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Vancouver CoastalHealth
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{URBAN AND SUBURBAN EDITION}

Cool Neighbourhoods Are Healthy Neighbourhoods:

How local government actions on climate change help to create healthier communities

NEIGHBOURHOODS ARE GETTING HOTTER

"Greenhouse gases refer to gases in the atmosphere that absorb heat radiated from earth. Together, greenhouse gases act like a blanket reducing heat loss, similar to the way the glass of a greenhouse warms the air inside the greenhouse. This greenhouse effect is a natural phenomenon that creates warmer conditions on Earth and makes life, as we know it, possible.

However, concentrations of greenhouse gases in the atmosphere have grown significantly since pre-industrial times, largely because of the burning of fossil fuels and permanent forest loss. The rise in greenhouse gas concentrations is amplifying the natural greenhouse effect and warming the planet, affecting wind patterns, precipitation, and storm events."[1]

—Government of Canada

The purpose of this briefing paper is to help ignite further collaboration between local government and health sectors around the development and adoption of mutual strategies for health and environmental benefits. The paper is intended to support the work of local and regional policy planners, energy planners, and public health practitioners. It will also support those involved in land use and transportation planning and health promotion, including local elected officials and community members or groups interested in connecting the dots between climate protection and health. The strategies and supporting research herein are particularly relevant to urban and suburban communities.

The paper provides a brief overview of the health impacts of climate change and outlines the health co-benefits of prevailing GHG emission reduction strategies. These strategies are:

1. Include GHG emission reduction targets and strategies in key community plans and policies (e.g. Official Community Plan, Regional Growth Strategy, etc.)
2. Encourage active and sustainable transportation and reduce vehicle travel
3. Create efficient communities by containing development within contiguous areas designated for growth, and build complete neighbourhoods in a compact area
4. Promote energy efficient buildings
5. Promote renewable energy sources and low-carbon electricity generation
6. Protect and maximize ecosystem functions

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The Opportunity

In BC, regional and local governments as well as public agencies such as health authorities are charged with balancing priorities and finding solutions for a multitude of complex issues. Collectively, the mandates of these agencies include: housing affordability, equity, air quality, climate change, environmental protection, population health, harmonizing budgets, meeting high standards for service provision, and improving quality of life—all with limited resources.

THREATENING NEWS

"Unless greenhouse gas emissions worldwide are sharply curtailed… the human toll of climate change is likely to become dramatically worse over the next several decades and beyond." [2]

—Maibach et al.

Health concerns include declining air quality, rising temperatures, increased frequency of extreme weather events, and higher incidences of food- and water-borne pathogens and allergens.[3] Climate change is a particular threat to groups that are vulnerable: the poor, the very young, the elderly, those already in poor health, the disabled, individuals living alone, and those with inadequate housing or lacking basic services.

FAVOURABLE NEWS

BC local governments are leading the way for action on climate change by including greenhouse gas reduction (GHG) targets and strategies in Official Community Plans. Many local governments are also undertaking specific community energy and emission plans, climate action plans, and energy-related policies, regulatory changes, and other initiatives to reach challenging GHG reduction targets over the long term.

Many strategies and actions that local governments undertake to achieve climate change mitigation and adaptation objectives have the added benefit of promoting health, thereby providing an efficient way to address multiple issues. Local governments can choose to invite health authorities to support their work to address climate change and promote sustainability. In doing so, local governments can more easily and systematically connect the dots between climate change objectives and health co-benefits. This connection will help demonstrate to residents their local government's leadership in addressing multiple public interests with greater efficiency.

Where Are the Synergies? Linking health benefits with community greenhouse gas reduction

This briefing paper explores some of the public health co-benefits and other health considerations of six greenhouse gas reduction strategies that are typically undertaken at a community or regional level. These strategies were selected from a general review of common elements found in community plans in BC and from provincial legislation for local GHG reduction. This paper suggests that community planners working in local governments will find it useful to link their climate action work with health paybacks, thereby accelerating the creation of sustainable and healthy communities for all.

"If properly chosen, action to combat climate change can, of itself, lead to improvements in health. The news is not all bad." [4]

—Geoff Watts

Individuals have minimal control over many of the influential factors that shape their living conditions. Most of these factors, known as the social and economic determinants of health, come from outside of the health care system (e.g. distribution of income and wealth, ability to access services, education, food and housing).[5] As a result of these socio-economic determinants of health, people with lower incomes are statistically less healthy.[6] In addressing health at the local level, socio-economic factors must be considered as part of the health puzzle. The implementation of GHG reduction strategies must be careful to not make daily living more challenging for those who may struggle with lower income levels or other social challenges.

	GHG Reduction Strategies	Public Health Co-Benefits
1	Include GHG emission reduction targets and strategies in key community plans and policies (e.g. Official Community Plan, Regional Growth Strategy, etc.)	Encourages healthy levels of physical activity, thus reducing risk of chronic disease Improves mental health Reduces health inequities, increasing quality of life and health especially for vulnerable populations who often experience lower health standards Reduces exposure to environmental hazards Reduces risk of injury
2	Encourage active and sustainable transportation and reduce vehicle travel	
3	Create efficient communities by containing development within contiguous areas designated for growth, and build complete neighbourhoods in a compact area	
4	Promote energy-efficient buildings	
5	Promote renewable energy sources and low-carbon electricity generation	
6	Protect and maximize ecosystem functions	

Table 1. List of six greenhouse gas reduction strategies. The list of strategies in this paper are not intended to be a comprehensive list or a catch-all for all GHG reduction strategies; rather, a sample list.

Strategy 1:

Include GHG emission reduction targets and strategies in key community plans and policies (e.g. Official Community Plan, Regional Growth Strategy, etc.)

Local government decisions influence almost half of BC's greenhouse gas emissions.[8] Many local decisions, plans and investments include targets for compact growth, green community design, and sustainable transportation—with an eye to also meeting social, economic and other goals. The inclusion of GHG targets and strategies in long-term land use plans sets a direction and obligation to create regulations and actions to achieve these targets. Local climate action strategies are often complementary to and helpful for achieving public health targets. The communities created from community plans and policies that include local climate strategies help to achieve better health and decrease our carbon footprint simultaneously.

"Architects and urban designers should look for points of overlap and symbiosis among active, sustainable, and universal design strategies, to maximize the performance of their designs." [7]

—New York City Active Design Guidelines

COMMUNITY EXAMPLE

Figure 1 shows how the City of Vancouver's environmental objectives (in its Climate Action Plan) and the BC Healthy Living Alliance's health promotion objectives (in its provincial Physical Activity Strategy) happen to have aligned strategies: both call for improvements in active transportation infrastructure as a way of achieving their desired outcomes.

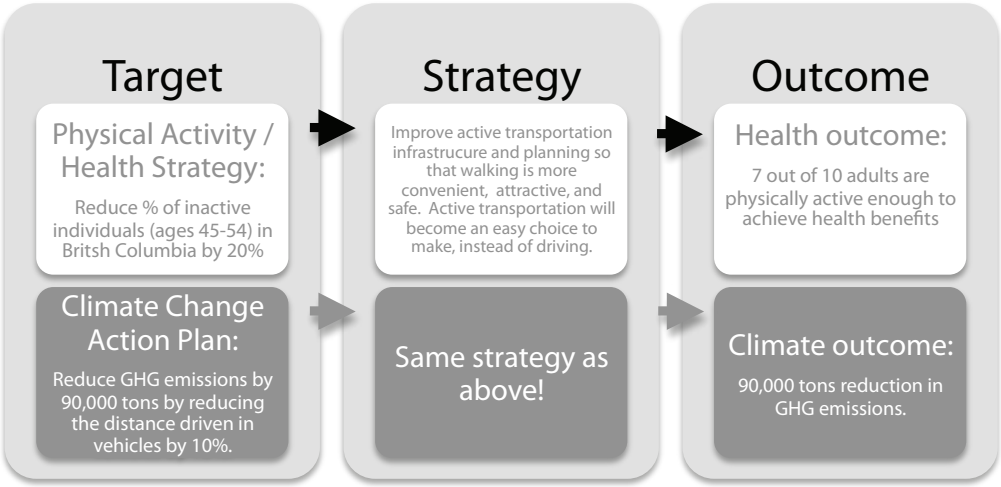

Figure 1: Summary of Targets, Strategies and desired outcomes of BC Healthy Living Alliance Physical Activity Strategy (2007)[9] and City of Vancouver Climate Action Plan (2005).[10]

This pre-existing alignment presents an opportunity to coordinate and directly link climate and public health strategies to achieve broader buy-in, integrated investment in strategies, linked data sets and monitoring, and greater impact through successfully combined outcomes. Local governments can use this example to consider how planning documents can be used to explicitly align local climate protection targets and strategies with health protection targets and strategies.

REGIONAL EXAMPLE

Metro Vancouver's Regional Growth Strategy (2011)[11] is a recently adopted regional government plan that aims to combine sustainability, climate, and health objectives. This plan commits the Metro Vancouver regional government to collaborate with health authorities to advance measures to promote healthy living through land use policies. The Regional Growth Strategy also includes performance measures for healthy and complete communities that have access to a range of services and amenities, as shown in Figure 2. This integration of health and sustainability actions and objectives resulted from proactive work by Metro Vancouver with input from Vancouver Coastal Health and Fraser Health authorities.

Develop healthy and complete communities with access to a range of services and amenities

1	Number of residents living within walking distance of a dedicated park or trail.
2	Hectares of dedicated park per 1,000 people living within the Urban Containment Boundary.
3	Number and percent of residents living within walking distance of a public community / recreation facility / centre.
4	Number and percent of residents living within walking distance of a grocery store.

Figure 2: Strategy 4.2 from Metro Vancouver's Regional Growth Strategy showing performance measures related to complementary objectives for a compact region and healthy communities.

Strategy 2:

Encourage active and sustainable transportation and reduce vehicle travel—with neighbourhood design, transportation systems and infrastructure

Shifting from private motorized transport to walking, cycling and public transit is associated with reduced cardiovascular and respiratory disease from air pollution, less traffic injury, and less noise-related stress. In addition, significant health benefits are expected from increased physical activity, which can prevent some cancers, Type 2 diabetes, heart disease, and obesity-related risks.[13]

GHG emissions can be reduced by replacing vehicle trips with walking, cycling and transit trips, and also by improving the efficiency and fuel of vehicles. From a health perspective, shifting to active transportation more quickly produces greater health co-benefits than improving fuel and vehicle efficiencies.[14]

People are likely to become physically active and remain active when it fits into their daily schedule and transportation needs (commuting, buying groceries, etc.), when they feel competent at doing the activity, and when they enjoy the activity. It has been found that utilitarian physical activities like walking and cycling are some of the best ways for people to get exercise on a regular basis who may lack time, energy, skills, money, or motivation.[15]

"Transportation systems and neighborhood design together determine the out of pocket cost, convenience, and comfort of different travel options. The travel choices we make on a daily basis—whether we get around via active or sedentary, polluting or non-polluting modes of travel—are a product of these investment and development decisions." [12]

—The American Public Health Association

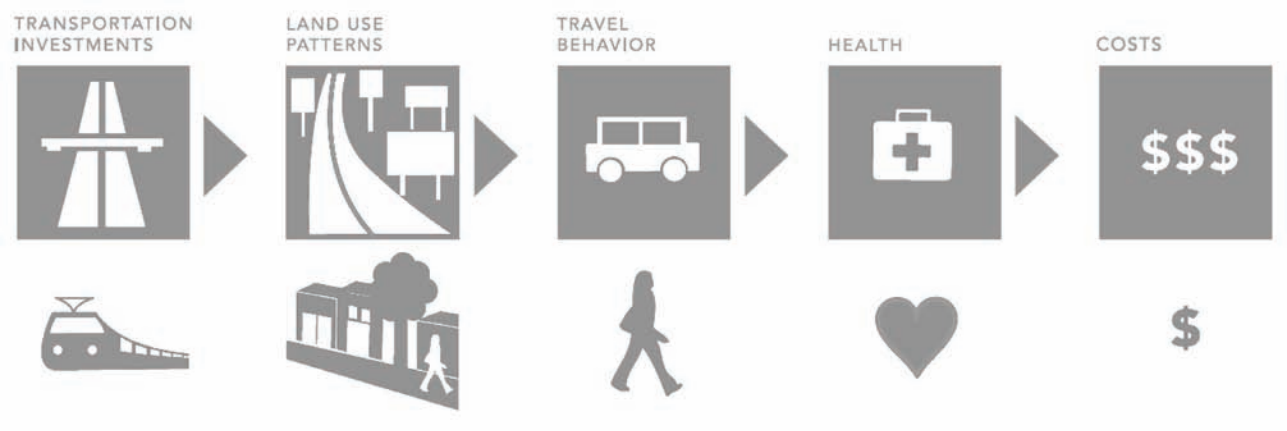

Figure 3: Linkages between transportation, travel behaviour, health and cost. Adapted from: American Public Health Association.[16]

ACTIVE TRANSPORTATION AND HEALTH

- People with lower incomes are much less likely to own a car than people with higher incomes.[17] Improved active transportation networks and transit service are an advantage in terms of improving everyone's mobility and access to community facilities, jobs, parks and more, and as a result improve community-wide health.[18]
- Research shows that children are more likely to walk to school and nearby recreation opportunities like parks when safe infrastructure exists, which increases their independence and their physical activity.[19]
- Residents of more walkable communities typically walk 2-4 times more and drive 5-15% less than if they lived in more automobile-dependent communities.[20] Creating and improving places to be active can result in a 25% increase in the percentage of people who exercise.[21]
- Mixed land uses and accompanying active transportation infrastructure reduce per capita vehicle use, and increase walking by 5-15%.[22]

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ACTIVE TRANSPORTATION AND SAFETY

- Traffic calming and reduced speed zones (e.g. 30 km/hr) increase safety for walking and cycling and can result in fewer injuries. Though walking and cycling (instead of driving) may not necessarily reduce injuries, it is still likely to improve overall health even when injury rates are taken into account.[23]
- People who are older and those who have lower mobility are less likely to choose to walk if infrastructure is unsafe. Good sidewalks, lighting, crossings, and routes make them more physically active and healthy.[24] If a neighbourhood is designed to meet the needs of the elderly and those with disabilities it will work for the entire population.[25]

A COMPLETE AND COMPACT COMMUNITY MAKES ACTIVE TRANSPORTATION CHOICES EASY

- Transit accessibility, residential density, and street connectivity are all features of a walkable neighbourhood. These factors are significantly associated with residents reducing energy expended (gasoline) on motorized transport and increasing energy expended (calories) on walking, because more trips are by active modes of transportation (walking, cycling) than non-active modes of transportation (vehicle).[26]
- On average, adults in the most walkable neighbourhoods of Metro Vancouver drive approximately 58% less than those in least walkable neighbourhoods, with the average reported daily travel distance for home-based trips around 7 km per day, controlling for socio-economic and demographic factors.[27]
- In a Vancouver study, living in a neighbourhood with at least one grocery store was associ¬ated with a nearly 1.5 times likeli¬hood of getting sufficient physical activity, as compared to living in an area with no grocery store.[28]
- In smaller communities the range of transportation options may be more limited. However, building sidewalks has been shown as an effective way to increase the number of people that are active in the community.[29]

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STRATEGY 3:

Create efficient communities by containing development within contiguous areas designated for growth, and make complete neighbourhoods in a compact area

Fewer GHG emissions from transportation is not the only benefit of an efficiently planned, compact community. Public and population health objectives are also more easily met in communities with compact and contained community growth, as shown in the facts below: public transit and active transportation are more feasible, land can be allocated for local food production, and multiple land uses and types of housing meet diverse needs.

TRANSPORTATION AND HEALTH-RELATED BENEFITS OF CONTAINED AND COMPACT NEIGHBOURHOODS

- Land use and design elements found in compact and walkable neighbourhoods are strongly linked to higher levels of physical activity. These elements include: residential and employment density, diversity of land uses, well-connected roads, bike paths, sidewalks,[30] and transit accessibility.[31] In contrast, residents of neighbourhoods with a lower degree of mixed use (typically lower-density areas) are more likely to be overweight or obese.[32] A typical Caucasian male living in a compact, mixed-use community (containing homes, jobs, green space, etc.) weighs about 4.5 kilograms (10 pounds) less than a similar man in a subdivision containing only homes.[33]

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- In a recent study of multiple metropolitan areas, it was found that communities with strong urban containment policies were associated with residents spending more time and traveling greater distances via walking and bicycling for both leisure and commuting. Places with weaker urban containment policies showed inconsistent relationships with physical activity.[34]
- Traffic deaths per capita are about four times higher for residents in low-density suburbs than for residents in higher density neighborhoods.[35]

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EQUITY AND SOCIAL WELL-BEING

- In communities that are not compactly developed, active transport and transit are less feasible choices. People with lower incomes bear a disproportionately high burden for vehicle transportation costs: they spend up to 40% of household income on transportation.[36]
- A community's social capital has been found to be higher in neigbourhoods that accommodate a mix of housing types and uses.[37] In neighbourhoods that are not compact, people tend to drive to get places because transit is not available. As a consequence, social capital is less in these neighbourhoods. Every 10 minutes of commuting by driving (the most common mode of transport in non-compact areas) decreases by 10 percent the time dedicated to family and community.[38]
- A mix of housing options in a neighbourhood is particularly important for aging adults. Many lower density areas do not have the health, long-term care, recreational and social service facilities that aging adults need to be healthy.[39]
- Low-density development patterns result in twice as many extreme heat events as compact areas and the burden of this climate change impact and health risk is most likely to affect vulnerable population groups.[40]

FOOD

Being able to grow food close to home is increasingly important for community economic resilience, as well as for resident health and household affordability.

- In compact communities, designated agricultural land is not threatened by other competing uses.[41] The cost of growing and buying food is increasing over time; this is a trend partly related to changes in weather patterns from climate change. Transporting food is increasingly expensive and linked with rising fuel costs.[42] Transporting food over smaller distances reduces transportation-related GHGs.
- A community's capacity to grow healthy food locally makes food more affordable and available to the community into the future. Policies to include small-scale agriculture (community gardens) as part of a complete and resilient community is also thought to have a positive long-term health outcome.[43]

CADE MARTIN

CAUTION:

Mitigating air pollution hazards from transportation emissions

Overall, GHG mitigation strategies aimed at buildings and transportation offer significant benefits to air quality and public health. In a study of four international cities with a combined population of 45 million people, GHG mitigation strategies implemented between 2001 and 2012 were predicted to reduce particulate matter and ozone ambient concentrations by about 10%, thereby preventing 64,000 premature deaths, 65,000 chronic bronchitis cases, and 37 million person-days of restricted activity or work loss.[44]

Greenhouse gas reduction and public health strategies are positively linked with complete and compact communities; however, the health considerations related to air quality require attention and recommendations for practice. Further work is needed to study and design mitigation measures to improve air quality close to high traffic and transit corridors.[45] Some studies have found increased exposure to air pollutants in these settings, while other studies have found the reverse.[46]

In the Metro Vancouver region, studies have identified that many vulnerable populations live in the least walkable areas of the region, and in some of these areas the air pollution is worse than average. Particular attention and planning is required to alleviate this health equity concern.[47] Metro Vancouver is in the process of creating guidelines on the location of land uses adjacent to emission sources.

A recent report for the BC Lung Association estimated that a 10% reduction in airborne fine particulate matter (PM 2.5) and ozone emissions in the area of Vancouver would produce $195 million (CAN) in health benefits (from decreases in mortality, emergency room visits, and in occurrences of asthma, bronchitis and cardiac incidents) in 2010.[48]

ECOSALON

STRATEGY 4:

Promote energy efficient buildings

For several hundred years, building and development standards have emerged to meet public health and safety needs.[49] For example, in the 1800s water sanitation requirements were introduced to reduce water-borne infectious diseases; in the early 1900s building regulations were adopted to allow light and air into taller buildings; and in more recent decades, air pollution controls, abatement of dangerous materials such as asbestos and lead, and laws mandating the installation of child window guards were implemented with the purpose of improving safety and population health.[50] A current focus on improving energy efficiency in building design also has important impacts on public health, as shown in the examples below.

INSULATION

- A New Zealand study calculated a 2:1 benefit to cost ratio for installing more insulation in buildings due to reduced health costs from illness and improved health equity. With increased insulation, adequate ventilation must also be included to avoid transmission of airborne infections (e.g. tuberculosis) and accumulation of indoor air pollutants[51] such as polycyclic aromatic hydrocarbons, formaldehyde, and radon.

VENTILATION

- High-performance natural ventilation in buildings can reduce respiratory illness by 9-20%, increase individual productivity up to 11%, reduce “sick building syndrome,” and achieve 25-50% reduction in energy use.[52]
- Natural ventilation in buildings can reduce dependence on air conditioning in hot weather. Air conditioning results in excessive noise, heat, energy consumption and GHG emissions. In the long term, buildings designed with natural ventilation will be a particular health benefit to lower-income people and disadvantaged groups who cannot afford the increasing energy costs to run air conditioning and who are more statistically likely to have existing health conditions that make them particularly vulnerable to extreme heat.[53]

SOLAR ACCESS

- Building design that maximizes solar access not only reduces space heating requirements, but the increased access to natural light is associated with reduced incidence of depression.[54]

SUPPORT FOR SUSTAINABLE AND ACTIVE TRANSPORTATION

- Secure and convenient bicycle racks and showers in residential, commercial and institutional buildings encourage people to ride regularly.[55] These design features and facilities in new and retrofit developments are an important contribution to the enabling of residents and visitors to choose active transportation.

STRATEGY 5:

Promote renewable energy sources and low-carbon electricity generation

There are important public health considerations, and possible benefits, that can result from shifting to energy sources with lower GHG emissions. Some are listed below.

SHIFTING ENERGY SOURCES

- The size of the benefit from shifting to low-carbon, renewable energy sources will depend on what energy source is currently being used to generate electricity. In British Columbia, hydroelectric power is prevalent and is a relatively low-carbon source.[56] Where electricity is generated by burning fuels, shifting to lower-carbon renewable energy sources (e.g. wind, solar, hydraulic, geothermal, and may significantly reduce deaths associated with air pollution exposures (<PM2.5).[57]
- Using renewable, low-carbon sources to meet the energy requirements of buildings offers the long-term benefit of lowering energy costs for building occupants. This offers a particular benefit to lower-income individuals who spend a relatively large proportion of their limited income on energy costs in homes.[58]
- Electric and hybrid vehicles are a promising transportation option due to their use of low-carbon energy that produces less emissions and air pollution than vehicles fueled by burning gasoline.

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CAUTION:

Climate-friendly fuels may have health drawbacks

There may be negative health consequences related to using some low-carbon fuels. Here are a few considerations:

DIESEL:

Newer and more efficient diesel vehicles result in lower exposure to particulates (PM10, PM2.5), but this benefit would be reduced in the case of a significant shift to diesel-fueled vehicles which would elevate PM levels overall (e.g. Europe in the last decade).

BIOFUEL:

The impacts on air quality remain unclear, and may pose risks of food insecurity and malnutrition for the poor if land availability for food production is affected.

COMPRESSED NATURAL GAS (CNG):

Initial evidence shows that CNG fuel can achieve a reduction in GHG emissions comparable to diesel but with far lower PM emissions. The potential of CNG as a win-win for health and mitigation should be examined.[59]

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STRATEGY 6:

Leverage ecosystem benefits for climate change mitigation and adaptation

Up to this point, this fact sheet has focused on climate change mitigation through GHG emissions reduction. On a parallel track, local governments are developing strategies to respond and adapt to current and impending impacts of climate change. Examples of local adaptation strategies include: water management features such as green roofs, and infrastructure and permeable paving; heat management strategies including shade structures, urban forestry, and reflective surfaces; and health promotion or health protection programs to address extreme heat, extreme cold, and insect-borne diseases that will continue to be exacerbated by climate change.[60]

Strategies to maintain and protect ecosystem elements for increased stormwater management capacity, aquifer protection, and water quality are often included as climate change adaptation strategies. We are dependent on clean water and the natural environment as basic building blocks for human health. We also derive environmental health benefits that may not be as readily apparent, for example:

GREEN SPACE

- Access to nature has a significant human health benefit by reducing stress and anxiety and improving mental health. Less access to nature is linked to exacerbated attention deficit or hyperactivity disorder symptoms, as well as sadness and higher rates of clinical depression. People with less access to nature are more prone to stress and anxiety.[61]
- Every 10% increase in green space can be associated with a reduction in health complaints equivalent to an increase of five years of life expectancy.[62] For children in particular, the greener their play environment the less severe their attention deficit symptoms are.[63]
- Increasing the deciduous tree canopy in urban areas not only decreases the heat island effect and keeps people more comfortable in hot weather, but it is also reported in some studies to result in a net improvement to air quality. Trees help to slow chemical reactions that form pollutants, and tree-shaded buildings are cooler.[64] However, a further consideration is potential increased allergies to pollen.

Conclusion

Local government action on climate change can be expected to yield health benefits, now and into the future. There are ready opportunities for local and regional governments and health sectors to collaborate more closely in order to achieve the greatest benefit with mutually dependent health and climate change objectives.

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ADDITIONAL RESOURCES

National Collaborating Centre for Environmental Health:
http://ncceh.ca/en/additional_resources/climate_change

Healthy Built Environment inventory of resources:
http://ncceh.ca/en/major_projects/built_environment