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Summary of MIIP and related GIS research

Vanier, D.J.

IRC-ORAL-693

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What is Public Infrastructure Management? What is Asset Management? Why GIS?

ESRI Regional User Conference
20 September, 2005

[Dana J. Vanier, Ph.D.](#)

Urban Infrastructure
National Research Council Canada– Institute for Research in Construction






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- Summary

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Definitions PIM

- Public Infrastructure Management
 - The Canadian Oxford Dictionary defines "infrastructure"
 - "basic structural foundation of a society ... roads, bridges, sewers, etc. regarded as a country's economic foundation"
 - Many organizations (CSCE) are also using the term "civil infrastructure systems" to describe "infrastructure".
 - This includes:
 - Dams, transmission towers, gas pipelines,
 - Bridges, roads, buried utilities, electrical, fleet, hospitals and sports facilities, parks and recreational facilities, wetlands.
 - Municipal infrastructure is a subset (20%)

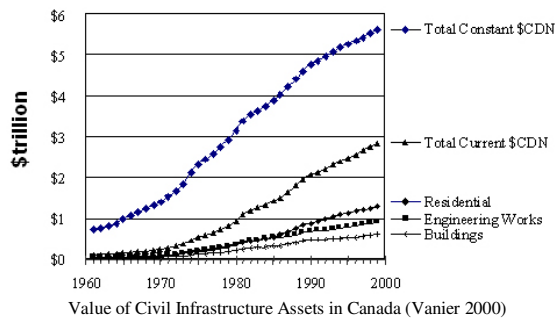
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Civil Infrastructure Systems

- Much of this CIS is publicly owned in Canada
 - Federal (National Defence, Public Works, Parks Canada, Solicitor General)
 - Provincial (Highways, provincial parks, detention centres)
 - Regional (municipal regions, tourist regions, Ontario, BC, GVRD)
 - Municipal (cities, towns, villages)
 - Utilities (EPCOR – Edmonton, Public Utilities)

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Amount and Age of all Infrastructure



Public Infrastructure Management

- Public Infrastructure is:
 - becoming increasingly complex
 - currently silos
 - multi-faceted
 - interdependent
 - integrated
 - more sophisticated
 - more accountability requirement from public
- New tools available (IT, DSS, GIS, new data)
- Need management tools
 - Asset Management

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What is Asset Management?

- Asset management 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.
- Look in “Primer” for examples of research and development around the world in AM.
 - irc.nrc-cnrc.gc.ca/uir/miip/docs/primer.pdf
- Two new AM initiatives in Canada:
 - InfraGUIDE – www.infraguide.ca – 55 “Best Practices”
 - MIIP – www.nrc.ca/irc/uir/miip

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MIIP Overview

- Municipal Infrastructure Investment Planning
- MIIP project outline (www.nrc.ca/irc/uir/miip)
- 3 Year project started in June 2002
- To finish in Mar 2006
- Approximately \$ 1.5 million (in-cash, in-kind)
- 10 Partners
 - Calgary, Edmonton, Hamilton, Ottawa, Prince George, Regina
 - Regional municipalities of Durham, Halton and Niagara
 - National Defence and NRC

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MIIP Overview

- Deliverables - www.nrc.ca/irc/uir/miip/
 - Survey on AM
 - Primer on AM
 - GIS for municipalities
 - Social costs of intervention
 - Condition assessment of buried utilities
 - Open Forum on AM Research Opportunities
 - State of Canadian buried utilities (Oct 05)
 - Framework for Municipal Infrastructure Management (Dec 05)

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MIIP - GIS for Municipalities

□ Part 1: GIS as an Integrated Decision - Support Tool for Municipal Infrastructure Asset Management

- Global Positioning System (GPS)
- Personal Digital Assistant (PDA) / Mobile computing
- Automated Vehicle Location (AVL)
- Road Weather Information Systems (RWIS)
- Remote Sensing

□ Research Literature

- Surveys on GIS Usage
- Data Conversion Issues
- Domain-Specific Applications
- Advanced Implementations Systems Integration
- irc.nrc-cnrc.gc.ca/uir/miip/docs/B5123-4.pdf

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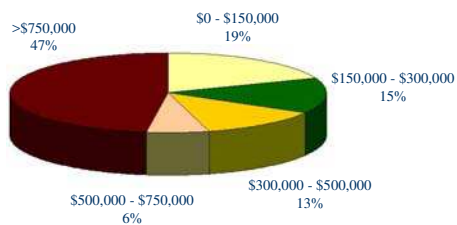
MIIP - GIS Report

□ Part 2: Interoperability of Geographic Information Systems for Municipal Asset Management

- GIS Technology in Municipal Asset Management
- Role of GIS in Municipal Asset Management Systems
- Recent Developments in GIS Data Collection, Access, and Modeling for Municipal Asset Management
- Data Requirements of Municipal Asset Management Systems
- Need for Interoperability and Spatial Data Standards
- Spatial Data Standards for GIS Interoperability

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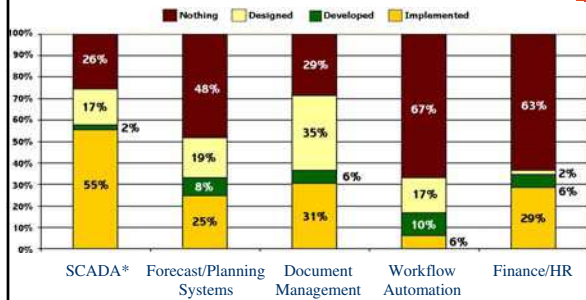
Utility Expenditures on GIS (GITA 2002)



These numbers correspond with responses received from MIIP Canadian survey

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Implementation Levels (GITA 2002)



* Supervisory Control And Data Acquisition

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MIIP – Review of Data Models

- Overall Construction Classification System (OMNIClass)
- XML (Extensible Markup Language)
- LandXML
- ISO 15926-2: Integration of life-cycle data for oil and gas production facilities
- Utilities Data Content Standard
- ESRI: Utility Data Model
- MIDS: Municipal Infrastructure Data Standard (Ontario)
- SDSFIE: Spatial Data Standard for Facilities, Infrastructure and Environment (Corps of Engineers)
- Build on Existing Models

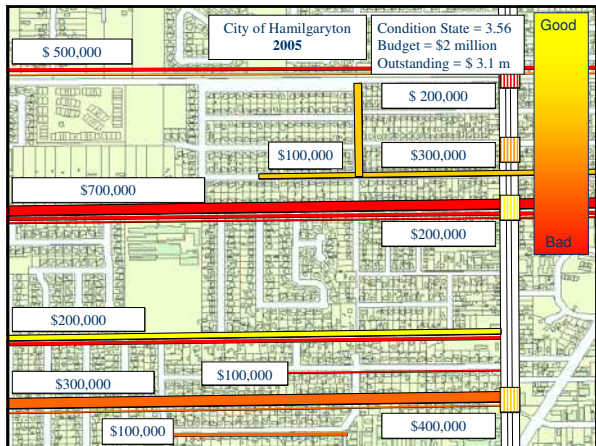
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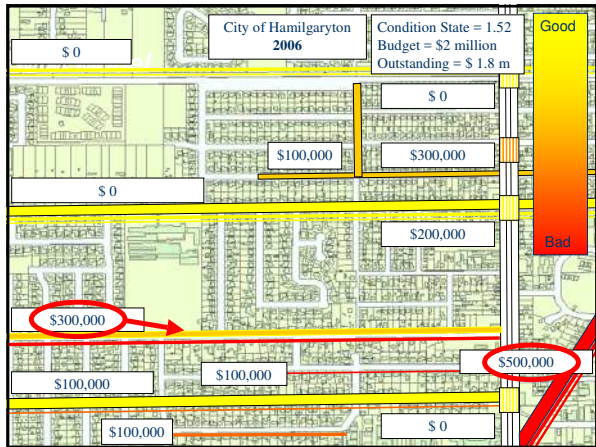
Six “Whats” of asset management

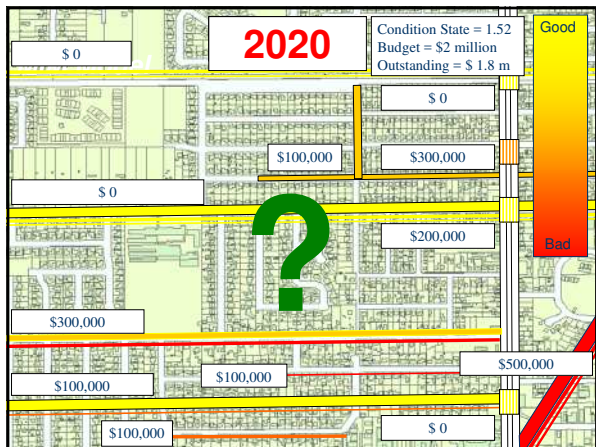
- What do you own? *Inventory System*
- What is it worth? *Financial Information System*
- What is deferred? *Computer. Maint. Mgmt. System (CMMS)*
- What is the condition? *Inspection System??*
- What is the remaining service life? *S.L. Tables??*
- What do you fix first? *Decision Support Systems (DSS)??*

There is a need for data models for infrastructure

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Decision Support System

- **Developing DSS**
 - *Multi-objective Optimization*
 - *Multi-attribute Decision Making*
 - *Condition Assessment*
 - *Service Life Prediction*
 - *Life Cycle Costs*
 - *Maintenance Prioritization*
- **National GIS Database (collect deterioration data)**
- **Standardized Data Models for Infrastructure**

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Summary

- **Definitions**
- **MIIP Project**
- **6 “Whats” of Asset Management**
- **GIS Opportunities**
- **Data Model for Sewer Infrastructure**
- **Decision Support System**

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