

**EXPLORING THE LIVED EXPERIENCES OF ENGINEER'S ON GREEN  
INFRASTRUCTURE IN URBAN DEVELOPMENT  
PROJECTS IN DAVAO CITY****Samrudin Z. Haron<sup>1</sup>****Ferdinand J. Juyo<sup>2</sup>****Lester John T. Precillas<sup>3</sup>**University of Southeastern Philippines, College of Development Management, Graduate School  
Program, Mintal Campus, Davao City**ABSTRACT**

This qualitative study explores the lived experiences of engineers working on green infrastructure projects in urban development in Davao City. As urban areas face growing environmental challenges, integrating green infrastructure is essential to achieving sustainability. While the role of green infrastructure in supporting sustainable urban development is widely acknowledged, the personal experiences and perspectives of engineers involved in these projects are often overlooked. Adopting a phenomenological approach, this research employs semi-structured interviews and participant observations to gather in-depth qualitative data on engineers' experiences, challenges, and strategies. Participants will include engineers from both the government and private sectors actively engaged in green infrastructure initiatives. Through thematic analysis, the study aims to reveal the complexities of their contributions to sustainable urban development in Davao City. The findings will provide valuable insights into the role of engineers in green infrastructure, offering practical recommendations for improving future practices in the city's urban planning and development.

**Keywords:**

Green Infrastructure, Sustainable Urban Development, Lived Experiences, Davao City

**INTRODUCTION**

One of the most important urban development strategies in the world today is green infrastructure, a nature-based approach that combines built environments and ecosystems. In order to address environmental, social, and economic issues, it refers to networks of green areas, natural systems, and cutting-edge technologies. Green infrastructure aids cities in fending off the negative impacts of urbanization and climate change by controlling stormwater, increasing biodiversity, and lowering urban heat (City Green, 2023). A growing number of cities around the world are realizing how crucial it is to include green infrastructure in their urban planning frameworks in order to attain resilience and sustainability. A growing demand for long-term, inclusive solutions to urban problems brought on by fast urbanization and environmental degradation is reflected in this change.

Over the past few decades, the Philippines' urbanization has increased, resulting in notable changes to infrastructure and land usage. Unprecedented demographic and economic expansion are being seen by cities like Davao, which is regarded as one of the most progressive in the nation. But this development has also led to increasing flooding, urban heat island impacts, pollution, and the loss of open spaces (Orfano, 2024). Finding a balance between environmental sustainability and economic growth has become crucial as cities like Davao fight to stay competitive and habitable. One practical strategy for reducing these environmental effects and improving the standard of living for city dwellers is the incorporation of green infrastructure into urban projects. With the help of the Japan International Cooperation Agency (JICA), the Davao City Infrastructure Development Plan and Capacity Building Project (IM4Davao) provides long-term answers to the city's infrastructure problems. In order to improve resilience against natural catastrophes and climate change, it highlights the integration of green infrastructure (JICA, 2020). As part of this vision, initiatives including urban parks, green roofs, urban woods, and sustainable drainage systems have been proposed. Realizing the city's sustainability goals depends heavily on engineers, who are at the forefront of planning, developing, and carrying

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out these initiatives. Their ability to strike a balance between environmental considerations and technical requirements guarantees that green infrastructure will be a workable and feasible solution.

Green infrastructure has many potential advantages, but integrating it into urban projects is fraught with difficulties. Its broad adoption is impeded by policy gaps, budgetary limitations, and low stakeholder knowledge (IJPREMS, 2024). For instance, private contractors and developers frequently put cost-effectiveness ahead of environmental concerns, and legal frameworks may be vague about what green infrastructure needs are. The viability and long-term upkeep of these initiatives are hampered by the lack of community involvement and public knowledge. A multi-stakeholder strategy including engineers, legislators, local government entities, and communities is needed to address these obstacles.

Addressing these issues and coming up with workable solutions require an understanding of the engineers' real-world experiences working on green infrastructure projects. Engineers are in a unique position to offer insights into the operational, financial, and technical challenges associated with putting green infrastructure into place. Their experiences highlight how difficult it is to close the gap between the objectives of policy and its actual implementation on the ground. Furthermore, these stories help educate policymakers about the support networks—like incentives, capacity-building initiatives, and more transparent regulations—that are required to improve the deployment of green infrastructure.

This study intends to investigate the viewpoints and real-world experiences of engineers working on green infrastructure projects in Davao City, where urbanization is drastically changing the built environment. The study aims to add to the larger conversation on sustainable urban development by recording their obstacles, inspirations, and achievements. The knowledge gathered from this study can be used to improve project designs, reinforce regulations, and encourage a sustainable culture among stakeholders. In the end, learning from engineers' experiences can help create a more resilient and greener Davao City.

### OBJECTIVES

Due to the fast development of Davao City, green infrastructure is essential for solving environmental issues. The experiences and difficulties engineers encounter when carrying out these initiatives, however, are still not well understood. This study attempts to understand their viewpoints in order to enhance next green infrastructure projects. This study aims to answer the following questions:

1. What are the experiences of engineers working on green infrastructure projects in Davao City?
2. What challenges do they encounter, such as technical, financial, or regulatory issues?
3. What strategies do they use to overcome these challenges?
4. What recommendations do they have to improve future green infrastructure projects, particularly in terms of policy, resources, or strategies?

### METHODOLOGY

The study will employ a phenomenological approach to investigate the lived experiences of engineers working on green infrastructure projects in urban development within Davao City. This approach is well-suited to understand how engineers perceive and make sense of their experiences with green infrastructure. It emphasizes exploring personal insights, challenges, and problem-solving strategies (Creswell & Poth, 2018). By focusing on individual experiences, this research aims to uncover the complexities involved in incorporating green infrastructure in an urban context, especially in a rapidly developing city like Davao.

The research will target engineers who have hands-on experience with green infrastructure projects in Davao City. A purposive sampling technique will be used to identify participants who have been directly involved in the planning, design, and execution of these initiatives. The selected participants will include engineers from government agencies, private construction companies, and non-governmental organizations that are engaged in urban development projects. The criteria for inclusion will be that participants have worked on green infrastructure for at least one year, ensuring they possess adequate knowledge and experience. This selection will allow the study to capture a wide range of perspectives and experiences concerning the challenges and strategies associated with green infrastructure (Merriam & Tisdell, 2015).

Data will be gathered through in-depth, semi-structured interviews, which provide the flexibility to explore predetermined topics while also accommodating new insights as the conversation evolves (Rubin & Rubin, 2012). An interview guide will be designed based on the study's research objectives, focusing on the participants' personal experiences, the obstacles encountered in green infrastructure projects, and their suggestions for improving these projects within Davao City. Depending on participants' availability, interviews will be conducted in person or online, and audio recordings will be made with participants' consent for later

transcription. This approach will allow for the collection of rich, detailed data, capturing the subtleties of the engineers' experiences (Seidman, 2019).

Thematic analysis will be employed to analyze the interview data. This widely used qualitative analysis method involves identifying and interpreting patterns or themes across the data (Braun & Clarke, 2019). The analysis process will begin with transcribing the interviews verbatim, followed by careful review and re-reading of the transcripts to become familiar with the content. Significant statements reflecting the participants' experiences will be coded and grouped into themes. These themes will be refined through an iterative process to ensure they accurately represent the data. The final themes will be presented in narrative form, supported by direct quotes from participants to provide a comprehensive understanding of the engineers' experiences with green infrastructure in Davao City (Nowell et al., 2017).

The aim of this analysis is to offer valuable insights into the challenges and opportunities engineers face in implementing green infrastructure projects within urban environments. The findings will enrich the existing literature on green infrastructure and urban sustainability, offering actionable recommendations to improve future green infrastructure efforts, particularly in developing cities such as Davao (Foster et al., 2021).

## RESULTS AND DISCUSSION

The respondents in this study are highly experienced professionals in the field of engineering, with substantial involvement in green infrastructure projects. Most have over 10 years of experience working in urban development, particularly focusing on sustainable and green infrastructure initiatives. Their expertise spans various areas, including environmental engineering, urban planning, and civil engineering. These engineers have actively contributed to the design, implementation, and management of green infrastructure projects across Davao City, bringing a wealth of knowledge and practical experience to their work. Their roles and responsibilities have allowed them to engage directly with the challenges and strategies associated with integrating green infrastructure into urban settings, making them well-suited to provide valuable insights for this study.

### Lived Experiences of Engineers Working on Green Infrastructure Projects

Table 1 summarizes the experiences of engineers working on green infrastructure projects in Davao City. It highlights key themes regarding the positive impacts, technical and regulatory challenges, and the importance of collaboration with local government units (LGUs). These insights are crucial for understanding the complexities of implementing sustainable urban development in the city.

**Themes 1: Positive Impact of Green Infrastructure** theme emphasizes how green solutions, like rain gardens and permeable pavements, improve water management, reduce flood risks, and enhance urban resilience and environmental quality.

R3: *Ang green infrastructure makatabang sa pag-manage sa tubig ug makapadayon sa kalimpyo sa palibot.*

R3: Green infrastructure helps manage water effectively and maintain a clean environment.

R5: *Makapadali og pag-ayo sa baha sa syudad pinaagisa mga green solutions.*

R5: It can speed up flood recovery in the city through green solutions.

The statements above were attested to by R3 and R5, who agreed during the interview that green infrastructure solutions, like rain gardens and permeable pavements, help manage water, reduce flood risks, and improve environmental quality, thus making the city more resilient and sustainable.

**Themes 2: Challenges in Technical Integration** reflect the difficulties engineers face when incorporating green infrastructure into existing systems. The need for design adjustments and the cost of integrating new technologies can delay or limit implementation.

R2: *Lisod kaayo i-integrate sa existing drainage systems ang green infrastructure, magkasumpaki usahay ang mga sistema.*

R2: It's very hard to integrate green infrastructure into the existing drainage systems; sometimes, the systems clash.

The statement above was confirmed by R2, who highlighted that integrating green infrastructure into existing drainage systems is difficult due to occasional conflicts between the systems, which can delay or limit implementation.

**Themes 3: Government Collaboration** theme highlights the vital role of LGUs in securing funding, permits, and policy alignment for successful project implementation. However, bureaucratic processes can sometimes cause delays in the approval of green infrastructure projects.

R1: *Ang collaboration sa gobyerno usa ka dakong tabang, pero dugay ang proseso sa pag-approve sa mga projects.*

R1: The collaboration with the government is a big help, but the process of approving projects takes a long time. The statement above was confirmed by R1, who emphasized that while government collaboration is essential, the lengthy approval process can hinder the timely implementation of green infrastructure projects.

Engineers involved in green infrastructure projects in Davao City shared that their experiences were shaped by the need for collaboration, adaptability, and innovation. A common observation was the importance of working closely with various stakeholders, including private companies, to secure additional funding and resources. This collaborative approach made projects more feasible and allowed engineers to adapt their designs to local conditions. For instance, integrating green infrastructure into existing urban systems required modifications to current infrastructure, ensuring that sustainability goals were met without compromising functionality. The flexibility in design and the ability to work with other sectors was highlighted as crucial for the success of these initiatives, as shown in Table 2. In conclusion, Table 1 provides a concise overview of engineers' experiences, focusing on the benefits, challenges, and collaborative efforts involved in green infrastructure projects in Davao City.

Themes	Description	Supporting Statements
<b>1. Positive Impact of Green Infrastructure</b>	Engineers highlighted the benefits of green infrastructure for improving environmental quality, water management, and urban resilience.	<i>Ang green infrastructure makatabang sa pag-manage sa tubig ug makapadayon sa kalimpyo sa palibot.</i> (Respondent 3)
		<i>"Makapadali og pag-ayo sa baha sa syudad pinaagi sa mga green solutions.</i> (Respondent 5)
<b>2. Challenges in Technical Integration</b>	Engineers faced difficulties integrating green infrastructure into existing urban systems.	<i>Lisod kaayo i-integrate sa existing drainage systems ang green infrastructure, magkasumpaki usahay ang mga sistema.</i> (Respondent 2)
<b>3. Government Collaboration</b>	Some engineers shared their experience working with local government units (LGUs) for project approvals and support.	<i>Ang collaboration sa gobyerno usa ka dakong tabang, pero dugay ang proseso sa pag-approve sa mga projects.</i> (Respondent 1)

*Table 1. Themes that emerged on the Lived Experiences of Engineers Working on Green Infrastructure Projects*

### Challenges Faced in Green Infrastructure Implementation

Table 2 presents the challenges faced by engineers working on green infrastructure projects in Davao City. These challenges are categorized into three main themes: technical issues, financial constraints, and regulatory delays.

**Themes 1: Technical Issues** highlight the difficulties engineers encounter when trying to integrate green infrastructure systems into existing urban setups. Many current infrastructures are not designed to accommodate

green features, creating significant coordination problems. This challenge was echoed by the respondents, with one noting that integration is tough due to the lack of preparedness in existing systems.

R4: *Lisod ang pag-integrate sa green infrastructure kay ang uban existing systems dili pa preparado para niini.*

R4: It's difficult to integrate green infrastructure because some existing systems are not yet prepared for it.

The statement above was affirmed by R4 during the interview, who highlighted that integrating green infrastructure is difficult because some existing systems are not yet prepared to support it.

**Themes 2: Financial Constraints** show that a lack of sufficient funding is a common hurdle in the successful implementation of green infrastructure. Engineers often face budget limitations, which hinder the full realization of green infrastructure projects. As a result, many engineers are forced to scale back on planned features or adjust their designs to stay within budget.

R7: *Daghang plano nga maayo unta pero kulang sa budget, maglisod mi mag-implemanta sa tanan nga features.*

R7: There are many good plans, but there's a lack of budget, making it difficult for us to implement all the features.

R7 shared that although there are many well-conceived plans, the lack of sufficient budget often prevents the full implementation of all the intended features. This highlights the financial constraints engineers face when executing green infrastructure projects.

**Themes 3: Regulatory and Approval Delays** point to the bureaucratic obstacles encountered in green infrastructure projects. Engineers noted the slow approval processes for permits and the challenges posed by outdated regulations, which impede the timely implementation of green infrastructure initiatives. These delays often force engineers to revise their designs or wait for extended periods before moving forward with the project.

R6: *Usahay maglisod mi tungod sa taas nga proseso sa approval sa mga permits, ug mga balaod nga wala magtutok sa green infrastructure.*

R6: Sometimes we struggle due to the lengthy approval process for permits and laws that do not focus on green infrastructure.

R6 expressed that the slow approval processes for permits, combined with outdated regulations that do not prioritize green infrastructure, often create significant challenges, delaying the progress of green infrastructure projects.

Several challenges emerged in the implementation of green infrastructure projects, as identified by engineers. Technical difficulties were one of the primary challenges, particularly when it came to integrating green systems with existing infrastructure. Engineers noted that older urban systems were not always compatible with modern green infrastructure elements, making integration complex and time-consuming. Financial constraints were another major challenge, with limited budgets often forcing engineers to scale down the scope of projects or sacrifice key components of the green infrastructure. Moreover, regulatory issues posed significant barriers, with slow government processes and outdated regulations delaying approvals and impeding project timelines. These challenges are reflected in the findings presented in Table 2, which highlight technical, financial, and regulatory issues as major obstacles. In summary, Table 2 highlights the significant barriers engineers face when working on green infrastructure projects, which range from technical and financial challenges to delays in regulatory approval. These findings are essential in understanding the complexities of green infrastructure implementation and offer insight into the areas that need improvement.

Themes	Description	Supporting Statements
1. Technical Issues	Engineers noted difficulties in coordinating green infrastructure systems with existing infrastructure.	<i>Lisod ang pag-integrate sa green infrastructure kay ang uban existing systems dili pa preparado para niini.</i> (Respondent 4)



<b>2. Financial Constraints</b>	The lack of sufficient funding was a common challenge in implementing green infrastructure.	<i>Daghang plano nga maayo unta pero kulang sa budget, maglisod mi mag-implemanta sa tanan nga features. (Respondent 7)</i>
<b>3. Regulatory and Approval Delays</b>	Slow government processes and outdated regulations hinder the timely implementation of green infrastructure.	<i>Usahay maglisod mi tungod sa taas nga proseso sa approval sa mga permits, ug mga balaod nga wala magtutok sa green infrastructure. (Respondent 6)</i>

*Table 2. Themes that emerged on the Challenges Faced in Green Infrastructure Implementation*

### Strategies for Overcoming Green Infrastructure Challenges

Table 3 presents the strategies used by engineers to overcome the challenges encountered in green infrastructure projects in Davao City. These strategies are organized into three main themes: collaboration with stakeholders, adaptation of green infrastructure designs, and policy advocacy.

**Themes 1: Collaboration with Stakeholders** reflects the importance of partnerships with various sectors, especially private companies, to secure additional funding and resources. Engineers highlighted how collaboration can ease financial constraints and ensure the successful implementation of green infrastructure projects. As one respondent noted, partnerships with private companies significantly aid in acquiring the necessary funding for these initiatives.

R8: *Ang partnership sa mga private companies makatabang sa pagkuha ug dugang nga funding para sa proyekto.*

R8: The partnership with private companies helps in securing additional funding for the project.

The statement above was affirmed by R8 during the interview, highlighting those partnerships with private companies are essential for securing additional funding, which is crucial for the successful implementation of green infrastructure projects.

**Themes 2: Adaptation of Green Infrastructure Designs** underscores the engineers' ability to modify designs to make green infrastructure more cost-effective. Engineers find ways to incorporate green infrastructure elements while reducing costs by utilizing local materials, as one respondent explained. This strategy ensures that projects are both economically feasible and environmentally beneficial, preserving the core functions of green infrastructure.

R2: *Pinaagi sa paggamit sa lokal nga mga materyales, nakatipid mi sa gasto, apan naa gihapon ang benepisyo sa green infrastructure.*

R2: By using local materials, we saved on costs, but still reaped the benefits of green infrastructure.

The statement above was attested to by R2 during the interview, who explained that utilizing local materials allowed for cost savings while still maintaining the environmental benefits of green infrastructure. This approach ensures both economic feasibility and ecological sustainability.

**Themes 3: Policy Advocacy** illustrates the efforts of engineers to push for policy changes that encourage the adoption of green infrastructure. Respondents emphasized the need for government incentives to make green infrastructure more attractive to developers. If policies were in place to provide incentives for adopting sustainable practices, engineers believe it would lead to greater implementation of green infrastructure projects across the city.

R5: *Kung ang gobyerno maghatag ug incentives para sa mga proyekto nga naggamit ug green infrastructure, mas daghan ang mag-implemanta.*

R5: If the government provides incentives for projects that use green infrastructure, more will be implemented.

The statement above was affirmed by R5 during the interview, who highlighted that providing incentives for green infrastructure projects would encourage more developers to adopt sustainable practices, leading to a broader implementation of green infrastructure across the city.

To address these challenges, engineers employed a range of strategies that focused on optimizing available resources and adapting designs. One key strategy involved collaborating with stakeholders, particularly private companies, to secure additional funding and resources. This collaboration helped to overcome financial constraints and facilitated the completion of projects. Another approach was to adapt green infrastructure designs to be more cost-effective without sacrificing their environmental and functional benefits. Engineers commonly utilized locally sourced materials to reduce costs while maintaining the effectiveness of green systems. Furthermore, advocating for policy changes became an important strategy to ensure that government incentives and support could help accelerate the adoption of green infrastructure. These strategies, as detailed in Table 3, reflect the engineers' ability to be resourceful and adaptive in overcoming project challenges. In summary, Table 3 highlights the strategies engineers employ to address challenges in green infrastructure projects. By collaborating with stakeholders, adapting designs to be more cost-effective, and advocating for policy changes, engineers aim to improve the feasibility and success of these projects. These strategies reflect a proactive approach to overcoming barriers and ensuring the long-term viability of green infrastructure in Davao City.

Themes	Description	Supporting Statements
<b>1. Collaboration with Stakeholders</b>	Engineers emphasized collaboration with other sectors, including private companies, to secure additional funding and resources.	<i>Ang partnership sa mga private companies makatabang sa pagkuha ug dugang nga funding para sa proyekto. (Respondent 8)</i>
<b>2. Adaptation of Green Infrastructure Designs</b>	Engineers modified designs to be cost-effective without sacrificing functionality.	<i>Pinaagi sa paggamit sa lokal nga mga materyales, nakatipid mi sa gasto, apan naa gihapon ang benepisyo sa green infrastructure. (Respondent 2)</i>
<b>3. Policy Advocacy</b>	Engineers called for policy changes to provide incentives for green infrastructure adoption.	<i>Kung ang gobyerno maghatag ug incentives para sa mga proyekto nga naggamit ug green infrastructure, mas daghan ang mag-implimenta. (Respondent 5)</i>

**Table 3. Themes that emerged on the Strategies for Overcoming Green Infrastructure Challenges**

### Proposed Improvements for Future Green Infrastructure Projects

Table 4 highlights the recommendations provided by engineers to improve future green infrastructure projects in Davao City. These recommendations are categorized into three key themes: training and education, government support and incentives, and long-term maintenance plans.

**Themes 1: Training and Education** emphasizes the need for continuous learning and development programs for engineers and planners focused on green infrastructure. Engineers believe that more training is essential for professionals to understand how to design, implement, and maintain sustainable green infrastructure. As one respondent noted, engineers and planners must be well-equipped with the necessary skills and knowledge to effectively manage these projects, ensuring their long-term success.

R3: *Magkinahanglan og mas daghang training para sa mga engineers ug planners para mahibal-an nila unsaon pagdesinyo ug pag-maintain sa green infrastructure.*

R3: There is a need for more training for engineers and planners so they can learn how to design and maintain green infrastructure.

The statement above was affirmed by R3 during the interview, emphasizing the importance of providing more training for engineers and planners to ensure they have the necessary skills and knowledge to design, implement, and maintain green infrastructure projects effectively.

**Themes 2: Government Support and Incentives** focuses on the importance of strong government policies and incentives to promote the adoption of green infrastructure. Respondents called for clear guidelines and financial incentives from the government to facilitate the widespread integration of green infrastructure in urban development projects. This would not only make green infrastructure more accessible but also motivate developers and city planners to prioritize it in future urban planning.

R4: *Ang gobyerno kinahanglan maghatag ug klarong mga guidelines ug mga insentibo para mas mapadali ang adoption sa green infrastructure.*

R4: The government needs to provide clear guidelines and incentives to accelerate the adoption of green infrastructure.

The statement above was affirmed by R4 during the interview, highlighting those clear guidelines and financial incentives from the government are crucial to accelerating the adoption of green infrastructure, making it more accessible and motivating developers and city planners to prioritize it in future urban projects.

**Themes 3: Long-term Maintenance Plans** stresses the significance of planning for the sustained upkeep of green infrastructure systems. Respondents noted that while green infrastructure may be installed successfully, there needs to be a dedicated plan for its long-term maintenance to ensure its functionality and longevity. Effective maintenance strategies would help prevent degradation and ensure that the infrastructure continues to provide environmental benefits for years to come.

R6: *Dili lang kay i-install ang green infrastructure, kinahanglan naa pod plano para sa maintenance niini.*

R6: Green infrastructure should not just be installed; there also needs to be a plan for its maintenance.

The statement above was affirmed by R6 during the interview, emphasizing that green infrastructure should not only be installed but also accompanied by a comprehensive maintenance plan to ensure its long-term functionality and environmental benefits.

Engineers provided several recommendations to improve the implementation and sustainability of future green infrastructure projects. One significant suggestion was the need for increased training and education for engineers and planners on the design and maintenance of green infrastructure. This would ensure that the workforce is equipped with the necessary skills and knowledge to effectively manage these projects. Additionally, stronger government support and incentives were recommended to encourage the adoption of green infrastructure. Engineers emphasized the importance of having clear guidelines and financial incentives that would make green infrastructure more attractive to stakeholders. Finally, engineers stressed the need for long-term maintenance plans to ensure the sustainability of green infrastructure systems. Without proper maintenance planning, these systems could deteriorate over time, reducing their effectiveness. These recommendations are summarized in Table 4, which illustrates the key areas for improvement in future projects. In conclusion, Table 4 summarizes key recommendations from engineers aimed at improving green infrastructure projects in Davao City. These include enhancing training and education, strengthening government support and incentives, and developing comprehensive long-term maintenance plans. Addressing these areas would not only ensure the success of green infrastructure projects but also contribute to the sustainable development of the city.

Themes	Description	Supporting Statements
<b>1. Training and Education</b>	Engineers recommended more training for engineers and planners on green infrastructure design and maintenance.	<i>Magkinahanglan og mas daghang training para sa mga engineers ug planners para mahibal-an nila unsaon pagdesinyo ug pag-maintain sa green infrastructure. (Respondent 3)</i>



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<b>2. Government Support and Incentives</b>	There is a call for stronger policy frameworks that encourage the adoption of green infrastructure.	<i>Ang gobyerno kinahanglan maghatag ug klarong mga guidelines ug mga insentibo para mas mapadali ang adoption sa green infrastructure. (Respondent 4)</i>
<b>3. Long-term Maintenance Plans</b>	Respondents stressed the importance of planning for the long-term sustainability of green infrastructure systems.	<i>Dili lang kay i-install ang green infrastructure, kinahanglan naa pod plano para sa maintenance niini. (Respondent 6)</i>

**Table 4. Themes that emerged on the Proposed Improvements for Future Green Infrastructure Projects**

### CONCLUSION

The integration of green infrastructure in urban development projects in Davao City presents both opportunities and challenges, as highlighted by the engineers involved in these initiatives. Their experiences demonstrate that green infrastructure can significantly contribute to sustainable urban development, but its successful implementation requires overcoming substantial technical, financial, and regulatory barriers. The strategies employed by engineers—such as stakeholder collaboration, adapting designs to local conditions, and advocating for policy change—showcase the ingenuity and resilience needed to manage these challenges. Furthermore, the emphasis on collaboration with private companies, modifying designs to be cost-effective, and pursuing government incentives reflects a pragmatic approach that balances environmental goals with the practical realities of urban development.

However, the study also underscores the need for substantial improvements in several key areas. Training and education for engineers and planners is critical to ensuring that the workforce is well-equipped to design, implement, and maintain green infrastructure.

Additionally, stronger and more supportive government policies are necessary to create a favorable environment for the widespread adoption of green infrastructure. Incentives, clear guidelines, and streamlined approval processes could significantly ease the challenges faced by engineers and accelerate the transition toward more sustainable urban development. Moreover, the importance of long-term maintenance planning cannot be overstated, as ensuring the sustainability of green infrastructure systems is crucial for maximizing their benefits over time.

Overall, this study provides valuable insights into the lived experiences of engineers in green infrastructure projects, offering practical recommendations for improving future practices. The findings have implications not only for Davao City but also for other urban areas facing similar environmental challenges. As cities around the world strive to become more sustainable, the lessons learned from Davao's engineers can serve as a model for enhancing green infrastructure initiatives in other urban contexts. By addressing the identified challenges and implementing the recommended strategies, it is possible to build more resilient, sustainable cities that integrate environmental and infrastructural needs.

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