Municipal Pavement Management in Canada: A Comparative Overview of Monitoring and Decision-making Approaches

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Paper prepared for the session AM - Innovative Technologies in Asset Management
2026 Transportation Association of Canada (TAC) Conference & Exhibition
Winnipeg, Manitoba

Acknowledgements

The authors gratefully acknowledge the municipalities that participated in the survey and provided valuable insights into pavement management practices.

Abstract

Municipal pavement networks are essential components of public infrastructure that require systematic monitoring and informed decision-making to sustain their performance under constrained resources. This study presents a comparative overview of pavement management practices among various municipalities, with emphasis on pavement types, condition assessment indices, condition data collection methods, data processing and analysis techniques, Pavement Management System (PMS) adoption, and the use of data in budgeting processes. Based on a structured survey, the results indicate that asphalt pavement is consistently utilized across all municipalities, while the distribution of other pavement types varies. The Pavement Condition Index (PCI) is widely used as a primary indicator, often accompanied by additional indices. A combination of manual and automated methods is used for pavement condition data

collection, and both consultant-based and in-house approaches are applied for data collection and analysis, often combined with automated tools. Data processing is primarily based on condition index calculation, with several municipalities also applying optimization and prioritization techniques. Most municipalities report adopting PMS and asset management systems, supported by a range of commercial, in-house, and customized proprietary systems. The incorporation of pavement condition and inventory data in budget preparation is also widely reported, although with some variation in the extent of application. The findings highlight the diversity of pavement management practices while illustrating the practical implementation of data-informed approaches in municipal context. This study offers a benchmarking overview of current practices and identifies areas for further exploration, with future work aimed at expanding the dataset and employing standardized performance measures for more comprehensive evaluation.

1 Introduction

Municipal road networks constitute one of the most extensive and valuable categories of public infrastructure assets in Canada by supporting mobility leading to economic activity and community development. These networks are continuously subjected to traffic loading, environmental exposure, and climate induced effects such as freeze–thaw cycles, moisture variation, and material aging, which collectively contribute to gradual pavement deterioration [1–3]. It is a significant challenge for the local government to maintain the acceptable levels of service under such conditions operating within constraint municipal budgets.

Municipalities have increasingly turned to structured pavement management practices to respond to these challenges. Pavement Management Systems (PMS) offer a systematic framework for organizing condition data, assessing pavement performance, and supporting maintenance and rehabilitation planning [4–6]. These systems depend on periodic condition monitoring, standardized performance indicators, and analytical tools to assist agencies in prioritizing interventions and optimizing lifecycle performance. Commonly used performance indicators include the Pavement Condition Index (PCI), as well as other indices such as the Ride Comfort Index (RCI), Pavement Quality Index (PQI), Structural Adequacy Index (SAI), and roughness-based measures like the International Roughness Index (IRI), which are applied individually or in combination to evaluate pavement condition [7–9]. Essentially, PMS enables municipalities to transition from reactive maintenance to more proactive and cost-effective strategies.

However, the implementation of pavement management practices differs widely across municipalities. Variations in organizational capacity, technical expertise, funding availability, and network size influence how condition data are collected, processed, and utilized in practice. Smaller municipalities often depend on manual inspections and engineering judgment, whereas larger municipalities are more likely to use automated data collection technologies, integrated databases, and formalized management systems [6–8]. These differences result in varying levels of integration of how pavement condition information is incorporated into planning and decision-making processes.

The extent to which condition monitoring and PMS outputs inform budgetary decisions is a key practical aspect of municipal pavement management. Although technical frameworks promote data-driven decision-making, municipal budgets are frequently influenced by broader constraints such as funding availability, administrative priorities and decisions, political direction, and competing infrastructure

demands in real world scenarios [10]. As a result, the link between technical analysis and financial decision-making may not always be fully aligned.

Therefore, understanding current practices across municipalities is essential for identifying common approaches and variations in pavement management implementation. This paper provides a comparative overview of pavement monitoring and decision-making practices within several Canadian municipalities. The focus is on documenting how municipalities from different provinces collect, manage, and use pavement condition data in practice. The findings offer insight into the diversity of existing approaches and highlight the key considerations for improving data-informed pavement management practices.

2 Literature Review

Pavement asset management has evolved into a structured discipline that integrates engineering, economic, and organizational considerations to enhance the long-term performance of road infrastructure. According to ISO 55000, asset management involves coordinated organizational activities aimed at deriving value from assets by balancing cost, risk, and performance throughout their lifecycle [11]. The American Association of State Highway and Transportation Officials (AASHTO) emphasizes the importance of aligning technical analysis with financial planning and organizational objectives through frameworks that facilitate performance-based decision-making in the management of transportation assets [4]. In Canada, the Transportation Association of Canada (TAC) offers detailed guideline on both design and management of pavement assets, highlighting the integration of monitoring, analysis, maintenance strategies, and lifecycle planning within a broader asset management context [1].

Pavement Management Systems represent the operational implementation of these principles. A standard PMS includes components such as inventory data, condition assessments, performance indicators, and decision-support tools that assist in identifying maintenance and rehabilitation needs [5,12]. These systems are designed to aid both short-term operational decisions and long-term capital planning by enabling agencies to assess network conditions and forecast future performance. However, the extent of PMS adoption varies across municipalities, reflecting differences in available resources, technical capacity, and institutional priorities [6,7].

Pavement type selection in municipal road networks is influenced by factors such as traffic loading, climatic conditions, constructability, and lifecycle cost considerations. Asphalt pavements are widely adopted in urban networks due to their ease of construction, maintenance flexibility, and cost-effectiveness. In contrast, concrete, gravel, and composite pavements are selected based on specific functional and operational requirements [1,2,4].

Condition monitoring forms the foundation of pavement management, as reliable and consistent pavement condition data are essential for pavement condition assessment, identifying deterioration trend identification, and support maintenance planning [1,2]. Common monitoring approaches include visual distress surveys, functional performance metrics i.e., ride quality or roughness, and structural evaluation techniques. The Pavement Condition Index (PCI), standardized under ASTM D6433, is widely used in municipal practice due to its systematic approach and ease of interpretation [9]. In addition to PCI, different agencies use various composite indices such as Pavement Quality Index (PQI), Ride Comfort Index (RCI), Structural Adequacy Index (SAI) and Surface Distress Index (SDI) to provide a comprehensive overview of existing pavement condition. Guidelines for pavement management mainly suggest periodic condition

data collection cycles, typically in the range of two to four years. This approach aids in reliable deterioration modelling and ensures timely maintenance planning [3,4].

Advancements in data collection technologies have led to the development of automated systems including Laser Crack Measurement Systems (LCMS), inertial profilers, imaging platforms, and Ground Penetrating Radar (GPR). These technologies enhance data accuracy, consistency and coverage compared to traditional manual techniques [6,13]. More recently, UAV-based imaging has emerged as an alternative approach for pavement condition assessment. Astor et al.[14] demonstrated the use of UAV-generated 2D and 3D models for pavement condition assessment using the Pavement Condition Index (PCI), while Zhang et al.[15] investigated UAV-based imaging combined with deep learning for automated pavement distress detection and classification. These studies demonstrate the potential application of UAV technologies for pavement condition monitoring, although their implementation in routine pavement management practice requires further investigation. In practice, pavement monitoring methods and frequencies vary across agencies depending on factors such as available funding, network size, technical capacity, and organizational priorities [3,6].

The importance of data quality and standardization in pavement condition monitoring is emphasized by many organizations. FHWA guidance highlights the need for well-defined data collection protocols, calibration procedures, and quality assurance measures to ensure reliable and consistent outcomes [16]. Similarly, studies from NCHRP indicate that inconsistent data collection methods can reduce the effectiveness of PMS management systems and limit the reliability of condition-based decision-making [6]. These findings are particularly relevant in municipal contexts, where resources and technical capacity vary significantly.

Beyond data collection, the effectiveness of pavement management depends on how condition data are processed and utilized. PMS tools are designed to convert raw condition data into actionable information through analysis, prioritization, and reporting [12]. In more advanced systems, in purpose of assessing alternative maintenance strategies and optimizing investment decisions deterioration models and lifecycle cost analysis are used [17]. However, the adoption of such analytical approaches varies widely, with many municipalities relying on simpler techniques or engineering judgment to decide the prioritization of rehabilitation or maintenance.

A critical component of pavement management is the integration of technical information into budgeting processes. Ideally, investments in maintenance and rehabilitation should be guided by condition data, performance indicators, and lifecycle considerations [4]. Life-cycle cost analysis offers a framework for evaluating long-term economic efficiency and determining the optimal intervention timing [17]. However, in practice, multiple factors influence municipal budgeting such as funding availability, political priorities, and competing infrastructure demands [10]. This can result in a disconnect between technically optimal solutions and actual decisions made.

Pavement preservation strategies underline the importance of timely, data-informed decision-making. Early interventions, such as preventive maintenance, have been demonstrated to extend the lifespan of pavements and reduce long-term costs [18]. However, the successful implementation of preservation strategies relies on consistent monitoring, reliable data, and the ability to integrate technical recommendations into financial planning.

Despite the existence and availability of well-established frameworks and tools, there is limited comprehensive evidence on how municipalities implement pavement management practices in real-

world scenarios, particularly within the Canadian context. Previous studies have largely focused on technical methodologies, leaving a gap in understanding how monitoring practices, data management, and budgeting processes are implemented across municipalities of varying size and capacity. This paper addresses this gap by providing a comparative overview of current practices, focusing on how pavement condition data are collected, managed, and used to support decision-making in several Canadian municipalities.

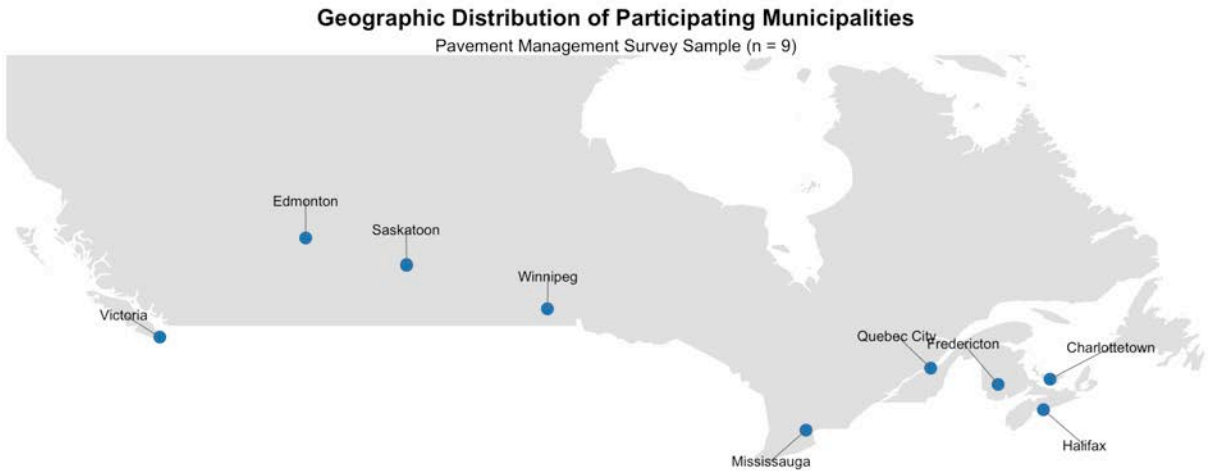
3 Methodology

This study is based on a structured questionnaire survey designed to observe current pavement management practices across Canadian municipalities. The survey targeted municipal agencies responsible for road infrastructure management and included questions related to pavement condition monitoring, data collection methods, data storage systems, use of Pavement Management Systems (PMS), analytical practices, and decision-making processes for maintenance and rehabilitation.

Survey responses were collected from municipalities across several Canadian provinces, representing a range of geographic, climatic, and organizational contexts. The questionnaire was designed to gather both qualitative and quantitative information on how pavement condition data are collected, managed, and utilized within municipal operations. The responses provided information on monitoring frequency, data collection responsibility (e.g., in-house or consultant-based), technologies used for condition assessment, types of performance indicators used, and the role of condition data in planning and budgeting.

Responses from nine participating municipalities are presented to illustrate current practices. These include the City of Edmonton (Alberta), City of Victoria (British Columbia), City of Winnipeg (Manitoba), City of Fredericton (New Brunswick), Halifax Regional Municipality (Nova Scotia), City of Mississauga (Ontario), City of Charlottetown (Prince Edward Island), Ville de Québec (Quebec), and City of Saskatoon (Saskatchewan). These municipalities provide coverage across multiple provinces and reflect a range of municipal sizes and operational contexts. Figure 1 illustrates the geographic distribution of the participating municipalities across Canada.

Figure 1. Geographic distribution of participating nine municipalities



Note: Blue circular markers denote surveyed municipalities

The participating municipalities are utilized to present a comparative overview of pavement management practices across different jurisdictions. The analysis presented in this paper is descriptive in nature and focuses on identifying commonly used approaches, variations in implementation, and general trends in monitoring and decision-making practices. Survey responses are summarized using tabulated comparisons and graphical representations to highlight differences and similarities among municipalities.

The broader dataset collected through the survey is part of ongoing research and will be used for more detailed analysis in future work. The current paper provides an overview of municipal practices and does not include comprehensive analytical evaluation.

4 Results

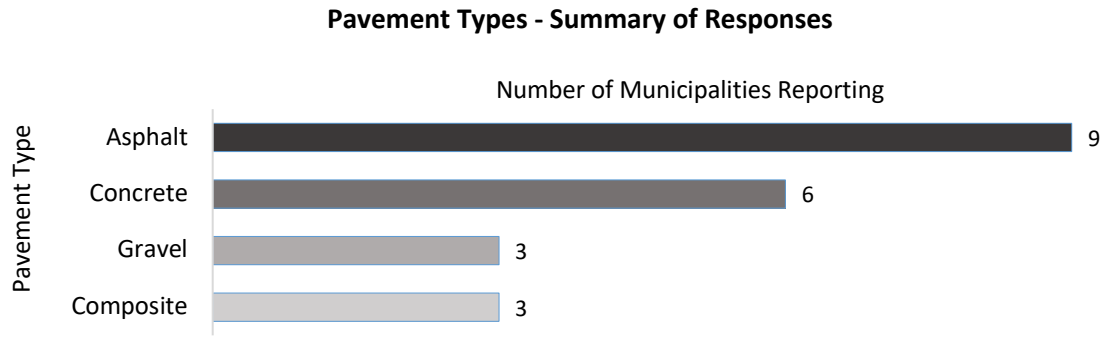
4.1 Pavement Types in Municipal Networks

The pavement types identified in the participating municipalities include asphalt, concrete, gravel, and composite pavements. Figure 2 provides an overview of the distribution of the pavement types across municipalities.

Asphalt pavement is reported in all municipalities, indicating its consistent use as the primary surface type within municipal road networks. Concrete pavement is also present in several municipalities, including Edmonton, Winnipeg, Halifax, Mississauga, Quebec City, and Saskatoon. Gravel surfaced roads are reported in a small number of municipalities, including Edmonton, Halifax, and Quebec City, while composite pavements are identified in Edmonton, Winnipeg, and Quebec City, typically consisting of asphalt overlays on existing concrete pavements.

Some municipalities, such as Edmonton and Quebec City, include all four pavement types within their networks. In contrast, Victoria, Fredericton, and Charlottetown report only asphalt pavement. The remaining municipalities exhibit combinations of two or three pavement types. The distribution shown in Figure 1 overall reflects variation in pavement composition across municipalities, with asphalt consistently present and other pavement types appearing to varying extents.

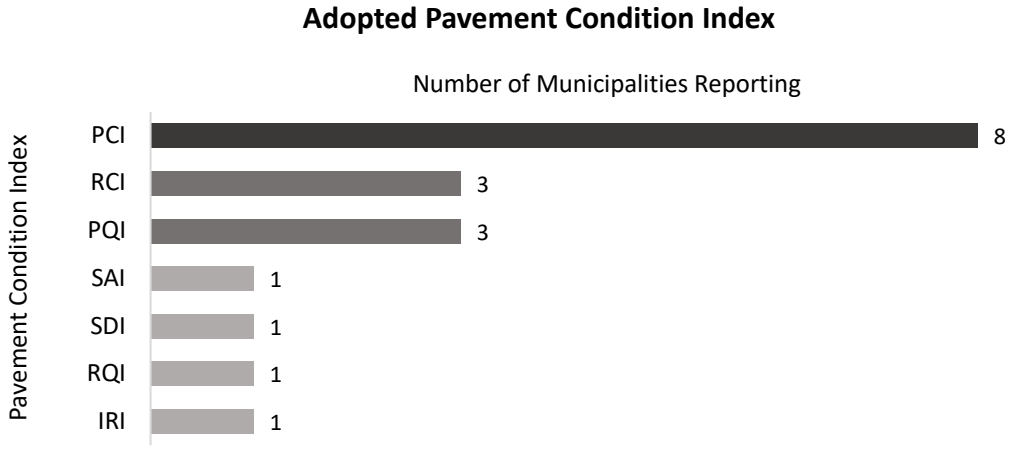
Figure 2. Pavement types present across municipalities



4.2 Pavement Condition Indices Used

Figure 3 presents the pavement condition indices and scoring systems reported across municipalities. The responses indicate that while PCI is consistently used across municipalities, other indices are applied selectively or in combination to support pavement condition evaluation.

Figure 3. Pavement condition indices used across municipalities



The Pavement Condition Index (PCI) is the most widely reported indicator, used by Edmonton, Victoria, Winnipeg, Fredericton, Halifax, Charlottetown, Quebec City, and Saskatoon. This reflects its consistent application as a primary measure of pavement condition across municipal networks. Several municipalities also report the use of additional indices. The Ride Comfort Index (RCI) and the Pavement Quality Index (PQI) are used in Halifax, Mississauga, and Saskatoon.

The Surface Distress Index (SDI) is reported in Mississauga, and Edmonton indicates the use of the Ride Quality Index (RQI). Some municipalities report the use of combined or derived indices. Halifax reports the use of a PQI derived from PCI and RCI. Saskatoon reports the use of additional measures, including Structural Adequacy Index (SAI) and International Roughness Index (IRI), which contribute to composite condition assessment.

4.3 Pavement Data Collection

The frequency of pavement condition data collection varies among municipalities, as shown in Figure 4. A two- to four-year inspection cycle is the most reported practice, adopted by Edmonton, Winnipeg, Halifax, Mississauga, Quebec City, and Saskatoon. This interval represents the predominant approach among the municipalities considered in this study. Fredericton and Charlottetown report annual data collection, indicating a shorter monitoring interval. In contrast, Victoria reports a longer interval, with condition data collected every five years or more. No municipalities indicate that condition data are collected only in conjunction with major rehabilitation activities. The reported practices show that while

periodic inspections at two- to four-year intervals are widely used in general, other monitoring frequencies are also present across municipalities.

Figure 4. Distribution of pavement condition data collection frequency across municipalities

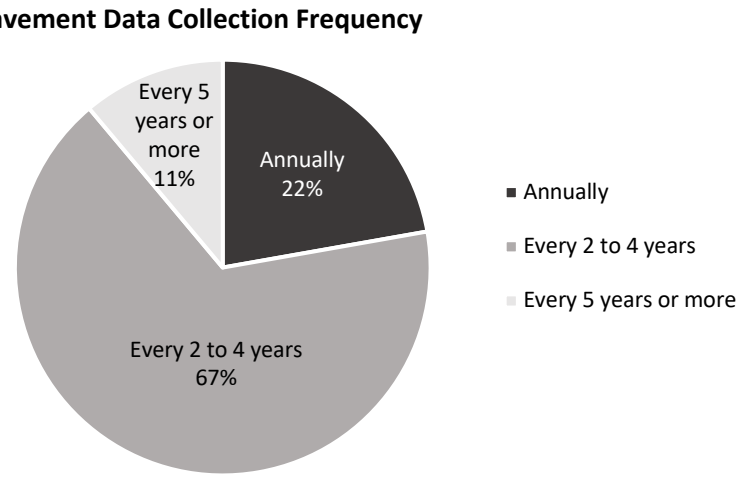
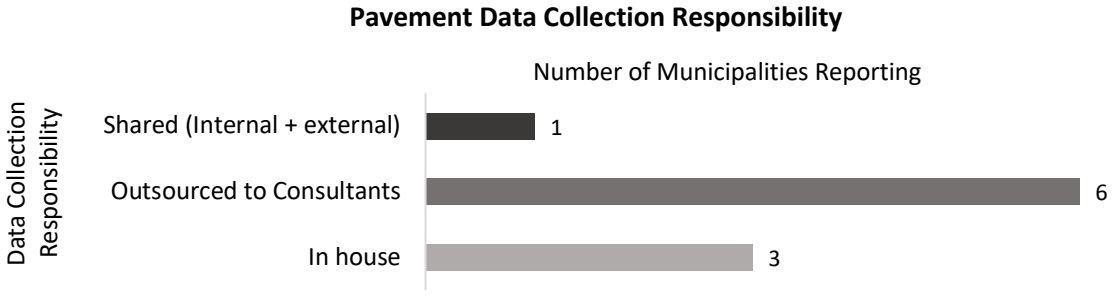


Figure 5 shows the distribution of responsibilities for pavement condition data collection. Consultant-based data collection is reported by several municipalities, including Victoria, Winnipeg, Halifax, Mississauga, and Saskatoon, indicating widespread reliance on external service providers for field data acquisition. Fredericton also reports the involvement of consultants, alongside participation from internal staff. In contrast, Edmonton and Charlottetown indicate that condition data collection is primarily conducted in-house, while Fredericton similarly reflects internal participation. A combined approach is observed in Quebec City, where both internal staff and external consultants contribute to data collection activities. In practice, urgent tasks such as pothole identification are typically handled in-house, while more comprehensive condition assessments involve external consultants.

These observations highlight that municipalities adopt a range of organizational approaches to data collection, with consultant-based methods commonly used alongside in-house and shared arrangements.

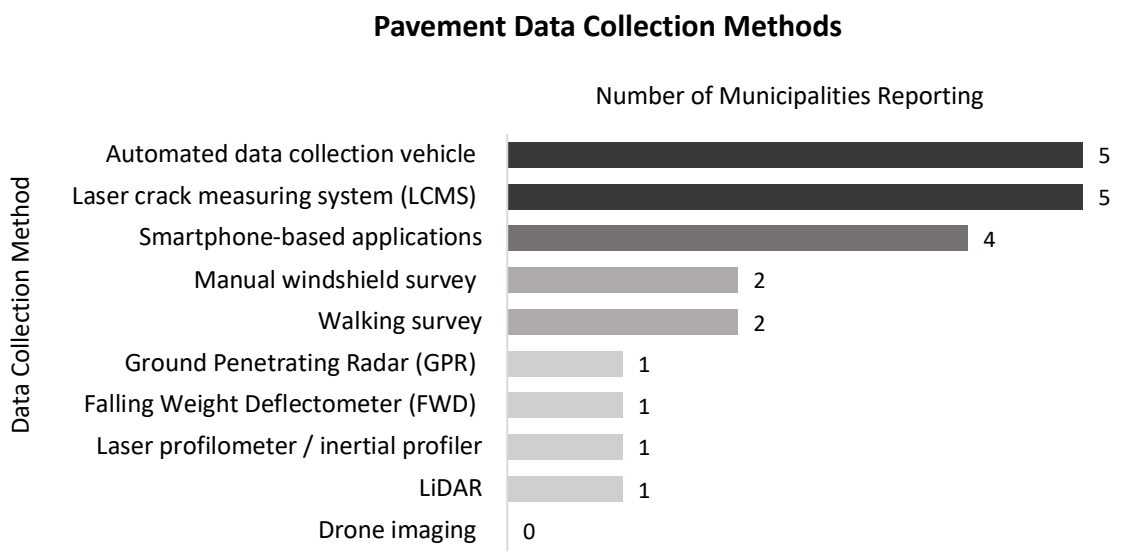
Figure 5. Responsibility for pavement condition data collection across municipalities



Note: Some municipalities reported more than one approach.

The data collection methods reported for pavement condition assessment are presented in Figure 6. A variety of data collection methods is used across municipalities, including both manual and automated approaches. Automated data collection vehicles and Laser Crack Measuring Systems (LCMS) are used in several municipalities, including Victoria, Winnipeg, Halifax, Mississauga, and Quebec City, indicating their application in network level condition assessment. Smartphone-based data collection applications are also reported in Edmonton, Fredericton, Charlottetown, and Quebec City. In Charlottetown, these applications are used in combination with manual inspection methods such as walking or windshield surveys.

Figure 6. Pavement condition data collection methods adopted by municipalities



Note: Some municipalities reported more than one method.

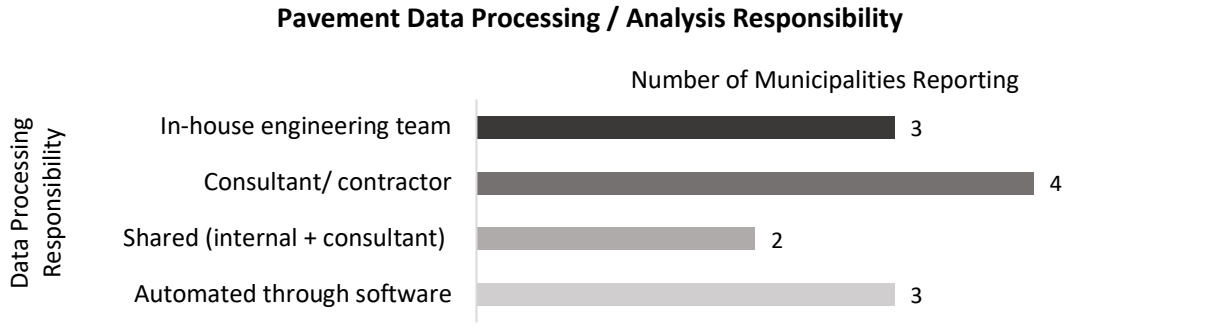
Manual inspection methods are reported in fewer cases. Walking surveys are used in Edmonton and Charlottetown, while windshield surveys are reported in Charlottetown and Saskatoon. Saskatoon also reports the use of Ground Penetrating Radar (GPR) and Falling Weight Deflectometer (FWD), indicating the use of additional testing methods. Quebec City reports the use of LiDAR-based data collection for specific applications such as frost heave monitoring. Although emerging technologies such as drone-based imaging have been identified in the literature for pavement condition monitoring, none of the participating municipalities reported their use in this study.

4.4 Pavement Data Processing / Analysis

Figure 7 presents the distribution of responsibilities for pavement condition data processing and analysis among municipalities. Consultant-based analysis is reported by four municipalities including Victoria, Winnipeg, Halifax, and Mississauga, indicating a notable reliance on external service providers for analytical tasks. In contrast, Edmonton, Charlottetown, and Saskatoon report that data processing and analysis are carried out by in-house engineering teams. A shared arrangement between internal staff and external consultants is observed in Fredericton and Quebec City, reflecting a combined approach to analytical activities. In addition, automated processing through software tools is reported in Edmonton, Mississauga, and Charlottetown. In Charlottetown, the process is described as partially manual and partially supported by a software platform. The results demonstrate that municipalities adopt a range of

approaches to data processing, including in-house, consultant-based, shared, and software-supported models.

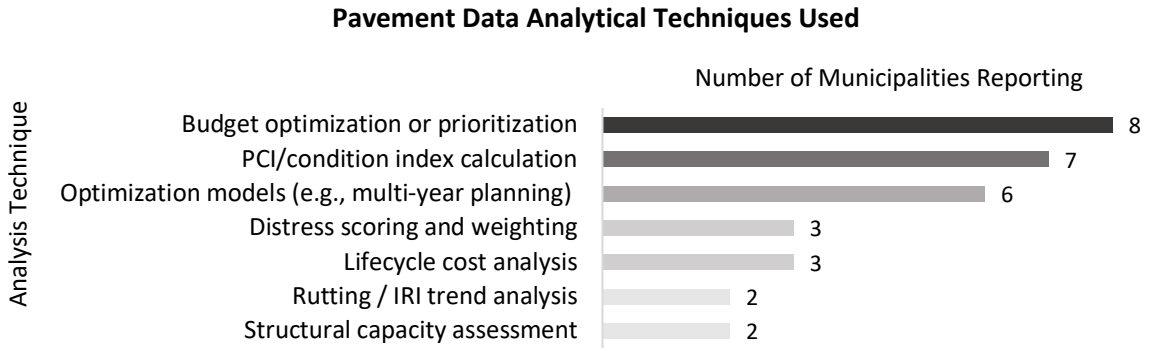
Figure 7. Responsibility for pavement condition data processing across municipalities



Note: Some municipalities reported more than one approach.

The analysis techniques applied to pavement condition data vary across municipalities, as illustrated in Figure 8. Condition index calculation is the most widely reported analytical approach, with most municipalities indicating the use of PCI or similar indices as a primary step in processing pavement condition data. This reflects the central role of standardized condition metrics in translating raw inspection data into usable performance indicators. Several municipalities also report the use of optimization-based approaches, including multi-year planning models and budget prioritization techniques. These approaches are observed in Edmonton, Winnipeg, Fredericton, Halifax, Mississauga, and Saskatoon, indicating the application of analytical tools to support decision-making beyond basic condition assessment.

Figure 8. Analytical techniques used for pavement data processing



Note: Some municipalities reported more than one approach.

More detailed engineering-based analyses are less uniformly reported. Edmonton applies a broader range of techniques, including distress scoring, rutting or IRI trend analysis, structural capacity assessment, and lifecycle cost analysis. Other municipalities show more selective use of these methods, with some incorporating trend analysis or structural evaluation as part of their workflow. Lifecycle cost analysis is reported by Edmonton and Mississauga, indicating consideration of long-term cost implications in

pavement management decisions. In addition, Quebec City and Mississauga report the use of additional or customized analytical approaches beyond these categories.

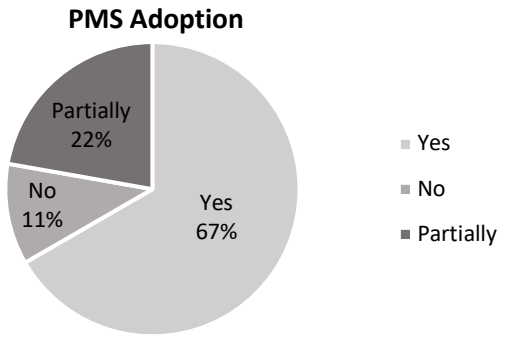
Saskatoon's practices include condition index-based evaluation alongside structural and performance considerations, supported by publicly documented asset management processes such as the State of Infrastructure reporting framework [19].

Overall, the results show that while condition index calculation forms the foundation of pavement data analysis, municipalities apply a range of additional analytical techniques with varying levels of complexity. The extent of analytical depth differs across municipalities, from basic index-based evaluation to more comprehensive, multi-criteria and optimization-based approaches.

4.5 PMS Adoption and Software Used

Figure 9 illustrates the adoption status of Pavement Management Systems among the municipalities. The distribution of responses indicates that PMS use is present in most of the municipalities, with a smaller number reporting either no use or partial implementation.

Figure 9. Pavement Management Systems adoption across municipalities



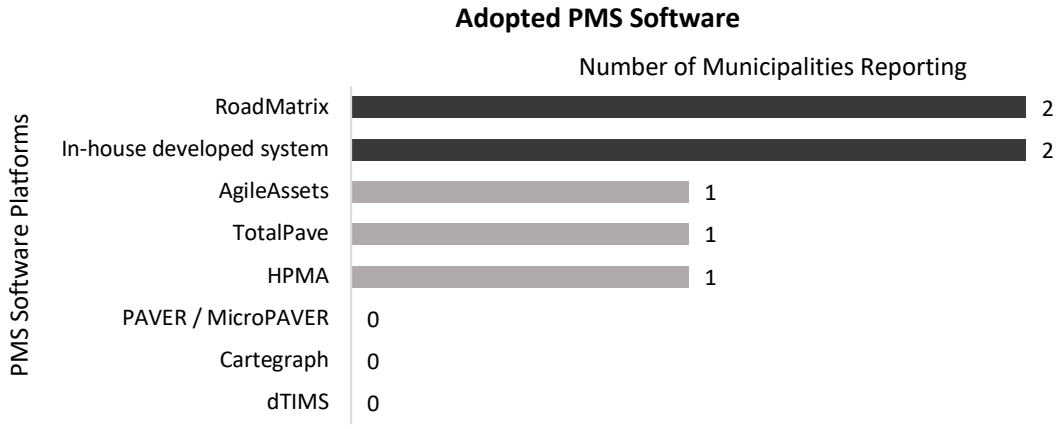
Most municipalities report active use of a PMS, including Edmonton, Victoria, Winnipeg, Halifax, Mississauga, and Charlottetown indicating that such systems are commonly integrated into pavement management practices. Fredericton reports that a PMS is not currently in use. In addition, Quebec City and Saskatoon indicate partial use of a PMS, suggesting that system implementation or utilization may not be fully established in these municipalities.

Figure 10 presents the range of software platforms and tools used for pavement management. A variety of PMS software solutions is reported. Winnipeg indicates the use of AgileAssets, while Mississauga and Saskatoon report the use of RoadMatrix. Saskatoon also reports the use of an in-house developed system, and Edmonton similarly indicates the use of a customized internal platform based on a Visual Condition Index (VCI) approach aligned with ASTM D6433.

Several municipalities report the use of alternative or proprietary systems. Halifax identifies the use of Highway Pavement Management Application (HPMA), and Charlottetown reports using TotalPave. Victoria indicates the use of Hydroweb, although it is noted that this system is no longer supported and may be replaced in future updates. Some municipalities report of not using of any of the listed PMS

platforms, which is consistent with earlier responses indicating either no PMS adoption or partial implementation. Overall, the responses reflect a range of software environments, including commercial platforms, in-house systems, and customized or legacy tools.

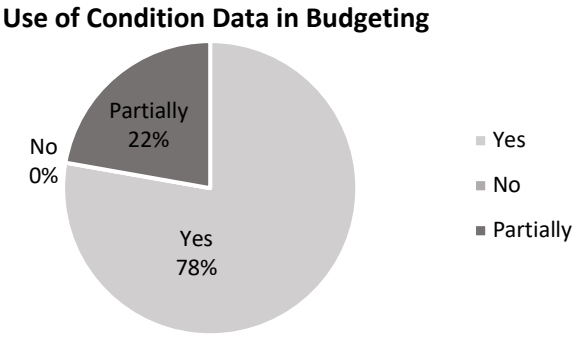
Figure 10. PMS software platforms used for pavement management



4.6 Use of Pavement Condition and Inventory Data in Budget Preparation and Allocation

Figure 11 presents how pavement condition and inventory data are used in the preparation of annual budgets and their role in guiding funding allocation. Most municipalities indicate that these data are incorporated into the budgeting process. This practice includes Edmonton, Victoria, Winnipeg, Fredericton, Mississauga, Charlottetown, and Saskatoon. Partial use of condition data is reported by Halifax and Quebec City, suggesting that these data are considered to some extent in budget allocation rather than being fully integrated into decision-making. No municipalities reported that pavement condition and inventory data are entirely excluded from budget preparation.

Figure 11. Use of pavement condition and inventory data in budget preparation



The responses indicate that pavement condition data are widely used in budget development and generally support funding allocation decisions, although the extent of their influence varies across municipalities.

5 Discussion

The findings of this study are consistent with established pavement asset management frameworks, which emphasize structured monitoring, data integration, and decision-support processes to support effective infrastructure management. Guidance from TAC [1] and AASHTO [4] highlights the necessity of linking condition assessment, performance indicators, and lifecycle-based planning within municipal pavement management systems. The observed use of monitoring programs, condition indices, and management systems across municipalities reflects the practical implementation of these principles in real-world settings.

Asphalt pavement is reported across all participating municipalities, reflecting its widespread application within municipal road networks due to its constructability, cost-effectiveness and adaptability to urban environments. Concrete, gravel, and composite pavements are also reported in several municipalities, demonstrating the diversity of pavement structures within these networks. The presence of different pavement types may reflect factors such as functional requirements, traffic demand, and historical design practices.

The monitoring practices identified in this study indicate that most municipalities follow periodic data collection cycles, particularly within a two- to four-year range. This corresponds with recommendations in pavement management literature, which emphasize the importance of regular monitoring to track deterioration trends and facilitate proactive maintenance planning. At the same time, the variation in monitoring frequency suggests that municipalities adapt these practices based on local constraints such as funding availability, network size, and operational capacity.

The reported data collection methods further reinforce trends identified in the NCHRP Synthesis 334 [13]. Municipalities utilize a combination of manual, semi-automated, and fully automated methods, including smartphone-based applications, automated data collection vehicles, and Laser Crack Measuring Systems (LCMS). This hybrid approach balances cost, efficiency, and data quality, as discussed in TRB guidance on pavement condition data collection [6]. The continued use of manual inspection methods alongside automated technologies suggests that traditional approaches still hold usefulness, particularly for localized assessments and validating automated data. Although recent studies have explored UAV-based technologies for pavement condition assessment [14,15], these applications appear to remain emerging within the context of the municipalities surveyed. Several factors may contribute to their absence from the reported practices, including implementation requirements, technical capacity, data processing needs, and the continued suitability of established data collection methods; however, the reasons for non-adoption were not investigated in this study.

The involvement of consultants in specialized data collection and analytical tasks reflects the role of external expertise in municipal pavement management, particularly when advanced technologies are involved. At the same time, in-house and shared responsibility models demonstrate differences in how municipalities organize these activities based on their available technical capacity and resources. Organizational capacity, data management practices, and resource availability can therefore influence how pavement management activities are implemented across agencies [6,7,13].

The analytical techniques reported in this study highlight varying levels of maturity in pavement data processing. While condition index calculation forms the foundation of analysis in most municipalities, several also apply optimization-based approaches for multi-year planning and budget prioritization. The

use of lifecycle cost analysis and structural or performance-based evaluations in some municipalities indicates more advanced analytical practices that extend beyond basic condition assessment. These approaches are consistent with asset management frameworks that emphasize the integration of economic and performance considerations in decision-making [1,4,17].

The adoption of Pavement Management System (PMS) further demonstrates the implementation of structured decision-support approaches among the participating municipalities. Municipalities utilize a range of platforms including commercial systems, in-house solutions, and customized tools, reflecting adaption to local operational needs. However, cases of partial or absent PMS implementation indicate that the level of adoption varies among municipalities, potentially reflecting differences in asset management maturity, available resources, and organizational capacity [1,4,6].

The extensive use of Pavement Condition Index (PCI) across municipalities aligns with its function as a standardized and widely recognized indicator of pavement condition. The adoption of additional indices such as RCI, PQI, SDI, SAI and RQI indicates that municipalities consider different aspects of pavement performance, including ride quality, structural adequacy, and surface condition. In some cases, municipalities also use combined or derived indices which underscores the necessity of integrating multiple performance measures into a unified assessment framework.

The incorporation of pavement condition and inventory data into budget preparation processes indicates the application of data-driven decision-making principles emphasized in asset management frameworks. Both TAC [1] and AASHTO [4] highlight the importance of linking technical analysis with financial planning to support effective resource allocation. Although most municipalities report utilizing such data in budget preparation, the presence of partial integration suggests that funding decisions are also influenced by additional factors such as policy priorities, budget constraints, and stakeholder considerations.

In summary, the findings indicate that municipalities are generally implementing pavement asset management practices in accordance with established frameworks and guidelines. However, variations in monitoring practices, data collection methods, analytical approaches, organizational responsibilities and system adoption highlight differences in how these principles are applied in practice. These differences suggest that, although asset management concepts are widely recognized, their implementation is shaped by local context, available resources, and institutional capacity.

These findings also highlight an opportunity to enhance coordination and promote greater consistency in pavement management practices across municipalities. National organizations such as the Transportation Association of Canada (TAC) provide a platform through which shared guidance and best practices can support more consistent implementation. Although full standardization may not be feasible due to variations in local conditions, certain elements such as condition assessment frameworks, performance indicators, and data collection protocols are suitable for alignment at a provincial or regional level. Such alignment improves comparability and facilitates knowledge sharing among municipalities.

This study therefore provides a practice-oriented perspective on how pavement asset management is currently implemented at the municipal level and identifies areas where improved alignment contributes to more effective decision-making processes. Based on these findings, future research has a prospect to explore how differences in monitoring, analysis, and PMS utilization influence long-term pavement performance and budget allocation outcomes through more detailed and quantitative approaches.

6 Conclusion

This study provides a descriptive overview of pavement management practices across municipalities, focusing on pavement types, monitoring approaches, condition assessment, data collection methods, data processing and analysis techniques, system utilization, and the role of data in financial planning. The findings show that municipalities are implementing structured monitoring programs using a combination of manual and automated data collection techniques, mostly supported by pavement management systems and condition indices such as PCI. Data processing practices are primarily based on condition index calculation, with several municipalities also applying optimization-based approaches and budget prioritization techniques. At the same time, differences are evident in monitoring frequency, organizational responsibilities, system implementation, and the use of multiple indices. The widespread use of pavement condition and inventory data in budget preparation reflects the application of data-informed practices, while the variation in tools, software platforms, analytical approaches, and operational models highlights the diversity of practices adopted across municipalities.

The work presented here is intended as a preliminary benchmarking overview of current municipal practices. Future research will extend this study by incorporating a larger dataset and applying standardized performance indicators to enable more detailed comparisons. Further investigation into the relationship between monitoring practices, PMS utilization, analytical approaches, and budgeting outcomes will offer deeper insights into the effectiveness of pavement management strategies.

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