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



Healthy Built Environment

## PROMOTING  EQUITY • ACCESS • DESIGN FOR ALL AGES

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## 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.

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# TABLE OF CONTENTS

The toolkit is organized into different "layers" as follows:

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# 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

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.

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## 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.

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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.

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## 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

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/

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.

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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

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.

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# 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.

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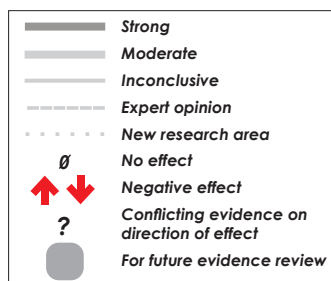Province-wide solutions.
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# APPROACH

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

| | |
|---|---|
| ▬▬▬ | *Strong* |
| ▬▬▬ | *Moderate* |
| ─── | *Inconclusive* |
| - - - | *Expert opinion* |
| · · · | *New research area* |
| Ø | *No effect* |
| ⬆ ⬇ | *Negative effect* |
| ? | *Conflicting evidence on direction of effect* |
| ⬤ | *For future evidence review* |

*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.

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# APPROACH

## Linkages Summary Legend

| | |
|---|---|
| ⬆⬇ | Positive effect |
| ⬆⬇ | Negative effect |
| 0 | 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.

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# 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.

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# 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[1]. 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.

----
[1]Contextual considerations identified in this user guide were informed by work conducted by Nicholas Smith in 2012 for Dr. Helena Swinkels, MHO, Fraser Health.

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# 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 Built Environment**

## 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.*

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# 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 eevidence.*

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# HEALTHY NEIGHBOURHOOD DESIGN
## FACT SHEET

## SUMMARY

Neighbourhoods are the places where we live, work and play. **How we design our neighbourhoods is vitally important to our health and well-being.** Land use decisions such as zoning, transportation systems and neighbourhood design significantly influence health. Consider, for instance, the distances people must travel to work, the convenience of buying healthy foods, or the safety of a park: these factors can promote good nutrition, physical activity and increase leisure time. The outcome can be better mental and physical health.

The "three Cs" of healthy neighbourhoods (complete, compact, and connected) have a variety of benefits. These neighbourhoods encourage "active transportation" (primarily walking, cycling and the use of public transit).

**Vision:**

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

## WHAT DO HEALTHY NEIGHBOURHOODS LOOK LIKE?

Planning Principle:

### 1. Enhance neighbourhood walkability
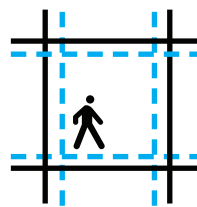
Walkable neighbourhoods are typically characterized by higher residential density, increased mixed land use, and high connectivity.

- A walkable built environment is supportive of physical activity, including walking and cycling for active transport or leisure.

- Research suggests a positive association between walkable land-use patterns and employment productivity.

- Grid-based neighbourhoods, rather than cul-de-sacs, can increase walking and cycling and reduce vehicle use.

- Walkable neighbourhoods positively influence the overall mobility and physical activity levels of older adults.

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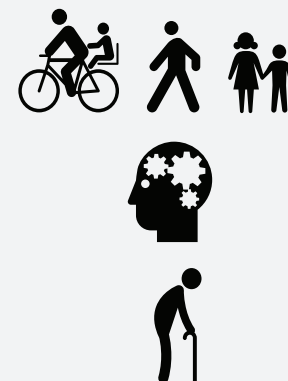
# HEALTHY NEIGHBOURHOOD DESIGN
## FACT SHEET

Planning Principle:
## 2. Create mixed land use

Create neighbourhoods with access to: schools, civic services, green space, retail, employment opportunities, and housing.

- Having access to a variety of amenities within close proximity of home makes active transportation or recreational physical activity more convenient. In general, increasing the mix of land use and proximity of amenities is important for encouraging physical activity.

- There are many gaps in the research pertaining to how aspects of the built environment impact vulnerable populations such as those with low incomes, mental illness or disabilities and those in urban vs. suburban and rural settings.

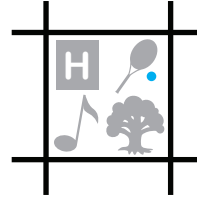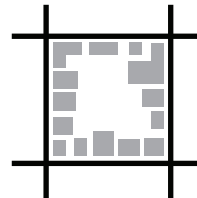- Research indicates that access to recreation facilities is important to help residents meet their physical activity needs. This is especially true for suburban residents who rely more on recreation for physical activity.

Planning Principle:
## 3. Build complete and compact neighbourhoods

Compact neighbourhoods have high residential and employment density.

- Increasing residential density may help to promote active school transport amongst school-aged youth.

- Numerous studies identify distance as a barrier to engaging in active transportation. Densification can increase proximity to work, school, and recreational opportunities, therefore increasing engagement in walking, cycling and physical activity.

- Density has been shown to promote healthy behaviour such as active transportation. However, decision-makers should also recognize that under certain circumstances compact growth has been associated with increased personal exposure to air pollutants. Strategies to mitigate this negative impact, such as building setbacks and lowering vehicle speed limits, should be considered.

- Densely developed neighbourhoods should be designed with spaces in mind that foster opportunities for social interaction, as high density neighbourhoods have been associated with social isolation and a decrease in mental health.

# HEALTHY NEIGHBOURHOOD DESIGN
## FACT SHEET

Planning Principle:

## 4. Enhance connectivity with efficient and safe networks
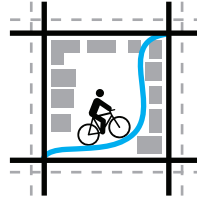
Develop a street network with high connectivity for walking, cycling, and use of public transit.

- Enhancing connectivity can encourage people to walk or cycle for recreational or transportation purposes. Connectivity has the potential to increase total physical activity levels.

- Enhancing street connectivity or intersection density provides active transportation users with more direct routes, thereby reducing travel time to a destination. Decision-makers should consider prioritizing connectivity to promote the utilization of active transportation.

- Studies suggest that creating a compact street grid will help to make a neighbourhood safer for drivers, pedestrians and cyclists. By prioritizing efficient travel for cyclists and pedestrians rather than drivers, the entire transportation system stands to benefit.

- There remain research gaps in whether improving connectivity at the level of the community, neighbourhood, or housing complex, or some combination of all of these levels, is most important for increasing levels of physical activity.

Planning Principle:

## 5. Prioritize new developments within or beside existing communities
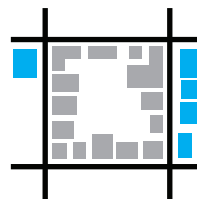
Utilize infill and brownfield reclamation to avoid sprawl.

- The amount of time people spend driving can be reduced when infill development occurs in areas close to transit infrastructure, employment, and other amenities.

- Infill development is one way to encourage densification. Using vacant or underutilized land in a neighbourhood can help prevent the negative effects of sprawl.

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# HEALTHY NEIGHBOURHOOD DESIGN
## FACT SHEET

## REFERENCES

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# HEALTHY TRANSPORTATION NETWORKS
## FACT SHEET

## SUMMARY

Transportation networks enable us to travel from place to place as we go about our daily lives. **How we design our transportation networks can have a significant impact on our health.** In the public realm, land use decisions influence the choices people make in how they move around. Consider, for instance, a person's decision on how to commute to work: the convenience of taking public transit, the safety of cycling and the distance and time it takes to walk. These factors all influence the preferred means of transport. Prioritizing "active transportation" (primarily walking, cycling and the use of public transit) and encouraging mobility of all people, can help achieve an increase in physical activity which can lead to better mental and physical health.

### 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.*

## WHAT DO HEALTHY TRANSPORTATION NETWORKS LOOK LIKE?

Planning Principle:

### 1. Enable mobility for all ages and abilities
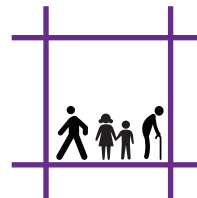
Promote safer streets and encourage physical activity.

- Improving streetscape aesthetics and making streets more usable by providing sidewalks, crosswalks, lighting and benches are all factors associated with an increase in physical activity among older adults.

- Research suggests that people belonging to ethnic minorities or those of low socioeconomic backgrounds are more likely to walk or cycle to school, making it especially important that these groups have good access to active transport infrastructure.

- Traffic calming methods such as narrow traffic lanes and residential traffic diversion can reduce traffic speed and volume, which reduces pedestrian and cyclist injury and encourages active transportation.

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# HEALTHY TRANSPORTATION NETWORKS
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Planning Principle:

## 2. Make active transportation convenient and safe
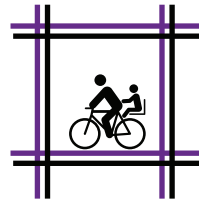
Encourage the decision to cycle, walk, or use transit through smart infrastructure and engineering choices.

- Separated bike lanes alongside major city routes, quiet residential bikeways, off-street bike paths and traffic signage have all been shown to be effective ways to encourage bike use.

- Providing easy access to trails and paths can encourage walking and cycling for active transport. Trails and paths should be located within residential areas to improve accessibility.

- Numerous studies have found that on-road marked bike lanes reduce rates of injury and collision while cycling.

Planning Principle:

## 3. Prioritize safety
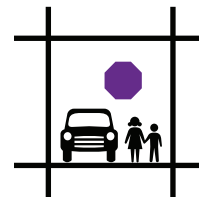
Establish a hierarchy of street users, giving priority to walking, cycling, and public transit, rather than private vehicles.

- Traffic calming features such as narrow lanes and street trees are associated with an increase in walking.

- Street safety improvements such as red-light cameras, left turn lanes and separated cycle routes have been shown to greatly decrease the occurrence of traffic collisions and injuries among all road users.

- Interventions to reduce neighbourhood crime rates could potentially improve physical activity levels, especially among older adults.

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Planning Principle:

## 4. Encourage use of public transit
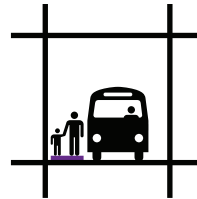
Enable the decision to use public transit by making it safe, convenient and accessible to everyone.

- Providing bike parking shelters and bike racks at bus stations has been shown to encourage the use of public transit.

- Convenient access to public transit can encourage equality by enhancing mobility among a wide range of vulnerable groups including children, older adults, women and people with disabilities.

- It is important to provide well maintained, safe access to transit stops. Achieving this can result in increased levels of physical activity since people often get to and from transit stops on foot or by bike.

- The relationship between use of public transit and effects of air pollution is an emerging area of study. While the use of transit helps lower overall ambient air pollution levels, it may be associated with higher personal exposure to air pollution.

Planning Principle:

## 5. Enable attractive road, rail, and waterway networks
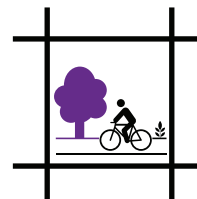
Encourage the use of active transport by enhancing the experience of cycling and walking.

- Studies linking aesthetic features to active transportation have mixed results. However, some evidence suggests that improving neighbourhood aesthetics, especially in parks, can promote physical activity, including walking, and cycling.

- There is some indication that signs of street decay, such as trash and vandalism can decrease levels of physical activity, especially among older adults.

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# 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.

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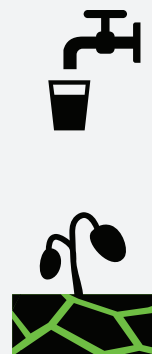
# HEALTHY NATURAL ENVIRONMENTS
## FACT SHEET

Planning Principle:

## 2. Maximize opportunities to access and engage with the natural environment
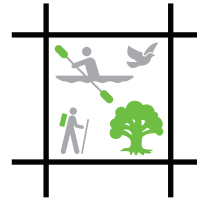
Enable natural environments to be experienced and accessed by all.

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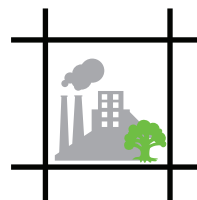
Careful community planning can limit production of, and exposure to air pollution.

- 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.

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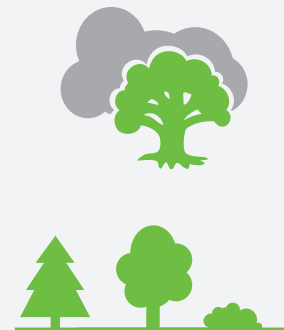
# HEALTHY NATURAL ENVIRONMENTS
## FACT SHEET

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.
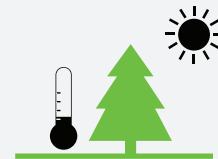
Planning Principle:

## 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.

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# HEALTHY FOOD SYSTEMS
## FACT SHEET

## SUMMARY

Food systems determine how we choose food and what food we have access to. **The food we eat is critical to our health.** Land use decisions can influence food production which can thereby impact the accessibility, quality and variety of food available to us. Consider for instance, where our food is produced, how our food products are manufactured, and the journey our food must make before arriving in our communities. When the food arrives in our community, is it equally available to everyone? What kinds of foods are available in different neighbourhoods? An initial step toward improving the health of our food systems should involve interventions that encourage the access to and availability of healthy food while educating people about healthy food systems.

**Vision:**

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

## WHAT DO HEALTHY FOOD SYSTEMS LOOK LIKE?

Planning Principle:

## 1. Enhance agricultural capacity

Provide space and opportunities to grow food in agricultural areas and in urban/semi-urban settings.

- Agricultural capacity is a key aspect of healthy food systems. Although not yet assessed through this evidence review, expert opinion indicates that agricultural land and workforce capacity are essential for a healthy food system, particularly at the regional or local level.

- Agricultural capacity relies on farms, farmers, and supportive infrastructure for agricultural services, as well as packing, processing, storage, and distribution capabilities.

- Research suggests that small-scale urban agriculture activities such as backyard or community gardens have the potential to build community and influence food knowledge and preferences, in addition to contributing to the local food supply.

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# HEALTHY FOOD SYSTEMS
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Planning Principle:

## 2. Increase access to healthy foods in all neighbourhoods
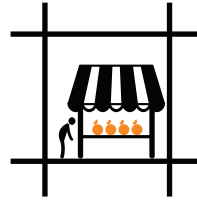
Increase access to healthy food retail and services within all neighbourhoods.

- An increase in healthy food is associated with an increase in the purchase and consumption of healthy foods such as fruit and vegetables.

- The availability of and accessibility to food retail outlets that sell a variety of fresh produce and whole foods at affordable prices (e.g., supermarkets) is linked to decreased obesity rates. Conversely, higher levels of obesity are linked to abundance of unhealthy food retail outlets that sell many processed and packaged foods (e.g., convenience stores).

- Increasing healthy food services, such as adding healthier food options in schools, is associated with healthier weights and increased fruit and vegetable consumption.

Planning Principle:

## 3. Improve community-scale food infrastructure and services
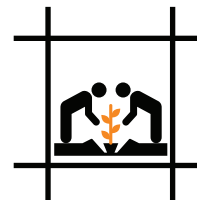
Strengthen community-scale food system supports, such as community kitchens and school gardens.

- Community kitchen participants enjoy food more and show improved budgeting, shopping, and cooking skills, as well as improved overall confidence.

- Community kitchen participants more readily engage with social services, demonstrate healthier behaviours, and show improved social and coping skills.

- Research suggests that school gardens foster an increase in food knowledge and encourage preferences for healthier foods.

# HEALTHY FOOD SYSTEMS
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# HEALTHY HOUSING
## FACT SHEET

### SUMMARY

We spend the majority of our time in our homes; we eat, sleep, socialize with friends and family, and often even work from home. While housing is considered a basic human right, not all housing is created to meet the same standards. Differences in housing, such as quality, accessibility, and affordability all have impacts on the health of the people who live there. These impacts can positively or negatively affect our health, both over the short and long-term. This is why **how we design our homes is critically important to our health and well-being**. Consider for instance, how living in a stable and affordable home that provides you with a warm, safe, and healthy environment can support your health. These factors all describe aspects of healthy housing which can promote good nutrition, healthy behaviours, and healthy relationships. Healthy housing can foster good mental and physical health, and improved quality of life.

**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.*

## WHAT DOES HEALTHY HOUSING LOOK LIKE?

Planning Principle:

**1. Increase access to affordable housing through provision of diverse housing forms and tenure types.**
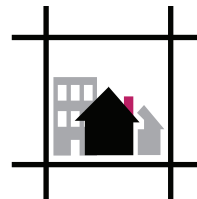


Provide subsidized and affordable housing programs, and mixed-income housing developments.

- Access to affordable housing decreases the frequency of moving between residences. Housing stability helps to reduce stress and allows people to take better care of themselves and their families.

- Living in affordable housing allows people to have more disposable income to buy necessities such as healthy food and medication, which in turn contributes to better health.

- Apartments in tall buildings are a type of affordable housing. Research suggests that social isolation, and the resulting negative health impacts, may be associated with living in this type of housing, particularily when living on a high floor. Therefore it is especially important to design spaces that foster social interaction as part of this housing type.

- Access to affordable housing helps to reduce overcrowding as people do not need to "double up" in order to afford housing.

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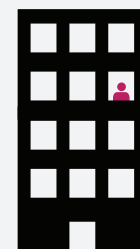
# HEALTHY HOUSING
## FACT SHEET

Planning Principle:

## 2. Ensure adequate housing quality for all segments of society
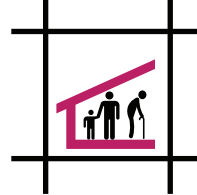
Ensure good quality housing structure, heating, insulation, and ventilation.

- Energy efficient housing helps people afford to live comfortably in their homes and avoid illnesses that are caused by cold and damp housing conditions. These conditions exist more commonly in countries with poor housing regulation and in cold climates.

- Adequate quality housing with suitable ventilation contributes to good indoor air quality by reducing the presence of allergens such as dust and mold, as well as harmful chemicals such as pesticides and volatile organic compounds like benzene and acetone. Good indoor air quality helps people to maintain good general and respiratory health, especially children with asthma.

- Living in adequate quality housing is strongly associated with an increased sense of safety, decreased crime, and improved social connections, when compared to living in poorer quality housing. These factors help people enjoy better health and improved quality of life.

- Poor quality housing is characterized by hazards that increase the risk of unintentional injuries such as burns and physical trauma. This can be prevented by ensuring that people live in good quality housing, which will largely benefit people of low socioeconomic status who generally live in poor quality housing.

- Research suggests that upgrading or retrofitting housing to make it accessible to people with physical disabilities allows these people to continue living independently in their homes. Most of the research reviewed focused on seniors with disabilities.
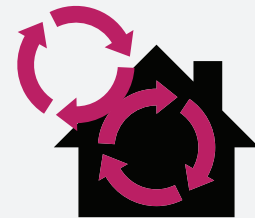
# HEALTHY HOUSING
## FACT SHEET



Planning Principle:

## 3. Prioritize housing for the homeless, elderly, low income groups and people with disabilities



Prioritize housing for vulnerable populations.

- Emerging research shows that access to adequate housing, specifically supportive housing, may improve health for people with mental illness. This is likely because supportive housing helps to increase social support networks.

- Medical priority rehousing is a promising intervention used internationally that is focused on rehousing people into good quality, subsidized housing according to medical need. This strategy helps people with physical and mental illness to access safe, affordable housing.

- Prioritizing access to permanent and safe housing for the homeless decreases their use of emergency services and helps to keep them safe from violence, injury, and communicable diseases.

- When the homeless are provided with housing, they are better able to access the healthcare services needed in order to take care of existing illness and diseases, and to stay healthy.





Planning Principle:

## 4. Site and zone housing developments to minimize exposure to environmental hazards



Conduct careful community planning to limit the production of, and exposure to air pollution, noise pollution, and other environmental hazards.

- Ensuring that housing developments are located a safe distance from busy roadways will likely decrease exposure to air pollution, which is linked to various respiratory and cardiovascular health problems.

- Research suggests that the location of housing relative to radon deposits impacts the level of indoor exposure to radon gas. Radon gas is a well known cause of lung cancer and other types of cancer.

- The proximity of housing to dense, busy areas such as roadways and industrial areas is related to noise levels heard inside the house. High levels of noise exposure can result in sleep disturbance, fatigue, and other mental and physical health problems.

# HEALTHY HOUSING
## FACT SHEET

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# HEALTHY NEIGHBOURHOOD DESIGN
## LINKAGES SUMMARY

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

## 1. Enhance neighbourhood walkability
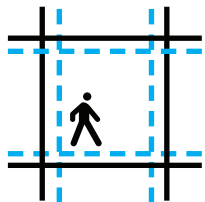
Walkable neighbourhoods are typically characterized by higher residential density, increased mixed land use, and high connectivity.

⬆ cycling
⬆ walking
⬆ physical activity

⬇ obesity
⬆⬇ employment productivity

## 2. Create mixed land use

Create neighbourhoods with access to: schools, civic services, green space, retail, employment opportunities, and housing.

⬆ walkability
⬆ use of recreational facilities
⬆ physical activity
⬆ walking
⬆ cycling
⬇ vehicle miles traveled

⬇ obesity/body mass index
⬆ mental health
⬆ social cohesion
❓ unintentional injury
⬆ quality of life
⬇ crime rates
⬇ premature mortality
⬇ chronic disease

## 3. Build complete and compact neighbourhoods
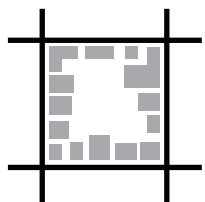
Compact neighbourhoods have high residential and employment density.

⬇ vehicle miles traveled
⬆ ambient air and water quality
⬆ transit use
⬇ heat island effect
❓ exposure to air pollution
⬆ physical activity
⬆ cycling and walking
⬆ density

⬇ unintentional injury
⬆ mental health (negative)
⬇ body mass index
⬇ obesity
⬇ premature mortality

## 4. Enhance connectivity with efficient and safe networks
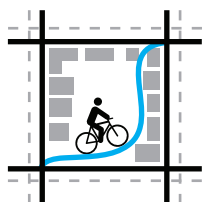
Develop a street network with high connectivity for walking, cycling, and use of public transit.

⬇ vehicle miles traveled
⬆ ambient air quality
⬆ traffic safety
⬆ cycling
⬆ walking
⬆ physical activity

⬇ obesity
⬆⬇ unintentional injury (negative)
⬇ premature mortality

## 5. Prioritize new developments within or beside existing communities
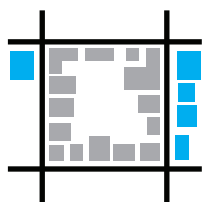
Utilize infill and brownfield reclamation to avoid sprawl.

⬇ vehicle miles traveled
⬆ use of recreational facilities
⬆ density
⬆ perceptions of safety
❓ walking
❓ physical activity

❓ body mass index
❓ crime rates

**Legend:**
⬆⬇ Positive effect
⬆⬇ Negative effect
⓿ No effect
❓ Conflicting evidence on direction of effect
⬆⬇❓ For future evidence review

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# HEALTHY TRANSPORTATION NETWORKS
## LINKAGES SUMMARY

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

## 1. Enable mobility for all ages and abilities
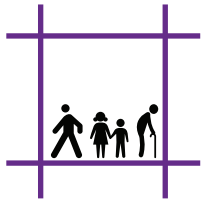
Improve the health of the whole community by promoting safer streets and encouraging physical activity.

- ⬆ physical activity
- ⬆ walking
- ⬆ perception of safety
- ⬆ transit use

→ ⬇ unintentional injury

## 2. Make active transportation convenient and safe
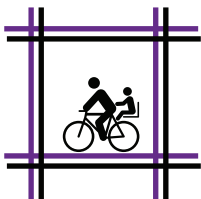
Encourage the decision to cycle, walk, or use transit, through smart infrastructure and engineering choices.

- ⬆ walkability
- ⬆ transit use
- ⬆ physical activity
- ⬆ walking
- ⬇ noise
- ⬆ safety
- ⬆ cycling

Health related outcomes:
- ⬇ obesity
- ⬆ mental health
- ⬇ unintentional injury
- ⬆ social connectivity
- ⬇ premature mortality
- ⬇ all-cause mortality

## 3. Prioritize safety
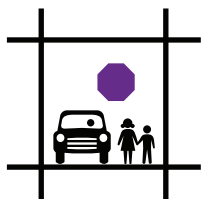
Establish a hierarchy of street users, giving priority to walking, cycling, and public transit, rather than private vehicles.

- ⬆ traffic safety
- ⬆ perceptions of safety
- ⬆ cycling
- ⬆ walking
- ⬆ physical activity
- ⬆ ambient air quality

Health related outcomes:
- ⬇ unintentional injury
- ⬆ quality of life
- ⬇ respiratory disease
- ⬆ mental health
- ⬆ social connectivity

## 4. Encourage use of public transit
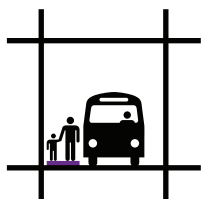
Enable the decision to use public transit by making it safe, convenient and accessible to all.

- ⬇ vehicle miles traveled
- ⬆ transit use
- ❓ exposure to air pollution
- ⬆ ambient air quality
- ⬇ noise levels
- ⬆ cycling
- ⬆ walking
- ⬆ physical activity

Health related outcomes:
- ⬇ obesity
- ⬇ unintentional injury
- ⬇ quality of life

## 5. Enable attractive road, rail, and waterway networks
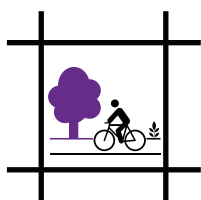
Encourage the use of active transport by enhancing the experience of cycling and walking.

- ❓ cycling
- ⬆ walking
- ⬆ physical activity

**Legend:**
- ⬆⬇ Positive effect
- ⬆⬇ Negative effect
- ⓿ No effect
- ❓ Conflicting evidence on direction of effect
- ⬆⬇❓ For future evidence review

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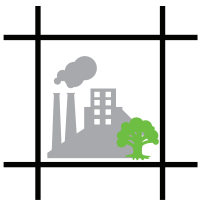
Careful community planning can limit production of, and exposure to, air pollution.

⬇ particulate matter
⬇ ground-level ozone
⬇ harmful emissions ($NO_x$ $SO_x$)

⬇ hospitalization for respiratory illness
⬇ cardiovascular mortality

## 4. Mitigate urban heat island effect
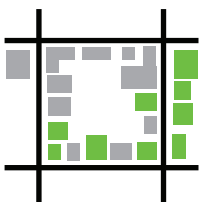
Expand the use of vegetation in the urban environment to mitigate the formation of heat islands.

⬇ ambient air temperature

⬇ heat related mortality and morbidity

## 5. Expand natural elements across the landscape
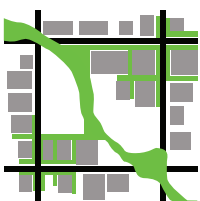
Increase vegetation across the built environment including in developments, neighbourhoods and transit hubs.

This planning principle was studied in the context of principles ❷ ❸ ❹

| | |
|---|---|
| ⬆ ⬇ | Positive effect |
| ⬆ ⬇ | Negative effect |
| ❶ | No effect |
| ❓ | Conflicting evidence on direction of effect |
| ⬆ ⬇ ❓ | For future evidence review |

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# HEALTHY FOOD SYSTEMS
## LINKAGES SUMMARY

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

## 1. Enhance agricultural capacity

Provide space and opportunities to grow food in agricultural areas and in urban/semi-urban settings.

- agricultural land
- agricultural workforce supports
- regional agriculture viability
- urban agriculture viability
- peri-urban agriculture viability
- packing & processing facilities
- storage & distribution facilities

## 2. Increase access to healthy foods in all neighbourhoods
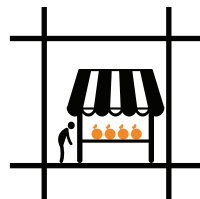
Increase access to healthy food retail and services within all neighbourhoods.

- healthy food retail
- healthy food services
- affordability of healthy food retail
- affordability of healthy food services
- food services options
- perception of healthy food environment

- diet quality
- diet related illness
- food skills
- obesity
- active transport

## 3. Improve community-scale food infrastructure and services
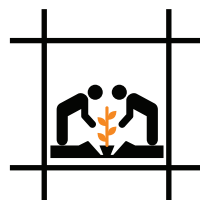
Strengthen community-scale food system supports, such as community kitchens and school gardens.

- community kitchens
- school gardens
- space to share food

- diet quality
- food skills
- food security
- enjoyment of food
- social skills
- social supports
- community empowerment
- coping skills
- healthy behaviours

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

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# HEALTHY HOUSING
## LINKAGES SUMMARY

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

## 1. Increase access to affordable housing through provision of diverse housing forms and tenure types

Provide subsidized and affordable housing programs, and mixed-income housing developments.

**Impact:**
- ⬆ home in multi-unit housing
- ⬆ home on high floor level
- ⬆ access to affordable housing
- ⬆ desegregate high poverty areas
- ⬆ choice of housing forms
- ⬆ residential stability
- ⬇ financial stress
- ⬇ over-crowding

**Health Related Outcome:**
- ⬇ social interaction
- ⬆ psychiatric distress
- ⬆ unintentional injury
- ⬆ general health
- ⬇ domestic abuse
- ⬇ violence
- ⬆ mental health
- ⬆ conflict
- ⬆ depression
- ⬆ food security
- ⬇ obesity
- ⬆ quality of life
- ⬇ injuries

## 2. Ensure adequate housing quality for all segments of society
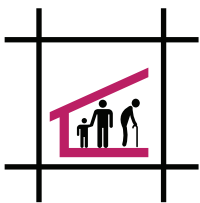
Ensure good quality housing structure, heating, insulation, and ventilation.

**Impact:**
- ⬆ energy efficiency
- ⬆ thermal quality
- ⬆ access to good quality housing
- ⬆ independent living
- ⬇ pests
- ⬇ exposure to allergens and chemicals
- ⬆ physical hazards
- ⬆ sense of safety
- ⬆ social connections
- ⬇ crime
- ⬆ indoor air quality

**Health Related Outcome:**
- ⬆ respiratory health
- ⬇ winter mortality
- ⬆ psychological health
- ⬇ unintentional injury
- ⬆ neurodevelopment
- ⬆ general health
- ⬇ mortality
- ⬆ quality of life

## 3. Prioritize housing for the homeless, elderly, low income groups, and people with disabilities

Prioritize housing for vulnerable populations.

**Impact:**
- ⬆ housing quality
- ⬆ access to adequate housing
- ⬆ social support network
- ⬆ access to permanent housing
- ⬆ healthcare use
- ⬆ access to housing for people with mental illness

**Health Related Outcome:**
- ⬆ general health
- ⬆ quality of life
- ⬆ mental health
- ⬇ injuries
- ⬇ risk behaviour
- ⬇ hospitalization

## 4. Site and zone housing developments to minimize exposure to environmental hazards
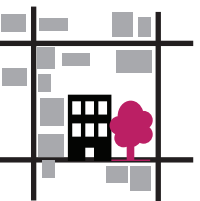
Conduct careful community planning to limit the production of, and exposure to air pollution, noise pollution, and other environmental hazards.

**Impact:**
- ⬇ air pollution exposure
- ⬇ radon exposure
- ⬇ chemical exposure
- ⬇ noise exposure
- ⬆ exposure to natural elements

**Health Related Outcome:**
- ⬆ respiratory health
- ⬆ reproductive health
- ⬆ children's health
- ⬆ physical health
- ⬆ birth outcomes
- ⬆ general health
- ⬇ cancer
- ⬇ depression
- ⬇ stress
- ⬆ mental health

**Legend:**
- ⬆ ⬇ Positive effect
- ⬆ ⬇ Negative effect
- Ø No effect
- ? Conflicting evidence on direction of effect
- ⬆ ⬇ ? For future evidence review

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# HEALTHY NEIGHBOURHOOD DESIGN
## EVIDENCE DIAGRAM

**Planning Principle**

**Impact**

**Health Related Outcome**



Legend:
- Strong
- Moderate
- Inconclusive
- Expert opinion
- New research area
- Ø No effect
- Negative effect
- ? Conflicting evidence on direction of effect
- For future evidence

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

Impacts: Cycling, Walking, Physical activity, Walkability, Use of recreational facilities, Vehicle miles traveled, Density, Exposure to air pollution?, Transit use, Heat island effect, Water quality, Ambient air quality, Ambient air quality, Traffic safety, Perceptions of safety

Health Related Outcomes: Productivity, Obesity, Body mass index, Social cohesion, Mental health, Unintentional Injury?, Quality of Life, Premature Mortality, Crime Rates, Chronic Disease, Unintentional Injury, Premature Mortality, Crime Rates?

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# HEALTHY TRANSPORTATION SYSTEMS
## EVIDENCE DIAGRAM



**Planning Principle**

**Impact**

**Health Related Outcome**

**Legend:**
- Strong
- Moderate
- Inconclusive
- Expert opinion
- New research area
- Ø No effect
- Negative effect
- ? Conflicting evidence on direction of effect
- For future evidence

**1.** Enable mobility for all ages and abilities

**2.** Make active transportation convenient and safe

**3.** Prioritize traffic related safety / Prioritize perceptions of safety / Prioritize crime related safety

**4.** Encourage use of public transit

**5.** Build attractive road, rail, and waterway networks

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# HEALTHY NATURAL ENVIRONMENTS
## EVIDENCE DIAGRAM



**Planning Principle**

**Impact**

**Health Related Outcome**

Legend:
- Strong
- Moderate
- Inconclusive
- Expert opinion
- New research area
- Ø No effect
- Negative effect
- ? Conflicting evidence on direction of effect
- For future evidence

1. Preserve and connect open space and environmentally sensitive areas

- Soil nutrient concentration
- Biodiversity
- Water quality
- Crop pollination
- Ecosystem functioning

Ecosystem services required to sustain life

- Vitamin D related → Cancer, Autoimmune disease
- Cognitive functioning, Attention deficit disorder
- Cognitive health → Attention restoration
- Anxiety
- Stress
- Attention restoration
- Psychological health → Mental health
- Physical activity
- Mood/depression regulation, Stress
- Lyme disease ?, Allergy ?, Insect attacks ?
- Spiritual inspiration
- Physiological health → Obesity, Mortality
- Social interaction → Chronic disease
- Healing, Stress
- Biodiversity
- Social well-being → Crime & violence
- Social cohesion
- Spiritual well-being → Spiritual inspiration

1. Preserve and connect open space and environmentally sensitive areas
2. Maximize opportunities to access and engage with the natural environment
5. Expand natural elements across the landscape

5. Expand natural elements across the landscape
3. Reduce urban air pollution

- Particulate matter
- Ground-level ozone
- Harmful emissions ($NO_x$ $SO_x$)

Hospitalization for respiratory illness → Cardiovascular mortality

5. Expand natural elements across the landscape
4. Mitigate urban heat island effect

- Ambient air temperature

*Inferred from Scientific Consensus*

Heat related mortality and morbidity

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# HEALTHY FOOD SYSTEMS
## EVIDENCE DIAGRAM

**Planning Principle**

**Impact**

**Health Related Outcome**

### Legend

- **Strong**
- **Moderate**
- **Inconclusive**
- **Expert opinion**
- **New research area**
- Ø **No effect**
- ↑↓ **Negative effect**
- ? **Conflicting evidence on direction of effect**
- **For future evidence**

### 1. Enhance agricultural capacity

- Agricultural workforce supports ↑
- Agricultural land ↑
- Regional agriculture viability ↑
- Urban agriculture viability ↑
- Peri-urban agriculture viability ↑
- Storage & distribution facilities ↑
- Packing & processing facilities ↑

### 2. Increase access to healthy foods in all neighbourhoods

- Healthy food retail ↑
  - Diet quality ↑
  - Obesity ↓ — Food skills ↑
  - Active Transport ? — Diet related illness ?
- Affordability of healthy food retail ↑
  - Diet quality ?
  - Obesity ↓
- Perception of healthy food environment ↑
  - Obesity ? — Diet quality ↑
  - Diet quality ↑ — Diet related illness ↓
- Food services options ↑
  - Obesity Ø
- Affordability of healthy food services ↑
  - Diet quality ↑
- Healthy food services ↑
  - Diet quality ↑
  - Obesity ↓

### 3. Improve community-scale food infrastructure and services

- School gardens ↑
  - Diet quality ↑ — Food skills ↑
- Space to share food ↑
- Community kitchens ↑
  - Diet quality ↑ — Enjoyment of food ↑ — Food skills ↑
  - Food security Ø
  - Social skills ↑ — Social supports ↑ — Community empowerment ↑
  - Healthy behaviours ↑ — Coping skills ↑

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# HEALTHY HOUSING
## EVIDENCE DIAGRAM

**Planning Principle**  **Impact**  **Health Related Outcome**

**Legend:**
- Strong
- Moderate
- Inconclusive
- Expert opinion
- New research area
- Ø No effect
- ↑↓ Negative effect
- ? Conflicting evidence on direction of effect
- For future evidence

**1. Increase access to affordable housing through provision of diverse housing forms and tenure types**

Impacts: Home in multi-unit housing · Home on high floor level · Choice of housing forms · Access to affordable housing · Overcrowding · Desegregate high poverty areas · Residential stability · Financial stress

Outcomes:
- Mental health · Conflict · Social interaction
- Psychiatric distress · Depression · Unintentional injury
- General health · Food security · Mental health · Obesity
- General health · Food security · Mental health · Violence
- General health · Food security · Mental health · Domestic abuse · Quality of life
- General health · Mental health · Injuries

**2. Ensure adequate housing quality for all segments of society**

Impacts: Energy efficiency · Thermal Quality · Indoor air quality · Access to good quality housing · Pests · Independent living · Exposure to allergens · Harmful chemical exposure · Physical hazards · Harmful chemical exposure · Sense of safety · Social connections · Crime

Outcomes:
- Winter Mortality
- General health · Respiratory health
- General health · Respiratory health
- Respiratory health
- General health · Unintentional injury · Mortality
- General health · Neuro-development
- General health · Unintentional injury · Psychological health · Mortality · Quality of life
- Respiratory health

**3. Prioritize housing for the homeless, elderly, low income groups, and people with disabilities**

Impacts: Housing quality · Access to adequate housing · Access to housing for people with mental illness · Access to permanent housing · Social Support Network · Healthcare use

Outcomes:
- General health · Mental health
- General health · Mental health · Quality of life
- General health · Injuries · Hospitalization
- General health · Risk behaviours

**4. Site and zone housing developments to minimize exposure to environmental hazards**

Impacts: Air pollution exposure · Radon exposure · Chemical exposure · Noise exposure · Exposure to natural elements

Outcomes:
- General health · Respiratory health
- Cancer
- Reproductive health · Birth outcomes · Children's health
- Mental health · Physical health
- Stress · Depression

# 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 ($kg/m^2$) (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).

**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).

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**Morbidity:** The incidence of illness in a population (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). 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).