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# The Quest for Sustainable Urban Transport Systems and Sustainable Cities Lessons for Kampala City.

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**ABSTRACT :**

Sustainable transport systems are crucial for underpinning the economic performance and prosperity of nations. As the global population hits eight billion, a lot of pressure is exerted on the already strained urban transport system. This calls for a sustainable and innovative way to balance the limited resources to meet the current needs of the population without compromising future needs. Kampala City is still experiencing rapid urbanization and motorization which has led to congestion, pollution, and inadequate transport facilities for the majority of its population. The purpose of this study was to carry out a systematic literature review on sustainable urban transport systems with a focus on drawing lessons for Kampala Capital City. This study adopted a quantitative approasch in its review.

**Keywords**: Urban transport, Sustainable Cities, Systematic Review

## Introduction

Sustainable transportation systems play a crucial role in supporting the economic performance and prosperity of nations. They are essential for addressing global climate change and reducing air pollution at the local level, particularly in urban areas. The majority of transportation occurs within and between cities, and with the rapid growth of urbanization, especially in developing countries, the urban population is projected to reach 60% of the global population by 2030. Cities are significant drivers of economic growth and social progress, accounting for approximately 85% of global GDP. As the global population surpasses 8 billion, the immense number of people places strain on already overburdened urban transportation systems and degrades the environment. It is necessary to find sustainable and innovative approaches to manage limited resources in order to meet the current needs of the population without compromising future requirements. This calls for the application of the concept of sustainable development, which aims to strike a balance between the social well-being of people, economic growth, and environmental protection.

Sustainable transportation plays an essential part in driving development, and this trend has been present for a significant period of time. Köhler (2013) suggests that Sustainable Urban Transport systems (SUTs) are a global concept. Developed nations continue making investments in infrastructure and mobility, considering them essential factors for sustainable transportation. The incorporation of dependable transportation networks is more important than ever in achieving sustainable development in smart cities. Smart cities aim to connect the skills and knowledge of individuals, the physical structures and systems in place, and the relationships and networks within society to promote environmentally-friendly economic progress rewording: promoting long-term, ecologically sound economic growth paraphrasing: fostering a sustainable approach to economic development and improve residents' quality of life. SUTs are a key element in realizing the vision of smart cities. The continuous movement of resources, including human labor and goods, contributes to domestic and global prosperity.

Transportation plays a vital role in enabling economic activity and social connectivity. While providing essential services, transportation is also a significant contributor to major sustainability challenges such as climate change, air quality, health and safety, energy security, and efficient resource utilization (EC, 2011). Cities worldwide need to establish sustainable transport systems that offer efficient and environmentally friendly mobility for their residents. Rassafi and Vaziri (2005) explain in their research that the increase in a nation's overall economic activity and output requires adaptable transportation networks that facilitate the availability of resources and access to markets for trade. Transportation also enhances better the quality of life by facilitating individuals' access to education, employment opportunities, healthcare services, and recreational activities (Hall, 2006). However, transportation also has negative effects such as resource depletion, pollution, and congestion (Rassafi and Vaziri, 2005). This necessitates the need for sustainable transport solutions to mitigate these adverse impacts.

Sustainable Urban Transport systems' goal is to fulfill present requirements while safeguarding the capacity of future generations to fulfill their own needs. (Kronsell, 2015). The World Commission on Environment and Development defines sustainable development as the progress that fulfils current needs while safeguarding the capacity of future generations to fulfil their own needs. In the context of transportation, sustainable development involves

providing cost-effective transport services to all segments of society, reducing travel demand, promoting sustainable modes of transport, efficient resource utilization, improving energy efficiency, and setting emission standards that align with economic, social, and environmental goals. To achieve the objectives of sustainable urban transport in urban areas, it is necessary to organize urban space, make transport services accessible, integrate various modes of transport, adhere to technological standards, and enhance urban freight logistics efficiency as part of urban planning and development. Various definitions of sustainable transportation have been put forward, touching on the ecological, financial, and societal dimensions (Hall, 2002).

Sustainable urban transportation involves giving precedence to transportation methods that prioritize the safety of both humans and the environment. (Zhou, 2012). The goals of sustainable transportation aim to offer transportation options that facilitate the growth of local economies while guaranteeing the sustainable conservation of natural resources (Zhou, 2012). According to Scholl et al. (1996), sustainable transport can be described as a transportation system in which consumers assume complete responsibility for the total societal expenses, encompassing those that would otherwise be passed on to future generations. This entails considering future requirements and desires, assessing the cost-effectiveness of different transportation volumes and methods, and guaranteeing that the overall advantages of transportation remain constant. Sustainable transport also requires changes in energy use to reduce carbon emissions (Scholl et al., 1996).

### *1.2 Statement of the Problem*

Sustainable transportation systems play a crucial role in supporting the economic performance and prosperity of nations. They are essential for addressing global climate change and reducing air pollution at the local level, particularly in urban areas. The majority of transportation occurs within and between cities, and with the rapid growth of urbanization, especially in developing countries, the urban population is projected to reach 60% of the global population by 2030. Cities are significant drivers of economic growth and social progress, accounting for approximately 85% of global GDP. As the global population surpasses 8 billion, the immense number of people places strain on already overburdened urban transportation systems and degrades the environment. It is necessary to find sustainable and innovative approaches to manage limited resources in order to meet the current needs of the population without compromising future requirements. This calls for the application of the concept of sustainable development, which aims to strike a balance between the social well-being of people, economic growth, and environmental protection.

Sustainable transportation plays a crucial role in driving development, and this trend has been present for a significant period of time. Köhler (2013) suggests that Sustainable Urban Transport systems (SUTs) are a global concept. Developed countries continue to invest in infrastructure and mobility, considering them essential factors for sustainable transportation. The integration of reliable transport systems is more important than ever in achieving sustainable development in smart cities. Smart cities aim to connect human capital, infrastructure, and social capital to promote sustainable economic development and improve residents' quality of life. SUTs are a key element in realizing the vision of smart cities. The continuous movement of resources, including human labor and goods, contributes to domestic and global prosperity.

Transportation plays a vital role in enabling economic activity and social connectivity. While providing essential services, transportation is also a significant contributor to major sustainability challenges such as climate change, air quality, health and safety, energy security, and efficient resource utilization (EC, 2011). Cities worldwide need to establish sustainable transport systems that offer efficient and environmentally friendly mobility for their residents. Therefore, the purpose of this study was to carry out a literature review on sustainable urban transport systems and sustainable cities with a focus on drawing lessons for Kampala Capital City. The specific objectives are; 1. To identify the key challenges facing Cities in developing Sustainable Urban Transport systems and a sustainable city. 2. To review the best practices and lessons learned from other cities in developing sustainable urban transport systems. 3. To explore how these best practices and lessons be adapted to the context of Kampala City.

## Systematic Literature Review

Systematic literature reviews center on a well-defined subject stemming from a research inquiry and employ predetermined criteria for the retrieval and selection of documents (Berrang-Ford, Pearce, & Ford, 2015). Furthermore, these reviews encompass the amalgamation and critical assessment of the collected sample and its outcomes (Van Wee & Banister, 2016). Within the domain of systematic reviews, bibliometric analysis and qualitative content analysis are frequently employed in tandem (Siders, 2019). Bibliometric analysis is useful for investigating aspects such as publication types, journal titles, cross-disciplinary connections, and publication frequencies over time (Siders, 2019). Qualitative content analysis, on the other hand, concentrates on the context surrounding chosen keywords and necessitates a manual examination of the scrutinized content, guided by a questionnaire and coding scheme, to attain a methodical analysis of the sample (Krippendorf, 2004) as advocated by Berrang-Ford et al. (2015).

## Methodology

The study employed a literature review technique to collect and evaluate relevant existing literature with the aim of investigating the research question. This approach entailed a careful examination of previous theoretical and empirical studies published in reputable peer-reviewed journals, as cited in Durach et al. (2017) and Seuring et al. (2005). Despite its meticulousness, this method is also comprehensive as it offers substantial evidence on a particular phenomenon across different settings and empirical methods. Furthermore, it aids in reducing biases present in the literature, as highlighted by Durach et al. (2017). A systematic literature review is a clearly defined and repeatable process that assists researchers in determining the research objective and designing the approach for locating and reporting articles (Ardito et al., 2015). This study has followed a series of steps to ensure a methodical, transparent, and reproducible methodology: 1. Review planning: During this stage, the research questions are formulated, and the search protocol is

established. 2. Review development: In this phase, the established protocol is executed, and relevant articles are gathered based on predetermined criteria. 3. Review results: This phase involves presenting the findings from the search and analysis conducted on the selected studies. The specifics of the analysis are provided in the Analysis section.

In order to answer the research questions, the following questions were asked about the strategies and measures for a sustainable urban transport system and sustainable cities. 1. What are the key challenges facing Cities in developing a Sustainable urban transport system and sustainable city? 2. What are the best practices and lessons learned from other cities in developing sustainable urban transport system? 3. How can these best practices and lessons be adopted to the context of Kampala City?

The search options provided consist of well-regarded sources like Science Direct, Springer Link, IEEE Xplore Digital Library, ACM Digital Library, Emerald, Taylor & Francis, JSTOR, and ProQuest. The search terms employed were "sustainable urban," "transport system," "Sustainable cities," "challenges of sustainable urban transport," and "developing nations." To refine the search, the focus was on articles published between 2012 and 2022, written in English, and accessible in their entirety. This choice was influenced by the Rio +20 conference, which occurred from June 20 to June 22, 2012, and served as the largest United Nations conference ever conducted. The initial search generated a total of 64 articles, which were further screened using the inclusion criteria.

**Table 1: INCLUSION CRITERIA**

| Inclusion Criteria | Reason for inclusion |
|---|---|
| Articles published from 2012 to 2022 | This time frame was chosen because it encompassed the latest publications available. |
| Published in peerreviewed journals | Peer-reviewed scholarly articles are considered to be of higher caliber in comparison to articles that have not undergone the rigorous evaluation process by experts in the field |
| Publications in the English language | Peer-reviewed scholarly articles are considered to be of higher caliber in comparison to articles that have not undergone the rigorous evaluation process by experts in the field |
| Publications in the English language | The English language dominates the field of sustainable transport. English is also the common language of these researchers. |
| Focus on developing countries based on UN (2017) classification | The focus of analysis is on developing nations, which are characterized by limited resources and face significant levels of inequality and vulnerability |
| Articles that focus on Sustainable Urban Transport Systems And Sustainable Cities | The goal is to collect pertinent evidence that aligns with the study's objectives. |

Initially, the titles and abstracts were analyzed in order to establish their pertinence. Subsequently, any duplicate articles were eliminated. The full content of the remaining articles was meticulously assessed to verify if they met the specified inclusion criteria. Ultimately, a comprehensive review was conducted on a total of 29 relevant articles.

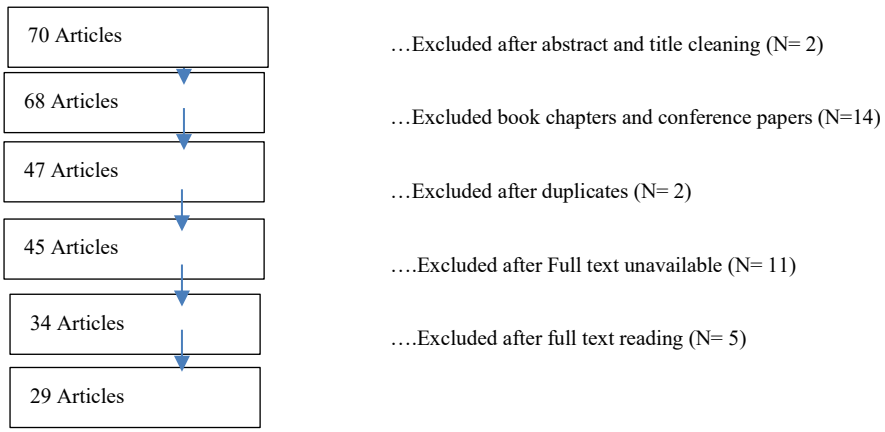


**Fig. 1. Flow diagram of the screening process.**

### *3.2. Validity and inclusion criteria*

To enhance the accuracy, reliability, and strength of this research while minimizing potential biases, a systematic search was carried out to collect relevant articles. The selection and analysis of these articles followed the methodology outlined by Durach et al. (2017). The inclusion criteria, detailed in Table 1, were employed to determine which articles would be incorporated in the synthesis sample. To ensure comprehensive coverage, the data obtained from the chosen articles were cross-referenced with each other and with materials from diverse sources, such as peer-reviewed publications, unpublished

articles, and institutional documents like policy papers and evaluation reports that were relevant to the study. This triangulation process helped validate the findings and bolster the overall robustness of the research. The following types of papers were excluded from the analysis:
• Informal literature surveys lacking references and publication records.
• Papers that have not undergone the peer review process.
• Previous versions of multiple papers that have been published in more than one journal.

### *3.3. Data extraction*

The researcher independently gathered data from the artificial sample using predetermined data extraction forms based on Durach et al. (2017) and Tranfield et al. (2003) to maintain consistency. These forms collected essential information about the sample being studied for coding. The overall information consisted of the title, publication date, and author(s) details, while the detailed information covered research goals, results, methodology, context/environment, and the journal where the articles were published.

### *3.4. Synthesis*

The analysis closely examined sustainable transportation systems and cities, with a particular emphasis on extracting valuable insights applicable to Kampala Capital City.

## 44.0 Findings

**The analysis of existing literature revealed that most of the studies related to sustainable urban transport systems and sustainable cities were conducted between 2012 and 202.** Regarding research methodology, majority of reviewed studies adopted qualitative methodology. This is informed by the large number of descriptive studies screened for review. A closer analysis of the papers published in various journals indicated that the International Journals of Sustainable Transport and Journals of Environmental Management emerged as the leading contributors in investigating the topic. These two journals comprised approximately 50% of all the papers examined in the research. The articles that were evaluated were widely spread across the globe, encompassing Europe, Asia, the Americas, and Sub-Saharan Africa. The majority of the authors directed their attention towards sustainable urban transport systems.

### *4.1 Sustainability Dimensions*

Each study analyzed in the research incorporated sustainability criteria. The majority of authors focused on assessing the sustainability of urban transportation systems and used similar criteria. However, one particular paper by Bojkovic et al. specifically examined the sustainability of transportation systems on a national scale. Around 81% of the papers considered the social, environmental, and economic aspects of sustainability, though there were slight variations in the terminology used by different authors. For example, Castillo and Pitfield referred to the social dimension as "equity and social inclusion." Furthermore, over half of the papers (52%) included additional dimensions such as technology, efficiency, or system effectiveness. Interestingly, only Gössling included walking as a factor in the sustainability evaluation, while Castillo and Pitfield were the sole authors to address cycling. This is significant as both walking and cycling are recognized as forms of active and healthy transportation.

In this section, the researcher explored the challenges mentioned in the assessment of 29 research papers that center on sustainable transportation systems in cities and the concept of sustainable cities. From these papers, i singled out the most common challenges that pertain to developing countries for closer examination. These prevalent challenges were subsequently utilized to establish links between the tools and methods currently employed in urban sustainable transportation systems and sustainable cities. Through this process, i acquired valuable insights about the gap between present practices in sustainable urban transportation systems and sustainable cities and the suggested approaches for future sustainable urban transportation systems and sustainable cities.

In sustainable urban transportation systems, three significant subtopics identified in the review are sustainability, society, and the environment.
The incorporation of sustainable practices into urban planning is a topic that lacks agreement among experts, as highlighted in the works of Gradinaru et al. (2018), Mohareb et al. (2016), Shummadtaya et al. (2013), and Kitchenham et al. (2007). Difficulties arise when attempting to implement sustainability principles into the development of cities. This is due to the varying definitions and contextual understandings of sustainability held by urban planners, which can hinder effective collaboration among policy coordinators, stakeholders, and government entities.

Inadequate urban planning results in undesirable and disconnected urban structures, resulting in higher levels of traffic congestion, susceptibility, and hazards, while also adversely affecting the public health of residents in vulnerable regions. Various studies (Gradinaru et al., 2018; Moroke et al., 2019; Kaagaard, 2016; Endo and Shibuya, 2017) highlight that planners often fail to comprehend the broader consequences of their inconsistencies on social interactions within communities.

Urban planners appear to have good intentions when it comes to safeguarding the environment by creating sustainable city designs and buildings. However, this has inadvertently resulted in an unintended consequence where urban growth has become haphazard and uncontrolled, leading to higher carbon emissions and the emergence of environmentally dangerous areas for inhabitants (Wamsler et al., 2013; Laffta and Al-Rawi, 2018; Shabatura et al., 2018). It is crucial for urban planners to acknowledge and assume greater responsibility for the environmental impact of their decisions.

The three prominent subtopics from the review that are found in developing countries are economy, society, and urban planning. Out of 55 challenges, six, and five of those subtopics respectively were found only in the topic of developing countries. Developing countries face many challenges in implementing sustainable urban transport systems due to economic constraints Russo et al., 2014; Ding et al., 2015; and Bai, et al., 2017). Whether aligned with transport, water security, or enabling technological assistance, developing countries are falling further behind in applying sustainable projects.

Developing nations encounter significant obstacles when it comes to achieving social sustainability. These countries are typically characterized by income disparities and low quality of life, with residents facing issues such as insufficient employment opportunities and inadequate housing and living conditions (Chang and Sheppard, 2013; Simon, 2013; Bai et al., 2017). Furthermore, their political systems often prioritize job creation over other aspects of development, without adequately considering the public's well-being. As a result, this approach lacks a comprehensive perspective that incorporates sustainable practices and fails to address the concerns of the population

Urban planning in low- to middle-income nations faces distinct challenges compared to developed countries, primarily because of the enduring impact of uneven development resulting from colonialism (Horn, 2015). Moreover, even if these developing nations aspire to create sustainable urban structures, they encounter limitations in terms of infrastructure and managerial capacities (Babalik-Sutcliff, 2013)

Urban sprawl encompasses three main subtopics: transportation, urban planning, and society. These subtopics were identified in a review and specifically relate to urban sprawl. Among a total of 59 challenges examined, transportation accounted for 11, urban planning for 10, and society for nine, all exclusively associated with the phenomenon of urban sprawl. Sprawl, as a low-density and dispersed form of urban expansion, is generally considered to be a threat to sustainability: it is characterized by inefficient modes of transit (Slaev, & Nedovic-Budic, 2017). Sprawling development patterns cause auto-dependent societies: people are forced to travel long distances, spending up to 40 percent of their income to get to work in town. Simon (2013); Artmann, et al., (2019) further increasing carbon emissions and contributing to climate change.

The review highlights two main subtopics related to population growth in the context of the review: developing country and urban planning. Specifically, among the 38 challenges discussed, only 10 pertain to the subtopic of developing countries, while five are specifically related to urban planning within the broader theme of population growth

Lessons for Kampala City

This review has identified the most commonly discussed challenges by researchers, which include urban planning, sustainability, and developing countries. The key topics of importance derived from the review are urbanization, urban sprawl, and population growth. It is clear that these three phenomena are interconnected. For instance, population growth drives urbanization as people seek better living conditions, and cities provide essential services and resources. This combination results in rapid expansion, leading to urban sprawl and its associated negative consequences.

To address the issues caused by urban sprawl, urban planners in Kampala city need to actively resist these counterproductive trends. Initially, they should adopt methods and techniques to effectively manage the existing problems, while also developing resilient strategies to confront future challenges. In the context of developing countries like Uganda, it is crucial for Kampala City's urban planners to leverage technology in predicting and addressing these rapidly changing trends to promote sustainable development. It is acknowledged that developing countries often face limitations in terms of data availability and specialized personnel. However, through this research, it is hoped that a starting point can be established, utilizing the latest effective technology as a foundation for progress

## Conclusion

The research questions were formulated to ensure a quality review. The review was framed around the challenges of sustainable urban transport systems and sustainable cities in the context of developing countries. The topics that most clearly challenge urban planners are urbanization, urban sprawl, and population growth. These topics are dependent on one another, and so need further investigation to identify the crux of the problem for sustainable practices in planning urban development. Twenty-nine research papers were found to be noteworthy for the review. All of the challenges addressed in this study came from 29 research papers. Finally, Sustainable practices used in developed countries would be either too advanced or too expensive to allow developing nations to address their problems realistically.

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