

Public Health Benefits of Green Development Standards

PREPARED FOR:
MISSISSAUGA PLANNING &
DEVELOPMENT COMMITTEE
APRIL 8, 2024



Disclosures: None

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Introduction to CAPE (Cdn Assn of Physicians for the Environment)

- ▶ The **Canadian Association of Physicians for the Environment** (CAPE) is a physician-directed non-profit organization, working at the **unique intersection of health and environment** to enable health for all through environmental protection. CAPE engages with governments and policy work, campaigns, education, media, and research





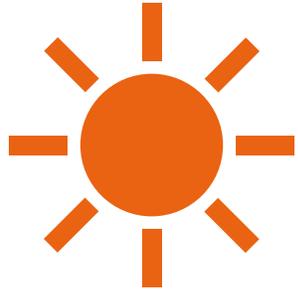
Implementing strong mandatory GDS is critical to maintaining public health

- ▶ Driven by escalating global GHG emissions, 2023 was the hottest year in recorded human history
- ▶ In Mississauga, the built infrastructure is the single greatest source of GHG emissions (52%)
- ▶ Strong Green Development Standards (GDS) are essential to meeting our climate targets with mandatory tiered targets including all new buildings to be net zero emissions by 2030 – “optional” is no longer an option

What's at stake if we don't get GDS right?



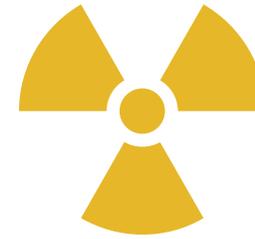
There are 2 primary environmental pathways to human health harms associated with our built infrastructure that must be controlled through GDS:



Carbon Pollution



GHGs/Planetary heating
Climate Change



Air Pollution



Particulate matter (PMs)
Toxic gases – especially NOx

Escalating GHG's fuel Climate Change

- ▶ ***“Climate change is the biggest threat to health in the 21st century and our very survival is at stake”***
- ▶ - Dr Vanessa Kerry, 2023
- ▶ WHO Director-General Special Envoy for Climate Change & Health

IMPACTS ON AVAILABILITY OF TRADITIONAL FOODS² AND MENTAL HEALTH³ IN THE NORTH

Due to arctic warming (3x Global Rate)⁴.

CLIMATE CHANGE ITS IMPACT ON HEALTH IN CANADA

Climate change is the biggest global health threat of the 21st century.

— Lancet¹



ASSOCIATION MÉDICALE CANADIENNE  CANADIAN MEDICAL ASSOCIATION

1-Costello, The Lancet, 2009; 2-Rosol R, IJCH, 2016; 3-Cunsolo A, Ellis N, Nature CC 2018; 4-Canada's Changing Climate 2019; 5-Yao J et al, 2016; 6-Hampshire, G, CBC 2016; 7-Kirchmeier-Young M 2017; 8-BC Int Health 2017; 9-Kirchmeier-Young M et al, Am Geo Un, 2018; 10-Alberta Health, 2016; 11-Teufel B et al 2017; 12-CBC Alberta Flood 2013; 13-United Nurses of Alberta 2013; 14-Yusa A, et al, Int J Env Res P H, 2015; 15- Smoyer-Tomic KE, et al. Ecohealth 2004; 16- Agriculture and Agri-Food Canada, 2015; 17-Cryderman K, 2018; 18- Ziska LH, The Lancet PH 2019; 19- Nelder MP, 2018; 20-Howard, C et al. The Lancet Countdown Policy Brief for Canada 2018; 21-Montreal PH, 2019; 22- Vogel MM et al, Am Geo Union, 2019; 23-Fenech, A, 2014; 24-Kelley, C, et al, 2015



The 2021 BC heat dome was the single deadliest weather event in Canadian history with over 600 deaths

An aerial photograph showing the aftermath of a disaster in a rural area. A dirt road winds through the center, flanked by green grass and large piles of brown debris, including wood and metal. In the upper center, a green-roofed building is partially destroyed. In the lower center, a dark-roofed house is heavily damaged, with its roof partially missing. To the right, a paved road with yellow double lines runs diagonally, with a red car parked on the shoulder. The overall scene depicts significant destruction to housing and infrastructure.

The climate crisis is harming housing and food security, which are both social determinants of health.

Climate change is escalating infectious diseases

- Climate change may **aggravate nearly 60% of all human pathogenic diseases**
- Risks of **Lyme, West Nile, pandemics** such as COVID, & more, have already increased [Source: Health Canada]
- Ontario may be at risk for **malaria, yellow fever, Zika** & more in near future [Source: Cdn Public Health Assn]
- Climate change is **increasing antibiotic resistance**

Climate change impacts mental health – disproportionately among youth

Canadian study post Fort McMurray fires:

- Depression, addictions, suicide

Global Study of 10,000 Youth:

- Climate anxiety affects daily life & functioning ~45%
- Hesitant to have children ~40%
- **Governments betray current & future generations ~60%**

Total premature deaths globally due to air pollution:
6.7 million / year

Ref: WHO 2022

15 300 premature Canadian deaths annually

(impact \$114 billion nationally)

6600 premature Ontarian deaths annually

(impact \$49 billion provincially)

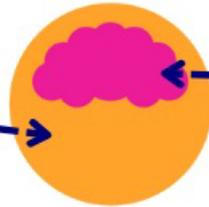
Ref: Govt of Canada 2022 (2016 stats)

Escalating Air Pollution is Toxic & Deadly

The health harms of air pollution



Skin ageing



Stroke

Brain development

Mental health

Dementia



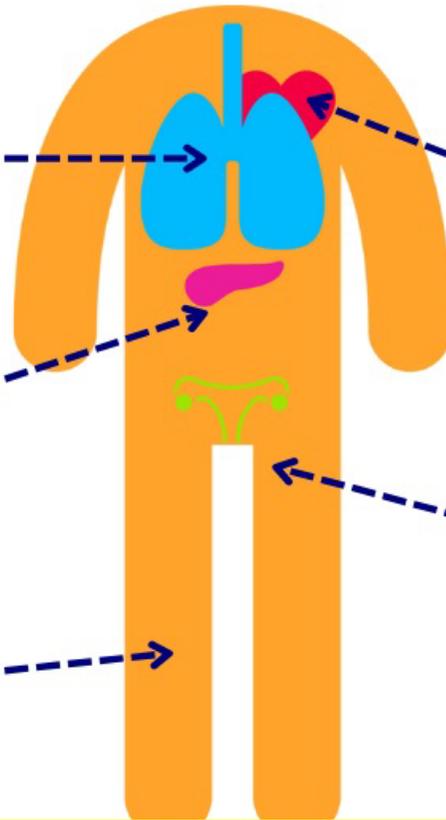
Lung diseases

Asthma

Lung cancer

Lung development

Pneumonia



Heart disease

High blood pressure



Insulin resistance
and diabetes

Premature birth

Low birthweight

Decreased sperm quality

Illness during pregnancy



Blood clots

PM 2.5's and Nox gases enter our blood streams via the lungs and cause disease in multiple body systems.

Air Pollution Causes Multiple Types of Cancer

- ▶ Lung
- ▶ Leukemia
- ▶ Breast
- ▶ Other



Air Pollution Risks to Pregnant Women & Infants

- ▶ Low birth weight
- ▶ Premature births
- ▶ Still births
- ▶ Birth defects



Air Pollution impacts Mental Health Independently of Climate Change

- ▶ Anxiety
- ▶ Depression
- ▶ Stress
- ▶ Suicide

Review > [Environ Sci Pollut Res Int.](#) 2021 Feb;28(8):9029-9049.

doi: 10.1007/s11356-021-12357-3. Epub 2021 Jan 22.

Association between particulate matter air pollution and risk of depression and suicide: a systematic review and meta-analysis

Qisijing Liu ^{# 1}, Wanzhou Wang ^{# 1}, Xuelin Gu ^{# 1}, Furong Deng ¹, Xueqin Wang ²,

▶ Recent research shows air pollution is increasing antibiotic resistance

- ▶ every 10% rise in PM 2.5 increases antibiotic resistance by 1.1% → By 2050 could lead to 840,000 premature deaths annually unless air pollution is curbed



Health Impacts of indoor gas use

- ▶ In-home gas appliances contribute to both indoor & outdoor air pollution and to climate change, leading to illness and deaths
- ▶ Gas stoves significantly increase childhood asthma risks by 42%, equivalent to secondhand smoke
- ▶ Gas stoves release several harmful chemicals like carbon monoxide, nitrogen dioxide (NO₂), formaldehyde & benzene, some even while stoves are switched off. These are linked to serious health issues including multiple lung diseases and cancer
- ▶ Gas furnaces release pollutants into our yards
- ▶ Buildings contribute nearly 19% of all NO₂ found in air pollution, arising mainly from methane (“natural”) gas usage



How is GDS
essential for
public health?

DRAFT - CITY OF MISSISSAUGA UPDATED GREEN DEVELOPMENT STANDARDS

| | TIER 1 MANDATORY REQUIREMENTS (2024-2027) | TIER 2 VOLUNTARY REQUIREMENTS (2027-2029) | TIER 3 VOLUNTARY REQUIREMENTS (2030) |
|---|--|---|---|
| THEME 1: ENERGY AND BUILDING PERFORMANCE | | | |
| EB1: Energy Performance | Meet the following energy performance targets: GHGI: 15 CO ₂ e/m ² /yr TEUI: 130 kWh/m ² TEDl: 60 kWh/m ² | Meet the following energy performance targets: GHGI: 10 CO ₂ e/m ² /yr TEUI: 100 kWh/m ² TEDl: 50 kWh/m ² | Meet the following energy performance targets: GHGI: 0 CO ₂ e/m ² /yr TEUI: 70 kWh/m ² TEDl: 37 kWh/m ² |
| THEME 2: CLIMATE IMPACTS | | | |
| CI1: Embodied Carbon | Conduct a whole building life cycle assessment (LCA) of the building's structure and envelope. | Conduct a whole building life cycle assessment (LCA) of the building's structure and envelope that demonstrates an emissions intensity of equal to or less than 370 kg CO ₂ /m ² , and identify reductions and material switching from high carbon materials like concrete. | Conduct a whole building life cycle assessment (LCA) of the building's structure and envelope that demonstrates an emissions intensity of equal to or less than 275 kg CO ₂ /m ² , and identify reductions and material switching from high carbon materials like concrete. |

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Both improved building/energy performance & reduced embodied carbon in an updated GDS will significantly reduce GHGs & improve air quality → both are critical to avoid escalating health harms due to planetary heating and toxic air pollution

Mississauga City Performance Tool (CyPT): Top Performing Technologies

High-Performing Technologies

The top-performing technologies in terms of GHG reduction are predominantly the result of electricity and heating technologies, with air-source electric heat pumps providing the most significant reduction of over 2 million tons of CO₂ savings. Electric heat pumps also appear in the top five technologies that would improve air quality in the city, followed by 100% transition to electric cars. Various building technologies would be the most significant in creating jobs, with building automation responsible for over 34,000 new FTEs.

GHG Reduction

REDUCTION IN ANNUAL CO₂eq EMISSIONS FROM 2050 BAP (TONS)

0 metric tons 2.2M

Electric Heat Pump



Electric Cars



Utility Scale & Rooftop PV



Combined Heat & Power



Non-Res. Building Automation



Air Quality Improvement

REDUCTION IN ANNUAL NO_x EMISSIONS FROM 2050 BAP (kg)

0 kg 1.7M

Electric Cars



Electric Heat Pump



Electric Buses



Utility Scale & Rooftop PV



Electrification of BRT Lines



Job Creation

DIRECT, INDIRECT, AND INDUCED FTEs BETWEEN TODAY AND 2050

0 Full-Time Equivalents 34k

Non-Res. Building Automation



Non Res. Room Automation



Non-Res. Building Envelope



Rooftop PV



Non-Res. Building Remote Monitoring



Cost Efficiency

kgCO₂eq SAVINGS / CapEx + OpEx

0 10.36

Electric Taxis



Congestion Charging



Intelligent Traffic Light Management



Network Optimization



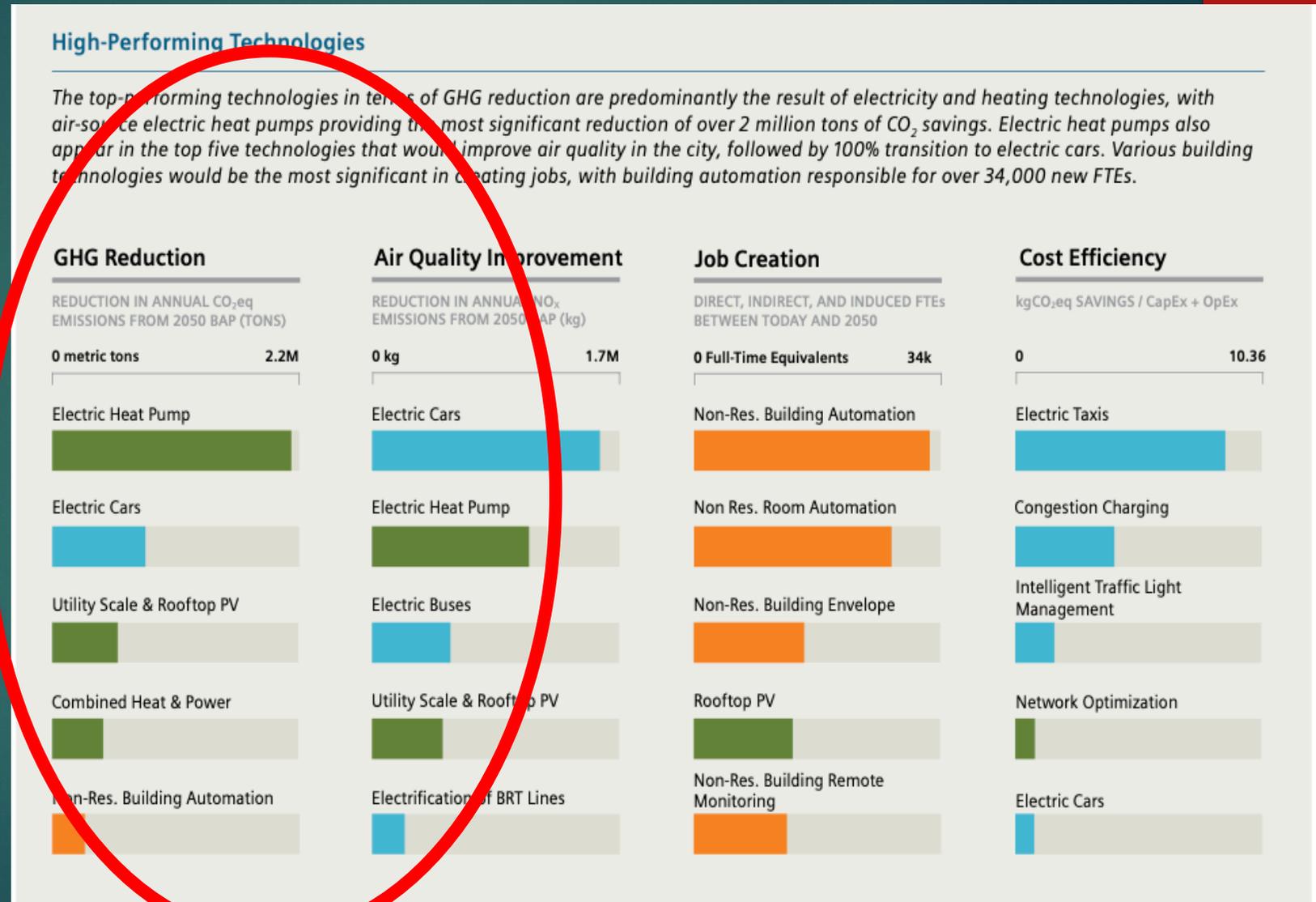
Electric Cars



Mississauga City Performance Tool (CyPT): Top Performing Technologies

CyPT Findings Showed:

- ALL of the top 5 technologies to reduce **GHGs** relate to GDS
- 3 of the top 5 technologies to improve **air quality** relate to GDS
- Heat pumps & EVs together provide both the largest GHG reductions & largest air quality improvements



DRAFT - CITY OF MISSISSAUGA UPDATED GREEN DEVELOPMENT STANDARDS

Additional Benefits

| | | | |
|---|--|--|--|
| <p>EV charging</p> <p>CI2: Electric Vehicle (EV) Charging Infrastructure</p> | <p>10% of all parking spaces will be equipped with an energized Level 2 charging or higher outlet installed adjacent to the space for the purpose of EV charging.</p> <p>Provide signage indicating that spaces with chargers are for customer and/or employee use rather than fleet vehicles.</p> | <p>20% of all parking spaces will be equipped with an energized outlet installed adjacent to the space for the purpose of EV charging.</p> <p>Or</p> <p>Achieve the following requirements:</p> <ul style="list-style-type: none"> • minimum 5% of parking spaces are equipped with an energized outlet installed adjacent to the space for the purpose of EV charging, • 5% of spaces (minimum one space) must be equipped with EV charging stations capable of Level 2 charging or higher, and • 5% of spaces (minimum one space) must be equipped with EV charging stations capable of Level 3 charging. Provide signage indicating that spaces with chargers are for customer and/or employee use rather than fleet vehicles. | <p>30% of all parking spaces will be equipped with an energized outlet installed adjacent to the space for the purpose of EV charging.</p> <p>Or</p> <p>Achieve the following requirements:</p> <ul style="list-style-type: none"> • minimum 15% of parking spaces are equipped with an energized outlet installed adjacent to the space for the purpose of EV charging, • 10% of spaces (minimum one space) must be equipped with EV charging stations capable of Level 2 charging or higher, and • 5% of spaces (minimum one space) must be equipped with EV charging stations capable of Level 3 charging. Provide signage indicating that spaces with chargers are for customer and/or employee use rather than fleet vehicles. |
| <p>Bicycle Parking</p> <p>CI4: Bicycle Parking and Amenities</p> | | <p>Meet the following bike parking, and bike amenities requirements:</p> <ol style="list-style-type: none"> 1. Class A (long-term bicycle parking) location: provide long-term bicycle parking in a secure controlled-access facility, or a purpose-built bicycle parking locker. 2. Class B (short-term bicycle parking) location: provide weather protected short-term bicycle parking in publicly accessible location at-grade or on the first parking level of the building below grade. 3. Bike repair station: provide at least 1 bike repair station in a publicly accessible location at-grade or on the first parking level of the building below grade. | <p>Achieve Tier 2 Requirements</p> |

- TRAP (traffic related air pollution) is a health equity issue: lower socioeconomic & racialized Canadians have higher TRAP exposure

- higher TRAP levels occur within 500m of major roads
 → 33% of Canadians live within 250m of major roads

- an EV transition addresses health harm & inequity

- facilitating active transport such as cycling has multiple direct & indirect health benefits

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| THEME 5: NATURAL SYSTEMS | | | |
|----------------------------------|--|---|---|
| NS1: Heat Island Effect | Use a combination of the following strategies to treat at least 75% of site's (non-roof) hardscape: <ul style="list-style-type: none"> • High-albedo paving materials • Open grid pavement and/or permeable surfaces • Shade from existing or new tree canopy | Use a combination of the following strategies to treat at least 90% of site's non-roof hardscape: <ul style="list-style-type: none"> • High-albedo paving materials • Open grid pavement and/or permeable surfaces • Shade from existing or new tree canopy | Achieve Tier 2 Requirements |
| NS2: Tree Growth | Plant 'shade trees' 6-8 m (20- 27 ft.) apart along the street frontages, and should be drought-tolerant and non-invasive. Provide adequate rooting space to support tree health and growth, through the minimum soil volume of 30m3 for each new tree. | Achieve Tier 1 Requirements | Achieve Tier 1 Requirements |
| NS3: Climate-Resilient Landscape | In all landscaped areas, including green roofs, plant a minimum of 50% native plants (including trees, shrubs, and herbaceous plants), including: <ul style="list-style-type: none"> • A minimum of 2 native flowering species to provide continuous bloom throughout growing season to support pollinators • Preference for drought tolerant native species. For vegetated buffer areas, adjacent Significant Natural Features, plant 100% native plants. Provide a natural heritage restoration and/or enhancement plan with the proposed locations of natural heritage restoration, design specifications, and ecological function. | In all landscaped areas, including green roofs, plant a minimum of 75% native plants (including trees, shrubs, and herbaceous plants), including: <ul style="list-style-type: none"> • A minimum of 2 native flowering species to provide continuous bloom throughout growing season to support pollinators • Preference for drought tolerant native species. For vegetated buffer areas, adjacent to Significant Natural Features, plant 100% native plants. Provide a natural heritage restoration and/or enhancement plan with the proposed locations of natural heritage restoration, design specifications, and ecological function. | In all landscaped areas, including green roofs, plant a minimum of 90% native plants (including trees, shrubs, and herbaceous plants), including: <ul style="list-style-type: none"> • A minimum of 2 native flowering species to provide continuous bloom throughout growing season to support pollinators • Preference for drought tolerant native species. For vegetated buffer areas, Significant Natural Features, plant 100% native plants. Provide a natural heritage restoration and/or enhancement plan with the proposed locations of natural heritage restoration, design specifications, and ecological function. |
| NS4: Sustainable Roofs | Buildings with an available roof area larger than 500m2 must include one or a combination of green roof, cool roof, and blue roof, or solar PV: <ul style="list-style-type: none"> • Green roof and/or blue roof for at least 50% of Available Roof Space; • Cool roof installed for 100% of Available Roof Space • Use a combination of a green, blue, cool roof or solar PV for at least 75% of Available Roof Space | Buildings with an available roof area larger than 500m2 must include one or a combination of green roof, cool roof, and blue roof, or solar PV: <ul style="list-style-type: none"> • Green roof and/or blue roof for at least 50% of Available Roof Space; • Cool roof installed for 100% of Available Roof Space • Use a combination of a green, blue, cool roof or solar PV for at least 75% of Available Roof Space | Buildings with an available roof area larger than 500m2 must include one or a combination of green roof, cool roof, and blue roof, or solar PV: <ul style="list-style-type: none"> • Green roof and/or blue roof for at least 50% of Available Roof Space; • Cool roof installed for 100% of Available Roof Space • Use a combination of a green, blue, cool roof or solar PV for at least 75% of Available Roof Space |

Natural Systems

| THEME 5: NATURAL SYSTEMS | | | |
|---|--|---|---|
| Heat Islands NS1: Heat Island Effect | Use a combination of the following strategies to treat at least 75% of site's (non-roof) hardscape: <ul style="list-style-type: none"> • High-albedo paving materials • Open grid pavement and/or permeable surfaces • Shade from existing or new tree canopy | Use a combination of the following strategies to treat at least 90% of site's non-roof hardscape: <ul style="list-style-type: none"> • High-albedo paving materials • Open grid pavement and/or permeable surfaces • Shade from existing or new tree canopy | Achieve Tier 2 Requirements |
| | Trees NS2: Trees | Plant 'shade trees' 6-8 m (20- 27 ft.) apart along the street frontages, and should be drought-tolerant and non-invasive. Provide adequate rooting space to support tree health and growth, through the minimum soil volume of 30m ³ for each new tree. | Achieve Tier 1 Requirements |
| Land-scaping NS3: Climate-Resilient Landscape | In all landscaped areas, including green roofs, plant a minimum of 50% native plants (including trees, shrubs, and herbaceous plants), including: <ul style="list-style-type: none"> • A minimum of 2 native flowering species to provide continuous bloom throughout growing season to support pollinators • Preference for drought tolerant native species. For vegetated buffer areas, adjacent Significant Natural Features, plant 100% native plants. Provide a natural heritage restoration and/or enhancement plan with the proposed locations of natural heritage restoration, design specifications, and ecological function. | In all landscaped areas, including green roofs, plant a minimum of 75% native plants (including trees, shrubs, and herbaceous plants), including: <ul style="list-style-type: none"> • A minimum of 2 native flowering species to provide continuous bloom throughout growing season to support pollinators • Preference for drought tolerant native species. For vegetated buffer areas, adjacent to Significant Natural Features, plant 100% native plants. Provide a natural heritage restoration and/or enhancement plan with the proposed locations of natural heritage restoration, design specifications, and ecological function. | In all landscaped areas, including green roofs, plant a minimum of 90% native plants (including trees, shrubs, and herbaceous plants), including: <ul style="list-style-type: none"> • A minimum of 2 native flowering species to provide continuous bloom throughout growing season to support pollinators • Preference for drought tolerant native species. For vegetated buffer areas, Significant Natural Features, plant 100% native plants. Provide a natural heritage restoration and/or enhancement plan with the proposed locations of natural heritage restoration, design specifications, and ecological function. |
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- Heat islands amplify heat related health harms & are a recognized health equity issue being more prevalent in lower socioeconomic communities
- Nature and/or common greenspaces have many proven health benefits

Health Benefits of GDS Natural Systems

- ▶ Improved mental health, happiness and creativity
- ▶ Improved memory, test scores in students including in ADHD, graduation rates and intent for college/university in students
- ▶ Larger brain size in schoolchildren
- ▶ Improved high blood pressure, heart disease and diabetes
- ▶ Decreased stress & stress hormone levels
- ▶ Improved longevity in seniors near walkable greenspaces
- ▶ Reduced social isolation & improved social cohesion





“We are running out of time...We are the last generation that has the opportunity to make the changes needed to avoid catastrophic climate change. Climate change must be treated like the public health emergency that it is.”

- Cdn Public Health Assn.

The ways in which we live, move and play today are critical to our sustainability. A strong updated GDS is a powerful move in the right direction towards a healthy and thriving future for all...

Thank you