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Original Article

Reducing Congestion in The Metropolitan Area: A Case of Greater Kampala Metropolitan Area

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ABSTRACT

Traffic congestion poses significant challenges for cities in developing countries, with Kampala, Uganda, being no exception. As the capital and largest city in Uganda, Kampala grapples with a burgeoning population and inadequate transport infrastructure, leading to gridlock, environmental pollution, and economic losses. This paper proposes the introduction of a congestion charge zone as a solution to alleviate traffic congestion in Kampala. Drawing inspiration from successful implementations in cities like London, the proposed system aims to discourage private vehicle use during peak hours by levying charges on entering designated zones within the city. The paper outlines the current state of transport in Kampala, highlighting the dominance of private vehicles and the shortcomings in public transit infrastructure. It explores the concept and mechanics of congestion charge zones, emphasizing the role of technology in enforcement and the potential for cost-effective implementation in Kampala, leveraging existing CCTV and traffic control infrastructure. Furthermore, the paper discusses key considerations for successful implementation, including the need for viable alternative transport options, public awareness campaigns, stakeholder engagement, and robust enforcement strategies. By implementing a congestion charge zone, Kampala stands to mitigate traffic congestion, improve air quality, and enhance overall urban mobility, contributing to sustainable development in the region.

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INTRODUCTION

Globally, traffic congestion is one of the most visible and immediate transportation problems facing major cities, and it can be attributed to several factors, including rapid growth in population, inadequate transport infrastructure, and an increase in the number of personal vehicles (Kumar et al. 2021). Traffic congestion is considered a major barrier to sustainable development since it lengthens travel time, increases energy consumption, causes crashes, and pollutes the environment (Litman, 2017; Rodrigue, 2020). Although congestion is a problem in both developed and developing nations, its prevalence and effects are more pronounced in the developing world . Economically, the effects of this congestion also vary across different economies or nations. In Europe, for example, the congestion cost is estimated at 1% of GDP (Christidis et al. 2012). This pales in comparison to African nations, such as Uganda and its capital city, Kampala. Traffic congestion in Kampala imposes significant economic costs. A 2020 policy brief published by the International Growth Centre (Baertsch, 2020a), estimated that congestion in the Greater Kampala Metropolitan Area (GKMA) costs approximately USD 1.5 million daily, representing 4.2% of GKMA's daily GDP and 1.9% of Uganda's national GDP. Another study, published in 2020 in the journal 'Technological Forecasting and Social Change', concluded that Uganda loses about 6.7% of its GDP annually due to traffic congestion (Kwikiriza, 2016; Muvawala et al., 2021). The effects are similar to those of other East African cities. For example, a study in Tanzania's Dar es Salaam found that workers lose approximately 2.5 hours a day to congestion and that workers earning at least Tsh 90,000 (≈33.3 USD) spend up to 39% of their earnings on transport fares alone . A 2014 study on the city of Nairobi, the capital of Kenya, found that the country loses the approximate equivalent of USD 1 billion in delays and USD 128 million in wasted fuel per year due to congestion . The common underlying theme across the cities is that the congestion is primarily caused by an ever-increasing number of vehicles without appropriate strategies for managing the congestion.

As seen, more cities in developing countries are experiencing traffic congestion mainly due to an increasing number of cars. As cities grow and become more urbanized, they attract new settlers, which not only increases the city's population but brings with it an increase in road traffic. This problem is further aggravated if the rate at which the city's transport infrastructure grows does not correlate with the traffic growth patterns, thus creating congestion. Congestion is undesirable and may cause delays, environmental pollution, noise, and even frustrate motorists and commuters. It has major health implications and may also lead to road traffic crashes and the degradation of the road infrastructure (Ackaah, 2019). It is, therefore, vital that major decision-makers in cities, especially from developing countries, innovate and implement intelligent solutions to deal with the ever-growing threat of traffic congestion (Banister, 2008).

This paper is aimed at offering a solution to traffic congestion by giving insight into the potential implementation of a congestion charge zone as a means to control traffic congestion in the city of Kampala, Uganda. It provides a background of the city, its traffic makeup, and statistics on the extent and effect of congestion in Kampala. The paper further examines the solution of congestion pricing through an analysis of its success cases (Eliasson, 2009a). The aim is to provide a contextualised and tailored solution that can be implemented in Kampala and, hopefully, in other developing cities around the world (Litman, 2005).

METHODOLOGY

The paper is a state-of-the-art review of existing literature on the topic of traffic congestion. It involves a compilation of congestion-related data, statistics, and qualitative reports. The research primarily focused on the underlying causes, effects, and relevant mitigation strategies of traffic congestion in both developed and developing cities. The study involved a review of academic literature and other relevant

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publications focused on combating traffic congestion and reducing its effects. For purposes of this study, only material directly relevant to the area of study and published from 2010 onwards was selected. The study involves an analysis and comparison of the congestion causes, effects, and solutions across both developed and developing cities with a particular focus on the concept of congestion pricing.

KAMPALA CITY

Kampala is the capital and largest city of Uganda. It spans approximately 200 Km^2 divided into 5 political divisions with an estimated population of 2 million people that grows by about 4% per annum. It is Uganda's political seat and biggest economic hub, accounting for 80% of the country's industrial and commercial activities and generating 50% of the national GDP (Ltd., 2021). Kampala has about 23% of its area as fully urbanized, 60% semi-urbanised and the rest (17%) is considered as rural settlements (Musoke et al., 2019).

Kampala is the administrative and financial capital of Uganda and, in recent times, has seen rapid growth and expansion beyond just the borders of the city but also to neighbouring suburbs, districts and peri-urban jurisdictions. This expanded area is now referred to as the Greater Kampala Metropolitan Area (GKMA). With a total population of 4.5 million, GKMA is home to 10% of Uganda's entire population and is made of Kampala city, the inner suburbs, and the peri-urban extension to Mukono, Wakiso and Mpigi districts. All spanning a total of 5,000 Km^2 with an annual population growth of 5% projected to reach 15 million people by 2040 (Baertsch, 2020b). When determining Uganda's strategy for the development of urban transportation, the government considers the Kampala area as a single entity (Musoke et al., 2019).

State of Transport in Kampala City

According to the Statistical Abstract for Kampala City, road transport is the dominant mode in the city (Statistics, 2013). The Kampala City Road network consists of a total of 2,110 Km; with only about 35% of this road network being paved while 65% is unpaved.

Despite part of the city being bordered by East Africa's largest lake, the city has no major water transport infrastructure. Furthermore, Kampala does not have any air transport infrastructure, nor does it have a city rail transport network of its own, but it has a national rail network bordering the city's Central Business District. The rail transport is managed by the Uganda Railways Corporation (URC), a government agency. The service includes Commercial Cargo transport and Passenger Rail Service - which was re-introduced in 2015 .

The passenger rail service is only 10 Km long, serves few stops, has a carrying capacity of 200 and makes 3 trips per day (Musoke et al., 2019). Although official figures are not available, the approximate number of registered vehicles in Uganda is 500,000, with estimates placing at least 50% within the GKMA (Statistics, 2013). It is further assumed that, due to its level of development, the Kampala city centre serves as either a starting point, through-point or destination for most of these vehicles (Kiggundu et al. 2012). These vehicles are primarily of 3 major broad categories;

- Public transport (14-seater minibus *taxis*)
- Motorcycle taxis (boda-boda)
- Private vehicles

Kampala Motorised Modal Split Estimation (2018)

As seen from Figure 1, despite being the mode of choice for only 9% of commuters in Kampala, private cars account for close to 37% of all motorised trips. In comparison, the minibus taxis responsible for moving 82% of commuters only make up 21% of all motorised trips in the area. Boda-Bodas make up the bulk of motorised trips in the city. Estimates put their number at close to 200,000 operating within GKMA.

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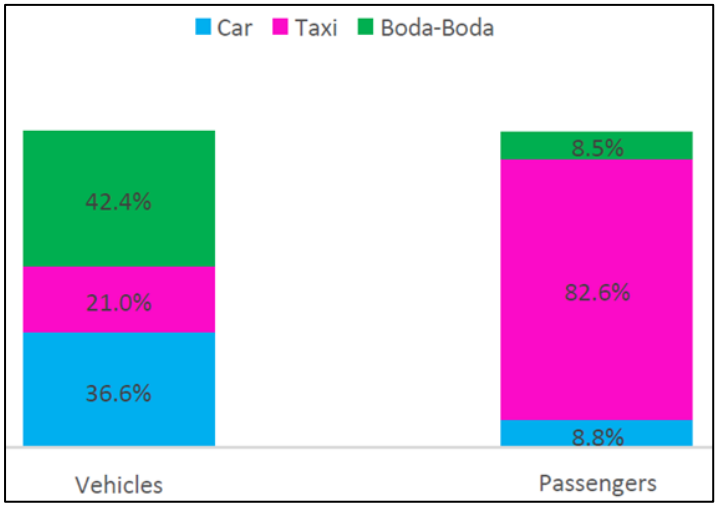
Figure 1 Kampala Motorised Modal Split Estimation (2018)



Musoke et al., 2019

There may be varying reasons to explain this modal split however most studies and reports about Kampala city seem to agree on a number of points, namely;

- The lack of a fully developed and organised mass transit public transport system,
- The poor road network affecting connectivity in some parts of the city,
- Lack of adequate NMT infrastructure,
- Kampala land use. The city is home to all the country's major ministries and government offices, the nation's parliament, industries, commercial bank headquarters, major schools, hotels, etc.

The combination of those factors, among others, has led to some individuals choosing to access the city centre with their private cars rather than use public transport or other means, for example, NMT.

Figure 2 Traffic Congestion in Kampala City

As a result, Kampala city experiences a lot of traffic congestion, especially during peak hours, as shown in *Figure 2*.

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What is Being Done

The GKMA Transport Master Plan 2018 gives details of 7 expressway projects totalling over 300 Km of paved roads that will connect to the city, improve overall transport connectivity and thus help to decongest the city. Some of these projects are nearing completion while some are expected to be completed as far as 2030.

These expressways, once finished, will lay the groundwork for the implementation of Kampala's Bus Rapid Transit (BRT) system. The most recent available plans for BRT in Kampala are included in the 2014 report prepared for the Ministry of Works & Transport by a consortium of transport engineering consultancies financed by the World Bank (KCCA, 2023). This proposed a pilot 25 km project, linking Kampala's Central Business District (CBD) with 4 major suburbs via three BRT trunk lines that would pass through the centre and run from one suburban terminal to another. The pilot would be operated by a fleet of 165 articulated buses, 18 m long, with a capacity of 150 passengers each.

There are also plans to register and heavily regulate the boda-boda cyclists by giving them fixed locations, uniforms and operation zones. However, there is currently no plan to tackle the problem of private vehicles

PROPOSED SOLUTION: INTRODUCTION OF A CONGESTION CHARGE ZONE

Considering the data from Kampala, private vehicles make up the bulk of the motorised trips yet carry very few passengers in and out of Kampala city. Furthermore, there's been no solid plan or innovation to tackle the problem; thus, the proposed solution of introducing a congestion charge zone.

What is a Congestion Charge Zone?

Working on the principle of congestion pricing, a congestion charge zone (*London Congestion Charge: Cost-Benefit Analysis*, n.d.) is an area in a city that levies a charge on certain vehicles that access it during a set time period. In the case of Kampala, these would be private vehicles. Exceptions can be made for public transport vehicles, emergency service vehicles, law enforcement, etc.

The first example of such a scheme was introduced in Singapore in 1975, which was initially based on a paper license system (subsequently replaced by an electronic system in 1988). However, the most far-reaching scheme is the road user-charging scheme in operation in London – the London Congestion Charging Scheme LCCS) (Department for Environment, n.d.).

The idea of introducing a congestion charge in Kampala has been discussed by the city's authorities, however, it probably would not be fully enforced until the Kampala flyover is fully completed. This flyover is the precursor to the initial works of Kampala's BRT system.

How the System Works

Although different variations of the system may exist, the proposed solution is zone-based pricing. According to information (Wilsons Epsom, 2023), this system involves imposing fixed or variable charges in order to drive within or into a congested area within the city. There is no need to buy any special tickets or stickers and the system has no need for toll booths or barriers. However, specialised cameras are installed at the entrances, exits and around the charge zone.

These cameras use Automatic Number-Plate Recognition technology (ANPR) to read and compare the vehicle number plate to records on a database. This is done to check whether the vehicle's driver has paid or if the vehicle is

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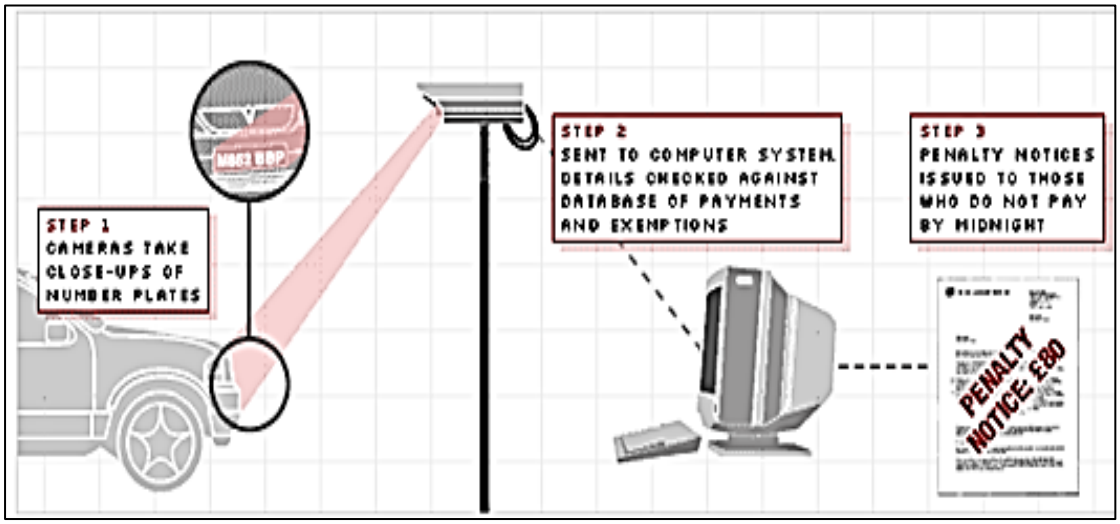
exempt from the charge. A driver may pay the congestion charge prior to accessing the zone or has until midnight of the billing day to clear the charge or else face a penalty (Transport for London, n.d.).

Figure 3: System Setup

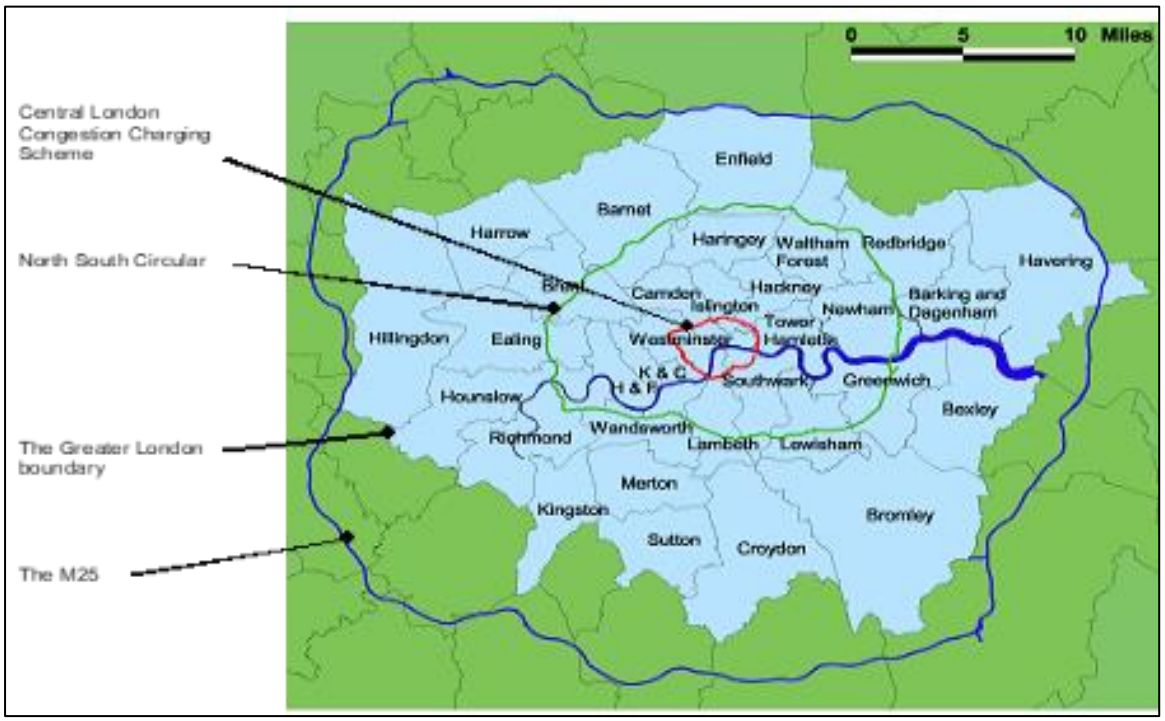


Source*: (BBC NEWS | UK | London Congestion Charge, n.d.)*

INTERNATIONAL EXAMPLE

Congestion pricing (Federal Highway Administration, n.d.), is not a ground-breaking idea, it has already been implemented in cities around the world. London, United Kingdom, enacted a similar policy in 2003 (Federal Highway Administration, n.d.). It was a necessary step for London to reclaim some of the spaces given to motorised vehicles without ending up with gridlock ((550), n.d.).

Figure 4: Map Showing London Congestion Charge Zone



Department for Environment, n.d

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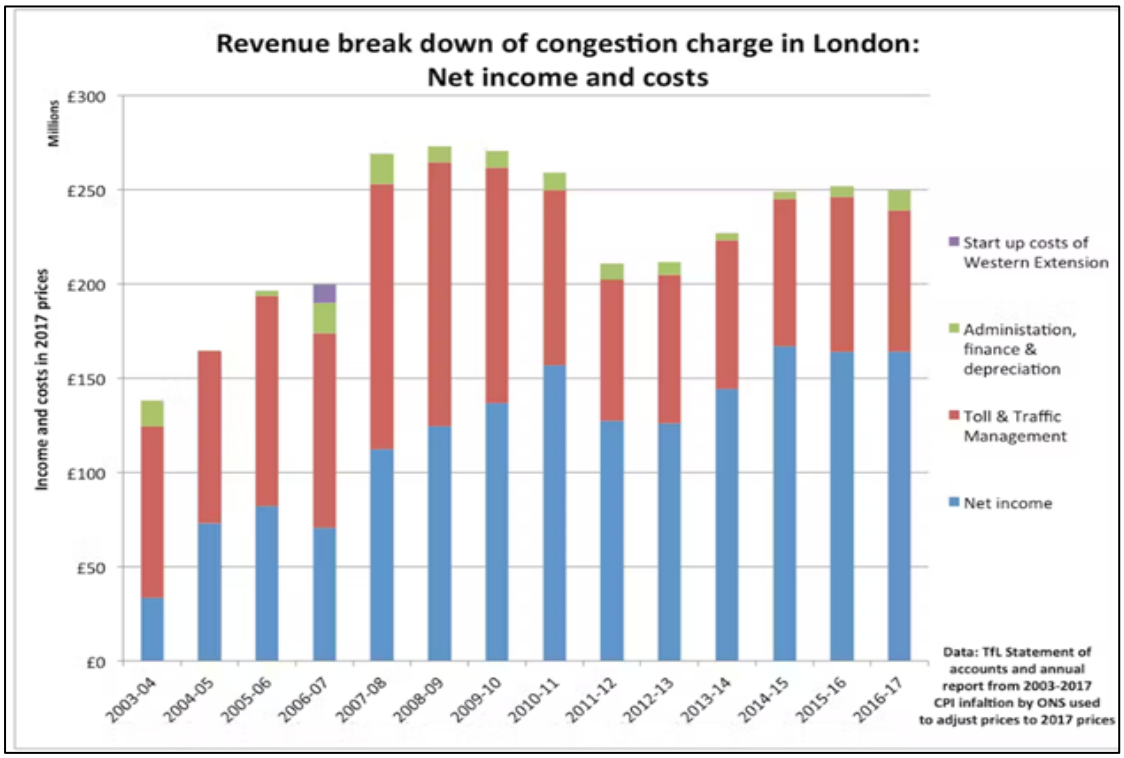
At 21 Km^2, the London charge zone is one of the largest congestion charge zones in the world. The standard charge is £15, every day from 7:00 am to 6:00 pm for each non-exempt vehicle driven within the zone, with a penalty of between £65 and £195 levied for non-payment. The congestion charge does not operate on Christmas Day (25 December).

Figure 5: Revenue Breakdown of Congestion Charge in London: Net Income and Costs



Source:*(London Congestion Charge: What Worked, What Didn't, What Next, n.d.-a)*

Overall, the key measures show that the charge zone has been a success. Transport for London (TfL) reported in 2006, that the charge reduced traffic by 15% and congestion by 30%. This effect has continued up to today. Traffic volumes in the charging zone are now nearly a quarter lower than a decade ago, allowing Central London Road space to be given over to cyclists and pedestrians (*London Congestion Charge: What Worked, What Didn't, What Next*, n.d.-a). Other cities that have explored congestion charging include Stockholm and New York.

APPLYING THE SOLUTION IN UGANDAN CONTEXT

When London initially implemented the congestion charge zone in 2003, start-up costs were high mainly because the technology was still relatively uncommon and costly, for example, cameras, servers, databases, etc. (Politics.co.uk, 2021). By January 2021, however, the Ugandan government had installed a total of 3,233 CCTV cameras on most major road junctions, trading centres and streets across the entire city of Kampala

Furthermore, in 2018 Kampala Capital City Authority (KCCA), under funding from the World Bank, unveiled a pilot traffic control centre that pioneered the monitoring and managing of the performance of the traffic network in the city. Additionally, in 2022, KCCA, with support from the Japanese International Cooperation Agency (JICA), began plans to construct a traffic control centre aimed at ending traffic congestion in the city. This, according to officials, will make Kampala the first city in East Africa to have such a smart facility. The project is expected to take 30 months from the day of the ground-breaking on November 8, 2022 The availability of these technologies in the city significantly lowers the start-up cost of this solution.

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Figure 6: Map Showing the Proposed Kampala Congestion Charge Zone

Source*: Authors proposed plan*

It is also important to note that in order for the congestion charge zone to be a success, decision-makers have to consider some key factors prior to the zone's implementation;

- Presence of viable transport alternatives, for example, BRT and NMT, to ensure that commuters have accessible and efficient options.
- The creation of adequate public awareness, as public acceptance and understanding of congestion pricing are crucial for its success (Eliasson, 2009b, 2016).
- Striking a balance between "what's necessary" and "what's considerate" when setting fees, ensures that the charges are effective in reducing congestion without disproportionately impacting low-income commuters (IDT, 2019.).
- Involvement of different stakeholders, including government agencies, transport operators, and the public, to ensure a holistic and inclusive approach (Banister, 2008).
- Having a clear enforcement strategy, as effective monitoring and compliance mechanisms are critical to the system's success.
- Creating a flexible, integrated and responsive system, allowing for adjustments based on traffic patterns, economic conditions, and public feedback (Litman, 2005).

Recommendations

The proposal to introduce a congestion charge zone in Kampala presents a promising solution to alleviate traffic congestion in the city. However, there are several additional considerations and potential challenges to address:

Public transport infrastructure: While the implementation of a congestion charge can incentivize commuters to opt for public transport, the success of such a system heavily depends on the availability, reliability, and efficiency of public transport options like the Bus Rapid Transit (BRT) system proposed for Kampala. It's crucial to ensure that these systems are adequately developed and integrated into the city's transportation network before implementing the congestion charge.

Equity and social impact: Any congestion pricing scheme must consider its potential impact on

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different socioeconomic groups, particularly low-income individuals who may heavily rely on private vehicles due to limited alternatives. Measures should be in place to address potential equity concerns, such as providing exemptions or discounts for certain groups, implementing income-based pricing structures, or investing revenue generated from the congestion charge into improving public transport accessibility for disadvantaged communities.

Behavioural change and public awareness: Successful implementation of a congestion charge requires a significant shift in commuter behaviour. Public awareness campaigns and education initiatives are essential to inform residents about the reasons behind the congestion charge, its benefits, and how it will be implemented. Additionally, clear communication about exemptions, payment methods, and penalties is necessary to ensure compliance and minimize confusion among commuters.

Enforcement and administration: Effective enforcement mechanisms are crucial to ensure compliance with the congestion charge regulations. This may involve deploying adequate surveillance technology, such as ANPR cameras, and establishing a robust system for processing payments, issuing penalties, and managing exemptions. Collaboration with law enforcement agencies and local authorities is essential to enforce the congestion charge effectively.

Data management and privacy: Implementing a congestion charging system requires collecting and managing sensitive data, such as vehicle registration details and payment information. It's imperative to establish stringent data protection measures to safeguard individual privacy and prevent misuse or unauthorized access to personal information.

Adaptive management and evaluation: Continuous monitoring, evaluation, and adaptation of the congestion charging scheme are essential to assess its effectiveness, identify potential shortcomings, and make necessary adjustments over time. Regular reviews should be conducted to analyse traffic patterns, revenue generation, environmental impact, and social equity considerations to optimize the system's performance.

Integration with urban planning: Congestion pricing should be part of a broader urban planning strategy aimed at creating more sustainable, liveable cities. Integration with land use planning, zoning regulations, and infrastructure development is crucial to address the root causes of congestion and promote sustainable transportation modes.

By addressing these factors and adopting a holistic approach to congestion management, Kampala can successfully implement a congestion charge zone that not only reduces traffic congestion but also promotes equitable access to transportation, enhances urban liveability, and contributes to sustainable development goals.

CONCLUSION

In conclusion, the proposal to introduce a congestion charge zone in Kampala presents a promising solution to tackle the city's persistent traffic congestion issues. With the population of Kampala and its surrounding areas projected to continue growing rapidly, addressing congestion is essential to ensure sustainable urban development, improve air quality and enhance the overall quality of life for residents.

The congestion charge zone, modelled after successful implementations in cities like London, offers a viable strategy to incentivize behavioural change among commuters, particularly by discouraging private vehicle use during peak hours. Leveraging existing infrastructure such as CCTV cameras and traffic control centres, Kampala is well-positioned to implement a cost-effective congestion charging system.

However, the success of the congestion charge zone hinges on several critical factors, including the availability and integration of robust public transport options like the proposed Bus Rapid Transit system, addressing equity concerns to

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ensure accessibility for all socioeconomic groups, and fostering public awareness and support through comprehensive education campaigns.

Furthermore, effective enforcement mechanisms, stringent data management protocols, and continuous monitoring and evaluation are essential to ensure the system's integrity, compliance, and adaptability over time. Integrating congestion pricing with broader urban planning strategies will be crucial to addressing the root causes of congestion and promoting sustainable transportation modes.

By addressing these considerations and adopting a holistic approach to congestion management, Kampala has the opportunity to significantly alleviate traffic congestion, enhance urban mobility, and contribute to the city's long-term sustainability and liveability. Through collaborative efforts and innovative solutions, Kampala can pave the way for more efficient and resilient urban transportation systems, setting an example for other cities in the region and beyond.

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