Municipal Risk Assessment Tool

ICLR, Basement Flooding Symposium

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Director, Research
Introduction

- Risk is changing….
- Both insurers and municipalities, need for tools to better understand risk
- Genesis of MRAT, PIEVC Vulnerability Assessment protocol
Introduction

- Past losses no longer reliable risk indicator
- PIEVC – Bottom-up approach
- MRAT- Top down
  - Based on limited number of validated risk indicators
What is Municipal Storm and Sanitary Infrastructure Risk Assessment Tool?

- Tool to quantify failure risk of municipal water infrastructure systems resulting in insurable losses for both current and future risk.
- Based on a 20 variable risk formula
- Top down approach
MRAT proponents

- IBC on behalf of P&C insurance industry is funding with assistance from NRCAN
- Expertise coming from Dillon
  - Multidisciplinary team of climatologists, engineers, risk managers, hydrologists
  - Supported by GIS and data treatment of TESERA
Governance Development

- Technical Working Group
  - Insurance industry senior executives
  - David Lapp
  - Slobodan Simonovic UWO

- Scientific Oversight Committee
  - Slobodan Simonovic
  - Alain Bourque Ouranos
  - Joann Klaassen Environment Canada
Database and Web Portal development will require user’s support.

Users working groups:
- Municipal
- Industry
Phase 1 (completed)
- Proof of concept
- Worked closely with Hamilton, Winnipeg, Fredericton
- Need claims data from both municipality & insurance industry for calibration purposes
- Concept works!
Phase 2

- Test/calibrate 17 municipalities in 4 regions
  - Atlantic
  - Central
  - Prairies
  - Pacific
- Build database & web portal
- Determine governance & funding
Phase 3

- Implementation

- Many issues not resolved but being considered:
  - Governance & funding
  - Communications
  - Implementation rate
What is Risk?

Sound objective methodology to understand risk:

\[ \text{Risk} = \text{probability} \times \text{vulnerability} \times \text{exposure} \]

- Climatic
- Operational
- Infrastructure variables
- Hydrology
Spatial Unit

- DRUID (Distinctive Risk Unit Indicator)
- Approx. 10 houses in urban setting
Vulnerability Indicators

- Vulnerability index
- Conditions that reflects the sensitivity to a climatic event
  - Hydraulic slope
  - Land use
  - Parcel count
Combined Sewer Density
Exposure Indicators

- Exposure index
- Conditions that influence the severity of a climatic event
  - Land use
  - Terrain
  - Proximity to water
Exposure: Soil Permeability
Mitigation Indicators

- Mitigation index
- Conditions which can reduce impact of exposure and vulnerability to a climatic event
  - Operation & maintenance
  - Emergency planning
  - Level of service
Climatic Variables

- Key element, real return periods
- What is the probability of an event
  - Current updated IDF curves
  - Future, future IDF curves derived from downscaled climatic information
Overall Risk Index

- Risk formula has over 20 calibrated variables
- Accuracy at about 80% based on municipal claims data, 94% based on detailed hydrologic modeling
- Still need to calibrate with longitudinal insurance claims data
- We will have a calibration algorithm
Need for Regional IDF Curves

- Point IDF have limits
- Too many weather observation stations with long-term weather data have been closed
- Need is there!
Updated IDF Curve: Hamilton

Intensity, mm/hr

Duration, min

Change (%) of calculated IDF curves relative to EC IDF curves:

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New Reality

- IDF = smoking gun!
- Our climate is changing!
- 1 in 100 is now 1 in 20-25
- Notwithstanding deferred maintenance the issue in light of our changing climate we need to review the design/performance criteria
Tool Capability

- Current risk
- Does not tell you how to resolve the risk but shows the areas at risk and at what level
- Future risk
- Everything else being equal if only IDF changes what is risk 2020-2050 horizons
Tool Output

- Through a web portal
- GIS risk map per municipality
- Working section which will allow municipalities to see impact of projects on risk
Collaborative Approach

- Problem climatic & technical
- Win/Win
- Public interest
- Create conditions to promote adaptation
  - Price signals/fairness in pricing
  - Home owner contribution
  - Incentives
  - Avoids mal-adaptation
Individual property risk can be mitigated

Industry cannot develop individual risk without objective understanding of infrastructure risk.

Potential approaches; premium, limits of coverage, combination
Benefits to Municipalities

- Availability of insurance
- Assist in calculation of cost/benefits
- Additional decision-making tool
- Updated rainfall climatic information
- Info on impact of future climate
- Help prioritize infrastructure investments
Where are we?

- Initiating phase 2
- Looking for municipalities to participate
- Launch planned for 2012
Map is a simulation only. It is not reflective of actual risk.
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Municipality “A” Low Rain Scenario, 2050

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GIS Database Model

- Principles
  - Detailed infrastructure data provided by municipalities
  - Municipalities can make real time modifications to the risk profile of each DRUID
  - Updated future climate models and IDF information provided by MRAT
- 2 interfaces
  - Municipal users
  - Industry users
Questions?

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