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KEY DRIVERS AND BEST PRACTICES FOR EFFECTIVE MUNICIPAL INFRASTRUCTURE MAINTENANCE

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Abstract

This study investigates the optimization of municipal infrastructure maintenance, focusing on the challenges and strategies required to ensure efficient and sustainable maintenance practices in South Africa. The motivation for this research stems from the persistent issues of resource mismanagement, insufficient budgeting, and the lack of advanced maintenance strategies that hinder infrastructure performance in municipalities. The methodology employed for this study was broken into 8 distinct phases. The methodology flow starts with the study's research design, a thorough review of related literature, conducting interviews, or surveying industry experts using a questionnaire. This is followed by reviewing existing literature coupled with the reviewing of expert interviews. From here the research methodology moves to the analysis of data, a systematic review of literature, and analysis of interviews. The final two steps involve the interpretation of results, the results are analyzed utilizing the Likert scale using statistical measures such as the mean, standard deviation, and variance of the data and concluding the results. The results reveal that insufficient resource allocation, poor asset management, and limited integration of advanced technologies, such as IoT and predictive maintenance tools, are the primary obstacles to effective maintenance. However, strategies like lifecycle planning and the implementation of proactive maintenance were identified as strengths, supported by a high Cronbach's alpha value of 0.82 and 0.92 for the survey evaluation of challenges experienced and strategies of maintenance respectively, indicating reliable internal consistency. The study concludes that municipalities must prioritize resource allocation, integrate advanced technologies, and enhance workforce training to improve infrastructure reliability and longevity. Recommendations include adopting a more proactive maintenance approach, leveraging data-driven technologies, and ensuring regulatory compliance to enhance operational efficiency and public service delivery. This research provides valuable insights for improving municipal maintenance strategies, with implications for better infrastructure management and cost-effective practices.

Keywords: Municipal Infrastructure; Infrastructure Maintenance; Preventive And Predictive Maintenance; Asset Management Strategies; Resource Allocation.

1. INTRODUCTION

Municipal infrastructure can be termed as the fully integrated system of structures and institutions owned and managed by governments to supply essential public facilities and services, which are necessary for the functional operations of municipalities and the welfare of citizens. The infrastructures include political, transport, education, health, electricity and energy, telecommunication, water, and recreational facilities, all of which serve as a vital function in sustaining the urban environment.

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The infrastructure of municipalities plays a significant role in economic development, mobility, and even support for public services in developing economies. However, much like virtually all capital equipment, those facilities must be subjected to regular, scheduled maintenance if the benefits from such systems are to exceed the associated costs (Michele & Daniela, 2011).

The Gauteng Province is facing serious challenges regarding municipal infrastructure, primarily because of the widespread corruption, mismanagement, and lack of appropriate maintenance strategies that have brought these critical systems near collapse-for instance, the system involved in water treatment and purification and wastewater processing (Bikam & Chakwizira, 2021).

Consequent to the deteriorating infrastructure, lives are under threat, and indirect costs, like legal claims or compensation, will rise from unsafe and underutilized public amenities. In addressing these issues, this research aims to highlight maintenance strategies that are appropriate to curb prevailing poor maintenance practices and mainly seeks strategies to optimize municipal infrastructure maintenance (Betz et al., 2023). Based on this evaluation of factors, this study develops better maintenance efficiency and provides hands-on insight into improvement in the sustainability and functionality of municipal infrastructure in Gauteng.

It also draws attention to the relevance of effective maintenance practices in preserving and maximizing the benefits that could be derived from public infrastructure investments. Based on this, the research into expert opinion and the dual-phase research approach allowed the derivation of a general understanding of maintenance challenges in this study, along with strategic recommendations to meet them.

This paper investigates the following research questions:

1. Factors affecting the delivery of quality maintenance works to municipalities in Gauteng
2. What strategies can be utilized to ensure maintenance optimization of municipal infrastructure?

The objectives of the study are to assess the factors that influence the quality of maintenance work performed on municipal infrastructure and to identify important elements for the optimization of maintenance. Concerning this, the study aims at such insight to improve efficiency and effectiveness in maintaining municipal infrastructures for sustainability and long-term functionality.

The rest of the paper is organized as follows; Section II presents the literature review. Section III discusses the methodology, and gives an overview of the Likert scale analysis, the formulae used, and the reliability mechanism that is utilized to validate the results. Section V goes into detail with the results and the calculations for the different statistical measures required.

2. LITERATURE REVIEW

Given the complex nature of maintaining interdependent systems, it is a very challenging task to effectively manage municipal infrastructure. This literature highlights the need for integrated solutions that are data-driven to better improve asset reliability while trying to reduce the

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chances of downtime (Gavrilaș & Neagu, 2020). It underlines various maintenance strategies, such as preventive, predictive, and condition-based maintenance, as a promising way to enhance operational efficiency. While preventive maintenance addresses routine activities to avoid failure, predictive maintenance bases its activities on data analytics, predicting imminent failures that timely intervention can avoid (Molęda et al., 2023). Condition-based maintenance works following real-time asset conditions for respective actions, thus avoiding futile activities concerned with the upkeep of assets (Raza & Ulansky, 2019).

Risk-based maintenance settles the issue of prioritization based on probability and impact. It ensures efficiency in resource optimization and long-term planning (Collina et al., 2024). Reliability-centered maintenance identifies asset function-criticality and failure modes systematically to drive maintenance decisions (Moradi-Sarvestani et al., 2024). Literature shows that the integration of Geographical Information Systems (GIS) and Computerized Maintenance Management Systems (CMMS) together acts as an effective combination in influencing better decision-making. After all, the holistic approach to the adoption of these strategies will yield much better sustainability and efficiency in management.

The literature underlines the importance and great challenges facing optimization issues in municipal infrastructures' maintenance strategies. Inappropriate asset management practices, such as not being able to integrate the decision-supporting tool into routines, are one of the most significant obstacles in maintaining infrastructure. The introduction of the Infrastructure Life Cycle Management System coupled with higher-order tools like CMMS and GIS opens ways for more effective decision-making. (Sonnemann et al., 2015).

Besides that, other optimization levers to reduce downtime, and risks, and improve general operational efficiency include preventive, predictive, and corrective maintenance. Preventive maintenance-aided analytics allow early fault detection, while predictive maintenance encompasses timely intervention given condition monitoring. Corrective maintenance, while reactive, can also be improved through descriptive analytics and diagnostics to get up from failure much faster (Afifi et al., 2024).

Combined, these methods allow a municipality to better implement an infrastructure sustainability and cost-efficient improvement framework. This review identifies the need for further development and wider diffusion of new advanced models for maintenance in municipal asset management challenges. (Bocewicz et al., 2023).

The literature review identifies a critical gap in existing research regarding comprehensive frameworks for municipal infrastructure maintenance in resource-constrained settings. Current studies predominantly address challenges such as resource allocation, regulatory non-compliance, and outdated technologies but fail to offer systematic solutions for overcoming these barriers, particularly in developing regions like Gauteng, South Africa. (Verma et al., n.d.). To address this gap, the research adopts a multi-faceted approach, beginning with data collection through questionnaires targeting municipal maintenance experts to evaluate existing practices and rank strategies such as predictive maintenance and resource optimization. Statistical methods, including Likert scale analysis and Cronbach's Alpha, are utilized to ensure

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the reliability and robustness of findings. These insights inform the development of a sustainable maintenance framework emphasizing resource efficiency, workforce training, and technological integration to enhance infrastructure maintenance outcomes in resource-scarce municipalities.

3. METHODOLOGY

To address the research questions, specific instruments are used for data gathering. The main tool used is a structured survey questionnaire, whose design includes customized Likert-scale questions to assess the challenges faced in the maintenance of municipalities and analyse the effectiveness of various optimization strategies.

Concerning the first research question, the survey focuses on the identification of key challenges, such as resource allocation, compliance issues, and asset management. The second question gauges the effectiveness and efficiency of maintenance strategies, such as predictive maintenance and the adoption of IoT. This research study employs snowball sampling to source municipal maintenance professionals with experience, which provides strong and contextual responses. Descriptive statistics are used to analyse the data collected, while Cronbach's Alpha is employed to validate the reliability of the data.

The targeted respondent in this research involves practitioners/experts working in the maintenance of municipal infrastructures, such as Civil, Electrical, or Mechanical Engineers, Project Managers, and senior management within municipal technical departments. All respondents have considerable work experience of not less than 5 to 8 years in the maintenance of municipal infrastructure, which may empower them to be insightful about current practices and challenges. This study utilized an online survey to collect data from industry experts in municipal infrastructure maintenance.

The initial sample size of 15 participants was selected based on the researcher’s industry contacts, with an additional 6 participants recruited using snowball sampling, an effective technique for closed populations or specialized topics. (Kirchherr & Charles, 2018). Snowball sampling was chosen for its cost-effectiveness and ability to reach target respondents.

Research Survey

The survey aimed to identify strategies for improving municipal infrastructure maintenance. Participants, selected based on qualifications and experience (minimum National Diploma and five years in relevant roles), evaluated factors on a scale of 1 (Low) to 5 (High), these participants were chosen due to their experience with municipal maintenance techniques and their knowledge of its shortcomings, this puts them in a unique situation to have insightful knowledge that is critical in answering the research questions of this study. These factors included resource allocation, asset management, technology, and compliance. Additionally, respondents rated the significance of various factors for improving maintenance using a "Strongly Disagree" to "Strongly Agree" scale.

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Likert Scale Data Analysis

A Likert scale was employed to assess participant responses that rank the different factors affecting the delivery of quality maintenance in municipal infrastructure, with each item coded numerically from 1 to 5. Descriptive statistics summarize the central tendencies and variability. The use of the Likert scale in this approach allowed for a detailed examination of the challenges and factors affecting infrastructure maintenance. (Yamashita, 2022). A statistical approach was taken to analyse the data and come up with the various statistical measures, mean, and standard deviation and a reliability test for the data was determined using Cronbach's Alpha reliability test. The Cronbach's Alpha reliability test can be summarized as shown in Table 1 below, with the ideal desired reliability value being 0.7 (Acceptable) to 0.9 (Excellent) or greater.

Table 1: Cronbach's Alpha interpretation

Cronbach's Alpha Value	Interpretation
≥ 0.9	Excellent
0.8 – 0.89	Good
0.7 – 0.79	Acceptable
0.6 – 0.69	Questionable
< 0.6	Poor

In analyzing the survey data for this study and determining the reliability of the data, key statistical measures of mean, variance, standard deviation, and Cronbach's alpha were utilized. The Mean gives the central tendency and, therefore, quantifies the overall feeling of the responses, while variance and standard deviation are dispersion measures around this average, giving a measure of the consistency of the responses. Cronbach's alpha was used to determine the internal consistency of data, that is, the items within the survey were reliable for the capture of the construct of interest. The higher the Cronbach's alpha, the greater the reliability, hence the effectiveness of the Likert-scale instrument in assessing the attitude of participants.

$$Mean = \frac{\Sigma X_i}{n} \quad (1)$$

$$Standard\ Deviation = \sqrt[2]{\frac{\Sigma(X_i - \bar{X})^2}{n-1}} \quad (2)$$

$$(Cronbach's\ alpha)\ \alpha = \left(\frac{N}{(N-1)}\right) * \left(\frac{1 - \Sigma({\sigma^2}_i)}{{\sigma^2}_x}\right) \quad (3)$$

4. RESULTS AND ANALYSIS

This chapter presents the findings of the research. Data collected through a questionnaire/survey was analysed using statistical methods. The results presented herein are derived from the application of the formulas outlined in the preceding section above. Table 2 below provides a demographic summary of the expert participants.

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Table 2: Demographics summary

Demographic	Item	Total	Percentage
	Years		
	5-8	14	66.67%
Experience	8-10	2	9.52%
	10-above	5	23.81%
	National Diploma	6	28.57%
	Bachelor's Degree	6	28.57%
Education Level	Honours Degree	5	23.81%
	Master's Degree	3	14.29%
	PhD	1	4.76%
	Project Manager	4	19.05%
Job Description	Electrical Technician	1	4.76%
	Civil/Elec/Mech. Engineer	15	71.43%
	Senior Management	1	4.76%

Table 2 above provides a demographic summary of the study's participants. The questionnaire sampled a sufficient number of experienced professionals, with the majority possessing 5–8 years of expertise. This distribution strengthens the research's validity by ensuring that insights are grounded in substantial practical experience. Participants' educational levels were fairly distributed among holders of national diplomas, bachelor's degrees, and honours degrees, ranging from 23.81% to 28.57%. This distribution reflects a strong foundation of knowledge and understanding relevant to the field. Furthermore, 71.43% of the experts interviewed specialize in Civil, Electrical, or Mechanical Engineering—an encouraging indicator, as effective infrastructure maintenance necessitates technical skills and knowledge from these disciplines.

4.1. Factors affecting quality maintenance within municipalities

The survey conducted looked into the factors municipal infrastructure maintenance personnel are faced with in their day-to-day maintenance work. This is done to get a better understanding of what the highest-ranking factors maintenance teams are faced with are often a hindrance in achieving the different maintenance goals the personnel have set. The survey looked at five different survey questions for this stage of the survey. The participants were asked to rank each question using a scale of 1-5 ranking the importance of various factors that impact the delivery of appropriate maintenance practices.

Table 3: Survey results of municipal factors affecting quality maintenance

Respondents	Resource Allocation and Budgeting	Asset Management Strategies	Technological Advancements	Regulatory Compliance and Standards	Human Factors and Training
Mean	3.43	3.24	2.81	3.29	3.29
Standard Deviation	1.21	1.14	0.93	0.90	1.06
Cronbach's Alpha	**0.82**				

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The results from the survey are summarised in Table 3 above. The survey results contain very critical information on challenges in municipal infrastructure maintenance, and statistical analysis gives a clear picture of the importance and variability of each factor. The mean scores indicate that Resource Allocation and Budgeting (mean = 3.43) have the highest priority, pointing out as the first big problem for maintenance teams. Regulatory Compliance and Standards and Human Factors and Training come next (both with mean scores of 3.29), underlining the importance of meeting regulatory requirements and ensuring the competency of the workforce. Next in line are Asset Management Strategies (mean = 3.24) and Technological Advancements (mean = 2.81), which both rank somewhat lower, indicating those areas are perceived as being less critical when compared to budgeting and compliance.

The standard deviations show that Resource Allocation and Budgeting have the largest variation, standard deviation = 1.21, indicating respondents' divergent opinions on this aspect. Conversely, smaller standard deviations in Technological Advancements and Regulatory Compliance suggest more uniformity among respondent perceptions of these factors.

The Cronbach's Alpha score of 0.82 falls within the "Good" reliability range, suggesting that the survey instrument reliably measures the perceived importance of these challenges. Looking into the priorities, Resource Allocation and Budgeting are on top, possibly because enough funding is central to full and timely maintenance. A close second in the list is regulatory adherence and workforce training; this means qualified personnel and scrupulous observance of rules. These insights could mean that municipalities could better reach improved maintenance outcomes by investing more in improving financial planning, regulatory alignment, and personnel training.

The IMF study points out that insufficient maintenance budgets have long-term repair costs and cause service disruptions, which confirms the early allocation of resources for the longevity and cost-effectiveness of infrastructure. (Blazey et al., n.d.). The review in Environmental Systems Research confirms that asset management is one of the important strategies; data-driven models help municipalities anticipate and avert failures in infrastructure by optimizing their maintenance activities. (Delnaz et al., 2023). These two sources show that solid budgeting and predictive asset management lessen the challenges of maintenance in municipalities. These findings are consistent with survey results that show resource allocation and asset management as top priorities for municipal maintenance.

4.2 Maintenance Strategies and Practices

The survey conducted further looked into the different maintenance strategies and practices employed by municipalities in infrastructure maintenance. This part of the survey seeks to get an understanding of the effective use of the various strategies of maintenance that municipalities use in maintaining their infrastructure. The survey looked at sixteen different survey questions for this stage of the survey, the participants were asked to rank each question using a ranking system ranging from strongly-disagree to strongly-agree. These qualitative measures were then assigned values to convert them to more interpretable quantitative data. Values of 1-5 were assigned as follows, strongly-disagree = 1, disagree = 2, neutral = 3, agree

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= 4, strongly agree = 5. The questions regarding this part of the survey were structured as follows:

Questions Q6 to Q20 in the survey examine the extent to which various practices and resources are considered essential to improving infrastructure maintenance effectiveness in municipal settings. These include foundational elements such as asset inventory and assessment (Q6), resource identification (Q7), and budget allocation (Q8), which collectively support maintenance planning and resource distribution. Strategic practices, including lifecycle planning (Q9) and risk management (Q10), are also assessed, reflecting a need for long-term and risk-conscious approaches in maintenance activities. The survey further addresses the role of advanced tools and technologies, such as data-driven decision-making (Q11), IoT and sensor technologies (Q12), and predictive maintenance tools (Q13), as well as asset management software (Q14), highlighting the importance of innovation in achieving maintenance goals. Additionally, compliance and monitoring practices, like compliance monitoring and reporting (Q15) and safety and environmental compliance (Q16), are evaluated to understand their perceived relevance in maintaining standards. Practical aspects, including documentation and record-keeping (Q17), training programs (Q18), and performance management (Q19), emphasize the value of systematic record maintenance and workforce development. Finally, adhering to standard operating procedures (Q20) captures the importance of consistent procedural standards to enhance overall maintenance quality. These questions collectively assess a range of factors that may contribute to more effective infrastructure maintenance within municipalities.

Table 3: Survey results on strategies of maintenance

Practices	Asset inventory and assessment	Resource identification	Budget allocation	Lifecycle planning	Risk management	Data-driven decision making	IoT and sensor technologies	Predictive maintenance tools	Asset management software	Compliance monitoring and reporting	Environmental compliance	Documentation and record-keeping	Training programs	Performance management	Operating procedures
Mean	**3.71**	4.23	**4.38**	4.48	**4.38**	**4.43**	**4.38**	4.43	**4.29**	**4.48**	**4.43**	**4.57**	4.48	**4.52**	**4.52**
Std. Dev	1.27	1.18	1.12	0.81	0.67	0.93	0.74	0.60	0.72	0.93	0.93	0.60	0.93	0.60	0.93
Cronbach's Alpha	**0.92**														

Table 3 outlines the results gathered from the survey of municipal infrastructure maintenance personnel and the statistical interpretation of the data. The analysis of municipal infrastructure maintenance strategies highlights several practices that respondents regard as essential to

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effective maintenance. Statistical measures, including mean, median, mode, standard deviation, and variance, reveal the perceived importance of each strategy. The results were further validated with a Cronbach's Alpha of 0.92, indicating excellent reliability and consistency across responses.

The mean scores suggest a high level of agreement regarding the importance of most strategies, with most means around or above 4.0. The highest mean values are found in Documentation and Record-Keeping (Q17, mean = 4.57), Training Programs and Skill Development (Q18, mean = 4.48), and Adhering to Standard Operating Procedures (Q20, mean = 4.52), underscoring the prioritization of systematic record maintenance, workforce development, and procedural adherence among maintenance personnel. The median and mode for these strategies also consistently scores at 5, demonstrating a strong consensus in their perceived importance.

Standard deviation and variance measures indicate varying levels of agreement for different strategies. Strategies such as Resource Identification (Q7, std. dev. = 1.18) and Asset Inventory and Assessment (Q6, std. dev. = 1.27) show higher variability, suggesting differing views on their necessity. In contrast, strategies like Lifecycle Planning and Maintenance (Q9, std. dev. = 0.81) and Adhering to Standard Operating Procedures (Q20, std. dev. = 0.60) show lower variability, indicating a more uniform perception of their critical role in maintenance effectiveness.

Ranking the top strategies by mean score, Documentation, and Record-Keeping rank highest, reflecting their role in tracking activities and ensuring accountability. Training Programs and Skill Development is also highly ranked, emphasizing the value placed on a skilled workforce for managing complex maintenance tasks. The third-highest strategy, adhering to Standard Operating Procedures, signals the importance of consistency and procedural rigor. This is closely followed by Lifecycle Planning, which indicates a shared understanding of the benefits of long-term strategic planning. Risk Management also ranks among the top strategies, highlighting the importance of mitigating potential risks to infrastructure integrity.

Efficient municipal infrastructure management requires comprehensive asset management planning, including asset inventory, lifecycle analysis, and risk management, to guide budget allocation and decision-making. This allows municipalities to prioritize maintenance based on service needs and risk through data on condition and lifespan; documentation, evaluations, and financial planning extend the life of assets and lower costs. (Michele & Daniela, 2011). This also improves infrastructure management, especially for water and wastewater systems, through requirements for asset assessment, service standards, and long-term financial projections, ensuring safety and environmental compliance. Long-term infrastructure efficiency and safety are further supported by training and systematic record-keeping, which embody key priorities in maintenance practices. (Soltanali et al., 2023).

4.3 Summary of Results

Further, the prioritization of Lifecycle Planning and Risk Management as top strategies points to the need for a long-term, risk-conscious approach in municipal maintenance planning. By focusing on these strategies, municipalities can address both immediate and future

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infrastructure demands effectively, potentially reducing maintenance costs and improving service delivery. Implementing these strategies systematically, supported by advanced data-driven tools where feasible, may enhance the resilience and sustainability of municipal infrastructure.

The survey results found in this paper are consistent with the literature on factors and strategies for optimizing municipal infrastructure maintenance. The major areas to which these results point include resource allocation, asset management, and technological advancement, all of which agree with the emphasis of the literature on proactive maintenance strategies such as preventive, predictive, and reliability-centred maintenance. The two most significant obstacles toward effective maintenance were identified by the respondents as budgeting and resource allocation, which are also vindicated in the literature where a shortage of financial resources along with the inability to manage core assets results in a lack of optimization. Advanced technologies that the respondents identified included IoT and predictive maintenance tools. Both are required to enhance the efficiency of maintenance, according to the literature, through the integration of more data-driven tools to enhance decision-making and reduce operational inefficiencies.

The statistical analysis, especially the high Cronbach's alpha of 0.8239 and 0.9175, shows strong internal consistency, confirming the reliability of the responses of the survey. Besides, the moderate values of the standard deviation reveal that varied experiences exist in maintenance practices; some strategies lifecycle planning, and the use of emerging technologies are rated as strengths. Thus, in sum, the findings do indicate that with the great difficulties of municipalities in allocating resources and managing assets, the adoption of advanced technologies and proactive strategies for maintenance can greatly enhance the performance and longevity of the infrastructure.

These results suggest that municipalities aiming to enhance maintenance outcomes should prioritize systematic documentation, structured training, adherence to procedures, proactive lifecycle planning, and risk management. The high Cronbach's Alpha score and strong consensus support these strategies as critical to achieving effective municipal infrastructure maintenance.

5. CONCLUSIONS

The leading challenge/factor identified in the study is resource allocation and budgeting in municipal infrastructure maintenance, which has the highest mean score of 3.43 and highest variability, with a standard deviation of 1.21, showing its critical nature and the varying perspectives among respondents. Other major challenges were regulatory compliance and workforce training, with a mean score of 3.29 for each, indicating that standards should be strictly followed and that there is a need for a well-trained workforce. These three concerns have been constantly rated as the most pressing by respondents.

By contrast, the desire for technological advances ranked last in the list of factors, with a mean score of 2.81, suggesting that these are less immediate concerns compared to basic funding,

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regulation, and human resources issues, which must be met before advanced technologies can be embraced. Similarly, issues related to detailed asset inventories and stakeholder involvement scored relatively low urgency ratings compared to the leading factors.

The most important strategy regarding maintenance was documentation and record-keeping, with a mean score of 4.57 and low variability, with a standard deviation of 0.60, reflecting very strong consensus on its critical role in ensuring effective management and accountability. Other strategies rated highly included following standard operating procedures, with a mean of 4.52, and lifecycle planning with a mean of 4.48, indicating their importance for sustainable and long-term maintenance outcomes. Training programs, with a mean of 4.48, and risk management strategies, with a mean of 4.38, were also stressed as important. Other strategies that were rated relatively lower included exploring cutting-edge innovations or advanced technologies. The findings highlight that the optimization of municipal infrastructure maintenance must be underpinned by resource allocation prioritization, regulatory compliance, and workforce training, while record-keeping, procedural adherence, and long-term planning remain key strategic imperatives. Of lesser priority, yet still relevant, are the adoption of technological advances and the maintenance of comprehensive asset inventories.

From these, some recommendations emerge. Municipalities should give due priority to the enhancement of resource allocation and budgeting procedures to ensure the availability of adequate financial and material resources for undertaking regular maintenance activities. Moreover, holistic asset management strategies, new technologies, and condition-based or predictive maintenance tools have the potential to ensure operational efficiency and elongate the life cycle of infrastructure assets. (Resende et al., 2021). There is a need for frequent workforce training to update the personnel with the constantly changing trends in maintenance practices and technologies that will help improve performance and safety. Lastly, compliance with regulatory standards helps sustain the reliability of infrastructure and public trust. By addressing these priority areas, municipalities are in a position where they effectively can manage their maintenance strategy.

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