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BEST PRACTICES UNDER THE NEW NATIONAL GUIDE TO SUSTAINABLE MUNICIPAL INFRASTRUCTURE

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ABSTRACT: The ***National Guide to Sustainable Municipal Infrastructure: Innovations and Best Practices*** is a project funded under the Infrastructure Canada Program and implemented by the Federation of Canadian Municipalities (FCM) in partnership with the National Research Council (NRC). It aims to provide a road map to the best available solutions for addressing infrastructure issues. It will also be the focal point for the pan-Canadian network of practitioners, researchers and municipal governments focused on infrastructure operations and maintenance.

It is anticipated that this 4-year project, approved in late 2000, will contribute to the current Federal programs and the demands for infrastructure renewal in Canada's municipalities. Municipal infrastructure is decaying at an accelerating rate due to reduced funding, insufficient quality control resulting in poor installation, little or no inspection and maintenance, and a general lack of uniformity and improvement in design, construction and operation practices, among other factors. The Guide will provide for the building of a network and knowledge to share best practices and innovations in infrastructure development so that infrastructure renewal can take advantage of the best knowledge and technology. Many decision-making processes used by municipalities or their providers of engineering services lack the comprehensive integration of environmental impacts and technology solutions required to balance infrastructure development and environmental well being. Therefore, the resulting projects often do not achieve the level of optimisation expected by the population.

The Technical Committees of the Guide (one in each of the following areas: Decision making and investment planning, Environmental protocols, Municipal roads, Potable water, and Storm and wastewater) have developed a road map for their activities and are currently working on 18 best practices to be completed within the first year. All best practices will be published in draft form to benefit from the comments of practitioners and elected officials prior to finalization.

The article will present an overview of the Guide project, including its history and activities to date. The conference presentations will also highlight the first series of draft Best Practice recommendations issuing from the Guide's five technical committees.

Keywords: Best Practice, scan, priorities, rounds, peer-review, sustainable infrastructure, road map

Overview of the GUIDE

The National Guide to Sustainable Municipal Infrastructure: Innovations and Best Practices is a project funded under the Infrastructure Canada Program and implemented by the Federation of Canadian Municipalities (FCM) in partnership with the National Research Council (NRC). It will provide a road map to the best available solutions for addressing infrastructure issues. It will also be the focal point for the Canada-wide network of practitioners, researchers and municipal governments focused on infrastructure operations and maintenance.

It is anticipated that this 4-year project, approved in late 2000, will contribute to the current Federal programs and the demands for infrastructure preservation and renewal in Canada's municipalities. Municipal infrastructure is decaying at an accelerating rate due to reduced funding, insufficient quality control resulting in poor installation, little or no inspection and maintenance, and a general lack of uniformity and improvement in design, construction and operation practices, among other factors. Within this context, Canadian Municipal governments currently spend between $12 – $15 billion dollars per year on infrastructure.

In support of these needs, the Federal Government announced the Infrastructure Canada Program, a $2 billion investment that is expected to generate $6 billion in municipal infrastructure improvements over the next five years through partnerships with other levels of government and the private sector. More recently, the Federal Government announced an additional $2 billion investment in a new program named the Canada Strategic Infrastructure Fund for large-scale infrastructure projects that contribute to economic growth and the quality of life in Canada.

The Guide will provide for the building of a network and knowledge to share best practices and innovations in infrastructure development so that the above infrastructure renewal can take advantage of the best knowledge and technology. Many decision-making processes used by municipalities or their providers of engineering services lack the comprehensive integration of environmental impacts and technology solutions required to balance infrastructure development and environmental well being. Therefore, the resulting projects often do not achieve the level of optimisation expected by the population.

The Guide mission statement, "***For the protection and enhancement of quality of life, the National Guide to Sustainable Municipal Infrastructure identifies and disseminates best practices and encourages innovation to support sustainable municipal infrastructure decisions and actions***" illustrates the determination to create viable, integrated solutions to infrastructure problems across the country.

Sustainable infrastructure means that today's decisions on the provision of municipal infrastructure protect and enhance the quality of life for the foreseeable future using measures of economic, environmental and social factors. Using this definition as a framework, the Guide will consist of two interrelated parts including (a) a decision-making and investment-planning tool and (b) a compendium of technical best practices.

Part A is intended for use by municipalities to assess their needs and help technical staff as well as elected officials manage their infrastructure assets more effectively by using best practices in the selection, development and implementation of infrastructure projects. The decision-making and investment-planning tool will also facilitate a process that includes ongoing monitoring, evaluation and feedback.

The compendium of technical best practices (Part B), composed of various sets of technical modules, will provide municipal infrastructure practitioners with best practices for the choice of best available technologies and methodologies. For the purposes of the Guide, Best Practices have been defined as:

state-of-the-art methodologies and technologies for municipal infrastructure planning, design, construction, management, assessment, maintenance and rehabilitation that consider local economic, environmental and social factors.

These best practices are being developed in the context of the life-cycle asset management functions and will comprise the majority of the Guide.

It is expected that the project will help the prioritising of funding allocations, assist in decision-making and long term planning and in the selection of best technologies related to the provision of municipal infrastructure. It is also expected that it will help to illustrate best strategies for highest return on investment, assist in the evaluation of life cycle costs; and support benchmarking.

The Guide has the support of a vast network of stakeholders across Canada, including national associations related to infrastructure development such as the Canadian Society for Civil Engineering. This network also encompasses representatives from such sectors as transportation and housing as well as Canada's large and small municipalities, and remote communities. This broad network will ensure that the differences between big and small towns, urban and rural municipalities, and northern and remote communities are addressed.

The Guide will build on the vast array of existing knowledge regarding municipal infrastructure practices and development. Its content will reflect the experience of practitioners and will be validated through input from academic and institutional researchers as well as from the user community. Such input will be provided through Technical Committees (TCs) whose members are volunteers drawn from the public and private sectors of the municipal infrastructure world, selected by the Project Steering Committee on the basis of their broad-based knowledge of, and participation in, municipal infrastructure-related matters. The TCs are responsible for the development of the technical content of the Guide as well as to ensure regional input (see organisational chart on Figure 1).

1. *Best Practices Development Process*

The Guide Best Practices are being developed using the familiar process used by, among others, recognised standards writing organisations (Figure 2). One full cycle constitutes a "round" of best practices development under the Guide. It is expected that there will be a total of 4 rounds in the 4-year term of the project, with each round yielding a minimum of 15 Best Practices.

Once the **priorities** for each development round have been identified (at the Technical Committee level) and approved (at the Technical Steering Committee level), **best practices scans** are contracted out in order to provide the Committees (and their Working Groups), with relevant background material on the particular subject area. These technology scans are intended to gather existing knowledge, whether from the published literature, or current practices used by municipalities or their suppliers of goods and services.

The Guide Technical Committees and their Working Groups use the results of the scans to extract information on what will become the **National (Draft) Best Practice**. To support their assessment and decisions, a multi-criteria analysis tool was developed by the CERIU (Centre of Expertise and Research in Urban Infrastructure) of Montreal.

Figure 1 - Guide Organisational Structure

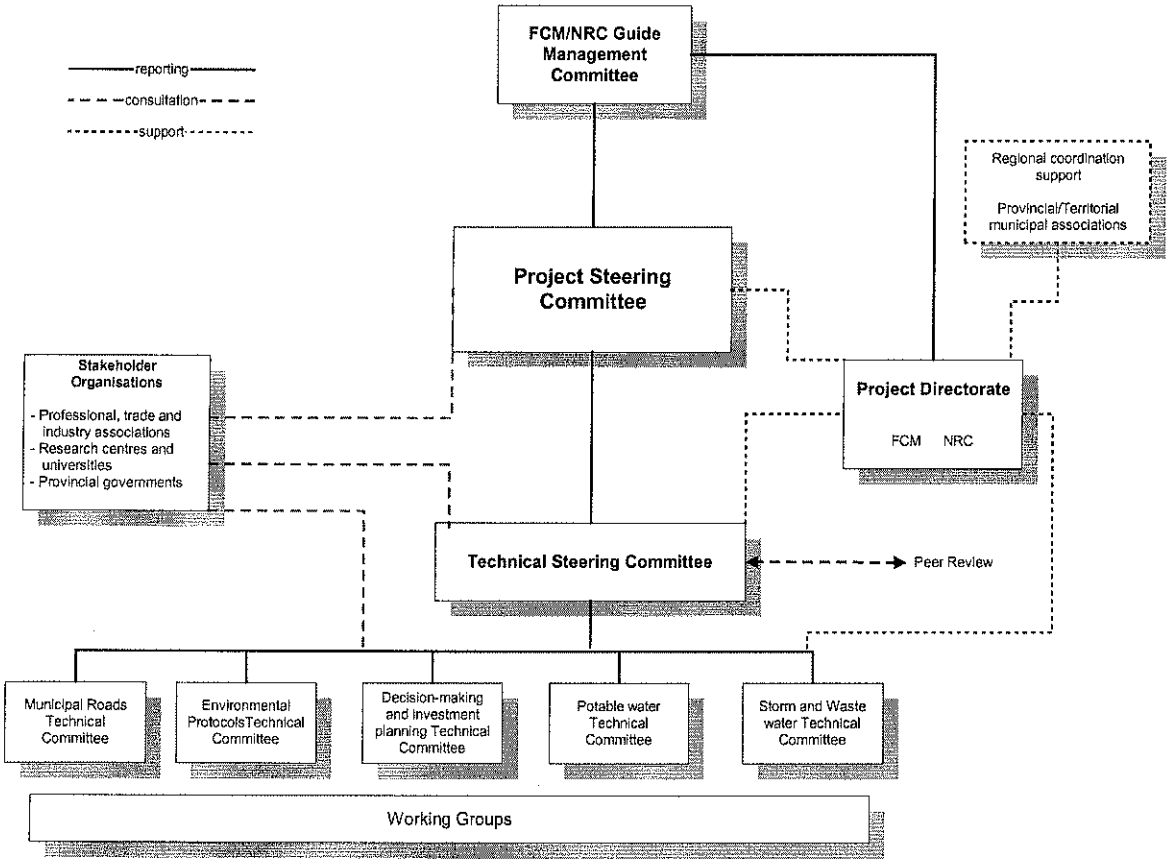
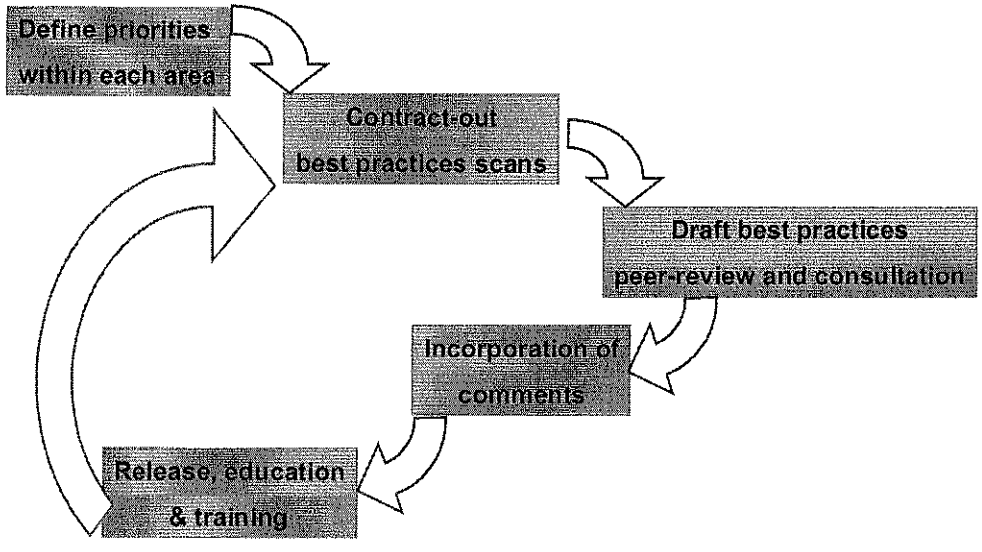


Figure 2 - Best Practices Development Process



Each Best Practice will contain the following elements:

- WHY (is the work under the best practice needed, e.g., the benefits)
- WHAT (needs to be done)
- WHERE (it needs to be done, and where not to do it)
- HOW (is the work to be done)
- WHEN (to do or not to do the work)
- References
- Other information such as case studies may be included.

Draft best practices will go through a **peer and stakeholder review** process. At the peer-review level, a limited number of experts in the field will be contacted and asked to ensure no key elements or concepts are missing. They will also be asked to confirm the documents truly represent a best practice in their experience. The stakeholder review process will consist of distributing, electronically or otherwise, the draft best practice to the largest number possible of stakeholders. The Guide's network, national professional and trade associations, advisories, etc. will be used to distribute the documents. Practitioners will be asked to review and comment the best practices over a limited period of time. Any comments received after that period (based on the use of the best practice) will be considered in future updates to the best practice.

The **release** of best practices, planned through various electronic means as well as more traditional processes, will require follow-up through **education and training.** This is particularly important for small, rural, and remote communities that do not have the capacity to apply the best practice methodologies or technologies without support. The Guide Directorate, together with Guide stakeholders, will be developing an education and training plan that will heavily rely on partnerships with local, regional or national organisations to develop the specific courses and deliver the best practices knowledge to these communities.

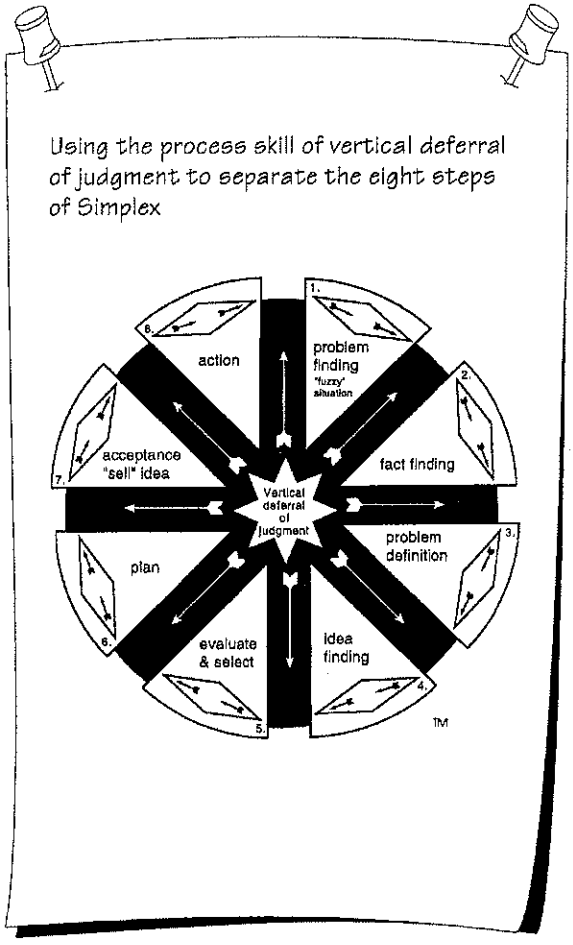
First Round Development

The five Guide Committees had their first meetings late July and early August 2001 and decided on priorities for the development of best practices. Since a key element of the development of the *Guide* is to avoid any duplication with activities from other Federal, Provincial/Territorial and national associations' initiatives, a **workshop** was organised prior to each of the Committee meetings to obtain additional input from key public and private stakeholders. Participants also had the opportunity to share with their colleagues' information on existing guidelines and best practices available within their jurisdiction, and on current activities directed at the development of best practices in the field.

The SIMPLEX Creative Problem Solving[1] process was used to create a road map for each of the 5 committees and to identify the priorities for the first round of best practices. The SIMPLEX process is founded on a divergence-convergence process that yields to "How Might We" (HMW) questions on the issues identified. The process is illustrated in Figure 3.

[1] **SIMPLEX: A flight to Creativity**, by M. Basadur, The Creative Education Foundation Inc. publisher, 1996.

Figure 3 - SIMPLEX process (after Basadur, 1996)

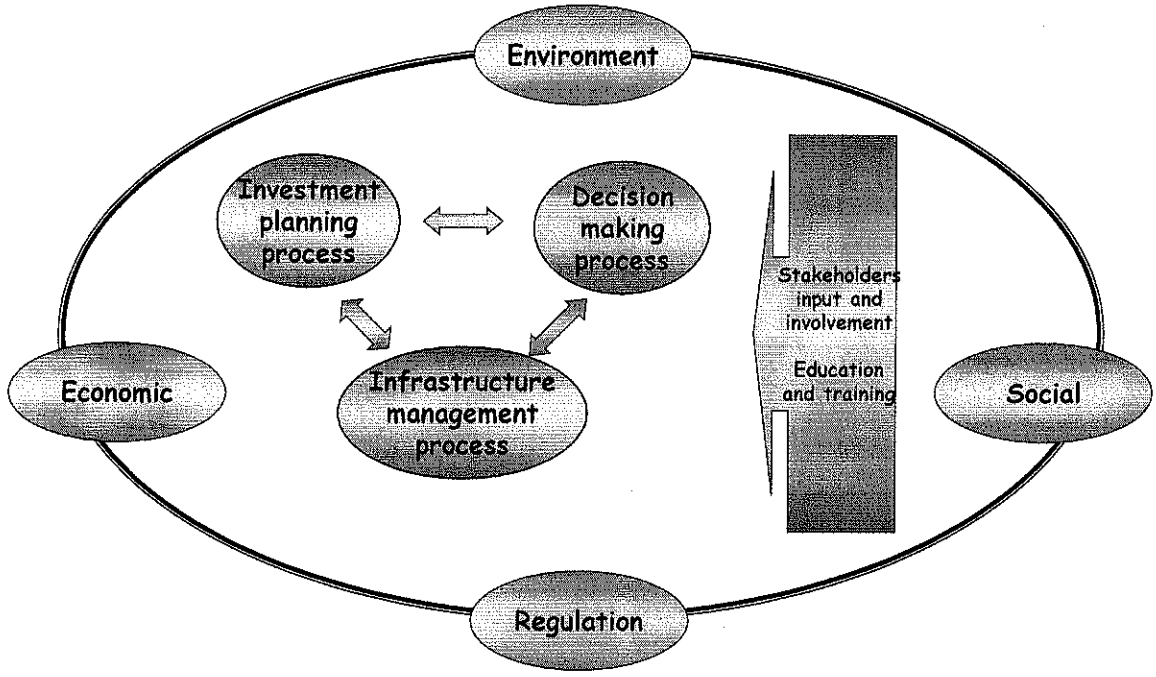


The road map is created by developing a tree for which each HMW question is preceded by a WHY (do we need to do this) and followed by a WHAT'S STOPPING US (from doing it). The best practice priorities were prioritised by individual voting.

The results of the workshops/TC meetings can be presented in various formats.

First, it is important to define the overall framework and the essential elements of the Guide, based on the discussions and identification of needs at the meetings. Figure 4 captures these elements.

Figure 4 - Municipal Infrastructure Guide Framework



The overall Guide sustainability framework of the Guide (i.e., Economic, Social, and Environment) has been supplemented with the regulatory concerns that will dictate in many instances the content of the best practices. Within this 4-component framework, the main elements under which best practices are developed are:

- Investment planning processes
- Decision making processes
- Infrastructure management processes

The first 2 elements are principally non-technical in nature, targeted to such municipal stakeholders as elected officials, administrators, finance officials, etc, and form what has been referred to "Part A" earlier in this article. However, the majority of the Guide's best practices will fall under the umbrella of infrastructure management processes, and those will be in great proportion of a technical nature.

Figure 5 presents a sample road map developed by one of the committees (the Potable Water technical committee) based on the input received/generated at the workshops. The highlighted text on the road map indicates priorities chosen by the committee for the first round development of best practices.

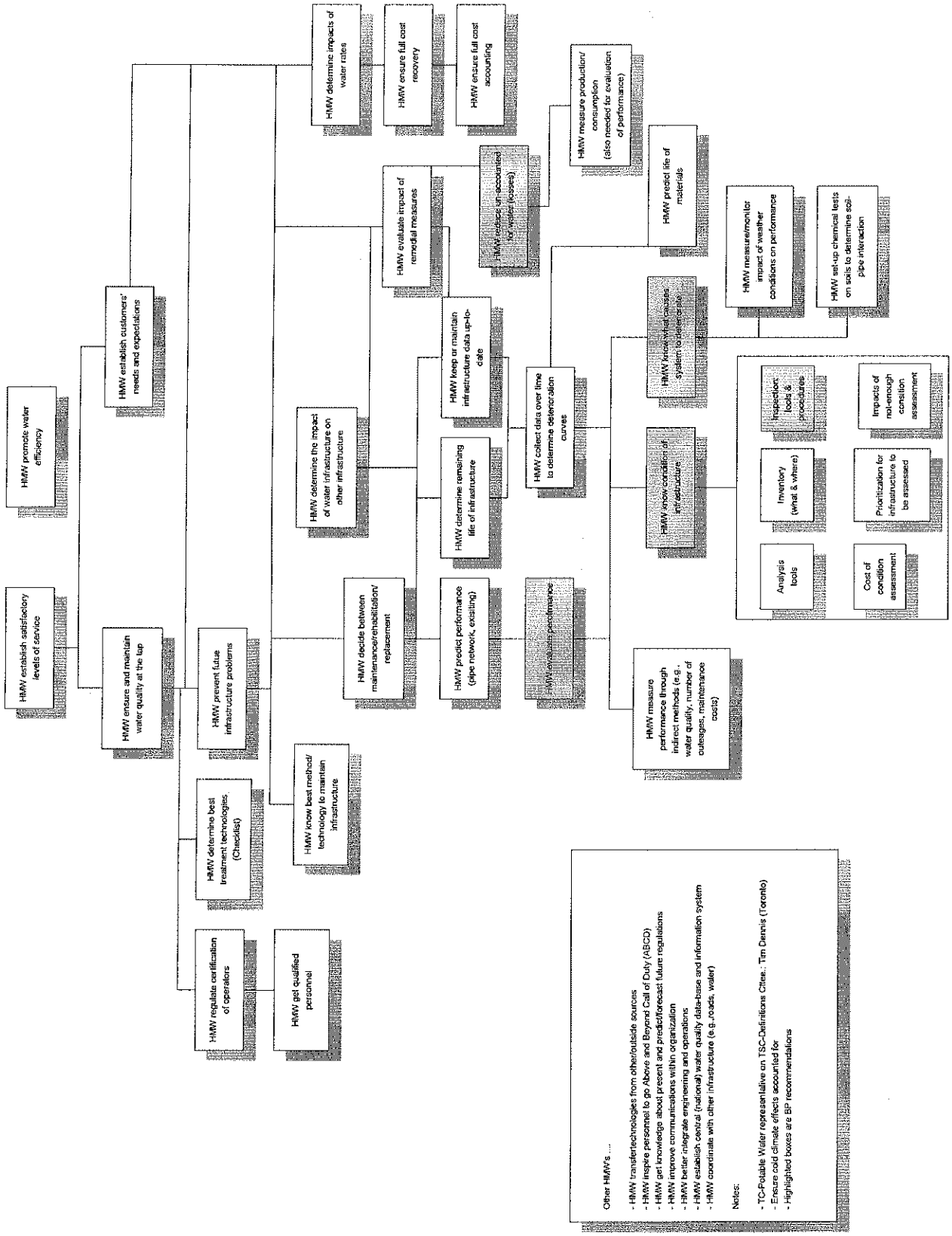


Figure 5 – Sample Guide road map

First Round Best Practices

Decision-Making and Investment Planning

The purpose of this section of the guide is to offer Best Practises for consideration by the local government elected officials in their Infrastructure Investment priorities and decisions. This has become increasingly important due to the following factors:

1. Local government budgets are severely stressed due to transfer of responsibilities from senior levels of government.
2. Tremendous pressure exists for substantial increases in other municipal services sector budgets (e.g., police, fire, parks and recreation) with strong visible public support.
3. Large rehab/reconstruction investments are required to deal with a growing backlog of neglected and ageing municipal infrastructure assets.
4. Recent federal program announcements are expected to lever significant increases in municipal infrastructure investments and guidance is needed on how best to spend these monies to achieve sustainable results.

It is therefore viewed that high level Best Practises are needed to assist elected officials in determining priorities and funding levels such that infrastructure needs and impacts are better understood and assessed. In addition, the objective of the proposed DM&IP Best Practises is to provide high level, simple to use "benchmark" type information for investment decisions for individual municipal infrastructure such as arterial roads, collector roads, drainage systems, water systems, sanitary systems etc. To achieve this goal, three Best Practises have been undertaken as a first step.

- Develop criteria/tests for balance between political, social, economic, and environmental benefits/risks
- Definition of levels of service in the context of decision making and investment planning
- Developing high level benchmarks [indicators, reference points] for policy level investment planning decisions – quantitative and qualitative

Environmental Protocols

The roles of the Environmental Protocols committee (TC-EP) have been defined as:

1. to ensure that environmental matters are accounted for in a coherent manner by the other technical committees; and
2. to liaise with other environmental bodies for regulations, etc. so that when documents are produced, the best practices conform with local/regional regulations

In order to define best practices priorities, the TC-EP defines environment as the biotic and abiotic elements and systems and their interactions, including their effects on human quality of life. These environment elements and systems include: land (including flora), water, air (including noise and light), and soil.

In addition to reviewing and inputting into best practices developed by other committees, the TC-Environment Protocols identified 3 best practices (BP) priorities related to creating/disseminating information for decision-makers to support sound environmental practices:

- Defining local environmental conditions, challenges and opportunities with respect to municipal infrastructure
- Determining the environmental costs and benefits associated with the desired level of municipal infrastructure service
- Determining the appropriate carrying capacity , in terms of municipal infrastructure, of the existing environment

Potable Water

The first set of priorities for potable water mainly focused on the distribution system due to the commonality of the infrastructure within all Canadian municipalities, as opposed to treatment plants, which are very project/location specific. With the adage "out of sight, out of mind", the distribution system has been neglected in many municipalities. In addition, the Technical Committee felt that focus on the distribution system would give the highest return per Guide dollar invested. The initial best practice priorities are also seeking a better understanding of or to add value to existing systems rather than construction of new systems. In particular, best practices identification for condition assessment, inspection, rehabilitation methodologies and water accountability are all reflective of true stewardship. The committee members do not espouse the premise "build it and they will come", but rather want to follow the premise "fix and maintain it and they will still come, and have better value".

The Potable Water Technical Committee thus concentrated on the following best practices during this first round:

- Inspection of distribution systems
- Evaluation of the condition and performance of distribution systems
- How to reduce losses in transmission/distribution systems – water accountability
- Determination of what causes the distribution/transmission system to deteriorate and fail

Storm and Wastewater

The Storm and Wastewater Technical Committee identified over fifty areas of interest for the Best Practices scans in linear infrastructure, wastewater treatment, customer interaction and receiving water issues.

Linear systems represent almost half of a municipality's total infrastructure investment. The selected initial scans, focusing on the linear systems, will investigate the largest un-quantified liability for municipal infrastructure. Synergies with potable water systems (condition/capacity assessment, construction and rehabilitation techniques, data collection) and with municipal roadways (utility boxes) were pursued. The independent selection of these issues by the other committees is indicative of the broad-based concern about linear infrastructure.

After mapping these needs, and following a review of their significance to the mosaic of Canadian municipalities, the following best practice areas needs were chosen for the first round:

- Prioritising / choosing technologies for the construction and rehabilitation of linear systems
- Evaluation of the structural and functional condition of linear infrastructure
- Implementing source control for storm and wastewater
- How to control /reduce inflow/infiltration (focus on sanitary sewers)
- How to get consistent sets of data for comparison

After setting the direction for the first scans, the absence of wastewater treatment and receiving water impact issues was a concern to the Committee. During the past decade, the United States Environmental Protection Agency has produced policies on Combined Sewer Overflow, Sanitary Sewer Overflow and has reissued the Clean Water Act. Environment Canada's CEPA toxicity assessments have raised issues for a number of water quality parameters (e.g. ammonia, road salt and chlorinated organics). The events in Walkerton, Ontario and North Battleford, Saskatchewan have also increased the degree of public and municipal government concern and these have spun considerable efforts to remedy current practice. Not wanting to duplicate such efforts, it is expected that their outcome and recommendations will make their way into future Best Practice scans, either through work directly under the Guide process, or by integration of knowledge developed by other organisations.

Municipal Roads and Sidewalks

The MR technical committee decided to focus on addressing the need to implement a planned, preventive approach to slowing the deterioration of existing roadways. The proposed best practices are expected to have significant, long-term benefits for all Canadian municipalities. For example, preventive maintenance offers the most cost-effective strategy to prolong the life of any jurisdiction's pavement infrastructure. Just as we learned that $1 of timely rehabilitation will save $5 of reconstruction, it is now time to get the message out that $1 of timely prevention will delay the requirement to spend $5 of rehabilitation.

The MR committee has been working on the following best practices during this first round:

- Timely preventive maintenance of municipal roads
- Inspection and condition assessment of utility access boxes [catch basins, valve boxes, electrical boxes, manholes]
- Rehabilitation of Utility Access Boxes
- Construction of Utility Access Boxes
- Crack Sealants for Bituminous Pavements

Project Status

Most of the first round best practices will have been drafted and made available for stakeholder comment by the end of May 2002. The Working Groups will consider comments received and appropriate changes will be made to the documents prior to their final release during the summer.

Meanwhile, all five technical committees are initiating work on the second round best practices with a view to having their drafts available in the winter of 2003. Some of these best practices will be based on information gleaned from the first round scans, perhaps supplemented with municipality-specific case studies. It is anticipated that the development of other best practices will require preliminary scanning work and this would take place in the fall of 2002.

Updated information on the Guide can always be found on the Web site (www.infraguide.ca).