

THE DILEMMAS OF IMPLEMENTING SMART MOBILITY IN CAPE TOWN

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Purpose: To establish underlying issues that have hindered the implementation of smart mobility systems in Cape Town.

Design/methodology/approach: This article review is based on a theoretical literature review on the idea of mobility and smart City in Cape Town, South Africa. The theoretical approach was based on published journals, government sources, and other sources.

Findings: Smart mobility is one of the developmental strategies of this City with a focus on enhancing the existing transport system. This will help improve commuter transfer speed and the overall quality of life. However, the current transport systems have greatly undermined commuter experience, leading to traffic congestion, high transport costs, air and noise pollution, and generally low quality of life. This has had a significant negative impact on the local inhabitants' economic, social, and psychological. The government has also lost revenue due to frequent maintenance, vandalism, and an underutilized transport system.

Originality/value: the presented review paper provides a realistic overview of the issues affecting the local government and residents of Cape Town. These issues directly affect the national government and, therefore, there is a need to change the underlying transport structures to ensure that Cape Town meets its smart mobility goals.

Keywords: Cape Town, smart city, smart mobility, digital infrastructure, quality of life.

Category of the paper: Literature Review.

1. Introduction

Cape Town, also known as the *Mother City*, has been listed as one of the cities in Africa at the forefront to become a smart city. It's the second-largest city in South Africa and has earned an international reputation for its touristic beaches and natural setting on the northern end of the Cape Peninsula. Besides that, it has been involved in several conversations relating to creative innovation, with the Cape Innovation and Technology Initiative (CiTi) being the oldest tech incubator in Africa.

Regionally, Cape Town has been applauded for its significant efforts to improve the City's needs based on current technological trends. The local governing body has implemented several strategies to make it smart to the core, especially concerning mobility. This has been catalyzed by implementing four pillars to facilitate the smart city initiative- digital inclusion, digital economy, digital infrastructure, and e-government (Luke & Isabella, 2019)

The idea of smart mobility is designed to improve the City's developmental dimensions, such as reduced traffic congestion and environmental pollution. Besides that, it's meant to improve commuter transfer speeds, increase safety, integrate several modes of transport, and improve the locals' quality of life.

With a rapidly growing population of over 4.71 million people (World Population Review, 2021), spatial variation in the socio-economic profile, environmental pressure resulting in air pollutants and greenhouse gas emissions, Cape Town, has all the key drivers (Fig. 1) needed to catalyze the development of smart mobility.

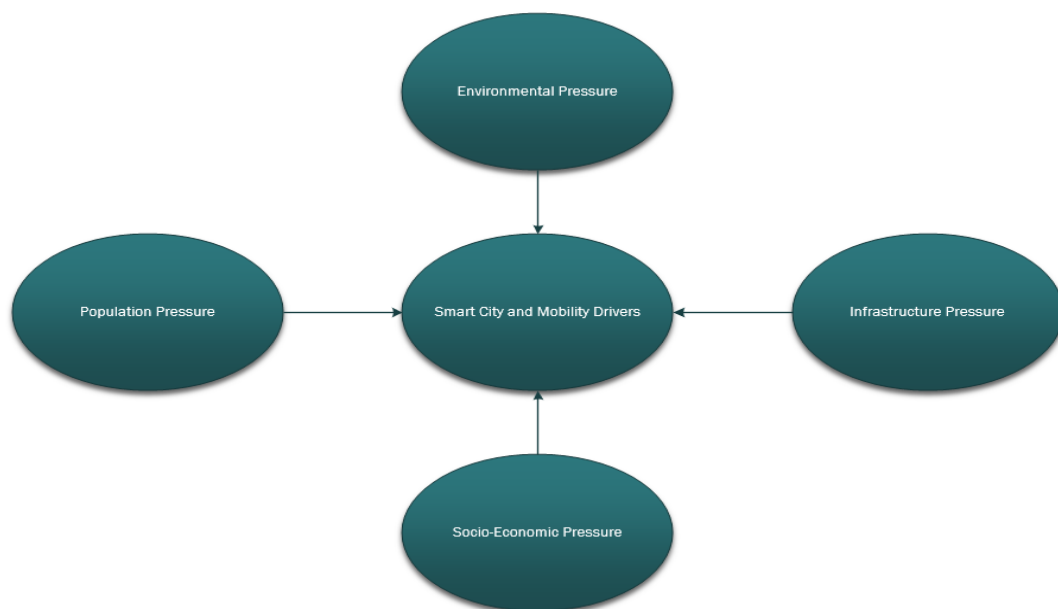


Figure 1. Key drivers of smart mobility. Source: own study.

But even though this City, through its officials, has put the necessary pillars and strategies already in place, it's clear that it's still far away from attaining its smart city status that would eventually result in smart mobility. Taxi wars have taken center stage in the transport system, with multiple reports of murder nearly every month. Railway vandalism caused by greenhouse gases, poor waste management, and poor transport system integration has made it hard to implement smart mobility. Additionally, environmental pollution and diversity in the transport system are some of the main dilemmas facing Cape Town.

This research paper specifically examines these dilemmas and the consequent implications of these causes in slowing down the journey of turning this touristic harbor into a safer and more sustainable city with mobility networks and intelligent transport systems.

2. Environmental Pollution

Poor management of waste is one of the top causes of environmental pollution. Even though Cape Town is one of the most populated cities in South Africa, its waste management plan is inadequate. Like other parts of the country, this City has poor waste management systems regarding the collection, delivery, and recycling of waste. There is a lack of clear line of authority and unreliable waste collection service and frequency. There are inadequate street containers, wrongly located containers, careless waste disposal, and illegal dumping of waste-by-waste disposal companies (Fakoya, 2014).

Due to the lack of public and municipal government cooperation, this City can't implement an effective waste management strategy. This has led to poor sustainability and increased environmental pollution, which would deter an element of the smart city living lifestyle. Pedestrians and other road users have problems effectively accessing different parts of the City due to poor waste disposal, health hazards.

While Cape Town's air quality is relatively good based on the current air quality index, there is no doubt that the presence of photochemical smog resulting from fuel-based motor vehicles has serious health effects. Note that the concentration of PM_{2.5} at Cape Town is currently 12 ($\mu\text{g}/\text{m}^3$). According to the World Health Organization (WHO), the recommended threshold for concentration at PM_{2.5} is 25 $\mu\text{g}/\text{m}^3$. This means that the current concentration is 0.48 times better than the recommended limit (WHO, 2021). However, smog and other air particles can significantly reduce drivers' and pedestrians' visibility.

The first recorded smog in Cape Town was in 1990, and this prompted many inquiries from the public and press. The frequency and amount of smog have increased subsequently due to the increased population and petroleum-based motor vehicles. This has led to low-level mist inversion, episodes of visible brown haze, and a "sweetly-acidic" smell (Popkiss, 1992). This warrants concerns, especially concerning respiratory diseases, mobility, and quality of life.

3. Lack of Smart Lighting

Smart lighting is important in promoting sustainability, increased security, lower energy use, and easier light customization. It should be noted that street lighting systems consumers higher power than most application domains. In the case of Cape Town, the high-power consumption and frequent blackouts have only implemented smart mobility a challenge.

The local government has admitted that poor lighting in many parts of the City has spurred crime and affected transport, especially at night. Even though there are plans to replace the high-intensity discharge (HID) lamps with light-emitting diodes (LEDs), this program hasn't

been implemented due to a lack of funds and vandalism. It should be noted that HID bulbs have a poor orange glow that makes it difficult for road users to see the surroundings. Additionally, these bulbs have poor lumen maintenance, and they lose a considerable light output and eventually burn out completely, leading to a waste of energy.

Of all the City's traffic lights, it's estimated that only 15% of street lights have LED bulbs. Besides that, managing traffic in some areas has become a menace due to the ongoing vandalism of street lights. The sprawling townships have the highest crime rates due to poor spatial development and poor connectivity.

Besides that, South Africa's main power supplier, Eskom, has been facing energy issues, leading to lasting and frequent interruptions. Eskom accounts for almost 98% of South Africa's electricity (Stott, 1997). Load shedding is a rolling blackout that involves the intentional shutdown of electrical power. The company's chief operations officer has stated that the reason for load shedding is due to neglect and lack of maintenance for over a decade, resulting in an unreliable and unpredictable system.

Loading shedding has a serious threat to security since a well-functioning infrastructure relies on a good transport system. The loss of electricity has a significant effect on transport, including the rail system. Besides that, the frequent power outages have led to the loss of millions of monies in revenue that would otherwise be used to make Cape Town a smart city. Overall, these factors have made it impossible to create an intelligent streetlight control solution that uses motion sensors. The lack of reliable power supply and constant vandalism means that this City still has a long way to go.

4. Lack of a well-integrated transport system and inefficiency

Cape Town's transport model mainly features metered taxis, metro trails, and MyCiti-a bus rapid transit service with feeders. All these were designed to integrate the City's public transport system. However, these modes of transport are not well integrated. There are no specific bus or taxi stages, and commuters can't rely on the available public means of transport to drop them on their doorsteps. This City hasn't implemented a scheduling mechanism that guarantees minimal disruption to transport. As a result, it isn't easy to schedule day-to-day commute.

The BRT bus system and metro trails were introduced to diversify the already struggling taxi industry. However, there is a missing link between these three transport systems. Even though the BRT system was introduced as a revolutionary public transport system to improve commuter service during the buildup to the 2010 Soccer World Cup, its service delivery is restricted to the "urban poor" in high-traffic areas only. It's not seamlessly integrated with the metro trail or the metered taxis; hence commuters can't connect from one mode of transport while commuting to the next.

The metro rail has occasionally been "crippling" transport services due to equipment failure. The train network, which serves approximately 620,000 commuters every day, operates on a 460 km track. However, commuters face delays and poor communication. The worsening conditions have resulted in inefficiency in service delivery. The limited and unreliable network has often left commuters stranded, interfering with economic productivity.

According to Wired (Stinson, 2017), thousands of commuters in Cape Town have had to navigate the extensive informal taxi stage network by word of mouth. Minibus taxi drivers are forced to garner information regarding routes based on experience. According to Madeline Zhu of WhereisMyTransport, a South African start-up, "People don't know how it works – they just know the few routes that they're used to running", the poor transport network integration means that people in informal settlements don't have access to metered taxi services easily. Besides that, the combination of over-reliance on poorly integrated taxis and affordability issues is a perfect recipe for failure to make this City implement smart mobility. The post-apartheid government means that most people still have to rely on public transport systems while they are socially and economically excluded. This has resulted in urban low-income residents who overweight the public transport system (Teffo & Zuidgeest, 2019).

5. Taxi Wars

Taxi wars are serious triggers for the economy of South Africa. The violent system, which has a history that dates back to the late 1980s, has been caused by the fact that this industry is determined to regulate itself. In Cape Town, for instance, the ongoing taxi dispute has been due to taxi routes. Local news reports that 82 people have been killed between January and July 2021. Violent entrepreneurship isn't new in South Africa. In the fight for more lucrative taxi routes and power brokerage, it becomes impossible to upgrade this City's public transport sector, with different factions fighting for power and control of the taxi market share.

Note that the metered taxi, the most popular option, is also in competition with shared riding services such as Uber (Carmody & Fortuin, 2019). This has resulted in the Uber-taxi war within Cape Town City. Drivers from both sides have raised regulatory issues with metered taxi drivers claiming that uber drivers operate without legal permits, for instance. A report by Gareth Van Zyl (Van Zyl, 2016) indicates that almost 2000 Cape Town Under drivers operated illegally without the metered taxi permits in 2016. This led to the impounding of over 300 Uber cabs. (ADEBAYO, 2019)

6. Lack of flexibility

There are only three primary forms of transport in this City. Note that other forms of flexible options such as trains, trams, e-bikes, and hover boards are limited. So, commuters are restricted when it comes to transport options. For a city with over 4.7 million people, a limited transport system increases the risk of accidents, transport delays, and extremely high commuting costs.

But even with the available roads, there is a big pothole problem in the townships. The City's transport directorate is estimated to have repaired almost 18,080 potholes between January and August 2021, only in addition to resurfacing 121 km of roads (City of Cape Town, 2021). While the massive repair process may be ideal in enhancing the transport system in this region, they also contribute to commuter delays due to frequent road diversions. The City of Cape Town government indicates that they repair approximately 2,260 potholes monthly, which translates to 75 potholes per day. It should be noted that the high number of potholes also contributes to accidents and hinder efficient mobility.

7. Railway vandalism

A functional rail network is important in providing commuters with an efficient and cost-effective transport alternative. Besides that, this is important in helping Cape town city attain its smart mobility goals and align with its economic development.

The widespread vandalism of fiber optic cables has resulted in frequent delays across the main transport corridors in Cape Town. In most cases, commuters are constantly advised to seek alternative means of transport due to communication outages and the high risk of accidents (George & Rust, 2018)

The unprecedented level of passenger rail infrastructure reached an extremely large scale, especially during the 2020-2021 lockdown period due to the pandemic. For the few functional railway systems, the commuter overcrowding has sparked the risk of accidents and delays.

8. Conclusion and Suggestions

The idea of Cape Town city implementing smart mobility seems close to fruition yet so far away. This City has a reasonable potential of becoming a smart city that's mobility friendly. This is because its location, global popularity, smart and innovative platforms, and availability

of resources, including data, can facilitate the whole process. However, the local governing body should consider diversifying its smart mobility profile, implementing intelligent transport systems, and using big data solutions that guarantee efficiency, flexibility, and safety. Besides that, it should implement clean technology by using vehicles with zero-emission. To curb taxi wars and public transport violence, the government should step in by implementing the right governing bodies that guarantee public safety. to prevent waste management and align this City with its smart city goals; this City should consider using **smart waste resources**. (SmartCitiesDive, n.d.) which could be key in enhancing transport efficiency and integration that commuters need.

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