Sustainability in Professional Engineering and Geoscience:

A Primer

Part 3: Practice-Specific Module - Municipal Engineering

Developed by the Sustainability Committee of the Association of Professional Engineers and Geoscientists of British Columbia APEGBC

www.apeg.bc.ca

www.sustainability.ca

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Part 3: Practice-Specific Module - Municipal Engineering

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1 Context and Introduction

APEGBC Sustainability Guidelines

Core to APEGBC's articulation of sustainability are the Sustainability Guidelines that state that, within the scope of a Member's task and work responsibility each Member, exercising professional judgment, should:

1) Develop and maintain a level of understanding of the goals of, and issues related to, sustainability .

2) Take into account the individual and cumulative social, environmental and economic implications

3) Take into account the short- and long-term consequences.

4) Take into account the direct and indirect consequences

5) Assess reasonable alternative concepts, designs and/or methodologies

6) Seek appropriate expertise in areas where the Member's knowledge is inadequate

7) Cooperate with colleagues, clients, employers, decision-makers and the public in the pursuit of sustainability.

The Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) has developed a Sustainability Primer as part of its implementation of a Sustainability Management System (SMS). The Primer's purpose is to act as an initial step in raising knowledge of sustainability, and to function as a simple, readily accessible resource on sustainability for engineers and geoscientists. It is not meant to be a comprehensive manual on "how to engineer sustainably", but rather is intended as an aid to help engineers and geoscientists implement sustainability principles in the course of their everyday activities.

Part I: Introduction of the Sustainability Primer outlines general issues that provide context to all our sustainability activities as professional engineers and geoscientists.

Part 2: Applying the Guidelines, develops some suggestions for approaches for applying APEGBC's Sustainability Guidelines (left) across the spectrum of engineering and geoscience activities.

This document is the first of several practice-specific modules (collectively referred to as ***Part 3: Practice-Specific Modules***) that are intended to assist practicing professionals apply these concepts and Guidelines in specific situations.

It is developed specifically to support ***municipal engineers***.

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Industry Canada Industrie Canada

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Feedback is welcome. Please email: sustainability@apeg.bc.ca, or complete the form at:

http://www.compassrm.com/active/apegbc/primer/

Approach

The keys to developing more sustainable approaches to municipal engineering lie in the skills, experience and ingenuity of practicing municipal engineers. It would be impossible, and surely undesirable, for anyone other than municipal engineers to consider and evaluate which specific approaches to given municipal engineering problems represent the best balance of economic, social and environmental benefits. There is no comprehensive guide to "sustainable municipal engineering", and this document does not claim to be such a guide. It is, rather, simply offered as an aid to help municipal engineers *explicitly* consider the context of sustainability in their everyday practice.

Part 2 of this Primer outlines some general ideas for applying the Sustainability Guidelines listed here. These include:

Increasing Awareness of Sustainability

Municipal engineers at all levels have a responsibility to familiarize themselves with sustainability issues and the ways in which the Sustainability Guidelines have or could be applied in their particular area of expertise. The label "sustainable" is infrequently applied to many worthy activities, perhaps with due cause; however, this sometimes means we have to dig around a little to find examples of conscious attempts to concurrently satisfy economic, environmental and social priorities. Many of the resources and links found in this Primer are offered in the hope that municipal engineers can use them as starting points for their own research.

Fully Investigating the Impacts of Potential Actions

Under any conditions, fully assessing the foreseeable impacts of potential actions is not an easy undertaking; in the busy and varied world of municipal engineering, where numerous small projects is often the rule, this can be even more demanding – and frankly implausible. Full Life Cycle Analyses or comprehensive Full Cost Assessments are rarely likely to be possible outside major engineering projects or academic situations. However, the emphasis we make here is on *applying the principles underlying these techniques* rather than in the purity of their formal application. On one level, municipal engineers should consider making the most of their relationship with consulting engineers, who should particularly be persuaded to explore these possibilities in more detail in almost any given situation. But if this Primer encourages even a small number of extra municipal engineers to pause for thought for an hour or so to think more thoroughly about objectives, consider creative alternative options and their possible impacts, and to select between them on this basis, then so much the better for us all.

The examples of interesting practices presented here were not necessarily developed with specific techniques in mind. Often, they will have been created from the strong interest of an individual or community to search out win-win situations to the problems shared by many. However, most of the examples shown here show the kinds of features we might expect of engineers and their partners exploring the social, economic and environmental synergies that exist for those who look for them.

Weighing the Impacts of Alternative Solutions

Engineering approaches are usually the result of much iteration of thought, design and refinement, so it is not surprising that developing more than one detailed solution to a problem is beyond the energy and budget of most organizations in most situations. However, the rewards for encouraging and fairly assessing alternative solutions are there to be found, as will be recognized by anyone who has participated in design contests or in separate design teams. The process of even sketching out and evaluating various solutions, perhaps with the participation or approval of non-technical representatives of the public, can ultimately help save money, increase public acceptance and build relationships and job satisfaction.

Again, many of the leads developed here may act as starting points for municipal engineers interested in considering and evaluating new approaches to problems with existing solutions. Remember that new, “green” approaches are not necessarily the most sustainable – the best solutions are those that form an optimum balance between our competing objectives in the eyes of the appropriate decision maker.

Fostering Consultation and Partnerships

The demands of a more sustainable engineering methodology for everyday professional decision-making are high, both within engineering’s own traditional boundaries and from the perspective of the expanded social role sustainability demands. Practicality obliges us to seek diverse professional opinions on areas we are unfamiliar with, and to learn enough about those areas that we can engage in critical discussion. But partnerships with fellow professionals comprises only half of our responsibility to consult with others – the second, arguably more important aspect requires us to actively solicit local community values on what’s important. Experts can often help answer “what could be”, but it’s up to the public to answer “what should be”.

Many of the examples noted here are a result of many such partnerships between professionals and the public, and again serve as starting point examples of what could be achieved on a widespread

scale by a more sustainable approach to professional engineering in British Columbia.

2 Scope of Municipal Engineering

2.1 Sectors of Influence

Municipal engineers are involved with a very broad range of subject matter, including activities associated with:

- Urban centres as holistic systems
- Municipal buildings
- Urban private and public transportation
- Roads and streets
- Water and wastewater management
- Solid waste management

Municipal engineers also work alongside utility professionals in managing issues relating to energy supply and demand management, telecommunications and public transportation.

The breadth of this activity is such that it is perhaps more helpful to organize a discussion of municipal engineering practice in terms of roles and responsibilities as they are applied in these technical areas.

2.2 Municipal Engineering Roles and Responsibilities

The range of roles and responsibilities of municipal engineers can be categorized as follows:

- Infrastructure planning
- Infrastructure design and construction
- Infrastructure operations and maintenance
- Regulation and enforcement
- Public consultation / grievance handling

The following table summarizes some of the key areas of influence municipal engineers have for furthering sustainability:

Table 1 Some sustainability responsibilities by engineering role

Municipal engineering roles	Example major sustainability-related professional tasks
All roles	• Maintaining familiarity with innovative technologies and techniques, and evaluating their suitability in accordance with the Sustainability Guidelines • Actively seeking appropriate expertise from and building partnerships with other professionals • Being aware of the importance of including public values in a wide range of issues • Being alert to opportunities to consider application of the Sustainability Guidelines over “Business as usual” approaches to familiar or new problems
Infrastructure Planning and Engineering	• Ensuring long term municipal engineering planning objectives align with sustainability principles • Identifying opportunities to increase systemic energy and material efficiencies, improve public liveability, boost economic development and reduce emissions through infrastructure planning
Infrastructure Design and Construction	• Ensuring that sustainability principles are embedded in Requests for Proposals (RFPs) from contractors, and that proposals are evaluated according to the Sustainability Guidelines.
Infrastructure Operations and Maintenance	• Ensuring an optimal balance between infrastructure efficiency and other sustainability objectives • This may include an analysis of the costs and benefits associated with facility retrofits, energy management programs, route planning algorithms, etc.
Regulation and Enforcement	• Ensuring that new or existing regulations are consistent with the Sustainability Guidelines • Using the Guidelines to evaluate possible amendments to existing regulations proposed by third parties (e.g. developers).
Public Consultation and Communications	• Ensuring that public values are reflected in municipal engineering decisions • Ensuring that the role of the public is properly evaluated when considering investment decisions (e.g. role of demand side management)

3 Infrastructure Planning and Engineering

Sustainability in Action: Municipal Environmental Initiatives in BC

This report prepared by local ENGO SmartgrowthBC describes some of the steps municipalities have undertaken to incorporate environmental considerations into their projects. Clearly, every "environmental" initiative does not necessarily illustrate "sustainability" (in the same way every economic initiative does not) – and not every municipal project necessarily has much input from municipal engineers. However, read critically, this survey gives a sense of the range and breadth of ideas that are becoming common practice throughout the province.

http://www.smartgrowth.bc.ca/munisurvey.html

At the strategic level of municipal infrastructure planning, the roles of engineers, planners, architects and other professionals are closely intertwined or even integrated. Engineers in may routinely consider the long-term development of urban systems, and rely on projections of likely demographic and economic changes to consider the future infrastructure development needs of municipalities. (It's worth noting that the multidisciplinary focus of the engineer involved in long term infrastructure planning is typical of the more general direction of professional engineering as a whole. Whereas some engineers still often work in professionally-distinct environments, it will become increasingly common to find engineers participating in close groups of a wide range of other professionals).

In many ways, the engineer's scope for influencing more sustainable development of a municipality is at its greatest in such a role. The life cycle of municipal infrastructure is long – timelines of 50 to 100 years or more are typical. If infrastructure planning is poorly conceived, communities will have to live with the negative social and economic consequences for many generations to come, as countless communities with downtown overpass ghettos and sprawling suburbs can attest. Things can eventually be put right, with an appropriate planning framework in place – but still such plans are often not in place. Moreover, getting it right first time in new communities can give a tremendous boost to a community's social, economic and environmental well-being.

Sustainability in Action: City of Kamloops TravelSmart Program

Developed by municipal engineers, planners and a number of local and agency stakeholders, the City of Kamloops' Travel Smart program seeks to reduce economic, environmental and social impacts of rising demand for transportation by tackling the root causes of demand growth from a broad-based, long term perspective. A combination of innovative land use planning, demand side management and explicit sustainability concerns, the program aims to maintain mobility levels and reduce expenditures on new infrastructure.

http://www.city.kamloops.bc.ca/transportation/plans/travelsmart_frameset.html

Long term engineering planning usually offers the opportunity to address the root causes of many of the symptoms we are trying to address with a more systematic approach to sustainability. Rather than ask, "what capital investments would best help us meet demand growth for new transportation services?", for example, the questions asked by the City of Kamloops (See sidebar) were more along the lines of, "what is driving the growth in transportation demand? – can we find ways to reduce demand while maintaining a commitment to meet the demand that cannot be reduced?" City engineers and planners found that through a mixture of demand side management, land use planning and other approaches, the necessity for many journeys could be avoided, thereby reducing the need for capital expenditures and increasing service levels on transportation routes that remained.

3.1 Information Resources

Useful sustainability information resources for municipal engineers involved in long term infrastructure planning include:

International Council for Local Environmental Initiatives

http://www.iclei.org/iclei.html

ICLEI is the international environmental agency for local governments

Federation of Canadian Municipalities

www.fcm.ca

FCM is partnering with the federal government on a variety of programs to further sustainable infrastructure development.

BC Energy Aware Committee

www.energyaware.bc.ca/toolkit.htm

A Toolkit for Community Energy Planning in British Columbia geared towards municipal leaders, planners and engineers.

California Energy Commission

www.energy.ca.gov/reports/energy_aware_guide.html

A more comprehensive Energy Aware Planning Guide

Canada's National Climate Change Process Municipalities Table

www.nccp.ca/NCCP/national_process/issues/municipalities_e.html

Part of the process informing the federal government's response to climate change issues, the municipalities table examined the options facing municipalities in curbing greenhouse gas emissions.

National Round Table on the Environment and the Economy (NRTEE)

http://www.nrtee-trnee.ca/eng/home_e.htm

Organization involved in a variety of programs related to the federal government's approach to urban sustainability.

Also, keep an eye on http://www.infraguide.ca/, the website of The National Guide to Sustainable Municipal Infrastructure. This project, funded under the Infrastructure Canada Program and implemented by the Federation of Canadian Municipalities (FCM) in partnership with the National Research Council (NRC), has the mission of identifying

and disseminating best practices and encouraging innovation to support sustainable municipal infrastructure decisions and actions. Municipal best practices findings will be online from summer 2002.

(Note: Financial resources are listed at the end of this document).

4 Infrastructure Design and Construction

Ask consultants to think about sustainability

The next time you're issuing an RFP, let consultants know that you're interested in sustainability. Bear in mind that one of the most commonly citied barriers to greater sustainability proactivity among consultants is the perception that "clients aren't interested in sustainability". In turn, consultants are sometimes blamed for lack of creative thinking. You can help break this cycle through some or all of the following:

Couch RFP requirements in terms of performance targets rather than specifying ways of doing things. For example, rather than asking for a design for a wastewater treatment plant, ask for solutions to the problem of contaminated water. Engineering consultants need space to get creative.

Ask consultants to describe the ways their proposed solutions apply the Sustainability Guidelines (You may wish to refer them to Part 2 of this Primer that discusses these issues). Make clear the importance you attach to their answers.

Creative thinking is resource intensive – where possible, ensure there is some kind of real incentive for firms to think rather than just turn out pre-packed, minimum cost, business as usual solutions.

The municipal engineer can do a number of things to help implement the APEGBC Sustainability Guidelines. These include:

- Requiring contractors to demonstrate their consideration of the Guidelines;
- Assessing competing bids using the Guidelines as a supporting framework to more conventional evaluation criteria (See *Part 2: Applying the Sustainability Guidelines*)
- Being alert and thoughtful to situations in which more imaginative solutions to everyday technical problems might be appropriate Favouring projects that are flexible to future technological developments

In *Part 2: Applying the Sustainability Guidelines*, we highlight the importance not just of identifying alternative solutions to a particular engineering design problem, but also using a systematic and holistic approach to selecting between them to ensure that some kind of optimum balance of economic, social and environmental considerations. A common mistake is to assume that because something is environmentally beneficial then it must also be a "sustainable" solution. But as any budget manager knows, for any investment in staff and financial resources, there is an associated "opportunity cost" that is foregone – the next best thing you could have done with that time and money may now no longer be done. Carefully evaluating the full costs and benefits associated with any undertaking is not just sound from a sustainability perspective, it's simply good management.

Sustainability in Action: GVRD Best Management Practices Guide

This report prepared by the GVRD not only details various state-of-the-art practices for managing stormwater, but also provides an example of the how APEGBC Sustainability Guideline 5 ("assess reasonable alternative concepts, designs and/or methodologies") might be implemented. In addition to comparing the different approaches on the basis of cost and technical applicability, other, more comprehensive decision factors are addressed, including "community acceptance" and impacts on property safety, fish habitat and water quality.

http://www.gvrd.bc.ca/services/sewers/drain/BestMgmtGuide.html

The GVRD Stormwater Best Management Practices Guide (sidebar) illustrates how different technical approaches to a problem can be assessed from the perspective of a wide range of costs (both financial and non-financial) and benefits.

Often, however, implementing the Guidelines relies on individual engineers having the vision to recognize when win-win situations might arise from what would otherwise be "conventional engineering" projects. A good example emerged from the failure of a storm water culvert in North Vancouver; rather than simply replace the culvert with another culvert, engineers worked with other stakeholders to develop an altogether more worthwhile project (see sidebar).

4.1 Resources Available

Below is a list of starting resources for municipal engineers interested in finding out more about more sustainable technical solutions to common municipal design and construction needs:

Two camps of engineering design

"We [design engineers] are breaking into two camps: 1) commoditized work and 2) value based ideas work. Clearly the latter is where we would like all engineers to practice"

- Kevin Hydes, President of Keen Engineering

Green Buildings BC - New Buildings

http://www.greenbuildingsbc.com/new_buildings/index.html

Good initial resource for those interested in green municipal buildings, including a guide to green building resources in BC and a link to the draft BC Leadership in Energy and Environmental Design (LEED) applications guide. Note that green building engineering will be the focus of a future sustainability module.

Minnesota Sustainable Design Guide

http://www.sustainabledesignguide.umn.edu

Guide to sustainable building design throughout the project life cycle.

US EPA Municipal wastewater technology assessments

http://www.epa.gov/OWM/mtbfact.htm

Comprise detailed technical assessments of many state of the art technologies for a wide range of municipal infrastructure options including combined sewer overflows treatment, storm water, disinfection, biological treatment (secondary and advanced), decentralized systems technologies, and others.

US EPA Decision Makers' Guide to Solid Waste Management

http://www.epa.gov/epaoswer/non-hw/muncpl/dmg2.htm

The Guide's primary goals are to encourage reduction of waste at the source and to foster implementation of integrated solid waste management systems that are cost-effective and protect human health and the environment.

Transport Canada

www.tc.gc.ca/../envaffairs/english/sustainability/etech.pdf

www.tac-atc.ca/tacqbe.htm

Ideas for sustainable transport technologies, including a database of sustainable transportation resources.

5 Infrastructure operations and maintenance

Key sustainability aspects to infrastructure operations and maintenance include:

- identifying efficiencies in the use of energy and materials
- upgrading and retrofitting infrastructure when necessary
- procuring and using materials with reduced negative impacts

Engineers responsible for the operations and maintenance of existing municipal facilities often have parallel objectives to those of sustainability advocates – minimizing the costs associated with unnecessarily profligate use of money, materials and energy. Applying sustainability principles in such roles should for the most part be the bread and butter of municipal engineers.

Of all municipal facilities, municipal building stocks perhaps offer the largest single opportunity to improve energy efficiency and reduce emissions. The process of performing energy audits of poorly performing buildings is now well-established, and as comprehensive building retrofit programs become the norm, financial mechanisms for enabling them are proliferating (see financial resources). Energy audits can, however, be implemented on the full range of municipal infrastructure.

Again, however, municipal engineers have much scope for applying their ingenuity to spot and help develop win-win sustainable solutions to operational and maintenance issues. This may be through supply-chain management, hiring of contractors or service companies, or whatever realm of influence the engineer has.

For example, the Lillooet municipal pool (see sidebar) had been in use for many years before municipal engineers took part in a study to investigate the feasibility of retrofitting the pool to use a simple solar thermal technique to save the use of fossil fuel energy during the summer season. After confirming the building's capability to withstand the weight of what was essentially a "black bag of water" on the roof, municipal engineers worked with a contractor to develop an appropriate control system for various necessary operations.

Sustainability in Action: District of Lillooet Municipal Solar Pool

A public swimming pool in Lillooet BC has been retrofitted with a solar thermal heating system that provides a low maintenance renewable heat source for much of the year. Under an energy service agreement with the contractor, the municipality is shielded from financial risk. After several years of proven value, the GVRD looks set to follow suit with a project that may lead to up to 16 other solar thermal pool retrofits – if this could work in the cloudy Lower Mainland, could it work for you? Some of the technical and administrative issues involved are described in the links below:

http://www.energyaware.bc.ca/tk_c_lillooet1.htm

http://www.gvrd.bc.ca/services/air/air2000/solarpool.html

5.1 Resources Available

Below is a list of starting resources for engineers interested in finding out more about more sustainable operations and maintenance approaches in municipal settings.

Green Buildings BC – Retrofits

http://www.greenbuildingsbc.com/retrofit/index.html

Find out more about building retrofit issues in the BC public sector.

Environment Canada Water

http://www2.ec.gc.ca/water/en/manage/effic/e_weff.htm

http://www2.ec.gc.ca/water/en/manage/effic/e_solm.htm

Introductions to a range of water efficiency issues, including metering, water recycling systems, wastewater re-use, flow control devices, distribution system pressure reduction, water saving devices (efficient fixtures, appliances and retrofits), drought resistant landscaping (xeriscaping), efficient sprinkling/irrigation technology, new process technologies, plant improvements, leak detection and repair, water use restrictions, elimination of combined sanitary/storm sewers to reduce loadings on sewage treatment plants, plant improvements

Municipal Wastewater Technology Assessments

http://www.epa.gov/OWM/mtbfact.htm

Comprising detailed discussions of around state of the art technologies for a wide range of water efficiency and operations/maintenance issues

Water Information Clearinghouse

http://www.waterwiser.org/

with many entries on sustainable approaches for municipalities.

Solid Waste Management Planning Software

http://www.tellus.org/sustcomm/software/wasteplan.html

WastePlan is a user-friendly computer application designed to facilitate integrated solid waste planning and analysis.

US EPA Environmentally Preferable Purchasing

http://www.epa.gov/oppt/epp/doccase.htm

A number of case studies detailing how municipalities and federal agencies are using their purchasing power to further sustainability objectives.

6 Public Regulation and Enforcement

Sustainable developers

Municipal engineers should be aware that one of the most commonly cited barriers to more sustainable solutions from the perspective of the private sector are certain municipal design codes that are often perceived to be unnecessarily inflexible and prescriptive. The criticism is that such codes have not been developed or reviewed with sustainability in mind, and therefore preclude certain activities for no real reason (A discussion of municipal barriers facing 'sustainable developers' can be found at:

http://www.energyaware.bc.ca/tk_c_developer1.htm

Sustainability in Action: Rethinking Design Codes in the Field

As part of a project undertaken with the City of Surrey, city engineering participants were empowered to amend municipal design codes during a process of multistakeholder design "charrettes" or workshops.

http://www.sustainable-communities.agsci.ubc.ca/projects/ADS.html

A further distinct area of influence of municipal engineers is in developing or implementing the regulations that place boundaries around certain public and commercial activities in a municipality.

For urban systems as a whole, the regulation of developers is of course primarily achieved through land-use zoning, following the direction set out in the Official Community Plan. Municipal engineers have scope for influence in both zoning decisions and in the development of OCPs, as well as having discretion on how these directions are implemented on the ground.

A second major regulatory activity concerns the development and application of development standards or design codes. Municipal engineers can help others implement the Sustainability Guidelines by ensuring that codes within their responsibility do not unwittingly prevent worthwhile activities (see Sustainable developers sidebar). When developers develop suggestions that do not comply with current codes, consider whether the spirit of the code is being threatened, or whether there is a public good to be met through their revision.

An interesting approach to developing design codes that are considerate of sustainability issues (among others) was developed by Professor Patrick Condon at UBC (see sidebar)

On the other side of the coin, municipalities can use regulation to encourage (or force) developers to integrate win-win sustainability elements into their designs. At a site in the City of North Vancouver, for example, developers are obliged to prepare their buildings for the day when district heating might become financially viable (see sidebar)

6.1 Resources Available

City of NE Coquitlam Official Community Plan

http://www.city.coquitlam.bc.ca/PDFs/neocpsumm.pdf

See how regulations can be used to create a sustainable community in one of BC's state-of-the-art OCP's.

Sustainability in Action: City of North Vancouver District Heating

The energy efficiencies associated with district heating systems have long been known and applied in North America and Europe. However, because revenues follow long after substantial capital costs have been spent, they can often appear risky from an economic investment perspective.

A novel approach taken by the City of North Vancouver has sought to build a market for district heating before any commitment is made to large expenditures. In selling prime development property to developers, the City requires developers to ensure that buildings are "district energy ready", meaning that they must make use of hydronic heating and have basement boilers that can be readily interconnected to a circuit. BC Gas is supplying boilers free of charge, and manages heat supply over the whole site. When the time is right, a commercial decision can be made as to whether a centralized system should take over, or whether the individual boilers could be operated in a 'mini-grid' configuration.

http://www.cnv.org/Projects/name.asp?id=33

Alternative Development Standards

http://www.marh.gov.bc.ca/GROWTH/NOV1996/alt.html

Short introductory article on ADS in BC

Alternative Development Standards for Sustainable Communities

http://www.sustainable-communities.agsci.ubc.ca/projects/ADS.html

UBC Professor Patrick Condon

Alternative Development Standards in Ottawa-Carleton

http://www.orsa.ca/documents/Winter99-24o31.PDF

Concerns about increasing development costs and the extensive amount of land consumed

7 Public communications / consultation

Sustainability in Action: Encouraging public participation from developers

The City of Victoria recently encouraged a developer of a high profile section of waterfront property to involve a public advisory body in its plans – a process that, in the opinion of City staff, made the difference for the proposal's ultimate acceptance by Council.

http://www.energyaware.bc.ca/tk_c_shoalpoint3.htm

If any engineering practice is used to incorporating public concerns and values into its daily operations, it is municipal engineering. The relationship between municipal engineers and the public is multidimensional, incorporating issues such as:

- multistakeholder planning processes
- demand-side management programs
- grievance resolution

Multistakeholder planning processes can be invaluable in incorporating public values into complex and difficult issues or decisions facing a municipality. Involving the public in such processes not only leads to smarter solutions, but also helps win public approval for whatever solution is finally adopted. In some municipalities, public processes are used on a widespread basis, particularly when potentially controversial land use changes are at issue. The City of Burnaby, for example, uses Area Advisory Committees for developing local plans, as do others.

Municipal engineers have long reaped the benefits of actively fostering public support for energy and emissions-related issues, such as water-saving and recycling programs. One of the most impressive examples of this is the City of Kamloops' WaterSmart program, which primarily through public education has had a tremendous impact on avoided economic and environmental costs (see sidebar).

Sustainability in Action: Helping the public to help you

The City of Kamloops' Watersmart program demonstrates how water infrastructure investments were put off through the use of an imaginative public education and regulation program that reduced household water use by 17% and saved over $50,000-$100,000 per year in electricity costs alone. As the City puts it on its website:

"There is an environmental ethic involved - we should appreciate that water is a valuable resource that is scarce in most parts of the world. Economically speaking, it makes sense to eliminate waste and to reduce consumption in order to minimize our requirements for upgrading our water treatment system. Squandering this resource places a financial burden on all utility rate payers."

http://www.fcm.ca/scep/case_studies/water_management/kamloops_water_sum.htm

http://www.city.kamloops.bc.ca/environment/index.html

7.1 Information Resources

Sample DSM program:

http://www.city.hamilton.on.ca/CityDepartments/toe/wm/waste/factsheets/factsheets.htm

Communities and Demand-Side Management (DSM) Programs in the US – a variety of ventures undertaken by communities

http://www.sustainable.doe.gov/municipal/commdsm.shtml

The Federation of Canadian Municipalities has details of a number of community-based GHG-reducing projects throughout Canada

http://www.fcm.ca

8 General Funding Resources

A number of financial resources are available to help municipal engineers initiate more sustainable engineering projects. These include:

Climate Change Action Fund

http://www.climatechange.gc.ca/english/actions/action_fund/index.shtml

The Climate Change Action Fund (CCAF) was established in 1998 by the federal government to help Canada meet its commitments under the Kyoto Protocol to reduce greenhouse gas emissions. Searching through the database of approved projects http://www2.climatechange.gc.ca/ccaf/search_e.cfm provides a great introduction to the kinds of sustainability projects being undertaken in municipalities throughout the country.

Green Municipal Enabling Fund
Green Municipal Investment Fund

The Federation of Canadian Municipalities (FCM) manages two funds from an endowment from the Government of Canada. The Green Municipal Enabling Fund (GMEF) provides grants for up to 50 per cent of the cost of feasibility studies for eligible projects up to a maximum of $100,000. The Green Municipal Investment Fund (GMIF) offers loans to municipalities or municipal partners to fund a portion of the capital costs of eligible projects. GMIF also provides a small number of grants for pilots of not-yet commercial technologies.

Infrastructure Canada

Infrastructure Canada, in partnership with provincial/territorial governments, is a tripartite program covering capital costs of municipal infrastructure projects. The Program does not fund pre-project expenses such as feasibility studies, although engineering costs related to the construction of the project are eligible for support.

Moving On Sustainable Transportation (MOST)

Transport Canada has established a Moving On Sustainable Transportation (MOST) Program

http://www.tc.gc.ca/EnvAffairs/most/About.shtml to support projects that produce the kinds of education, awareness and analytical tools we need if we are to make sustainable transportation a reality.