Development Permit Areas for Climate Action:

A Guide for Energy Conservation, Water Conservation and GHG Emissions Reduction

Ministry of Community, Sport and Cultural Development

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Table of Contents

Introduction

Local governments have had the authority to establish Development Permit Areas (DPA) for purposes such as protecting the natural environment, revitalizing commercial use areas and guiding the form and character of development since 1985.

In 2008, the provincial government amended the *Local Government Act* (LGA) to include three DPA purposes for climate action, establishing objectives to promote:

1. energy conservation;
2. water conservation; and,
3. reduction of greenhouse gas emissions.

The expanded development permit authority supports the provincial government's broader action on climate change, including the requirement for local governments to have greenhouse gas (GHG) reduction targets, policies and actions in Official Community Plans (OCP) and Regional Growth Strategies (RGS). This expanded authority can also be used by local governments to help meet their Climate Action Charter (CAC) commitments.

The purpose of this guide is to help local governments use their DPA authority to conserve energy, conserve water and/or reduce GHG emissions. The guide is intended primarily for local governments and their planning staff. The content of the guide may also benefit others involved in land-use planning and development, including developers, builders, architects, landscape architects and planning consultants.

The information contained in this guide is intended to help local governments make strategic choices about using DPAs effectively for action on climate change. The guide:

- describes the legislative authority for DPAs for climate action;
- identifies considerations for local governments that are undertaking a climate action DPA;
- presents examples of DPA strategies for energy conservation, water conservation and GHG reduction; and,
- highlights local government examples of climate action DPAs and related initiatives.

Keys for Success

The success of a DPA for climate action depends on the suitability of the DPA and DPA guidelines to local circumstances. Local governments will need to consider the local feasibility of implementing specific DPA requirements, including assessing factors such as costs, benefits, risks and/or unintended consequences associated with undertaking the DPA.

The success of a DPA also relies on the actions of the development and building industry that design, build, install, or manage the features required by local government DPA guidelines.

Stakeholders, including representatives from the development and building industry, can contribute to an understanding of the costs, benefits, risks and unintended consequences of DPA guidelines and the local feasibility of a DPA in a given community.

Stakeholders may also include experts such as representatives from warranty providers, insurance companies, financial institutions or utility companies, as well as community and neighbourhood groups, and members of the public. Meaningful consultation early in the DPA process can build stronger buy-in, contribute to the development of practical implementable guidelines, and improve the chances of a DPA being effectively implemented.

Local governments will need to consider how best to consult with the development and building industry, experts and other stakeholders to help acquire the knowledge needed to implement effective DPAs.

Legislative Authority for DPAs for Climate Action

Local governments can designate DPAs in their OCPs to achieve one or more purposes. Sections 919.1 and 920 of the LGA set out the authority for DPAs. Section 919.1 identifies ten DPA purposes, including the three purposes related to climate action: energy conservation; water conservation; and GHG emissions reduction.

An OCP or zoning bylaw must specify DPA guidelines that describe how the purposes and related objectives will be addressed in the designated area. A Development Permit (DP) is required to construct, add to or alter a building, or subdivide a parcel of land within a DPA. A local government may issue a DP that varies or supplements a zoning or subdivision bylaw. A local government may also delegate the issuance of a DP.

For DPA purposes related to climate action – energy conservation, water conservation and GHG emissions reduction – local governments can make requirements related to:

- landscaping (e.g. requiring drought tolerant plantings);
- siting of buildings and other structures (e.g. building orientation to capture solar energy);
- form and exterior design of buildings and other structures (e.g. provision of overhangs for shade);
- specific features in the development (e.g. naturalized ponds that capture and store rainwater runoff); and,
- machinery, equipment and systems external to buildings and other structures (e.g. rainwater collection systems, geothermal systems).

The expanded DPA authority in the LGA is intended to apply to elements that are exterior to buildings. Local governments can make requirements related to development-wide features external to buildings such as permeable surfaces, shared multi-purpose amenity spaces or ponds that capture and store rainwater. The energy conservation, water conservation and GHG emissions reduction provisions can be applied to single-family residential, multi-family residential, commercial and industrial developments.

Municipalities may wish to consider using their authority under the *Community Charter* to address building design matters that cannot be addressed using the DPA authority. Sections 8(3)(l), 9(1)(d) and 9(3) of the *Community Charter* provide municipalities with powers to adopt bylaws in relation to buildings and other structures. Such bylaws would be considered concurrent authorities and therefore subject to provincial involvement, which means that the bylaws must be:

- in accordance with a regulation established by the Minister responsible;
- in accordance with an agreement with the Minister responsible; or,
- approved by the Minster responsible.

The *Buildings and Other Structures Bylaws Regulation (B.C. Reg. 86/2004)* enables municipal councils to adopt a bylaw that establishes standards for the construction, alteration, repair or demolition of buildings or structures, as long as the standards are not additional to or different from those set by the B.C. Building Code.

Municipalities that are considering the adoption of building standards that exceed Building Code requirements are encouraged to contact the Building and Safety Standards Branch of the Ministry of Energy and Mines by e-mail at Building.Safety@gov.bc.ca.

The BC Building Code

Greening the BC Building Code is an ongoing initiative. The current focus is on reducing buildings' energy and water use. The initiatives complement climate action DPA strategies and include:

- code changes to improve the energy performance of housing to the equivalent of EnerGuide 80 in 2011;
- solar hot water ready homes (where practical) in 2011; and,
- code requirements to support the increased use of non-potable water for toilet flushing and sub-surface irrigation in 2011.

For more information, see: http://www.housing.gov.bc.ca/building

Implementing DPAs for Climate Action

The success of a DPA for climate action depends on the suitability of the DPA and DPA guidelines to local circumstances and on early, meaningful consultation with stakeholders, experts and community members. The following considerations are intended to help local governments assess the local feasibility and support the effective implementation of DPAs for climate action.

Favourable Local Context

A growing community, a strong development market and a positive working relationship between the local government and the development/building sector can help ensure the effective implementation of DPAs. The local context will influence the likelihood of success. Consider whether:

- the community is growing or anticipating growth;
- there is a good working relationship with the development/building sector;
- there is an opportunity to engage the development/building sector in discussion about cost-effective DPA guidelines;
- there is public support for designating DPAs for climate action; and,
- the climatic conditions, topography and/or site conditions are suited to the DPA and DPA guidelines under consideration.

Complementary Tools

Local governments can combine DPAs with complementary tools for greater impact on climate action. For example, consider combining a DPA for climate action with bylaws that increase density, especially near transit. Other tools that have the potential to increase the impact of a DPA for climate action include fast-tracked development approvals, reduced Development Cost Charges (DCCs), tax exemptions and reduced permit fees. Consider:

- whether a DPA can be aligned with complementary tools to increase impact on climate action;
- aligning the provisions in zoning bylaws to accommodate DPA guidelines, e.g. shading devices might be allowed to project into setbacks; and,
- which tool, or combination of tools, can deliver the desired reductions for less cost and with fewer resources.

Complementary Tools for Climate Action

- local service area bylaws used to create district energy service areas (City of North Vancouver);
- zoning bylaws with minimum standards for bicycle parking that are required for all developments (City of Victoria); and,
- rebates on building permit fees for new and renovated single family homes built to energy efficient standards. (District of Saanich).

Optimal Locations

Locating climate action DPAs in areas that align with the principles of complete, compact communities will enhance energy savings and GHG reductions. Consider locations that minimize sprawl and in turn:

- preserve significant environmental resources including trees and other plants that store carbon and reduce GHGs;
- protect forests that recharge and filter groundwater;
- promote shorter commutes between homes, workplaces, shopping and recreation;
- create options for walking, cycling and transit to reduce GHG-emitting trips;
- minimize road, sewer and water infrastructure investment in areas with low population densities; and,
- reduce housing costs and residential and commercial tax rates that stem from inefficient and costly servicing.

Compact developments that minimize infrastructure expansion can save energy and reduce GHG emissions. Consider re-developing the following types of sites before developing natural and un-serviced (greenfield) sites:

- previously developed sites (infill);
- former industrial areas (brownfield sites);
- aging strip mall areas (greyfield sites); and,
- sites serviced by existing public infrastructure (e.g. sites near transit corridors, water, sewer, roads, utilities and/or existing district energy systems).

A Guide to Green Choices

For more information about land use planning that supports climate action goals, see the Ministry of Community, Sport and Cultural Development's *A Guide to Green Choices*. The guide provides practical advice for communities of all types: large, small, rural, resort-based, urban, and suburban. It is available online at: http://www.cscd.gov.bc.ca/lgd/planning/greenchoices.htm

Consider the optimal scale for a DPA for climate action — is the subdivision or neighbourhood the best scale for achieving the climate action goals? Also, consider that local conditions – climate, topography and the built environment – will vary and should be taken into account when designating the location and size of a DPA.

For example, a climate action DPA for an urban infill site can save energy and reduce GHG emissions by minimizing sprawl and infrastructure expansion. However, that same urban infill site may offer fewer opportunities for passive solar gain because of taller buildings blocking sunlight to the site. Consider local conditions when designing DPA guidelines to ensure maximum effect.

Combining DPA Purposes

The LGA provides the authority for local governments to combine more than one purpose within a DPA.

Combining complementary purposes can achieve multiple objectives within one DPA. For example, requirements to protect the natural environment, its ecosystems and biological diversity complement those related to energy conservation, water conservation and GHG reduction. Encouraging the construction of green pathways for alternative modes of transportation to reduce GHG emissions and connecting linked open spaces that support habitat and wildlife conservation, in turn protects the natural environment, saves energy and reduces GHGs.

Combining an environmental protection DPA with a climate action DPA can achieve broader rainwater management goals. A water conservation DPA might include strategies that reduce the demand for potable water (for example, low water use landscaping), and support on-site rainwater infiltration and rainwater capture for re-use.

An environmental DPA could include rainwater management strategies that mimic and/or minimize change to natural hydrological conditions, contribute to a "lighter hydrological footprint" and ultimately conserve water resources. Combining environmental protection strategies such as minimizing site disturbance during construction with water conservation DPA strategies can improve rainwater conservation and achieve multiple objectives.

The Water Balance Model

The Water Balance model (http://www.waterbalance.ca) is one tool that can assist in designing developments that minimize change to natural hydrological conditions. The tool compares the impact of different development scenarios on the hydrological system of a site and helps make decisions about how best to manage rainwater runoff.

In situations where DPA requirements reduce the need for new infrastructure, consider reducing DCCs. For more information about DCCs, refer to the Development Cost Charges Best Practices Guide at: http://www.cscd.gov.bc.ca/lgd/finance/development_cost_charges.htm.

DPA Guidelines and Climate Change Adaptation

Making strategic choices now about which climate action tools to use can help slow the rate and extent of future climate change. British Columbia communities have already experienced the impacts of climate change, including warmer than usual winters, more frequent severe storms, flooding and drought conditions.

Local governments will need to be prepared to adapt to the current day impacts of changing climatic conditions as well as take steps to slow future climate change. Consider applying a "climate change adaptation lens" when developing DPA guidelines.

For example, a DPA guideline that encourages planting of shade trees near buildings can help reduce energy use and GHG emissions related to mechanical cooling in the summer months. A climate change adaptation approach would involve choosing planting locations and selecting the types of shade trees that would survive new climate conditions such as extended periods of dry hot weather and/or more severe storm conditions.

DPA guidelines that conserve potable water also reduce energy and GHGs used to treat and distribute potable water and treat wastewater. Such guidelines also help to prepare communities for expected decreases in water supply arising from changing climate conditions.

A climate change adaptation approach can increase a community's resilience in the face of changing climate impacts.

Climate Change Adaptation Tools

The Ministry of Community, Sport and Cultural Development is working with the Ministry of Environment, Fraser Basin Council and Natural Resources Canada as part of the B.C. Regional Adaptation Collaborative (RAC) to develop climate change adaptation tools for B.C. local governments.

ReTooling for Climate Change is a website focused on climate change adaptation. The site, funded through the BC Regional Adaptation Collaborative (BC RAC), provides some of the latest information on climate change, local impacts and adaptation planning, and includes a Tools & Resources section that links users to material across North America and around the globe. For more information, see http://www.retooling.ca.

The Water Conservation Calculator

The Water Conservation Calculator (WCC) is a free, web-based decision-support tool that illustrates how specific water conservation measures can deliver fiscal and physical water savings for communities. It can help staff make the case for conservation and help decision-makers make informed decisions about infrastructure funding. For more information, see http://www.waterbucket.ca/wuc/?sid=15&id=217&type=single.

Additional climate change adaptation resources can be found on the Ministry of Environment's Climate Change Adaptation Strategy webpage (http://www.env.gov.bc.ca/cas/adaptation/strategy.html) and in the document Climate Change Resources for B.C. Planners (http://www.env.gov.bc.ca/cas/pdfs/cc_resources.pdf).

Accessing Specialized Knowledge

Assessing the local feasibility of implementing a DPA for climate action is likely to require specialized and/or technical knowledge. For example, local governments may need specialized technical knowledge to evaluate development permit applications that include onsite energy generation equipment. Local governments may also need new capacity to:

- compare the costs and benefits of introducing climate action strategies, both in the short and long-term;
- understand the relative costs and benefits of various DPA requirements;
- gauge risks and/or unintended consequences of DPA requirements;
- undertake studies to quantify solar, geothermal or wind energy potential ; and/or,
- assess annual and seasonal climate conditions to determine whether potential strategies can provide intended benefits throughout the year.

Expert knowledge may already exist within a local government organization. Consider assessing whether local government staff have the knowledge, resources and availability to implement climate action DPA guidelines and identify where gaps and resources exist.

An integrated, or cross-organizational, approach to addressing climate action goals is an effective way to share internal expert knowledge and incorporate internal expertise into decision-making, planning, policies and actions related to climate action goals. Greater internal integration between planning and engineering staff can contribute to the effective monitoring and enforcement of DPAs. Consider whether training opportunities are available for local government staff.

External expertise may be required to increase a local government's capacity to implement DPAs for climate action. Consider whether external expertise is available, what it costs and whether financial resources are available to obtain it. Also assess whether trained individuals are available to design, install, build and maintain new technology, landscaping, machinery, systems or equipment.

Including experts as part of an early, meaningful consultation process can help to ensure the DPA guidelines can be effectively implemented and deliver the expected outcomes. Consider undertaking a comprehensive consultation process, such as the Integrated Design Process (IDP), to develop climate action DPA guidelines in complex situations.

Integrated Design Process (IDP)

The Integrated Design Process (IDP), offers a model for engaging relevant disciplines and stakeholders when developing complex climate change DPA guidelines. This collaborative approach engages a broad team throughout the project. Decision-making takes a system-wide perspective and considers life-cycle costs.

The IDP has the potential to deliver successful outcomes in situations with challenging environmental, social and economic goals. For more information, refer to the B.C. Green Building Roundtable's Roadmap for the Integrated Design Process Part One: Summary Guide at http://www.metrovancouver.org/buildsmart/design/Pages/integrateddesignprocess.aspx

Specialized knowledge is likely to be a key component of assessing the relative costs and benefits of proposed DPA requirements, and determining whether a DPA can be implemented in a cost-effective way. Tapping into the knowledge of development/building sector representatives and technology-specific experts can help local governments understand the potential costs and benefits of proposed DPA requirements. Some questions to consider include:

- What are the costs of the proposed DPA requirements to the community, local government and developer?
- What are the expected measureable benefits of the proposed DPA requirements in terms of energy savings, water savings and GHG emissions reductions?
- Are the expected benefits likely to outweigh the life-cycle costs of implementation?
- What is the likelihood that the DPA requirements will result in an increase to the price of the residential, commercial or industrial units being developed?
- Consider the relative costs and benefits of possible DPA requirements — can some requirements deliver the same or greater benefit for less cost than others?
- What are the estimated on-going operational and maintenance costs of the proposed requirements compared to conventional approaches that do not include climate action DPA requirements?

Development Approval Information Areas and DPAs for Climate Action

The *LGA (S. 920.01, 920.1)* provides the authority for local governments to designate areas and/or specify circumstances in which development approval information can be required.

Development approval information is information related to the anticipated impact of a proposed activity or development on the community. If a local government designates a Development Approval Information Area or specifies circumstances for which information can be required, it must also establish procedures and policies that set out the process for requiring information as well as the type of information that is required.

Local governments may want to consider aligning a Development Approval Information Area with a DPA for climate action in order to obtain information about the impact of a proposed activity or development on energy conservation, water conservation and GHG reduction.

Different Types of DPA Guidelines

Prescriptive guidelines, performance-based guidelines or a combination of both can be considered when making requirements for a DPA. The development/building sector can provide input on the types of guidelines for optimal implementation of the DPA.

Prescriptive guidelines focus on how a goal will be achieved and describe a particular solution. The prescriptive approach can provide clarity and make it relatively easy for a builder or designer to follow. However, the prescriptive approach can also be a barrier to innovation - by precluding less expensive and/or innovative technologies that were not available when the guidelines were written.

Performance guidelines describe the required outcome or performance rather than prescribing how a solution should be implemented. A performance-based approach allows for innovation and creativity in achieving intended outcomes. Methods for determining whether the performance objectives have been reached must be defined.

The United Kingdom's Planning Policy Statement: Planning and Climate Change provides an example of a performance-based approach. Like the Merton Rule, the planning policy statement requires planning authorities to set a target percentage in all new development for decentralized and renewable or low-carbon energy use. The policy statement also states that the targets should avoid prescribing the technologies that should be used and be flexible in how carbon savings from local energy supplies are to be secured. The policy statement is available online at: http://www.communities.gov.uk/publications/planningandbuilding/ppsclimatechange.

The Merton Rule

The Merton Rule was developed and adopted in 2003 by the London Borough of Merton in the United Kingdom.

The Merton Rule is planning policy that requires housing developments of 10 or more units, or 1,000m2 of non-residential development, to generate at least ten percent of their energy needs from onsite renewable energy equipment. For more information, see Merton Council's Merton Rule webpage (http://www.merton.gov.uk/living/planning/planningpolicy/mertonrule.htm)

Third-party rating systems can provide examples of prescriptive and performance-based strategies for local governments that are developing climate action DPA guidelines. For example, the Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND) rating system applies to the broader neighbourhood scale and includes strategies related to energy and water efficiency, solar orientation and on-site renewable energy sources. More information is available at http://www.cagbc.org/Content/NavigationMenu/Programs/LEED/RatingSystems/Neighbourhooddevelopments/default.htm.

The 2010 Built GreenTM checklist incorporates site strategies for water conservation such as supplying a minimum of 8" of topsoil or composted yard waste as finish grading throughout the site. It is available online at: http://www.builtgreencanada.ca/checklist-certification.

In Summary...

To help guide the successful application of DPAs for climate action, use the summary checklist of considerations described above. The checklist, Getting it Right – Questions and Considerations for Implementing DPAs for Climate Action, can be found at the end of the guide.

Example DPA Strategies for Energy Conservation and GHG Reduction

DPAs for energy conservation, water conservation and GHG reduction are another tool in a local government's tool kit for climate action. Sections 4 and 5 of the guide provide examples of energy conservation, water conservation and GHG reduction strategies designed to assist local governments in developing their own locally-appropriate DPAs for climate action. Local governments will need to consider how to adapt these strategies to local circumstances.

The strategies in this section focus on conserving energy and reducing GHGs. The examples vary from simple (promoting tree planting), to more complex (developing a district energy system that uses renewable energy). They illustrate a range of opportunities for local governments, recognizing local governments each have different capacities to use the DPA authority.

The strategies are organized into the areas for which local governments can make requirements under the DPA authority *(LGA Section 920 (10.1))*:

- landscaping;
- siting of buildings and other structures;
- form and exterior design of buildings and other structures;
- specific features in the development; and,
- machinery, equipment and systems external to buildings and other structures.

Consider the local feasibility of implementing particular strategies, including an assessment of the cost, benefits, risks and unintended consequences.

Energy Conservation and GHG Reduction

Most GHG emissions within a local government's jurisdiction result from energy consumption and the burning of fossil fuels. As a result, strategies to address GHGs frequently overlap.

Landscaping – Strategies for Energy Conservation and GHG Reduction

Landscaping can modify wind and temperature conditions on a site and in turn influence the energy performance of buildings and structures.

For example, trees can be used as windbreaks to reduce wind speed and allow for natural ventilation in and around buildings. The appropriate positioning of new trees and/or the selective retention of existing trees near buildings can reduce the need for mechanical cooling and heating of buildings, conserve energy and reduce GHGs. Trees can also be planted to shade expanses of hard surfaces that would otherwise cause heat build-up.

Increasing the number of trees and amount of vegetation can also expand the carbon storage capacity within a community by absorbing carbon dioxide, a major GHG. Landscaping that encourages walking and cycling (e.g. construction of pathways and trail networks) can also reduce GHG emissions.

Landscaping - Strategies for Energy Conservation and GHG Reduction

1. Planting for Passive Solar Gain and Cooling

This strategy can help reduce winter heating and summer cooling requirements and contribute to lower energy consumption.

Consider the local feasibility of...

planting trees and removing trees selectively to maximize passive solar gain, natural ventilation and natural cooling, and increase the entry of natural light into buildings.

For example:

- Use deciduous trees on the southern and western-facing side of a building to maximize the warming effect of solar radiation in winter months and the cooling effect of shade in summer months.
- Locate coniferous trees so they block winter winds without blocking solar gain.
- Avoid storm damage to buildings and structures by planting low, shrub-like trees or hedges near buildings and taller trees farther away.

For information on landscaping standards, refer to:

- *British Columbia Landscape Standard - B.C. Society of Landscape Architects (BCSLA) at* http://bcsla.org/
- *B.C. Landscape & Nursery Assocation (BCLNA) at* http://www.bclna.com

2. Windbreak Planting

This strategy can help reduce winter heating and summer cooling requirements.

Consider the local feasibility of...

planting trees and other vegetation around buildings to act as windbreaks against cold winter winds, and to direct cooling summer breezes.

For example:

- Plant coniferous trees to block winter wind – especially on the north face of a building. Coniferous trees planted near southern facades will block desired light and solar gain.

For more information and design guidelines for winter conditions, refer to:

- *City of Fort St. John's Official Community Plan, Appendix A – Winter City Design Guidelines (http://www.fortstjohn.ca/files/pdfs/bylaws/communityPlan.pdf).*
- *Liveable Winter Cities Association (http://www.wintercities.com).*

3. Creating Alternative Transportation routes

This strategy can help reduce GHG emissions.

Consider the local feasibility of...

creating pedestrian and/or cycling pathways to encourage the use of alternative modes of transportation.

For example:

- Encourage pedestrian and cycling pathways to connect neighborhoods, commercial centres and amenities, including existing green spaces and natural areas.
- Encourage trail networks and/or pedestrian and cycling pathways within new or existing green corridors to encourage alternative modes of transportation.

4. Tree Planting

This strategy can contribute to energy conservation and the reduction of GHG emissions.

Consider the local feasibility of...

planting trees to store carbon, reduce water run-off, buffer windstorms and mitigate summer heating impacts.

For example:

- Add to the urban forest (treed ecosystems within urban areas) by creating or expanding wooded areas and parks and planting street trees.
- Enhance the natural green network by increasing the quantity, density and diversity of trees.
- Plant trees in trenches rather than in large underground containers so trees live longer and grow larger as they mature.

For more information on developing successful strategies for urban forest management, refer to:

- *Planting Our Future – A Tree Toolkit for Communities (http://www.treesfortomorrow.gov.bc.ca/resources/Plantingourfuture.pdf).*

5. Paved Areas Planting

This strategy can reduce GHG emissions and energy use related to cooling. Shade trees can reduce summer surface temperatures and increase the pavement life of roads and parking lots.

Consider the local feasibility of...

planting trees and other vegetation along streets, in parking areas and in other paved open spaces to provide shade, store carbon and reduce local urban heat build-up.

For example:

- Increase the number of street trees by reducing standards for spacing street trees and use double rows where possible to add to the urban forest..
- Plant shade trees and vegetation along curbs and in paved open spaces, particularly large parking lots, roads, sidewalks and driveways.

For more information on developing successful strategies for urban forest management, refer to:

- *Planting Our Future – A Tree Toolkit for Communities (*http://www.treesfortomorrow.gov.bc.ca/resources/Plantingourfuture.pdf*).*

Siting Buildings and Other Structures – Strategies for Energy Conservation and GHG Reduction

Building orientation can help reduce both energy use and GHG emissions. Local conditions, including sun, wind, natural features and topography can influence the energy performance of buildings. The careful positioning and orientation of buildings to take these conditions into account can reduce GHG emissions resulting from mechanical heating and cooling.

Consider reducing Development Cost Charges (DCC) when new development results in reduced public infrastructure expansion costs. For more information on Development Cost Charges, refer to http://www.cd.gov.bc.ca/lgd/finance/development_cost_charges.htm.

Siting Buildings and Other Structures - Strategies for Energy Conservation and GHG Reduction

1. Site Selection

This strategy can reduce mechanical heating and cooling demand and lower GHG emissions.

Consider the local feasibility of...

developing south-facing sites to maximize passive solar energy gain and/or solar energy collection.

For example:

- Identify south-facing development sites that have minimal obstruction blocking access to sunlight and provide opportunities for planting trees and shrubs to control solar gain.

2. Site Layout

This strategy can reduce GHG emissions and conserve energy.

Consider the local feasibility of...

applying strategies that support compact subdivision development.

For example:

- Concentrate growth in small areas to reduce the impact on existing natural areas and reduce servicing costs (consider reducing DCCs).
- Design subdivisions that cluster buildings, retain existing vegetation and natural areas – for carbon storage and GHG reduction – and maximize infrastructure use.
- Encourage the use of small lots where single family developments are being considered.

For more information on efficient use of developable land, refer to:

- *Guide to Green Choices: Ideas and Practical Advice for Land Use Decisions in British Columbia Communities* (http://www.cscd.gov.bc.ca/lgd/planning/greenchoices.htm).

3. Solar Orientation

This strategy can reduce the need for mechanical heating and cooling and be most effective when applied in conjunction with other passive design strategies.

Consider the local feasibility of...

orienting buildings to maximize winter solar gain and summer cooling.

For example:

- Orient buildings towards the south, with the long axis running east-west. A southern building orientation is ideally achieved on south-facing lots with minimal obstructions that can block solar access (sun/shade analysis can identify the impact of obstructions).
- Consider subdivision layouts that optimize solar gain for each building.
- Locate windows on the south-facing facade for maximum winter solar gain and natural light.
- Minimize windows on north facade to limit heat loss.
- Use window overhangs and/or fixed operable shading devices to control solar gain.
- Choose roof shape and orientation to maximize passive solar gain and opportunities for solar energy collection.

For more information on passive solar design, refer to:

- *City of Vancouver Passive Design Toolkit – Best Practices* (http://vancouver.ca/sustainability/documents/PassiveDesignToolKit.pdf).
- *City of Vancouver Passive Design Toolkit – For Homes* (http://vancouver.ca/sustainability/documents/58346PassiveKitBookPrt9.pdf).
- *City of Vancouver Passive Design Toolkit – For Larger Buildings* (http://vancouver.ca/sustainability/documents/58345PassiveKitBookPrt3.pdf).

4. Wind Exposure

This strategy can reduce mechanical cooling and heating demand.

Consider the local feasibility of...

siting buildings and other structures to maximize passive ventilation and cooling and reduce unnecessary wind exposure and wind tunnel effect.

For example:

- Orient primary building facades towards prevailing breezes to maximize passive ventilation and passive cooling (consider possible conflict with orientation for solar gain).
- Build curved rather than long straight streets to reduce wind impacts.
- Use structures (such as garages or fences) or trees as windbreaks.

For more information on passive solar design, refer to:

- *City of Vancouver Passive Design Toolkit – Best Practices* (http://vancouver.ca/sustainability/documents/PassiveDesignToolKit.pdf)
- *City of Vancouver Passive Design Toolkit – For Homes* (http://vancouver.ca/sustainability/documents/58346PassiveKitBookPrt9.pdf)
- *City of Vancouver Passive Design Toolkit – For Larger Buildings* (http://vancouver.ca/sustainability/documents/58345PassiveKitBookPrt3.pdf)

Form and Exterior Design of Buildings and Other Structures – Strategies for Energy Conservation and GHG Reduction

The physical form and exterior design of buildings and structures can influence the amount of energy savings and GHG reductions they generate.

The shape, height and volume of a building comprise the building's form. The exterior design encompasses the building's exterior elements that can be designed to respond to local environmental conditions.

Form and exterior design strategies can be combined with aesthetic form and character objectives *(LGA 919.1 (1))* to ensure a solution that simultaneously achieves climate action goals and is aesthetically pleasing.

Form and Exterior Design - Strategies for Energy Conservation and GHG Reduction

1. Built Form

This strategy can reduce the need for mechanical heating and cooling and therefore GHG emissions related to energy consumption.

Consider the local feasibility of...

using building forms that maximize energy performance, including solar energy use and passive ventilation and cooling, and minimize unwanted solar gain and adverse wind effects.

For example:

- Design and orient south-facing roofs and walls to maximize passive solar gain and create opportunities for solar energy collection.
- Vary height, rooflines and massing to reduce shade on neighbouring buildings and optimize sun exposure for heat gain and daylight.
- Use building shapes that minimize adverse wind effects and optimize conditions for passive ventilation and cooling.

For more information on passive solar design, refer to the City of Vancouver Passive Design Toolkits, including:

- *Passive Design Toolkit – Best Practices (p. 19-20)* (http://vancouver.ca/sustainability/documents/PassiveDesignToolKit.pdf).
- *Passive Design Toolkit – For Homes* (http://vancouver.ca/sustainability/documents/58346PassiveKitBookPrt9.pdf).
- *Passive Design Toolkit – For Larger Buildings* (http://vancouver.ca/sustainability/documents/58345PassiveKitBookPrt3.pdf).

2. Exterior Design of Buildings

This strategy can reduce mechanical heating and cooling demands and reduce GHG emissions.

Consider the local feasibility of...

designing the exterior elements of a building to take into account local climate conditions, maximizing the use of solar and wind energy and minimizing their unwanted impacts.

For example:

- Use deep window overhangs and/or fixed adjustable external shades on south-facing facades that can block out high-angle summer sun and allow entry of low-angle winter sun.
- Locate windows on south-facing facades for maximum solar gain. Minimize glazing on north-facing facades.
- Locate operable windows to maximize natural ventilation, ideally on opposing or adjacent walls, to create cross-breezes.

Specific Features in the Development – Strategies for Energy Conservation and GHG Reduction

Specific features in the development include those external to the building such as permeable pavements or naturalized ponds that clean and control storm water flows. Specific features might also include innovative design elements such as multi-purpose shared amenity spaces.

Specific Features in the Development – Strategies for Energy Conservation and GHG Reduction

1. Permeable and/or Reflective Surfaces

This strategy contributes to reducing local urban heat build-up, cooling demand and GHG emissions, particularly in urban centres.

Consider the local feasibility of...

choosing permeable paving and/or reflective materials to reduce heat absorption and heat build-up by allowing water to infiltrate the ground and evaporate, cooling the paved surfaces and surrounding air.

Consider maintenance costs sometimes associated with keeping porous surfaces unclogged.

For example:

- Use permeable or porous paving materials and/or light-coloured reflective paving materials (e.g. white asphalt, concrete made with white cement mixtures, light-coloured pavers) for sidewalks, driveways, roads and parking lots.
- Limit impervious paving and/or dark-coloured absorptive materials for sidewalks, driveways, roads and parking lots.

For more information on reducing the "urban heat island effect" see:

- *Clean Air Partnership, Urban Heat Island* (http://www.cleanairpartnership.org/urban_heat_island).
- *Cooling Summertime Temperatures: Strategies to Reduce* Urban Heat Islands (http://www.epa.gov/heatisland/resources/pdf/HIRIbrochure.pdf).

2. Shared Amenities

This strategy can maximize efficient use of land and reduce GHG emissions.

Consider the local feasibility of...

increasing the amount of shared multi-purpose amenity space and using shared spaces to encourage activities that contribute to GHG reductions.

For example:

- Promote covered outdoor multi-purpose areas for recreation, air-drying laundry and storing bicycles, strollers and garden equipment.
- Provide areas for recycling collection, composting and waste disposal that are appropriately sized, easily accessible and have capacity for future expansion.
- Consider exempting shared amenity spaces from Floor Area Ratio (FAR) and Floor Space Ratio (FSR) calculations.

Machinery, Equipment and Systems External to Buildings and Other Structures – Strategies for Energy Conservation and GHG Reduction

Energy consumption and greenhouse gas emissions can be reduced by incorporating innovative technologies for energy generation and distribution into community planning initiatives and site-specific planning for new developments.

Machinery, Equipment and Systems External to Buildings and Other Structures – Strategies for Energy Conservation and GHG Reduction

1. Exterior Lighting

This strategy has the potential to contribute to reductions in energy consumption and GHG emissions.

Consider the local feasibility of...

using timer- and/or sensor-controlled energy-efficient exterior lighting systems to provide light only when required. Also, consider using lighting systems that are powered by renewable energy sources.

For example:

- Use energy-efficient lighting exterior for walkways, driveways, entryways and general exterior lighting.
- Use solar-powered lighting systems.

2. Alternative Transportation

This strategy has the potential to contribute to the reduction in fossil fuel use and lower GHG emissions.

Consider the local feasibility of...

providing infrastructure that promotes the use of alternative transportation.

For example:

- Install on-site electrical car charging stations.
- Use on-site renewable energy generation such as solar panels or wind turbines as the source for electric car charging stations.
- Install short and long-term bicycle parking in commercial and multi-unit residential developments.

3. On-Site Energy Generation

This strategy can reduce energy use and GHG emissions generated from fossil fuels. On-site renewable energy systems, where viable, are also a potential source of revenue for local governments, developers, building owners and occupants.

Consider the local feasibility of...

using on-site renewable energy generation systems to supply electricity, heating and cooling energy to buildings and other structures, water pumps, sewage pumps and/or charging stations for electric vehicles.

For example:

- Develop an on-site renewable energy generation system where viable. Renewable energy sources include:
  - geothermal energy (heat loops and wells);
  - wind (turbines);
  - heat energy extracted from air (heat pumps);
  - biomass;
  - bio-gas;
  - wastewater effluent; and,
  - solar energy (collectors and/or photovoltaic (PV) panels).
- Use micro-hydro turbines in place of pressure-reducing valves to capture energy from water flowing in pipes where the scale of development makes it viable.
- Use wind turbines or solar energy systems to run water pumps that support landscape irrigation.
- Require a target percentage of the energy to be used in new developments to come from on-site renewable or low-carbon energy sources, where it is viable (e.g. the "Merton Rule" – 10% of energy provided by on-site renewable energy).

For more information about renewable energy and energy planning, see:

- *Community Energy Association* (http://www.communityenergy.bc.ca/resources-introduction/heating-our-communities-renewable-energy-guide-for-local-governments-in-bc).
- *BC Sustainability Energy Association* (http://www.bcsea.org/learn/get-the-facts/renewable-energy-technologies).
- *Natural Resources Canada (NRCan) – Renewable Energy* (http://www.nrcan.gc.ca/eneene/renren/index-eng.php).

For more information about providing surplus "clean" energy to the BC Hydro distribution system, see:

- *BC Hydro – Net Metering Initiative (*http://www.bchydro.com/planning_regulatory/acquiring_power/net_metering.html*).*

For more information about the Merton Rule, see:

- *Merton Council – The Merton Rule website (http://www.merton.gov.uk/living/planning/planningpolicy/mertonrule.htm).*

For more information about resources from waste, refer to:

- *Resources From Waste: Integrated Resource Recovery (IRR) website (http://www.cd.gov.bc.ca/lgd/infra/resources_from_waste.htm).*

4. District Energy Systems

This strategy can reduce energy use and GHG emissions through efficient management of the distribution of energy.

Consider the local feasibility of...

developing a district energy system to distribute thermal energy (heat and hot water) to consumers. Also consider supplying a district energy system with one or more renewable energy source(s). When a district energy system is supplied by a renewable energy source greater reductions can be achieved.

For example:

- Install a pipe distribution system for a district energy network.

Funding from BC Hydro is available for pre-feasibility and feasibility studies to assess a community's needs and determine whether a district energy system is a viable choice for energy efficiency and community benefits. For more information, contact Victoria Smith, Manager, Aboriginal & Sustainable Communities Sector, 604-453-6565.

FortisBC provides financial support for district energy system feasibility studies to determine the potential and technical feasibility of building, owning and operating a district energy system. For more information, contact Jason Wolfe, Manager, Community Energy Solutions, 604-592-7516.

For more information about district energy systems refer to:

- Canadian District Energy Association (CDEA) (http://www.cdea.ca/).
- BC Hydro District Energy Systems (http://www.bchydro.com/powersmart/ps_communities/district_energy.html).
- FortisBC (Terasen Gas) District Energy Systems (http://www.fortisbc.com/EnergySolutions/DistrictEnergySystems/Pages/default.aspx).

5. Waste Management

This strategy can reduce GHG emissions.

Consider the local feasibility of...

using an Integrated Resource Recovery (IRR) approach to waste management, which regards waste as a potential resource and mimicks the closed-loop cycles in nature. The IRR approach encompasses water, energy and infrastructure.

In particular, consider drawing on expertise to assist in determining the feasibility, optimal scale and location for possible implementation.

For example:

- Install anaerobic digesters that convert biosolids and wet organic waste from food processing and agricultural waste into biogas.
- Combust wood waste and other dry organic waste for heating and/or electricity, and to create biofuels for heating or transportation.

For more information about resources from waste, refer to:

- *M*inistry of Community, Sport and Cultural Development's website (http://www.cscd.gov.bc.ca/lgd/infra/resources_from_waste.htm).
- *C*ommunity Energy Association's Clean Energy for a Green Economy (http://www.communityenergy.bc.ca/sites/default/files/Clean%20Energy%20for%20a%20Green%20Economy.pdf).

Example DPA Strategies for Water Conservation

Water conservation strategies range from specific demand-side management strategies to strategies that address broader rainwater management goals. Water conservation strategies can also act as climate change adaptation measures, in particular for areas that are experiencing drought conditions. These strategies can prepare a community for the impacts of climate change, such as a reduced water supply, as well as help to mitigate against future climate change impacts.

The example strategies vary from simple (collecting rainwater from roof downspouts in rain barrels for irrigation), to the more complex (collecting rainwater in below-ground cisterns, also for irrigation purposes). They illustrate opportunities for local governments with different capacities to use the DPA authority.

The strategies for water conservation (WC) are organized into the following areas for which local governments can make requirements *(LGA Section 920 (10.1))*:

- landscaping;
- specific features in the development; and,
- machinery, equipment and systems external to buildings and other structures.

Consider the local feasibility of implementing particular strategies, including an assessment of the cost, benefits, risks and unintended consequences.

The Water Conservation Calculator

The Water Conservation Calculator (WCC) is a free, web-based decision-support tool that illustrates how specific water conservation measures can deliver fiscal and physical water savings for communities. It can help staff make the case for conservation and help decision-makers make informed decisions about infrastructure funding. For more information, see http://www.waterbucket.ca/wuc/?sid=15&id=217&type=single.

The Water Balance Model

The Water Balance model (http://www.waterbalance.ca) is one tool that can assist in designing developments that minimize change to natural hydrological conditions. The tool compares the impact of different development scenarios on the hydrological system of a site and helps make decisions about how best to manage rainwater runoff.

Landscaping – Strategies for Water Conservation

Plants found in native or 'naturalized' landscapes have adapted to the soil and water conditions specific to the geographic area.

Naturalized landscapes that include climate and soil-adapted plants (e.g. drought resistant plants) can be used in conjunction with techniques that capture and store water from naturally occurring sources to reduce the need for supplementary irrigation and increase water conservation.

Landscaping – Strategies for Water Conservation

1. Vegetation Types

This strategy can reduce water consumption, as well as energy consumption (the energy used to treat and transport water for irrigation and treat the water after use).

Consider the local feasibility of...

selecting indigenous tree, shrub and plant species to reduce the need for supplementary irrigation.

For example:

- Landscape new developments using native or naturalized species and drought-resistant plants.
- Use low-maintenance, salt-tolerant species along streets, sidewalks and other public spaces.
- Apply 'xeriscape' or low water use landscaping techniques to minimize and/or eventually eliminate the need for irrigation.

For more information on 'xeriscaping' and climate-appropriate plant selection, see:

- *City of Kamloops – Creating a Kamlooops Xeriscape brochure (http://www.city.kamloops.bc.ca/ipm/pdfs/Brochure-CreateXeriscape.pdf).*

For more information on developing successful strategies for urban forest management, refer to:

- *Planting Our Future – A Tree Toolkit for Communities (http://www.treesfortomorrow.gov.bc.ca/resources/Plantingourfuture.pdf).*

2. Retaining and Restoring Natural Vegetation

This strategy conserves water resources by helping to increase the absorptive capacity of the soil, allowing rainwater to be captured, stored and slowly released.

Consider the local feasibility of...

retaining or restoring high-value natural vegetation to support effective rainwater management.

For example:

- Assess the development site for high-value natural vegetation that provides effective stormwater management.
- Design the development so that high-value natural vegetation and soil are retained.
- Restore high-value natural vegetation using plants suited to the climate and soil conditions.
- Replace trees that were removed during site development with trees suited to the climate and soil conditions.

For more information about assessing the potential for development while maintaining the original hydrologic condition, see:

- *Water Balance Model website* (http://www.waterbalance.ca).

3. Enhancing the Topsoil Layer

This strategy can reduce the need for irrigation and potable water. It can also reduce energy because less energy is used to treat and distribute potable water.

Consider the local feasibility of...

providing sufficient topsoil to promote well-rooted landscaping that requires less irrigation and stays green longer during drought conditions.

For example:

- Retain and/or add a healthy, absorbent topsoil layer sufficiently deep to allow for well-rooted planting and reduced irrigation requirements.

For more information about topsoil, absorbent landscaping and water conservation, see:

- *An Economic Rationale for Integrated Stormwater Management – A Resource for Urban and Rural Land Development in B.C.* (http://www.env.gov.bc.ca/epd/epdpa/mpp/stormwater/urban_rural_land/pdf/42.pdf).
- *Waterbucket Green Infrastructure webpage about the Topsoil Primer – Topsoil: Just How Do You Obtain a Topsoil Layer to Advance Rainwater Management and Water Conservation Goals?* (http://www.waterbucket.ca/gi/?type=single&sid=104&id=480).

Specific Features in the Development – Strategies for Water Conservation

Alternative design choices for specific features can conserve water and reduce energy use throughout the life-cycle of the development.

Specific Features in the Development – Strategies for Water Conservation

1. Permeable Surfaces

This strategy can conserve water and reduce the load on local government stormwater systems. The use of permeable paving surfaces can also save energy by reducing the urban "heat island" affect and the need for mechanical cooling in buildings.

Consider the local feasibility of...

using permeable paving surface materials to increase rainwater infiltration and recharge groundwater supply.

In particular, consider maintenance costs sometimes associated with keeping porous surfaces unclogged.

For example:

- Use permeable pavers for residential streets, plazas/squares, courtyards, school yards, parking lots, driveways, walking and bicycle paths.
- Use bark mulch and wood chips for walking paths.
- Use concrete pavers or other permeable surfaces for parking lots, walkways and driveways.
- Minimize non-permeable surfaces to facilitate on-site rainwater infiltration.

2. Rainwater Collection Features

This strategy helps to conserve water resources and also saves energy as less energy is used to treat and distribute water.

Consider the local feasibility of...

using naturalized ponds, bioswales or rain gardens to collect, store and/or attenuate the flow of rainwater and potentially re-use rainwater to irrigate non-edible plants and landscaping.

For example:

- Collect and re-use rainwater from naturalized ponds for irrigating non-edible plants, landscaping and washing vehicles.
- Use vegetated channels such as bioswales in place of concrete storm channels and drains to capture, store and slowly release rainwater.

For more information on water management, see:

- *Province of BC Living Water Smart website (http://www.livingwatersmart.ca).*
- *Capital Regional District Innovative Rainwater Management website (http://www.crd.bc.ca/watersheds/LID/rain-water-tour-main.htm).*

Machinery, Equipment and Systems External to Buildings and Other Structures – Strategies for Water Conservation

Managing rainwater through on-site infiltration and efficient irrigation systems reduces overall water consumption, recharges groundwater supply and lowers the impact on stormwater systems.

Machinery, Equipment and Systems External to Buildings and Other Structures – Strategies for Water Conservation

1. Rainwater Collection Systems

This strategy helps to conserve water resources and saves energy as less energy is used to treat and distribute water.

Consider the local feasibility of...

installing above-ground or below-ground rainwater collection systems to capture, store and potentially re-use rainwater to irrigate non-edible plants and landscaping.

For example:

- Collect water from roof downspouts and direct it to planted areas or into rain barrels for irrigating non-edible plants and landscaping.
- Collect rainwater in above- or below-ground cisterns for irrigation or sub-surface infiltration systems that store runoff.

For more information on rainwater management, refer to:

- *Water Balance Model (*http://www.waterbalance.ca*)*
- *An Economic Rationale for Integrated Stormwater Management – A Resource for Urban and Rural Land Development in B.C. (*http://www.env.gov.bc.ca/epd/epdpa/mpp/stormwater/urban_rural_land/pdf/42.pdf*).*
- *Capital Regional District Innovative Rainwater Management website (*http://www.crd.bc.ca/watersheds/LID/rain-water-tour-main.htm*).*

2. Irrigation Systems

This strategy conserves water as well as energy.

Consider the local feasibility of...

using efficient irrigation systems that support water, soil and energy conservation practices.

For example:

- Design, install and manage cost-effective and efficient irrigation systems.

For more information about efficient landscape irrigation refer to:

- *Irrigation Industry Association of B.C. webpage (*http://www.irrigationbc.com*).*
- *Landscape Irrigation Scheduling Calculator (*http://landscape-calculator.irrigationbc.com/?date=Fri%20Dec%2011%2016:49:47%202009*).*
- *Irrigation Fact Sheet: B.C. Trickle Irrigation Manual, Chapter 15 Landscape Micro Irrigation (*http://www.agf.gov.bc.ca/resmgmt/publist/500Series/565000-1.pdf*).*

Local Government Examples of DPA Strategies for Climate Action

Local governments in B.C. are using DPAs and DPA guidelines to achieve their climate action goals of conserving energy, conserving water and reducing GHG emissions.

City of Fort St. John

DPAs for Multiple Family Development, Highway and Service Commercial Development, Core Commercial Development, and Commercial Development

The City of Fort St. John Official Community Plan (OCP) identifies four DPAs that promote Winter City Design principles as well as water and energy conservation objectives. The DPA guidelines include requirements related to:

- use of landscaping methods that utilize low water consumption;
- incorporating design elements that facilitate solar heat retention; and,
- stormwater best management practices to minimize runoff and increase retention and infiltration.

For more information about the City's DPA guidelines, see: http://www.fortstjohn.ca/files/pdfs/engineering/OCP%202010/Consolidated%20OCP%20Bylaw%201880%20Schedule%20A%20-%202010May14.pdf.

District of Lake Country

DPA for GHG Reduction and Resource Conservation

The District of Lake Country Official Community Plan (2010-2030) includes a Greenhouse Gas Reduction and Resource Conservation Development Permit Area. The DPA guidelines include requirements related to:

- lot and building orientation to maximize solar gain and natural ventilation;
- use of vegetation that requires minimal irrigation; and,
- subdivision layouts to allow for alternative transportation options.

For more information about the District's DPA for climate action, see: https://lakecountry.civicweb.net/Documents/DocumentList.aspx?ID=5460 .

City of Langford

Community Energy and Emissions Reductions Strategy

As part of their Community Energy and Emissions Strategy Action Plan 2011, City of Langford staff will be establishing a development permit area and guidelines to encourage energy efficiency and a reduction of greenhouse gas emissions for Council's consideration.

City of Richmond

Plan Policies to Encourage GHG Reduction, Energy and Water Conservation

The City of Richmond has policies in its newly adopted City Centre Area Plan (CCAP) that encourage energy conservation, water conservation, the reduction of GHG emissions and ecologically based amenities (e.g. groundwater recharge) to support environmentally sustainable development.

The City is also developing a Community Energy and Emissions Plan (CEEP). As part of the CEEP development process, it may be determined that DPA guidelines will be developed to reduce GHG emissions and promote water and energy conservation.

For more information about the City's CCAP, see: http://www.richmond.ca/services/planning/projects/ccareaplan.htm.

District of Saanich – Climate Action Plan

The District of Saanich has released a Climate Action Plan that outlines targets for water and energy conservation, as well as GHG reductions. The District has also outlined the various short and long-term actions it will undertake to meet these targets, including the creation of new Development Permit Area guidelines.

For more information about the District's Climate Action Plan, see: http://www.saanich.ca/living/climate/pdf/climate_action_plan_web.pdf .

District of Sooke – DPA for GHG Reduction and Energy Conservation

The District of Sooke 2010 Official Community Plan (OCP) identifies the reduction of GHG emissions and energy conservation as a qualifying category in their Town Centre DPA. District staff is working to develop accompanying requirements that will eventually be added to their DPA guidelines.

For more information about the District's Town Centre DPA, see: http://www.sooke.ca/assets/Documents~and~Forms/Bylaws/400%20OCP%20ADOPTED%20MAY%2017%2010.pdf .

City of Vancouver

Passive Design Best Practice Toolkit and Passive Design Guidelines

The Passive Design Toolkit promotes best practices for passive design within the City of Vancouver. The Toolkit is intended to support decision-making for new multi-family developments that will maximize occupant health and comfort and minimize energy use by relying less on mechanical and electrical systems. The City has also developed passive design guidelines, including land use policies for one and two-family dwellings and for larger commercial and residential buildings.

For more information about the City's Passive Design Toolkit, see: http://vancouver.ca/sustainability/PassiveDesignGuidelines.htm .

Resort Municipality of Whistler (RMOW)

DPAs for GHG Reduction, Energy Conservation and Water Conservation

The Resort Municipality of Whistler Official Community Plan (OCP) contains two DPAs with energy and water conservation objectives. The DPA guidelines include, for example:

- requirements related to building location and orientation for passive solar heating and natural ventilation;
- the coordination of roof overhangs, window placement and landscaping to provide cooling and shade in summer and solar access in winter; and,
- roof design and equipment to allow rainwater collection systems for irrigation purposes.

For more information on RMOW's Development Permit Areas 27 and 28, see: http://www.whistler.ca/images/stories/PDF/Building/2009/OCP%20-%20Text%20-%20May_%202009.pdf .

Getting it Right – Questions and Considerations for Implementing DPAs for Climate Action

The following questions and considerations can help assess the local feasibility of implementing a DPA for climate action, including the costs, benefits, risks and/or unintended consequences. Meaningful consultation with the development/building sector, experts, community groups and the public can also increase the likelihood of effective implementation of a climate action DPA.

Favourable Local Context
Consider whether:

- the community is growing or anticipating growth;
- there is a good working relationship with the development/building sector;
- there is an opportunity to engage the development/building sector in discussion about cost-effective DPA guidelines;
- there is public support for designating DPAs for climate action; and,
- the climatic conditions, topography and/or site conditions are suited to the DPA purposes and guidelines under consideration.

Complementary Tools
Consider:

- whether a DPA can be aligned with complementary tools to increase impact on climate action;
- aligning the provisions in zoning bylaws to accommodate DPA guidelines, e.g. shading devices might be allowed to project into setbacks; and,
- which tool, or combination of tools, can deliver the desired reductions with less cost and fewer resources.

Optimal Locations
Consider:

- locations that minimize sprawl and align with the principles of complete, compact communities;
- previously developed and/or serviced sites before choosing natural, un-serviced sites;
- the optimal scale – subdivision or neighbourhood – for the DPA guidelines under consideration; and,
- how local conditions such as climate, topography and the built environment will impact the implementation of the DPA.

Combining DPA Purposes
Consider:

- combining requirements for purposes that complement each other and can achieve multiple gains; and,
- reducing Development Cost Charges in situations where the DPA requirements reduce the need for new infrastructure.

DPA Guidelines and Climate Change Adaptation
Consider:

- how the guidelines can contribute to reducing the anticipated impacts of climate change.

Accessing Specialized Knowledge

Consider:

- assessing whether local government staff have the knowledge, resources and availability to implement climate action DPA guidelines;
- drawing on internal expert knowledge;
- whether training opportunities are available for local government staff;
- implementing an integrated or team approach to addressing climate action goals;
- drawing on external expertise to increase capacity;
- assessing the availability of experts, the cost of acquiring their expertise and the ability to pay for these costs;
- including experts as part of an early, meaningful consultation process;
- undertaking an Integrated Design Process (IDP) to engage relevant disciplines and stakeholders in developing complex climate action DPA guidelines; and,
- tapping into the knowledge of development/building sector representatives and technology-specific experts who can help understand the potential costs and benefits of proposed DPA requirements (see related questions in the Accessing Specialized Knowledge section).

Development Approval Information Areas and DPAs for Climate Action

Consider:

- aligning a development approval information area with a DPA for climate action.

Different Types of DPA Guidelines

Consider:

- how best to consult with the development/building sector for input on types of guidelines for optimal implementation;
- whether to use prescriptive or performance-based guidelines, or a combination of both; and,
- looking at third-party rating systems such as LEED-ND or Built GreenTM for examples of prescriptive and performance-based strategies that apply to elements external to the building.