chronic respiratory diseases (e.g., chronic obstructed pulmonary disease and asthma) and diabetes (World Health Organization).

**Communicable disease:** Also known as infectious disease, is caused by pathogenic microorganisms, such as bacteria, viruses, parasites or fungi. Communicable diseases can be spread, directly or indirectly, from one person to another. Zoonotic diseases are infectious diseases of animals that can cause disease when transmitted to humans (World Health Organization).

**Community kitchens:** Also called collective kitchens, they are community-based cooking programs where small groups of people come together to prepare meals and take food home to their families. In a community kitchen every member contributes by planning, preparing, and cooking food. Community kitchens create opportunities for learning about the importance of healthy eating and developing the skills to prepare healthy and affordable meals (Community Kitchen’s Best Practise Toolkit – Canada).

**Connectivity:** Refers to the directness of links and the density of connections in a transport network. A highly permeable network has many short links and intersections, and minimal dead-ends. As connectivity increases, travel distances decrease and route options increase, allowing more direct travel between destinations, and creating a more accessible and resilient transportation system ([healthyplaces.org](http://healthyplaces.org)).

**Densification:** Facilitated sustainable settlement planning through efficient use of spatial resources including bulk service infrastructure, energy sources and a decreasing supply of well-situated land. It is a key strategy to mitigate urban sprawl on the periphery of established development, while accommodating demand proximal to existing economic opportunities and infrastructure (City of Johannesburg, South Africa).

**Ecosystem services:** Simply stated, the benefits people derive from ecosystems. Besides provisioning services or goods like food, wood and other raw materials, plants, animals, fungi and micro-organisms provide essential regulating services such as

pollination of crops, prevention of soil erosion and water purification, and a vast array of cultural services, like recreation and a sense of place (International Union for Conservation of Nature).

**Equity (in health):** Exists when all people can reach their full health potential and are not disadvantaged from attaining it because of their race, ethnicity, religion, gender, age, social class, socioeconomic status, sexual orientation or other socially determined circumstance (National Collaborating Centre for Determinants of Health).

**Food system:** The whole array of activities, ranging from input distribution through on-farm production to marketing and processing, involved in producing and distributing food to both urban and rural consumers (Michigan State University – Department of Agricultural Economics).

**Greenway:** A corridor of undeveloped land preserved for recreational use or environmental protection (Webster Dictionary).

**Infill development:** Development that occurs in underutilized or undeveloped land in already developed urbanized areas, thereby “filling in” an unused part of a community (Resources for the Future – organization).

**Mixed land use:** Enables a variety of land uses including residential, commercial, and industrial to be co-located in an integrated way that supports sustainable forms of transport such as public transit, walking and cycling, and increases neighbourhood amenity. Mixed land use developments can enhance the economic vitality and perceived security of an area by increasing the number of people on the street and in public spaces (Smart Growth).

**Morbidity:** The incidence of illness in a population ([diffen.com](http://diffen.com)). Morbidity is typically used to quantify the burden of disease related to a specific illness, e.g., ‘cardiovascular morbidity’.

**Mortality:** The incidence of death in a population ([diffen.com](http://diffen.com)). Mortality can refer to the overall death rate in a population (e.g., all-cause mortality), or death related to a specific illness (e.g., cardiovascular mortality).

**Overcrowding:** Living in housing that does not have enough bedrooms for the size and make-up of resident households, according to the National Occupancy Standard (Canada Mortgage and Housing Corporation).

**Radon:** Radon is a colourless, odourless radioactive gas that is formed naturally by the breakdown of uranium in soil, rock and water. As a gas, radon is slowly released from the ground, water, and some building materials that contain very small amounts of uranium, such as concrete, bricks, tiles and gyprock. Radon gas breaks down further to form additional radioactive particles called radon daughters, or “progeny” that can be breathed into the lungs (Health Canada).

**Sprawl:** Also known as urban sprawl, it is a development pattern characterized by the following features: low-density development with new growth appearing primarily on previously undeveloped or agricultural land; outward development at the city edge, in contrast to a process of densification within the city’s existing boundaries; emphasis on separation of major land uses (residential, commercial, industrial) and on single-use

development (in contrast to mixed-use development); and disconnected residential development where new subdivisions are not contiguous with each other or with the rest of the city (Alberta Health Services).

**Urban heat island effect:** Describes built up areas that are hotter than nearby rural areas. The annual mean air temperature of a city with 1 million people or more can be 1–3°C warmer than its surroundings. In the evening, the difference can be as high as 12°C. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality (US Environmental Protection Agency).

**Vulnerable populations:** Vulnerable populations are those which have increased susceptibility to adverse health outcomes as a result of inequitable access to the resources needed to handle risks to health. Examples of vulnerable populations include: Aboriginal peoples, people living in poverty, immigrants and temporary workers, refugees, people with disabilities, and people who are gender and sexually diverse (Calgary Health Region).

**Walkability:** The extent to which the built environment supports and encourages walking by providing for pedestrian comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in journeys throughout the network (Journal of Aging and Physical Activity).