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Client Report

B-5123.12

Municipal Infrastructure Investment Planning (MIIP)

MIIP Report: Open Forum on Opportunities for Research in Asset
Management in Canada

for

City of Calgary

City of Edmonton

City of Hamilton

City of Ottawa

City of Prince George

City of Regina

Department of National Defence

Regional Municipality of Durham

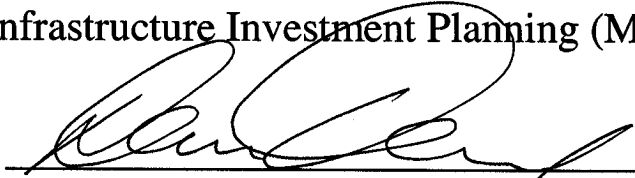
Regional Municipality of Halton

Regional Municipality of Niagara

June 2005

Municipal Infrastructure Investment Planning (MIIP)

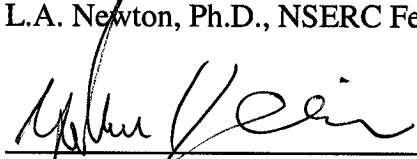
Author


D.J. Vanier, Ph.D., Project Manager

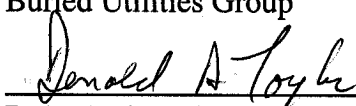
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MIIP Report: Open Forum on Opportunities for Research in Asset Management in Canada

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Issued: 2005-06-30

1 Introduction

Currently, there is considerable interest in the asset management of civil infrastructure systems (CIS) in Canada. Many initiatives exist in Canada at the federal, provincial, regional and municipal government levels relating to asset management (AM)¹. In addition, a large number of technology/engineering companies are actively promoting AM services and software to public and private organizations in Canada.

It is generally understood by most people in the domain that the proper management of CIS assets is necessary, if not essential; however, there are few codes, standards or guidelines available to assist practitioners in Canada. The need for AM has been clearly identified in many of the objectives and recommendations for action in the CIS Technology Road Map (TRM – See Appendix A); however, process in the adoption of AM is slow. Unlike the USA and Australia where AM is well-accepted and mandated by law; in Canada, it will be a challenge to legislate AM protocols in the short term, to develop AM techniques, or to educate the professionals and the public about AM best practices. See Appendix A for a list of AM activities in Canada².

However, the high-level application of AM philosophy, strategies and techniques at the national, provincial, regional or municipal level is outside of the scope of this report, but it provides the context for this **Open Forum on Opportunities for Research in Asset Management in Canada** as the research community should address the needs of the AM stakeholders.

The representatives of the Municipal Infrastructure Investment Planning (MIIP) Project invited a number of individual and organizations involved in AM in Canada to participate in this Open Forum to identify these needs (see Appendices B and C for the list of attendees and invitees).

The objectives of the Open Forum were:

- Present an overview of the deliverables of the MIIP project;
- Outline current activities in other AM areas in Canada, and
- Elicit suggestions from the group regarding future research directions for:
 - subsequent phases of MIIP project, and
 - collaborative AM research.

¹ A listing of definitions of terms used in this report is included in Section 3.0.

² Appendix A contains the names of organizations, their related AM projects, listing of relevant documents and a website link to the organization or their AM documents. This appendix provides a context for asset management activities in Canada and elsewhere.

Forty-seven individuals were invited to attend the Open Forum. Thirteen were unavailable or they sent other representatives. In total, 34 individuals attended, from 19 different organizations representing primarily consultants, municipalities, universities and federal departments.

1.1 Open Forum Agenda

The Open Forum started with a brief overview of deliverables of the MIIP project (www.nrc.ca/irc/uir/miip), a summary of activities at the NRC's new Centre for Sustainable Infrastructure Research (CSIR) in Regina (www.nrc.ca/irc/csir), and outlines of the InfraGuide project (www.infraguide.ca), the Technology Roadmap (www.csce.ca/TRM), Infrastructure Canada's Knowledge Outreach and Awareness initiative (www.infrastructure.gc.ca/research-recherche/KOA/AboutKOA_e.shtml) and brief summaries of other related initiatives (see Appendix D for the agenda).

The attendees were then presented with a bubble diagram of related activities in AM research, development and implementation in Canada³. Figure 1 is divided into three major topics: research, policy and practice. The attendees were also asked for names of additional initiatives (and the relative position of each of the initiatives on the bubble diagram); these have already been incorporated in Figure 1. This list of initiatives is not intended to be comprehensive of those outside of Canada and may be missing some smaller Canadian activities in the field.

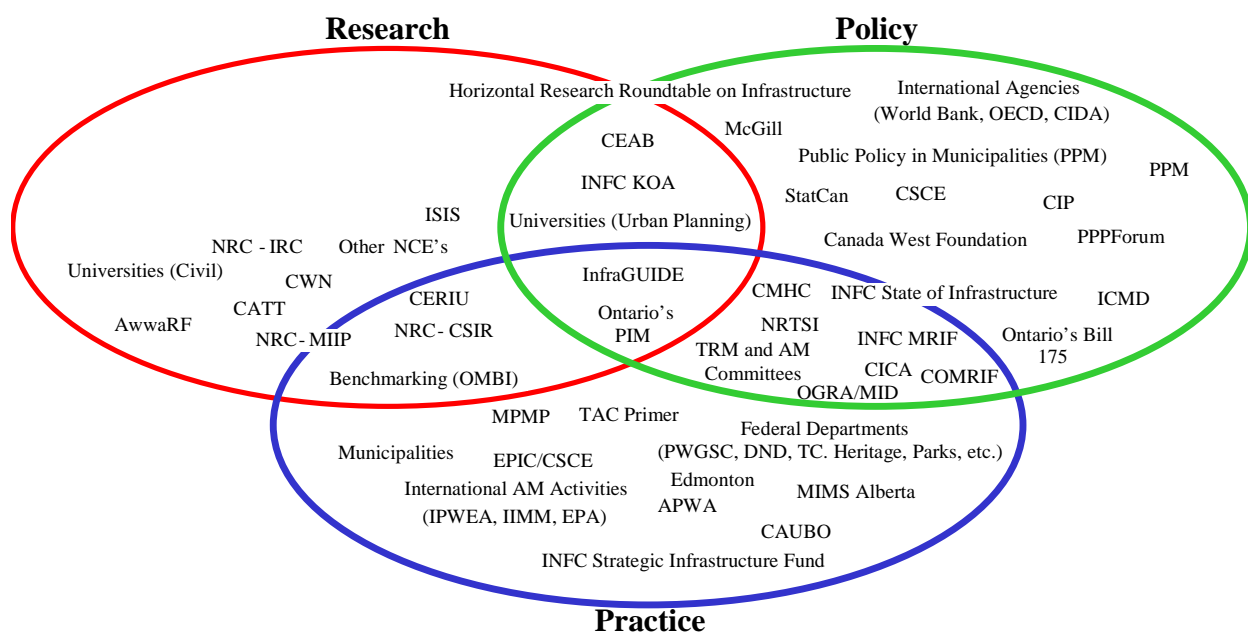


Figure 1: Bubble Diagram of related topics in AM research, development and implementation

³ To conserve space on this figure the details about the initiatives (and the full activity name) are provided in Appendix A.

The participants were then assigned to one of four breakout groups (each with representation from the academic, consultant, municipal and federal sectors) and were tasked with identifying:

- Gaps that exist in the AM domain (and the rank of these gaps);
- Research opportunities that could fill these gaps, and
- Stakeholders involved.

2 Open Forum Results

The cumulative results from the four breakout groups are presented in Appendix E. As there were four breakout groups involved and a variety of participants, it is difficult to assign priority rankings to each of the gaps presented. The ranking provided in Appendix E is based on a subjective evaluation by the authors of this report.

The different breakout groups identified similar gaps that fall into a number of general priorities (in order of importance):

- Communication of technical information to stakeholders;
- Research and knowledge acquisition;
- Education;
- Sustainability, and
- National infrastructure strategy

The gaps, research opportunities and stakeholders are detailed within the following sections.

2.1 Communication of Technical Information to Stakeholders

The communication of asset management was one of two gaps each of the highest priority. This gap included specific items such as infrastructure literacy, public awareness, and professional awareness.

Many of the attendees felt there was a need for the public and for professionals to know more about the general state of infrastructure in Canada. The term “infrastructure literacy” was used to describe the importance of civil infrastructure systems to Canada’s economy; the general state, condition and performance of that infrastructure, and the cost to repair and replace that infrastructure. Awareness of asset management (i.e. tools, techniques, advantages, success stories, best practices, costs, software, etc.) was identified as another shortcoming from both the public’s and professional’s vantage.

Opportunities suggested that would address this gap included activities such as:

- federally sponsored workshop on asset management;
- continued activities by the Technology Road Map (TRM) and associated roundtables, and
- central clearinghouse for information on AM.

The stakeholders identified were InfraGuide, Federation of Canadian Municipalities (FCM), Infrastructure Canada, CSCE, RAIC, CPWA/APWA Canadian Chapters/OPWA, Canadian Association of University Business Officers (CAUBO) and provincial associations of municipal and public engineers.

2.2 Research and Knowledge Acquisition

The second high priority was “Research and Knowledge Acquisition”. A distinction was made in the Open Forum between research and knowledge acquisition: research being the process of creating new knowledge and knowledge acquisition being the discovery of existing knowledge from other sources. Most of the breakout groups identified two general gaps: economic analysis and technical analysis.

Economic analysis gaps were identified as:

- determination of the life cycle costs of assets;
- evaluation and validation of the 2-4% general “rule of thumb” on the annual expenditures for maintenance (as a percentage of current replacement value);
- studies on the social benefits and costs of infrastructure maintenance and construction, and
- equitable prioritization methods and funding models between the various engineering disciplines (roads versus bridges, etc.).

Technical analysis gaps to be addressed were:

- the lack of defined levels of asset service;
- little data on remaining service life;
- few standardized asset assessment and rating methods, and
- the dearth of tools to perform integrated asset management.

Opportunities that exist to fill these gaps include:

- economic benefit/cost analysis research identifying life cycle and social costs of infrastructure intervention;
- development and acceptance of standardized and defined levels of service (municipal benchmarking initiative, rider comfort index);
- research and development of standardized condition assessment protocols for municipal infrastructure;
- objective reviews of AM software, and
- creation of a “toolbox” or repository of standard software methods.

The stakeholders identified included the research organizations such as universities (both civil engineering and urban planning departments), NRC and consultants, and other organizations and projects such as municipalities, InfraGuide, Canadian Water Network (CWN), Centre for the Advancement of Trenchless Technology (CATT), MIIP, AwwaRF, and CSA.

2.3 Education

The next priority identified was the formal education of the new generation of technical staff. The gap identified was the current focus on “design” in conventional education (whether it be civil engineering or urban planning) with very little emphasis placed on “renewal” or life cycle analysis. In fact, very few courses exist in Canada that relate to infrastructure, let alone

infrastructure management at the university, college or technical school levels. The same is true however, of most educational institutions around the world. If any courses do exist at management schools, they are primarily concentrating on business administration or general engineering management and not infrastructure management. In addition, the current curricula are not concentrating on an integrated systemic approach, but are still focused on “silos” of expertise.

Opportunities exist to augment the current curricula with new courses on infrastructure management:

- university degrees in public infrastructure management;
- post graduate degrees in public infrastructure management;
- community college diplomas in infrastructure management;
- joint programs between civil engineering and urban planning departments;
- dedicated conferences and workshops in Canada and abroad focusing on infrastructure management;
- courses and workshops related to the InfraGuide *Best Practices*, and
- courses geared towards developing countries

Stakeholders in the educational sector are the obvious parties to deliver the new courses: universities, community colleges, and technical schools. In addition, other organizations such as the CSCE, RAIC, Canadian International Development Agency (CIDA), International Centre for Municipal Development (ICMD), Canadian Institute of Planners (CIP), Canadian Engineering Accreditation Board (CEAB) and Educational Program Innovations Center (EPIC) also have an interest or can influence the outcomes of this priority.

2.4 Sustainability

The next gap related to sustainability issues. The sustainability gaps included:

- lack of sustainable infrastructure strategies for Canadian municipalities, and
- lack of solid knowledge relating to the environmental impact of rehabilitation.

Opportunities that exist include the wide selection of topics related to “green” agendas, climate change and toxins. The stakeholders that are most interested in sustainability are the municipalities, provincial and federal authorities and research organizations.

2.5 National Infrastructure Strategy

The last, and not necessarily the lowest priority, was the need for a National Infrastructure Strategy. A proposal was made by a number of participants to establish an objective, non-political body such as a *Canadian Council for Infrastructure* reporting at a high level to government (federal and/or provincial). Its mandate would be to ensure that the infrastructure agenda is high on the priorities of politicians, much like education and health care. The stakeholders include Infrastructure Canada and its provincial counterparts, FCM, the “Big City Mayors’ Caucus, CCPE, CSCE, and the Horizontal Research Roundtable on Infrastructure (HRRI).

3 Definitions

The following is a list of definitions for this Open Forum report.

Asset Management (AM) is a business process and decision-support framework that: (1) covers the extended service life of an asset; (2) draws from engineering as well as economics; and (3) considers a diverse range of assets.

Asset Manager is the individual responsible for management for the physical asset for both the tactical and strategic time horizons (+5 years). The asset manger may also be the operations manager (shorter time horizon of 1 to 2 years).

Civil Infrastructure Systems (CIS) are permanently constructed works. Typically CIS includes road and bridge networks, buried utilities, buildings, housing, transmission lines and pipes, and other permanent structures such as dams.

Knowledge Acquisition is the discovery of existing knowledge from other sources.

Municipal Infrastructure includes those assets managed by municipalities. These typically include, but are not restricted to, the following classes of assets: buried utilities, roads, transit systems, bridges, water/sewage treatment plants and parks. Some jurisdictions are responsible for a variety of buildings (i.e. police stations, fire halls, indoor swimming pools, arenas and community centres) but their responsibility could also extend to other types of buildings such as social housing, schools and vehicle maintenance depots.

Research is the process of creating new knowledge.

Stakeholder is an individual or group with an interest in the success of delivering a service or product and maintaining the viability of the product and service.

Technology Transfer is the process of sharing knowledge.

Appendix A: List of AM-related Activities (and Abbreviations)

AASHTO	American Association of State Highway and Transportation Officials < www.aashto.org/aashto/home.nsf/FrontPage > <i>Asset Management Strategic Plan</i>
ANAO	Australian National Audit Office < www.anao.gov.au > <i>Asset Management Handbook and Asset Management Guide</i>
APWA	American Public Works Association < www.apwa.net > Canadian Chapters < www.apwa.net/Chapters/ >
AwwaRF	American Water Works Research Foundation < www.awwarf.org >
Big Six	Canada West Foundation < www.cwf.ca > <i>Drop by Drop: Urban Water Conservation Practices in Western Canada; A Capital Question: Infrastructure in Western Canada's Big Six [Cities]; No time to be Timid: Addressing Infrastructure Deficits in the Western Big Six [Cities]</i>
Bill 175	Sustainable Water and Sewage Systems Act (Bill 175 2002) <i>Province of Ontario Initiative</i> < www.e-laws.gov.on.ca/dblaws/statutes/english/02s29_e.htm >
CATT	Centre for the Advancement of Trenchless Technology < www.civil.uwaterloo.ca/catt >
CAUBO	Canadian Association of University Business Officers < www.caubo.ca > <i>A Point of No Return: Urgent Need for Infrastructure Renewal at Canadian Universities</i>
CCPE	Canadian Council of Professional Engineers < www.ccpe.ca >
CEAB	Canadian Engineering Accreditation Board < www.ccpe.ca/e/ccpe_about.cfm >
CERIU	Centre for Expertise and Research on Infrastructures in Urban Areas < www.ceriu.qc.ca >
CICA	Canadian Institute of Chartered Accountants < www.cica.ca > <i>Accounting for Infrastructure in the Public Sector</i>
CIDA	Canadian International Development Agency < www.acdi-cida.gc.ca >
CIP	Canadian Institute of Planners < www.cip.ca >
CMHC	Canada Mortgage and Housing Corporation < www.cmhc-schl.gc.ca > <i>Achieving Infrastructure Efficiency, Achieving Infrastructure Cost Efficiency/Effectiveness Through Alternative Planning Approaches, Provision of Municipal Infrastructure Through Demand Management: Guidebook and Case Studies</i>
COMRIF	Canada-Ontario Municipal Rural Infrastructure Fund's < www.comrif.ca >
CPWA	Canadian Public Works Association < www.cpwa.net/advocacy.asp >
CSA	Canadian Standards Association < www.csa-international.org >
CSCE	Canadian Society for Civil Engineering < www.csce.ca >
CSIR	Centre for Sustainable Infrastructure Research < irc.nrc-cnrc.gc.ca/csir >
CWN	Canadian Water Network < www.cwn-rce.ca >
DND	Department of National Defence < www.forces.gc.ca >
Edmonton	City of Edmonton < www.edmonton.ca/infrastructure > <i>Infrastructure Strategy: 2002 Update</i>
EPA	Environmental Protection Agency < www.epa.gov/owm/assets_management.htm >
EPIC	Educational Program Innovations Center < www.epic-edu.com >
FCM	Federation of Canadian Municipalities < www.fcm.ca >

FHWA	Federal Highway Administration, US Dept. of Transportation < www.fhwa.dot.gov > <i>Primer on Asset Management, Life-Cycle Cost Analysis Primer; Highway Economic Requirements System; Data Integration Primer; Primer: GASB 34</i>
GASB	Governmental Accounting Standards Board < www.gasb.org > <i>GASB Statement 34</i>
HRRI	Horizontal Research Roundtable on Infrastructure < www.infrastructure.gc.ca/research-recherche/infraresearch/reports/report-e.pdf >
ICMD	International Centre for Municipal Development, Federation of Canadian Municipalities < www.icmd-cidm.ca >
IIMM	International Infrastructure Management Manual < www.ipwea.org.au >
INFC	Infrastructure Canada < www.infrastructurecanada.gc.ca > Strategic Infrastructure Fund; National Infrastructure Canada Program
InfraGuide	National Guide to Sustainable Municipal Infrastructure < www.infraguide.gc.ca > <i>30+ Best Practices</i>
IPWEA	Institute of Public Works Engineering Australia < www.ipwea.org.au > <i>International Infrastructure Management Manual</i>
IRC	Institute for Research in Construction < irc.nrc-cnrc.gc.ca >
ISIS	Intelligent Sensing for Innovative Structures < www.isiscanada.com >
ISO	<i>ISO 156861-1: 2000. Buildings and constructed assets -- Service life planning -- Part 1: General principles, International Organization for Standardization</i>
KOA	Knowledge-building, Outreach and Awareness Program < www.infrastructure.gc.ca/research-recherche/KOA/AboutKOA_e.shtml >
McGill	McGill University < www.regionomics.com/infra/Draft-July03.pdf > Mirza, S. and M. Haider, <i>The State of Infrastructure in Canada: Implications for Infrastructure Planning and Policies</i>
MIIP	Municipal Infrastructure Investment Planning < www.nrc.ca/irc/uir/miip > <i>Survey on Municipal Infrastructure Assets; Primer on Municipal Infrastructure</i>
MIMS	Municipal Infrastructure Management System < www.albertamims.org >
MPMP	Municipal Performance Measurement Program < www.mah.gov.on.ca >
MRIF	Municipal Rural Infrastructure Fund < www.infrastructure.gc.ca >
NCE	Network of Centres of Excellence < www.nce.gc.ca >
NRC	National Research Council < nrc-cnrc.gc.ca >
NRTSI	National Round Table on Sustainable Infrastructure < www.ccpe.ca/e/pub_ceo_mar_05.cfm >
OECD	Organisation for Economic Co-operation and Development < www.oecd.org >
OGRA	Ontario Good Roads Association < www.ogra.org >
OMBI	Ontario Municipal CAO's Benchmarking Initiative < www.caobenchmarking.ca >
OPWA	Ontario Public Works Association < www.opwa.ca/home.asp >
PIM	Ministry of Public Infrastructure Renewal < www.pir.gov.on.ca > <i>Province of Ontario</i>
PPForum	Public Policy Forum < www.ppforum.ca > <i>Public Infrastructure in Canada: Status, Priorities and Planning</i>
PPM	Public Policy in Municipalities < www.ppm-ppm.ca >
PWGSC	Public Works and Government Services Canada < www.pwgsc.gc.ca >
RAIC	Royal Architecture Institute of Canada < www.raic.org >

StatCan	Statistics Canada < www.statcan.ca > <i>Public Infrastructure in Canada: Where do we stand?</i>
TAC	Transportation Association of Canada < www.tac-atc.ca > <i>Primer on Highway Asset Management; Bridge Management Guide</i>
TC	Transport Canada < www.tc.gc.ca > <i>National Highway System Condition and Needs Update</i>
TRM	National Infrastructure Action Plan < www.csce.ca/TRM > <i>The Civil Infrastructure Systems (CIS) Technology Road Map</i>
Victoria	Government of Victoria, Australia < www.doi.vic.gov.au > 1998 -- <i>Facing the Renewal Challenge of aging assets: Victorian Local Government Infrastructure Study</i> ; 2004 -- <i>Sustaining Local Assets: Local Government Asset Management Policy Statement</i>
WIN	Water Infrastructure Network < www.win-water.org > <i>Clean and Safe Water for the 21st Century: A Renewed National Commitment to Water and Wastewater Infrastructure; Water Infrastructure Now: Recommendations for Clean and Safe Water in the 21st Century</i>
World Bank	World Bank < www.worldbank.org >

Appendix B: Attendees

Abdel El Halim	Carleton University
Dave Lau	Carleton University
Ghani Razaqpur	Carleton University
Sabah Alkass	Concordia University
Tarek Zayed	Concordia University
Mahmoud Ahmed	Concordia University
Rob Porter	Infrastructure Canada
Catherine Kim	Infrastructure Canada
Debbie de Grasse	Transport Canada
Rima Raad	Transport Canada
Brian Kyle	Public Works and Government Services Canada
Sylvain Boudreau	InfraGuide
Guy Felio	Infrastructure Canada and NRC
Margaret Hill	Infrastructure Canada
Rowland Taylor	Software Applications
Clark Lawlor	Software Applications
Mark Damm	Consultant
Tom Dawe	Consultant
Dave Hubble	NRC – IRC - CSIR
Mahmoud Halfawy	NRC – IRC - CSIR
Darryl Dartmouth	NRC – IRC - CSIR
Solomon Tesfamariam	NRC - IRC
Dana Vanier	NRC - IRC, MIIP member
Linda Newton	NRC - IRC, MIIP member
Kelly Martin	City of Ottawa, MIIP member
Lisa Headley	DND, MIIP member
Alfred Ho	Region of Durham, MIIP member
Geoff Linschoten	Region of Halton, MIIP member
Ray Marshall	Region of Halton, MIIP member
Sam Sidawi	Region of Niagara, MIIP member
Theresa Cloake	City of Edmonton, MIIP member
Steve Wyton	City of Calgary, MIIP member
Dave Dyer	City of Prince George, MIIP member
David Calam	City of Regina, MIIP member

Appendix C: Additional Invitees

(These individuals sent their regrets, or sent or suggested another individual to attend)

Saeed Mirza	McGill University
Osama Moselhi	Concordia University
Mark Knight	CATT, University of Waterloo
Reg Andres	Consultant
Leo Gohier	Consultant
Wally Wells	Consultant
Luc Begin	Consultant
Casey Vander Ploeg	Canada West Foundation
Marie Lemay	Canadian Council of Professional Engineers
Michel Langelier	Canadian Society of Civil Engineering
Jacques Taky	Director Realty Asset Plans (DRAP), DND
Betty Mathews-Malone	County of Haliburton
Gerry Davis	City of Hamilton
Jan-Mark Gustafson	City of Saskatoon

Appendix D: Agenda

NRC, 1PM – 4:30PM, Friday, May 13, 2005

Room 114, Building M-20, 1200 Montreal Road, Ottawa

1 PM

Presentations

- MIIP Project
- Centre for Sustainable Infrastructure Research (CSIR NRC)
- InfraGuide Best Practices
- Technology Roadmap (TRM)
- City of Edmonton Infrastructure Strategy 2004
- Infrastructure Canada's Knowledge-building, Outreach and Awareness (KOA) program
- US EPA meeting on Asset Management in Water/Wastewater Utilities

3 PM

- Four Breakout Groups (Number of groups – dependent on number of attendees)
- 40-minute breakout discussion of gaps in research in asset management in Canada and prioritization of these research gaps.

First (30 minutes)	Second (5 min.)	(5 min)
Research GAP Identification	Stakeholders	Priority
<i>Examples</i>	<i>Examples</i>	<i>1</i>
Deterioration Curves	Citizens	2
Social impact of Infrastructure	Utilities, municipalities	3
Climate Change	Prov., Fed. Government
Recapitalization Ratios	Consulting Engineers
Age of Canadian Infrastructure	Municipalities
National Benchmarks	Municipalities

3:45 PM Discussion of Potential Research Agenda

First (10 minutes)	Second (5 min.)	(5 min)
<i>Potential Research Agenda</i>	<i>Responsibility</i>	<i>Priority</i>
Classification systems	Municipalities	1
Maintenance level guidelines	Universities	2
State of Infrastructure in Canada	Industry Canada, NRC, provincial government dept.	3

4 PM Group Presentations to Open Forum

Appendix E: Breakout Session Summary Table

Gap – What is the opportunity?	Agenda – How can it be addressed? Priority: * low, ** med, *** high	Stakeholders What association/group is involved?
<i>Communication of technical information to stakeholders ***</i>		
Infrastructure literacy	Federal workshop Applying current research/technology (e.g. TRM, roundtable, etc) Information hub National or international library or network	InfraGuide FCM Infrastructure Canada (INFC)
Public awareness about state of infrastructure	Proactive outreach	FCM InfraGuide INFC
Professional awareness	Foster collaborative environment	CSCE CIP RAIC CPWA/APWA provincial and regional chapters Canadian Association of University Business Officers (CAUBO) Provincial associations of municipal and public works engineers Universities (curriculum)
National infrastructure strategy	Establish Canadian Council for Infrastructure	INFC and provincial counterparts FCM – Big City Mayors' Caucus National and provincial associations of municipal and public works engineers CSCE (TRM) Horizontal Research Roundtable on Infrastructure (HRRI)

Gap – What is the opportunity?	Agenda – How can it be addressed? Priority: * low, ** med, *** high	Stakeholders What association/group is involved?
<i>Research and Knowledge Acquisition (Economic analysis) ***</i>		
Life cycle costs	Practical cost/benefit analysis research	Universities (research) Municipalities MIIP Consultants
Evaluation and validation of existing practice (e.g. 2 – 4 % for M&R rule)	How does O&M spending affect long-term health of facilities?	
Social benefits and costs		
Practical allocation of \$ across asset classes (LCC, social costs, environmental, risk)	Applications to large municipalities and small to mid-sized municipalities	
<i>Research and Knowledge Acquisition (Technical analysis) ***</i>		
Defining levels of service	Standardized levels of service Municipal services provided (e.g. garbage collection, Recycling, snow plowing, etc) Benchmarking/performance levels (e.g. boil water advisories, breaks per km, rider comfort index (RCI), etc).	Municipalities Universities (research) Research organizations (e.g. CATT, Canadian Water Network, AWWARF, etc) OMBI Consultants
Standard condition assessment and rating systems	Roads, bridges, buildings, sewers, water mains, treatment plants & other municipal assets	Universities (research) IRC – CCMC, MIIP, research programs CSA Consultants
Integrated assessment	Rollup tools for decision makers	Municipalities Research organizations Universities (research) MIIP Consultants
Framework support & harmonization	Data standards Dictionary of uniform terms “Toolbox” for software methods & review of software	InfraGuide MIIP Universities (research) CSA
Integrated asset management framework		MIIP InfraGuide Universities (research)

Gap – What is the opportunity?	Agenda – How can it be addressed? Priority: * low, ** med, *** high	Stakeholders What association/group is involved?
<i>Sustainability **</i>		
Sustainable infrastructure strategy for municipalities		FCM InfraGuide MIIP Universities (research) HRRI
Environmental impact of rehabilitation	Toxins Climate change “Green” agenda	Universities NRC
<i>Education **</i>		
Education/raise level of expertise	University programs, courses Research Construction management Urban planning Integrated programs Dedicated conferences Export of expertise (CIDA, OECD)	Universities (curriculum) CIDA CSCE CIP RAIC CEAB
Change paradigm – teaching “design for renewal”		
Multidisciplinary		

Appendix F: Original Invitation

April 14, 2005

The Municipal Infrastructure Investment Planning project (www.nrc.ca/irc/uir/miip) is having their annual meeting in Ottawa at NRC on 12/13 May 2005.

The partners in this consortium have suggested that the MIIP project team invite others interested in "**Opportunities for Research in Asset Management in Canada**" to an open forum discussion.

The objectives of the open forum are **to present an overview of the deliverables of the MIIP project and to elicit suggestions from the group regarding future research** directions for subsequent phases of the MIIP project, and for collaborative asset management research.

Unfortunately, the MIIP project does **not have the resources to cover travel expenses**. However, if you feel that you would benefit from the participation in this open forum discussion and could contribute to the research direction in this important field of research, your participation would be warmly welcomed.

The open forum discussion on "Opportunities for Research in Asset Management in Canada" will take place on Friday, 13 May from 1300 to 1600 hours at the Institute for Research in Construction (Building M20) at 1200 Montreal Road, Ottawa.

The following individuals have been contacted to attend the open forum, or will be attending the MIIP meeting.

If you have suggestions for others who could, or should attend, these names would be appreciated.

I would ask you kindly **to reply your intentions** of attending (or comments about the open forum), **as soon as possible** to assist us in the organization of this event.

Dana Vanier (613) 993-9699

Name	Affiliation
Mark Damm	Engineering Consultant
Reg Andres	Engineering Consultant
Tom Dawe	Public Sector Digest
Leo Gohier	Engineering Consultant
Wally Wells	Engineering Consultant
Guy Felio	NRC and Infrastructure Canada
Margaret Hill	Infrastructure Canada
Tony Varriano	Infrastructure Canada
Brian Kyle	Public Works and Government Services Canada
Jacques Taky	Director Realty Asset Plans (DRAP), DND
Casey Vander Ploeg	Canada West Foundation
Abdel El Halim	Department of Civil Engineering, Carleton University
Mark Knight	CATT, University of Waterloo

Saeed Mirza	McGill University
Osama Moselhi	Concordia University
Marie Lemay	Canadian Council of Professional Engineers
Michel Langelier	Canadian Society of Civil Engineering
Nancy Schepers	National Guide to Sustainable Municipal Infrastructure
Sylvain Boudreau	National Guide to Sustainable Municipal Infrastructure
Betty Mathews-Malone	County of Haliburton
Jan-Mark Gustafson	City of Saskatoon
David Hubble	NRC, Centre for Sustainable Infrastructure Research
Mahmoud Halfawy	NRC, Centre for Sustainable Infrastructure Research
Sam Sidawi	Region of Niagara, MIIP member
Geoff Linschoten	Region of Halton, MIIP member
Alfred Ho	Region of Durham, MIIP member
Steve Wyton	City of Calgary, MIIP member
Theresa Cloake	City of Edmonton, MIIP member
Gerry Davis	City of Hamilton, MIIP member
Kelly Martin	City of Ottawa, MIIP member
Dave Dyer	City of Prince George, MIIP member
David Calam	City of Regina, MIIP member
Rima Ammouri	Department of National Defence, MIIP member
Dana Vanier	NRC, MIIP project manager
Linda Newton	NRC, MIIP researcher