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Research Article

Smart Sustainable Cities Implementation in Zambia: An Investigation into the Relationship Between Political Will and Barriers to SMART Sustainable CITIES

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Abstract

The emergence of smart sustainable cities (SSCs) offers a potential solution to many urban development challenges, prompting various cities and nations, including Zambia, to adopt this concept. However, it is essential to recognize the significant role that politics plays in the implementation of SSCs in Zambia. This study aimed to explore the relationship between political will and the barriers to the development of SSCs in the country. Using a quantitative research method, a questionnaire survey was administered via Google Forms, gathering responses from 92 participants. The study examined the relationship between prioritized barriers and the lack of political will, employing the Kendall Tau b correlation coefficient. A positive correlation of varying significance was found between the lack of political will and the barriers to SSC implementation in Zambia. Particularly strong correlations were identified between the lack of political will and several barriers, including insufficient knowledge and information sharing, inadequate research and development funding, lack of technological capacity, limited use of information and communication technology (ICT) for environmental sustainability and energy efficiency, insufficient funding for SSC initiatives, as well as centralized decision-making processes and top-down approaches. While this study was conducted in Zambia, the findings may not significantly differ from those in other developing countries.

Keywords

Smart Sustainable Cities, Implementation, Zambia, Relationship, Politics, Barriers

1. Introduction

Studies have shown that the global urban population has increased significantly, rising from 0.75 billion in 1950 to 4.22 billion in 2018 with projections indicating that by the mid-twenty-first century, 68 percent of the world's population will reside in urban areas [1]. Observations of the trend show a consistent increase in urban populations from 1950 to 2025, with the epicentre of urbanization shifting from the northern to the southern hemisphere (ibid). Kundu et al. [1] further note that cities in Africa are currently experiencing the fastest growth, a trend that is expected to continue between 2025 and 2050. This rapid urbanization has triggered numerous challenges, including urban sprawl, urban poverty, higher unem-

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ployment rates, increased living costs, housing affordability issues, a lack of urban investment, weak urban governance, rising inequality, urban crime, and environmental degradation [2]. In response to these challenges, the concept of smart sustainable cities (SSC) has emerged as a potential solution to many problems associated with urbanization in major cities worldwide [3]. This interest in SSCs, coupled with the issues stemming from rapid urbanization, has led countries both developed and developing alike to embrace this concept. Although there is no consensus on the definition of smart sustainable cities, the main goal of SSCs seems to be to ensure that cities offer the current and future generations, improved living conditions to their citizens which span the economic, technological, social, and regulatory aspects [4].

Zambia, located in Southern Africa and home to a population of approximately 19.6 million [5], has experienced a notable increase in its urban population. This figure grew from 34.6 percent in 2000 to 40 percent in 2022 [5, 6]. Rapid urbanization has led to several challenges, including the rise of informal settlements that often lack basic services such as water supply and sanitation infrastructure [7]. Other challenges associated with urbanization in Zambia's fast-growing cities include severe environmental degradation and heightened disaster risks. This is largely due to ineffective planning and land management, which are struggling to keep up with the influx of people and the pressure for services. Additionally, leapfrog developments contribute to urban sprawl and increase costs for local governments to provide infrastructure and deliver services [8].

To tackle these challenges, Zambia has initiated various smart and sustainable initiatives, beginning with the establishment of the Smart Zambia Institute (SZI). Although Zambia's commitment to implementing smart sustainable cities is evident in various policies and the creation of the SZI, progress has been hindered by several barriers, including a lack of political will. This study aims to explore the relationship between political will and the obstacles to implementing smart sustainable cities in Zambia.

2. Role of Politics in Smart Sustainable Cities Development

The discourse surrounding SSCs comes with numerous promises, particularly in addressing the challenges posed by rapid urbanization. While cities in both developed and developing countries have embraced this innovative concept, the implementation of SSCs has faced various barriers. One significant set of challenges relates to politics. For instance, the Smart Cities Council [9] identifies the lack of visionary leadership as a major obstacle to the widespread adoption of Smart Cities. This is because elected leaders are often viewed as visionaries due to their persuasive abilities and political influence. However, care must be taken to ensure that such political influence does not lead to a top-down approach in SSC implementation, which can sometimes exclude community participation. In terms of innovation diffusion within an SSC, Lee et al [10] observed that top-down, publicly driven partnerships might help accelerate the early adoption of smart city initiatives. Conversely, Yigitcanlar et al [11] pointed out that in Northeast Asia, community resistance to top-down, politically oriented processes with minimal public involvement highlights the need to strike a balance for successful smart city development. Some scholars, such as Harrison [12], argue that the bottom-up approach provides a fairer model for urban development by acknowledging the diverse needs of various users. This approach also holds the potential for wider acceptance among residents. By carefully considering the variety of human needs, the likelihood of new technologies being embraced by the entire community is enhanced, as the focus starts on users' experiences rather than on the technologies themselves [12].

Political leadership plays a crucial role in the success of smart cities. The example of Seoul illustrates this, as an elected official appointed a chief innovation officer and established an office for civic innovation to drive new services [10]. While political will and influence are essential at the project's outset, sustaining long-term success may require a more decentralized approach. Manville et al [13] emphasize the importance of political will in launching SSC initiatives, noting that political leadership is vital for establishing a vision, facilitating citizen participation, and creating processes for SSCs. Moreover, the presence of political will fosters an enabling environment for the successful implementation of SSC initiatives. This is evident in the increased credibility of smart city initiatives when launched by a city’s mayor [13]. The cases of Gimpo and New York demonstrate the critical role of political leadership in driving smart city innovation [14]. Political will, stakeholder involvement, and the context of the Fourth Industrial Revolution are recognized as key factors in smart city development, alongside consideration of government policy agendas [14]. In emphasising the importance of politics in the development of SSC, Anthopoulos [15] argues that city management must recognize that technology alone will not make a city smarter. Building a smarter city requires a political understanding of technology. In the case of Trikala, Anthopoulos [15] observed that the stakeholder management process faced challenges, partly due to political opposition. This highlights the crucial role that politics and political leadership play in securing stakeholder buy-in. The Trikala case demonstrates that a lack of support from political leaders can be a significant barrier to the implementation of smart city initiatives. Therefore, it is essential to conduct an initial assessment of a project's potential and the level of political will before starting such initiatives. It is important to understand that even smart city technologies should be viewed as artefacts constructed within a specific socio-historical context, influenced among other factors by political dynamics [12].

While no study has explicitly linked the barriers to implementing smart cities and SSC with political will, various

studies have shown that political will and factors influenced by politics significantly impact the success of SSC implementations.

In a study conducted in Saudi Arabia, Mutambik [16] utilized literature review and semi-structured interviews to identify the key challenges faced by SSC. The findings indicated that governance and legal-related factors ranked as the second most critical challenges to the success of SSCs. These factors included political instability, a lack of trust, inadequate cooperation and coordination among city networks, unclear IT management visions, poor public-private participation, and the absence of a common information system model [16]. It is important to recognize that governance largely falls under the purview of political leadership. Therefore, it can be argued that if there is political will supporting SSC initiatives, it will lead to favourable policies that, in turn, will facilitate successful implementation.

Schuch de Azambuja [17] identified various barriers classified by their respective domains, with governance-related barriers being the most significant, followed by issues related to urban infrastructure. Governance-related barriers included factors such as a lack of political will and support, political instability and complexity, centralized decision-making, a top-down approach, and insufficient IT knowledge among planners [17]. The ranking of governance-related barriers as the most important highlights the critical role that politics and political leadership play in the implementation of Smart City Concepts. On the other hand, urban infrastructure-related barriers included urban infrastructure deterioration, a deficit in technological infrastructure, and poor quality of ICT-based services (ibid).

Through a comprehensive literature review, Jayasena. N. S. et al [18] established that existing policies, political uncertainty, and disorganized funding structures can impede investment in Smart Cities (SC). This study highlights that the challenges to the successful implementation of SSCs are not solely due to a lack of political will, but also arise from political uncertainties. In a separate study, Rana et al [19] utilized an extensive literature review along with a questionnaire survey to identify significant barriers to the development of SC in the Indian context. They found that governance-related barriers, particularly political instability and a lack of trust between citizens and the government, were the most pressing issues. Other governance-related challenges included insufficient cooperation and coordination among the city's operational networks, an unclear vision for IT management, poor private-sector participation, and the absence of a common information system model [19]. These two scholars both affirm the influence of politics in the implementation of SSC, though they did not attempt to establish a relationship between political influence and the barriers to the implementation.

In a study aimed at identifying the limitations to the adoption of SC in the Northwest Province of South Africa, Enwereji et al [20] conducted open-ended interviews. They observed several challenges, including a lack of financial resources, inadequate infrastructure, delays in decision-making processes, and a lack of strategic leadership. Other identified limitations included corruption among key players, an inability to implement research outcomes, and a scarcity of investors. Their research emphasized the critical role of political leadership in the successful implementation of SC. The presence of political will in the development of SC could lead to policies that reduce decision-making delays, combat corruption, and ensure the allocation of sufficient financial resources for SC implementation. Although Enwereji et al [20] did not attempt to establish a direct link between these limitations and political will, their findings underscore that the lack of political will is a significant barrier to the implementation of SC initiatives.

Similarly, Bayu [21], through secondary data analysis of various SC projects in Rwanda and Ethiopia, concluded that political leadership is indispensable for the success of SC. The measures adopted by these two countries, along with the alliances formed with various stakeholders, highlight this essential role. This perspective aligns with the findings of Wiig et al. [22], who noted that SCs have a specific history rooted in policy and politics, originating from efforts in electronic governance. Despite the progress made by political leaders in Rwanda and Ethiopia, they face challenges such as a lack of clarity surrounding SC, underdeveloped governance systems, poor urban planning and design practices, inadequate public participation, and issues related to inclusion. Further, there are mindset barriers characterized by resistance to change, insufficient financial resources for urban infrastructure, and the presence of underdeveloped ICT infrastructure [21]. These findings highlight that while political will is crucial, it is not sufficient for the success of any smart city initiative; other supportive factors must also be in place.

Using exploratory interviews, Pries-Heje et al [23] identified several barriers to SSC implementation. These include a lack of scalability due to an emphasis on quick wins, misalignment between municipal structures and processes with smart city needs, legal and regulatory challenges, security issues, a lack of an innovation culture within city administration, caution and risk aversion around data use, and gaps in capacity and knowledge. Implementing SSC initiatives often leads to significant changes, necessitating strong leadership, particularly political and administrative leadership to facilitate this transformation. Pries-Heje et al [23] noted that effective smart city leadership must navigate these challenges by establishing, maintaining, and defending a clear vision and direction while enacting strategies to achieve specific goals that promote progress. Additional leadership roles include being an engineer, which involves structuring the smart city and coordinating collective tasks; being a storyteller, which means sharing narratives and tailoring information to resonate with specific groups; being a learner/knowledge builder, which entails fostering a culture of learning and modelling continuous education; and being a relationship builder, fo-

cused on developing and enhancing internal and external relationships [23]. A thorough review of the roles of smart city leadership indicates that political power is essential for fulfilling these responsibilities, highlighting the significant impact of political will on the successful implementation of smart cities. Although Pries-Heje et al [23] did not explicitly explore the connection between political will and identified barriers, they did emphasize the crucial role that leadership plays in the success of smart city initiatives.

The literature reviewed so far highlights the crucial role that political will, in its various forms, plays in the implementation of SSCs across many countries worldwide. However, to our knowledge, no article has explored the relationship between political will and the barriers to the implementation of SSCs. Recognizing this gap, the current paper aims to provide insights into this issue.

3. Materials and Methods

This study utilized a quantitative research approach, employing a questionnaire survey targeted at participants from various sectors, including architectural engineering, construction, security, traffic management, governance, banking, healthcare, telecommunications, ICT service providers, NGOs, and other potential users of SSCs.

An extensive review of the existing literature was conducted to identify the barriers that hinder the effective implementation of SSCs. This groundwork was instrumental in the formulation of the survey instrument. The research employed a purposive sampling technique, with an initial target sample size of 100 respondents guided by the finding of Glenn (1992), as referenced in the work of Singh and M. B. Masuku [24]. Ultimately, a total of 150 questionnaires were disseminated via Google Forms, an accessible online platform. The study focused on participants in Zambia, achieving 92 completed responses, which reflects a response rate of 61.3% considered acceptable by Daikeler et al [25].

To analyse the association between political will and other barriers to SSC implementation in Zambia, the Kendall Tau B correlation coefficient was applied. Additionally, the Relative Importance Index (RII), as suggested by Rooshdi et al [26], was used to assess the relative importance of the items on the Likert scale.

4. Results

The barriers to SSC implementation in Zambia presented in Table 1 below are those with a calculated relative importance index (RII) above 0.8 which according to Sakhare et al. [27] fall in the category of factors with high importance. Furthermore, the lack of political will had an RII of 0.85 which puts it in the category barriers with high importance.

Table 1. *Correlation of the barriers to SSC implementation with lack of political will and influence of local culture.*

Barriers to Smart Sustainable Cities	RII	Kendall's Tau_b	Political will
Outdated and dilapidated infrastructure	0.89	Cor Coeff	.305**
		Sig. (2-tailed)	.001
Lack of funding for Smart sustainable services and initiatives	0.88	Cor Coeff	.288**
		Sig. (2-tailed)	.002
Lack of proper implementation of the local area plan	0.87	Cor Coeff	.219*
		Sig. (2-tailed)	.020
Lack of political will	0.85	Cor Coeff	1.000
		Sig. (2-tailed)	
Lack of stakeholder engagement	0.85	Cor Coeff	.203*
		Sig. (2-tailed)	.032
Lack of coordination in the implementation of smart sustainable services	0.85	Cor Coeff	.222*
		Sig. (2-tailed)	.017
Increasing debt burden which usually discourages an increase in spending for the benefit of modernisation	0.83	Cor Coeff	.180
		Sig. (2-tailed)	.052
Lack of knowledge and information sharing as well as engagement opportunities	0.83	Cor Coeff	.345**
		Sig. (2-tailed)	.000
Insufficient Research and Development (R &D) funding and lack of technological	0.82	Cor Coeff	.319**

Barriers to Smart Sustainable Cities	RII	Kendall's Tau_b	Political will
capabilities		Sig. (2-tailed)	.001
The centralized decision-making process, top-down approach	0.81	Cor Coeff	.251**
		Sig. (2-tailed)	.006
Lack of planning; vision and strategy, project management, capacity (HR), and ICT knowledge among city planners	0.81	Cor Coeff	.274**
		Sig. (2-tailed)	.003
Insufficient use of ICT for environmental sustainability, and energy efficiency.	0.81	Cor Coeff	.301**
		Sig. (2-tailed)	.001
The lack of standardised assessment frameworks for Smart Sustainable Cities	0.8	Cor Coeff	.192*
		Sig. (2-tailed)	.037
lack of awareness of the availability of smart sustainable services	0.8	Cor Coeff	.151
		Sig. (2-tailed)	.102
Weak Public-Private Partnership and Inefficiency of Resource Management	0.8	Cor Coeff	.191*
		Sig. (2-tailed)	.039
Influence of local culture and the high resistance to change	0.8	Cor Coeff	.220*
		Sig. (2-tailed)	.016

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).
Source: Authors own.

A Kendall's tau b correlation was conducted to examine the relationship between the lack of political will and other barriers to the implementation of SSC in Zambia.

The results indicated a positive correlation between the lack of political will and other barriers to SSCs in Zambia. Although correlation does not imply causation, these findings suggest that changes in political will can influence changes in other barriers. It is important to note that the strength of the correlation between political will and the various barriers to SSC ranges from weak to significant.

From Table 1, it is evident that the barrier with the highest correlation coefficient and therefore the most significant is, the lack of knowledge and information sharing, as well as limited engagement opportunities. This suggests that a shift in political drive would likely lead to a significant corresponding improvement in knowledge and information sharing related to SSCs. Conversely, the barriers with the lowest correlation coefficients involve a lack of awareness regarding the availability of smart sustainable services. This finding indicates that, even when political resolve exists, it may not necessarily lead to increased awareness of available services.

Based on the findings of this study, it was established that several barriers to the implementation of SSC in Zambia show a positive correlation with political will, however the following barriers have a statistically significant correlation:

1) Lack of knowledge and information sharing as well as engagement opportunities.
2) Insufficient R and D funding and lack of technological capabilities.
3) Outdated and dilapidated infrastructure.
4) Insufficient use of ICT for environmental sustainability, and energy efficiency.
5) Lack of funding for Smart sustainable services and initiatives.
6) The centralized decision-making process, top-down approach.

This study has established a positive correlation between political will and the barriers to the implementation of SSCs in Zambia. However, future research should investigate whether there is a causal relationship between political will and these barriers. Additionally, conducting another study to examine the relationship between the barriers to implementing specific SSC domains and political will would be beneficial. Understanding the nature of this relationship is important for developing policies that effectively address these barriers.

5. Discussion

This study revealed a positive correlation between the between political will and the barriers to SSCs implementation in Zambia. This observation is consistent with the work of Wiig et al [22], who noted that SSC has a particular history in policy and politics, originating from electronic initiatives. It is important to highlight that governance, identified by Mutambik

[16] as a major barrier to SSC implementation, is closely linked to the nature of political leadership. As established by Lee et al [10], political leaders play a critical role in the success of SSC, and a lack of political will is expected to have negative effects, as demonstrated by this study's findings.

However, it is important to note that political will alone is not sufficient for the success of SSC, as demonstrated by Bayu [21] in the study of Ethiopia and Rwanda. In examining these countries, Bayu [21] found that while political will was present, the projects encountered various challenges. The findings suggest that some factors may not strongly correlate with the presence of political will, which aligns with the conclusions of this study. This insight emphasizes the need to not only seek political will during the planning and implementation phases of SSC projects but also to establish measures that address other related barriers.

While there is a positive relationship between the lack of political will and other barriers to SSC implementation in Zambia, the statistical significance of this correlation varies across different barriers. The correlation is significant with some barriers but weak with others. Therefore, the presence of political will help overcome certain barriers, particularly those with a strong correlation, but it may have little to no effect on other barriers. This critical role of political will is one of the reasons Anthopoulos [15] emphasized the need for initial screening of project potential and the status of political will before starting projects. Based on these findings, the correlation between the lack of political will and the barriers listed below is notably higher than with others:

1) Lack of knowledge and information sharing as well as engagement opportunities.
2) Insufficient R and D funding and lack of technological capabilities.
3) Outdated and dilapidated infrastructure.
4) Insufficient use of ICT for environmental sustainability, and energy efficiency.
5) Lack of funding for Smart sustainable services and initiatives.
6) The centralized decision-making process which favours a top-down approach.

Governance-related barriers, as identified by Schuch de Azambuja [17], are considered the most significant obstacles to the implementation of SSCs. This is highlighted by the strong positive correlation between political will and these barriers. Governance, a product of political leadership, plays a crucial role in influencing funding across various sectors, infrastructure development, and policies that promote environmental sustainability and information sharing.

The strong correlation between political will and centralized decision-making processes suggests that political will is likely to lead to a top-down approach. While this top-down method may accelerate SSC development in the initial stages [10] it is essential to maintain a balance. Such an approach can face resistance later on, particularly if there is little public involvement, which is often characteristic of top-down strategies in SSC development.

6. Conclusions

As Zambia embraces the implementation of SCC as a potential solution to mitigate the effects of urbanization and improve service delivery, it is essential to understand the relationship between political will and the barriers to SCC implementation. The findings of this study indicate a positive correlation between the lack of political will and the obstacles to implementing SCCs in Zambia, although the significance of this correlation varies. A strong relationship was observed between the lack of political will and several factors, including insufficient knowledge and information sharing, inadequate research and development funding, insufficient technological capacity, limited use of information and communication technology (ICT) for environmental sustainability and energy efficiency, lack of funding for SCC initiatives and a centralized decision-making process which favours a top-down approach.

The identification of a positive correlation between barriers to the implementation of SSCs in Zambia and political factors underscores the critical role of political leadership in the successful realization of SSC initiatives. This finding highlights the necessity of formulating robust strategies to cultivate political will prior to the initiation of any SSC infrastructure project. One viable strategy is for entities involved in SSC implementation, both within governmental and private sectors, to advocate for financial support from institutions with green climate funds or other funding mechanisms that promote sustainability. Both governmental bodies and implementing agencies can allocate a portion of these funds to establish pilot SSC projects that aim to secure political endorsement by illustrating the benefits of SSC initiatives in addressing pressing societal challenges.

These pilot projects should effectively demonstrate the significance of research and development, as well as the enhancement of funding aimed at improving ICT skills among the populace. Additionally, the projects should elucidate the role of ICT in advancing environmental sustainability and energy efficiency, while also stressing the necessity for new infrastructure to elevate the quality of life for urban residents. Furthermore, the pilot initiatives should exemplify the merits of a decentralized, bottom-up approach in fostering the success of SSCs.

The establishment of this correlation also indicates the imperative for comprehensive stakeholder mapping and categorization based on the influence of each stakeholder on project outcomes, along with the development of tailored engagement strategies that address the varying levels of influence stakeholders exert on the success of specific SSC endeavours.

While this study is not without limitations, predominantly due to its reliance on ranked barriers identified through a questionnaire survey conducted in Zambia, its findings remain significant and may hold relevance for numerous developing nations across Africa.

Future research focused on discerning the causal relationships between barriers to SSC implementation in Zambia and the absence of political support could yield valuable insights. Moreover, an investigation into the optimal engagement of political leadership in the development of SSCs to ensure project success would be particularly advantageous.

Abbreviations

SSC	Smart Sustainable Cities
SC	Smart Cities
R and D	Research and Development
RII	Relative Importance Index
ICT	Information and Communication Technology
SZI	Smart Zambia Institute

Author Contributions

Chipulu Chipulu: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Visualization, Writing – original draft

Chabota Kaliba: Conceptualization, Methodology, Supervision, Writing – original draft

Balimu Mwiya: Supervision, Writing – review & editing

Charles Egyabeng Coleman: Formal Analysis, Writing – review & editing

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Data Availability Statement

The data supporting the outcome of this research work has been reported in this manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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