MORRISON HERSHFIELD



WEATHER EXTREMES

Prepare to Improve Your Transit System's Resiliency <u>Pg.1</u>

Managing Risk With Information

Information Based Asset Management Practices <u>Pg.5</u>

TRANSIT*ional* TIMES

Upcoming Events for our Transit Team Pg.9

WEATHER EXTREMES

Improving Your Transit System's Resiliency

Resiliency can be defined in many ways, but at its core it means being better prepared for, and better able to recover from adverse events such as extreme weather or other disasters. For transit agencies, readiness for emergency situations is important, but now, more than ever, effective resilience to climate change and extreme weather events is essential; to protect current and future infrastructure investments, and maintain safe operational capabilities. Identified, are some of the potential risks stemming from extreme weather and a resiliency checklist to assist you with the assessment of these risks and the development of potential mitigation strategies.

RISK SCENARIOS

While each area of the country is different in terms of expected climate change variables, scientists are aligned in their assessment that over time weather events will become much more impactful in terms of their frequency, duration and intensity. As a result, these extreme weather events and natural disasters will threaten the operations and the capital assets of transit systems nationwide.

It is safe to say that in 2019, a number of transit systems across Canada will be severely impacted by changing weather events. Will yours be one of those impacted?

Conducting an assessment of the resilience of both your operations and capital assets against a number of climate change variables, considering your geographic location and climate projection data, is prudent to understanding the potential vulnerabilities of your transit system. Each system must be assessed against risks posed by the following Initial Climate Change Variables and how these are expected to change over time:

- Average and Extreme Temperature
- Average and Extreme Rainfall
- Total Annual and Extreme Snowfall
- Freeze/ Thaw Cycles
- Freezing Rain
- Wind

The combined effects of these variables must also be taken into consideration when assessing likely impacts, such as the possible effects of extreme rain on top of snow events, freezing rain plus wind, and drought followed by extreme rainfall.

TRANSIT SYSTEM VULNERABILITY

Determining exactly where and what operations/ elements of your system are most vulnerable is integral to improving your system's resiliency.

To determine vulnerability, a formal climate change vulnerability and resiliency assessment process should be undertaken. The process would consider the following factors:

- Geographic Location
- Historic Climate Patterns
- Operations Mapping
- Physical Infrastructure Components of the Transit System
- Climate Factors to be assessed
- Climate Projections for the factors listed above
- Infrastructure Design Standards/ Guidelines
- Operating Standards/ Performance Goals

The output of this exercise will provide data allowing you to perform an initial risk assessment for each operation or component of your transit system. The risk assessment will identify the hazards, assess the probability and severity of weather-related events, and allow a determination and categorization of risk levels.

ASSESSING YOUR RESILIENCY

Recognizing the various ways transit systems are organized in Canada, (stand-alone agencies vs. municipal based systems) the assessment of agency resilience needs to include a broad array of stakeholders both internal and external to the agency. An integrated approach assessing a number of program areas across the entire organization produces the best result. Program areas would include;

- System Policy Development
- Transportation / Transit Planning
- Project Development and Standards
- Operations & Maintenance
- System Safety Management (Emergency Planning)



TRANSIT SYSTEM RESILIENCY CHECKLIST

Assessing both day-to-day operations and capital assets can begin with some simple questions.

While not an exhaustive list, your answers to the following questions will provide you with an understanding of your agency's resiliency.

System Policy Development

- Are all groups within our organization aligned through policies that set out our approach to achieving resiliency/ emergency management?
- Do we understand our interdependencies (internal/ external) and the plans we/they have in place for levels of service before, during and after extreme events?
- Has our agency engaged in provincial, regional, municipal resiliency efforts? Is a policy in place to guide this effort?
- An agency is intricately linked with, and dependent on the infrastructure of the Province, Region, Municipality and private entities such as roads, bridges, tunnels, railroads, water, sewer, electric, gasoline, diesel, natural gas, satellite cable, radio, internet and communications systems.
- Do we have a policy/ process which defines roles and responsibilities for these external parties?

System Planning

We advise having a joint transportation/ transit planning process in-place between the Region/ Municipality/ Transit Agency that addresses:

- The establishment of City-wide transit/ transportation priorities during and after extreme events?
- Does transit have priority in most corridors, or should they?

 How do we address the changing demand for service (increases/ decreases) during and after emergency events, and how do we monitor performance?

Project Development & Planning

- Is a process in place to understand Federal/ Provincial/ Municipal guidelines and standards for climate change adaptation to new projects?
- Is each new infrastructure project, including retrofits to existing assets, vetted through a formal climate change vulnerability and resiliency assessment?
- Are smaller 'operating' projects included in a vetting analysis, as above?

Operations & Maintenance

- Have disaster operations plans been drafted and communicated which implement a crisis management center and management hierarchy to respond to climate events?
- Have formal processes been adopted for on-going weather monitoring and communications on a 24/7, 365 basis? Have response statuses been devised with attendant management and call-out lists?
- Have we met with Unions and Staff Representatives to address expected issues prior to dealing with major storm events? Is subordination of collective agreements required/ agreed during a declared emergency?
- Have redundancies for service-critical functions been addressed in the event of loss (i.e. vehicle fueling, vehicle storage, radio communications, etc.)?
- Have we established a secondary list of suppliers as redundancy against the loss of access to a main supplier (fuel, parts, consumables, rental agencies.)?
- Have we access to a supply of alternate fleets – i.e., school buses?

- Have we provisioned for alternate storage and maintenance facilities (MSF) for revenue fleets, including fueling, in the event of a loss of our own MSF.
- Can we reasonably deal with demand for special requests evacuation support, fire buses, transport of staff, etc.?
- Will we operate all our services or ration them to preserve resources. Is this policy acceptable by customers and elected officials?
- How will we communicate with employees that are away from work during a crisis? How will we deal with employees expected to deliver services over longer periods of time?
- Have we designed and operated alternate service routes in event of loss due to flooding/ snow?
- How will we communicate with customers, stakeholders and suppliers before, during and after a storm event?
- Have asset management plans been updated to account for changing weather patterns?

System Safety Management (Emergency Planning)

- Have agency Safety Management Plans been updated with climate adaptation protocols?
- Has the agency Emergency Management Plans (EMP) been updated and the information shared with all relevant stakeholders?
- Have joint EMP plans been developed between Region/ Municipality/ Transit Agency?
- Are agency employees familiar with their roles and responsibilities during emergencies?

Your answers to the above questions should provide you with a very quick understanding of your agency's resilience, and its ability to plan, manage and recover from extreme climate events. If gaps have been identified, the time is now to begin the process of mitigation by defining next steps across your agency.

ABOUT THE AUTHOR

Jim Teeple is the Practice Lead for Morrison Hershfield's Transit Operations & Maintenance Advisory service. He is the former Deputy Chief Operating Officer of the Toronto Transit Commission, the 3rd largest transit agency in North America by ridership.

Your comments or enquiries relating to this article may be directed to Jim via email at: <u>jteeple@morrisonhershfield.com.</u>



MANAGING RISK WITH INFORMATION

Why Our Industry Has Been Slow To Adopt Information Based Asset Management Practices

Assessing the resiliency of your transit systems requires comprehensive information about those systems. Whether it is Building Information Models (BIM) for facilities or Geospatial Information Systems (GIS) for horizontal infrastructure, information has become integral to the operation and management of capital assets in the digital age.

A LOCAL DEL COLLEGE

The information that is needed to manage the risks of climate change and extreme weather events includes geographic and spatial location, performance characteristics, product and material specifications, condition, and maintenance history. This information often exists in disparate formats and in many different locations. Collating information ad hoc can be time-consuming, difficult and expensive.

Computerized Maintenance Management Systems (CMMS) and Enterprise Asset Management (EAM) systems can be used to manage this information, but the adoption of information-based asset management practices is necessary to realize the inherent value in the data. Industry has been slow to adopt these practices due to several factors we will discuss here.

Lack of Best Practice and Guidelines

While the connections between BIM, GIS and asset management are becoming more widely understood, they are still not clearly defined and are further complicated by the differences in maintenance requirements for each type of asset. There is no one-size-fits-all solution, and the lack of best practices or industry guidelines makes it difficult to establish the requirements for these kinds of information systems.

The Construction Industry Does Not Understand Operations and Maintenance

One of the barriers to establishing informationbased asset management practices has been a lack of useful information produced by the construction industry. Indeed, design consultants and contractors do not really understand what information is needed for operations and maintenance or how it will be used. This leaves the owner or facility manager to gather the information after the systems are already in use, at their cost. It is up to owners to put requirements in place, based on downstream procedures, with onus on operations and maintenance consultants and contractors to inform owners what is required.

Information Uses and Requirements Are Not Well-Defined

Understanding how information is going to be used is critical to establishing how the information needs to be organized for it to be useful.

At each stage of a project, information must be fit for purpose. The accuracy, precision and level of detail for spatial information as well as parametric attributes need to be suitable for future consumption. With the pace at which technology is moving, the tendency is to add spurious requirements that increase the cost of collecting information.

Because of the unique aspects of different systems, the diverse requirements of owners, operators and managers throughout the industry makes it difficult to establish common information requirements beyond a few simple use cases such as space management, preventative maintenance scheduling or inventory control. Designers and contractors would benefit from a better understanding of how the information they produce is going to be used for operations and maintenance activities.

Data Can Be Lost Due To Interoperability and Translation

Information is often being produced by consultants and contractors with very different needs from the owner, operator or manager and the software they use can have a significant impact on the usability of information later in the asset lifecycle. Designers, for example, need to be able to quickly iterate design concepts and update contract documents. Design software is not well-suited for managing data that have little bearing on form, function, or constructability.

Translating between different software needs to be carefully planned in order to assure the required information makes it into the final product intact.

Data formats and software are constantly changing. It is unreasonable to assume that the information being produced right now will still be valuable in ten years. Information that wasn't very useful due to technology limitations ten years ago, such as high-density laser scans, is now being used on a wide variety of projects. Consultants and contractors are now finding new and innovative ways to use the information that couldn't be predicted at the time.

Information Quality Issues

After overcoming the challenge of identifying requirements for an enterprise asset information system, the quality of the data being incorporated into the database will affect the usability of the system. Information quality issues can limit the reliability of the reports and analyses derived from the data.

Information can be lost when translating from one software format to another or small errors can be introduced, particularly when transcribing from drawings and entering manually into an EAM database. Asset management information is typically introduced as near the end of the construction process as possible, often during the commissioning stage, using procedural methods and minimal oversight. This information is not subject to the same level of scrutiny as design or construction information, and mistakes are not as likely to be caught. Changes to design information may not be identified during construction which can lead to discrepancies between the recorded information, and actual conditions on site.

Procedures to enforce quality and responsibility for ensuring the information is included in project records, particularly when many consultants and contractors are responsible for producing that information, has proven to be very challenging. 6

How do you get the information you need to assess risks of climate change and extreme weather events?

Despite the challenges we just described, the good news is that there has been a lot of progress made in recent years, and there is a substantial amount of literature available discussing the solutions to these problems. In order to ensure your organization is prepared, you can ask the following questions:

- Who are the information managers in your organization?
- Do you have clearly-defined information requirements for assessment, operations and maintenance?
- Are information requirements included in contracts with consultants and contractors?
- Do your information managers engage with consultants' and contractors' counterparts to clarify and assess information requirements on projects?
- Do you have visibility into your projects through a common data environment to review samples of the information being produced prior to receiving final deliverables?
- Do you review 3D models and information requirements during regular project meetings?
- Do you have Data Certification procedures in place to ensure the quality of information being used on projects?

While climate change represents a potentially costly and looming threat to transit systems, the risk can be reduced by having the right information about those systems, today.

ABOUT THE AUTHOR

John Dutz is a BIM/CAD Manager and Senior Land Development Tech.

Your comments or enquiries relating to this article may be directed to John via email at: <u>jdutz@morrisonhershfield.com</u>





Look For Our Team at an Upcoming Event Near You

MAR 8

EVENTS

WOMEN IN TRANSPORTATION -WOMEN'S DAY BREAKFAST

Toronto, ON

Our COO Catherine Karakatsanis is honoured to be part of the distinguished IWD guest speaker panel.

Event Details

TORONTO RAILWAY CLUB -BUSINESS LUNCHEON WITH CORINA MOORE

Toronto, ON

MAR 22

Join individuals from our Transit Team at this important presentaton and networking event.

Event Details

MAR 31

CEA TRANSPORTATION CONFERENCE

Red Deer, AB

Vivian Yu and Rebecca Stanzeleit from our Transit Design Group will be presenting on "Building Responsive Transit Infrastructure in the Face of Uncertainty".

Event Details



URBAN TRANSIT INFRASTRUCTURE - EAST

Toronto, ON

Come meet our Transit Group at this conference and networking event and find out more about what we are up to in the East.

Event Details

MAY 3

TORONTO RAILWAY CLUB-BUSINESS LUNCHEON

Toronto, ON

Join individuals from our Transit Team at this important networking event.

Event Details

URBAN TRANSIT INFRASTRUCTURE - WEST

Vancouver, BC

Come meet our Transit Group at this conference and networking event and find out more about what we are up to in the West.

Event Details



APR 30

MAY 8





WWW.MORRISONHERSHFIELD.COM/TRANSIT