AN URBAN PLANNING PERSPECTIVE ON THE READINESS OF THOHOYANDOU CBD PUBLIC SPACES IN DEALING WITH THE COVID-19 PANDEMIC: A CASE STUDY OF THOHOYANDOU CBD

BY

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THIS DISSERTATION IS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTER'S IN URBAN AND REGIONAL PLANNING IN THE DEPARTMENT OF URBAN AND REGIONAL PLANNING, FACULTY OF SCIENCE, ENGINEERING, AND AGRICULTURE

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A Masters Dissertation is submitted to the Department of Urban and Regional Planning in the Faculty of science, engineering, and Agriculture, in fulfilment of the requirements for the Award of Master of Urban and Regional Planning (MURP) Degree

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DECLARATION

I, RATSHILINGANA MUDANALO MARYLINE (Student Number 11635987); hereby declare that this mini dissertation titled "URBAN PLANNING PERSPECTIVE ON THE READINESS OF THOHOYANDOU CBD PUBLIC SPACES IN DEALING WITH COVID-19 PANDEMIC: A CASE STUDY THOHOYANDOU CBD, for master's in Urban and Regional Planning at the University of Venda, hereby submitted by me, has not previously been submitted for a degree at this or other university and that this is my work. All reference materials contained therein have been appropriately acknowledged.

Student Signature…  …… Date……27/02/2023……

DEDICATION

This dissertation is devoted to God Almighty, who has given me the perseverance to finish this research, as well as to my lovely family, including my husband Netshiongolwe T.G., my dear daughters Mukumela Rialivhuwa Netshiongolwe, Netshedzo Nechie Netshiongolwe, and my one and only son Riamuvhona Netshiongolwe, for all of their sacrifices and support in ensuring that momma continues to pursue her In addition, I have dedicated this dissertation to my late mother Lilian and my four siblings, Prince, Mukondi, Mutali, and Fhulufhelo Raselekane. I promise to keep making you proud and say this for you.

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May God bless you all!!!!!!

ABSTRACT

Thohoyandou CBD public spaces need to be ready in the future to urgently react to pandemics. This study aims to introduce urban planning measures that must be taken into consideration to improve the current performance of public spaces in reducing the spread of COVID-19. The study is guided by four research objectives which are as follows, (i) To analyse urban planning and urban management attributes that are critical in limiting the spread of COVID-19 in public spaces. (ii) To identify and categorize public spaces that are likely to pose a threat to limiting the spread of the COVID-19 pandemic in Thohoyandou CBD. (iii)To determine urban management factors that are significant to COVID- 19 in public spaces of Thohoyandou CBD and (iv) To come up with an urban planning-based resilience framework that will boost the ability of public spaces to respond to the challenges of a pandemic. Twenty-five public spaces were analysed based using five study constructs, which included waste management attributes, water provision attributes, ecological/environmental attributes, demographic attributes, and public space management and behaviours. Data was analysed using Hierarchical Cluster Analysis (HCA), Multiple regression Analysis (MRA) and analysis of standardised mean score z-values. Data screening procedures were employed using normality test measures of skewness and kurtosis. Results revealed that there are five critical issues that need to be addressed if we are to limit the spread of COVID-19 in public spaces. These include waste management, water provision, public space user demographics, public space management behaviors and environment integrity issues. HCA results revealed two unique categories of public spaces based on their responsiveness to the spread of COVID -19. Cluster 1(one) is made up of 10 public spaces accounting for 40 % of the total and Cluster 2 is made up of 15 public spaces accounting for 60 %. **C**luster 2 type of public spaces are generally performing relatively well in responding to the COVID-19 pandemic as evidenced by positive and high standardized mean score z values when compared to cluster 1 (one) type of public spaces. MRA results revealed that the most significant (P value <0.05) attribute capable of reducing the spread of COVID-19 is water provision. The study concluded by recommending a resilience framework aimed at reducing the risk and exposure to COVID- 19 as well as building public pace capacity to withstand challenges posed by future pandemics. Critical interventions for building resilience should focus on such issues as building functional waste management and water facilities, redesigning of some public spaces, deployment of smart technologies, improved infrastructure maintenance and public space monitoring as well as rolling out of education campaigns. More

intervention efforts should be directed to 40 % of public spaces belonging to cluster 1 as they were found to be severely compromised.

KEY WORDS: COVID-19; Public space, resilience framework, vulnerability and spread of COVID-19.

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LIST OF ACRONYMS

COVID-19	Corona virus disease of 2019.
WHO	World Health Organization.
UN	United Nations.
CBD	Central Business Area.
IDP	Integrated Development Planning.
UNESCO	United Nations Educational, scientific and Cultural Organization.
UNICEF	United Nations Children's Fund.
AZ	AstraZeneca.
J&J	Johnson & Johnson.
SARS-CoV-2	Severe Acute Respiratory Syndrome Corona virus 2.
SARS	Severe Acute Respiratory Syndrome.
PPEs	Personal Protective Equipment's.
MSW	Management of municipal solid waste.
SMW	Solid Medical Waste.
SDG	Sustainable Development Goal.
WASH	Water, Sanitation, and Hygiene.
AI	Artificial Intelligence.
MERS	Middle East Respiratory Syndrome.
ICTs	Information and Communication Technologies.
GIS	Geographic Information system.
CCTVs	Closed -Circuit Television.
WMA	Waste Management.
WPA	Water Provision.
DA	Demographic Attributes.
UPMA	Urban Planning Management Attribute.
EEA	Ecological/Environmental Attribute.
SPSS	Statistical Package for Social Sciences.
HCA	Hierarchical Cluster Analysis.
ANOVA	Analysis of Variance.
MRA	Multiple Regression Analysis.
CUPM	Critical urban planning management attribute that is limiting the spread.
CWMA	Critical waste management attributes that are limiting the spread of COVID-19.

SWPA	The significance of Water provision attributes critical in limiting.
SPMB	Significant public space management and behaviours.
IDLSC	Important Demographic attributes.
IEDA	Importance of ecological/environmental demographic.
PSTLS	Public spaces which are likely to pose a threat to limiting the spread.

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1. CHAPTER ONE: THE PROBLEM AND ITS SETTING

1.1.Introduction

According to UN-Habitat, (2020), COVID-19 Future pandemics like COVID-19 can pose significant threats to liability and sustainability in central business districts (CBDs) due to their potential to disrupt various aspects of urban life and infrastructure. Here are some reasons why: Economic Impact: CBDs are often the economic hubs of cities, housing numerous businesses, financial institutions, and commercial activities. Pandemics can lead to lockdowns, business closures, and reduced economic activity, causing financial strain on businesses and individuals alike. This can result in job losses, reduced revenue for local governments, and decreased investments in the CBD (Jasiński, 2022). Remote Work and Changing Work Patterns, the pandemic has accelerated the adoption of remote work and flexible work arrangements (Kordshakeri, 2021).

CBDs are characterized by high population density, which can facilitate the rapid spread of contagious diseases pandemics can create health concerns, leading to reduced foot traffic, increased demand for medical facilities, and changes in the design and layout of public spaces to ensure social distancing (Molaei, 2022). Supply Chain disruption pandemics can disrupt global supply chains, affecting the availability of goods and services in CBDs. This can lead to shortages of essential supplies, increased prices, and challenges in maintaining the functioning of businesses and services (Molaei, 2022). Tourism and Hospitality many CBDs are also popular tourist destinations, with vibrant cultural scenes and entertainment options, pandemics can lead to a decline in tourism, impacting revenue for hotels, restaurants, and cultural institutions, which can have cascading effects on the local economy. Social Dynamics (Wilson, 2021).

Future pandemics, similar to the situation with COVID-19, have the potential to seriously jeopardize the viability and sustainability of central business districts (CBDs) by disrupting various facets of urban life and infrastructure (Molaei, 2022). Here are several explanations for this concern. In order to confront these challenges, urban planners and policymakers need to contemplate strategies such as diversifying the roles of CBDs beyond merely office spaces,

investing in digital infrastructure to support remote work, enhancing healthcare facilities and disaster preparedness, endorsing mixed-use urban development, and encouraging sustainable urban planning that factors in health and safety considerations(Low, 2020). Molaei, (2022) stated that is essential to acknowledge that the extent of the impact of upcoming pandemics on CBDs will hinge on diverse factors, including the severity of the pandemic, the efficacy of public health measures, technological progress, and the reactions of governments, businesses, and communities.

Alter, (2020) argues, that the COVID-19 era has drastically altered relationships between public space users and streets, public spaces, and public utilities. This imposed regulations and precipitated disruptions daily at public spaces and private spaces. Most of these tormented by the pandemic live in poverty and rural areas, making them several the most vulnerable people on earth.

According to Anguelovski, (2020), indicated that COVID-19 had a significant effect on public space in cities and limitations on the use of public space and social distance that have been key policy measures, with the world's population being asked to stay at home and avoid many public places. According to Null and Smith (2020), to deal with the long-term effects of the COVID-19 pandemic on public space limitations must be loosened up, urban planners must apply urban perspective strategies considerations, particularly in terms of how public space will be used, perceived, and designed in the future. Therefore, it is uncertain how significant and extensive the transition will be.

Journalists, planners, designers, and architects have already made predictions about how this crisis will alternate their connection with public spaces (Florida et al., 2020). According to Roberts (2020), there's a sizeable amount of uncertainty concerning how COVID-19 may also influence the future design, utilization, and perceptions of public areas; the crisis may considerably modify how we interact with public spaces. Studying and measuring these modifications could be crucial inside the next months and years to guide urban planners on how to plan for post-COVID-19 urban public spaces (Florida, 2020). Oscilowicz et al. (2019)

have emphasized that while most government interventions in dealing with the COVID-19 pandemic must restrict contact in public areas, public spaces may be a platform for sharing (linking locations and people). Give them the chance to learn about precautionary measures including the value of keeping a physical distance and practicing good hygiene to keep the lines of communication open.

Public spaces provide many platforms for dialogue and negotiation, allowing the government, the negative, and informal workers to discuss and jointly provide with suitable frameworks to save the spread of the coronavirus in public spaces with an effective position (of public spaces), that similarly offers more desirable sustainable infrastructure and spatial planning measures to reduce COVID-19 pandemic. Government still needs to provide clear and handy statistics on public space users due to the fact there is lots of incorrect information in social media news, unfortunately, not nothing continues to be acknowledged approximately how ultra-modern public spaces are dealing with modern scenario.

Public spaces provide many structures for discussion and negotiation, allowing the government, and public space users to speak about the pandemic and together give the essential frameworks to help unfold the coronavirus. The public space with a positive position equally presents enhanced sustainable infrastructure and spatial planning measures. Government nevertheless desires to provide clear and on hand information on public spaces because, there is a lot of misinformation in social media news. However, little is known about how today's public places are satisfying this positive and high capacity of COVID-19 issues (Abend, 2019).

People worldwide all around the world have been urged to stay at home and avoid going to a lot of public areas because social withdrawal and limitations on using public have been critical policy measures to prevent the spread of COVID-19 and safeguard public fitness (Sandford, 2020). Once the boundaries have been at ease, it is uncertain how the COVID-19 pandemic will affect public spaces in the end, especially when it comes to how public space users make

use of and understand public space in the future. The purpose of this study is to draw interest to new concerns on the intersection of urban planning and COVID-19. Planning, the COVID-19 problem might radically alter how individuals interact with public spaces (Sandford, 2020).

1.2.Background of the study

Wuhan, a city in China (Hubei Province), is where the new coronavirus was discovered. According to Markusen, (2020), who indicated that it was discovered around the end of 2019 and the virus strain has never been found in humans elsewhere in the world, Infections rapidly spread throughout China, prompting the World Health Organization (WHO) to declare a worldwide state of emergency. Since then, incidents have been confirmed in other nations other than China, such as South Africa (Markusen, 2020).

Thohoyandou CBD public areas must be prepared to respond promptly to pandemics in the future, but it is unclear how this preparedness might be developed, at least from the perspective of urban planning, to enhance how effectively public spaces are performing in preventing the spread of COVID-19, this study intends to present urban design solutions that should be considered in future. When social distancing is difficult, government may provide access to personal hygiene such as personal protective equipment to reduce the spread of COVID-19 in public spaces. The goal of this study is to ascertain and comprehend the degree to which the Thohoyandou CBD public spaces design is prepared to handle the COVID-19 pandemic, which is already escalating inequalities (Kluth, 2020).

Due to their lack of access to medical treatment and more difficult self-isolation, racial minorities, and poor communities were particularly hard struck by COVID-19 (Du et al., 2020). These social injustices based on the race, class, and neighbourhood could penetrate the public sphere. For instance, disadvantaged populations typically have fewer access to green areas, whether they are public or private. Additionally, compared to wealthy communities, green spaces in lower-income areas are frequently smaller, less well-maintained, and less abundant (Dahmann et al., 2010). COVID-19 may promote the privatization of public space

by physically closing off streets or parks, resulting in an increase in gated communities and neighbourhoods (Heynen et al., 2006).

Our lives have all been significantly impacted by COVID-19 pandemic, and not just temporarily. However, the pandemic presents a chance to visualize and expansion of infrastructure toward a better future for cities and the people who live in them. By continuing to link cities globally, offering them a global forum for exchanging experiences and ideas, and developing practical urban solutions and activities that may help cities realize this goal, UNESCO stands ready to support cities throughout the globe in this crisis (UNESCO, 2020).

South Africa received the greatest COVID-19 cases approximately 1.56 million and nearly casualties nearly 54,000 in April /19/ 2021. More than 292 thousand amounts of the Johnson & Johnson (J&J) COVID-19 vaccine have been provided in South Africa, which began the country wide rollout of the vaccine. USA hopes to reap herd immunity by means of immunizing at least sixty seven percent of its population (40 million human beings) with the aid of the end of 2021. (UN-Habitat, 2020). The government delayed the first deployment of the AstraZeneca (AZ) vaccine because to worries about its effectiveness, particularly against the new B.1.351 type, which is responsible for 90% of infections in South Africa (UN-Habitat, 2020).

To prepare and create a response plan, it is crucial to conduct a comprehensive and quick evaluation of the entire city. This might involve spatial planning, quality mapping, risk and vulnerability assessments, and urban design strategies to give evidence-based recommendations and educate short-, medium-, and long-term plans to promote response and recovery from pandemics, particularly in open public spaces. (UN-Habitat, 2020). Accessibility, adaptability, design, administration, maintenance, connection, and equal distribution throughout a city are just a few of the public spaces issues that need to be addressed in the short-medium and long-terms because of the coronavirus outbreak (UN-Habitat, 2020).

Building confidence in public areas is necessary both during and after the pandemic, when cities begin to emerge from lockdown. The COVID-19 worldwide pandemic, which is categorized as an emergency by the World Health Organization (WHO) and is endangering sustainable development in all its aspects, has paralyzed the world economy. Urban planners must respond to the Crisis' severe effects on Africa, particularly in public spaces, by reviving and reconstructing their policies and methods (UN-Habitat 2020).

1.3.Problem statement

The COVID-19 situation has brought to light several shortcomings in public spaces, including those related to connection, accessibility, adaptability, design, administration, and maintenance. A unified policy agenda integrating urban planning, community development, architecture, green building, and public health is required to address this (UN-Habitat, 2020). Thohoyandou CBD public space was very affected by COVID-19 and poses significant challenges and concerns, primarily due to the inherent characteristics of CBD public spaces that facilitate the spread of the virus. Thohoyandou CBD is comprising such as high population density, limited space, and various communal amenities contribute to the problem. As a result, the close interactions and interactions within these spaces provide ample opportunities for the virus to be transmitted among individuals. Consequently, addressing the COVID-19 spreading in CBD public spaces is imperative in order to mitigate the risk of infection, protect public health, and ensure the safety and well-being of the community.

Open spaces and parking spaces

In Thohoyandou's central business district, there aren't many remaining green spaces, yet parking lots and other public areas can be useful or harmful in the fight against the pandemic. Either area can be used to build up temporary locations, such as restrooms, detention facilities, a location for a portable clinic, social isolation areas, etc. However, during a pandemic, vacant open public spaces draw undesired crowds, the high density of communities alongside the

roadways is caused by their spatial distribution of parking spaces, which often tend to be fully occupied by mid-morning with vehicles. However, there are also unauthorized parking "extensions" made by automobiles that are pressured public spaces (Anyumba, 2019).

Street-level obstacles

The existence of street-level obstructions within Thohoyandou's CBD has played a role in the spread of COVID-19 in various public areas, this situation has given rise to instances of congestion and close contact (Anyumba, 2019). These obstructions encompass factors like limited sidewalks, densely populated pedestrian zones, and intersections with heavy traffic. Consequently, these barriers have resulted in immediate physical closeness between individuals, thereby increasing the likelihood of virus transmission (Anyumba, 2019).In the public spaces of Thohoyandou CBD, these street-level obstacles make it challenging to adhere to health and safety recommendations (Anyumba, 2019).Pedestrians are compelled to be in close proximity, which undermines their ability to maintain an appropriate distance from others. This situation intensifies the risk of transmission and highlights the difficulties associated with practicing safe distancing (Anyumba, 2019).

Street trading

The Thohoyandou CBD Street trade organization plays a role in both economic and social activity. Regrettably, it has contributed to the transmission of COVID-19 within public spaces due to inadequate adherence to proper precautions and guidelines. The density of people and interactions in public areas, especially in Central Business Districts (CBDs), has heightened the vulnerability to virus spread. It's important to underscore that the activity itself is not inherently responsible for transmission; rather, it is the behaviours and practices displayed by those utilizing public spaces in Thohoyandou CBD, since 90% of Thohoyandou public spaces are used for street trading businesses (Anyumba, 2019).

1.4. Justification of the study

Public places are created by the public for the public. All towns need to be prepared for any pandemic that impacts human behaviour, especially to access public areas, as their IDP document must include any level of preparedness because they were developed for and brought to life by residents, serve the public good, and promote social cohesion.

Municipalities need to be able to prevent, detect, respond to, and care for a community that is experiencing a pandemic. To do this, they need to establish action plans for a quick reaction to a pandemic like COVID-19.

Urban designers want to make city public spaces more welcoming, pleasant, and secure places for people to live in. What is created and the way it is designed could be influenced by the public's impressions (WHO, 2020). This study will evaluate how prepared urban planners are to address the COVID-19 pandemic and create a safer environment for public places, which serve a range of purposes for different demographics and sociologically susceptible elements of society (WHO, 2020). This research is crucial in establishing how prepared urban designers must be to deal with the COVID-19 pandemic since public areas foster public space users' social connections that lessen loneliness and isolation.

1.5.Research aim

The aim of the study is to assess the extent to which Thohoyandou CBD public spaces are ready to deal with COVID-19 pandemic challenges.

1.6.Research objectives

- To analyse urban planning and urban management attributes that are critical in limiting the spread of COVID-19 in public spaces.
- To identify and categorize public spaces that are likely to pose a threat to limiting the spread of the COVID-19 pandemic in Thohoyandou CBD.
- To determine urban management factors that are significant in limiting the spread of COVID- 19 in public spaces of Thohoyandou CBD.
- To recommend an urban planning-based resilience framework that will boost the ability of public spaces to respond to the challenges of a pandemic.

1.7.Research questions

- What are the urban planning and urban management attributes that are critical in limiting the spread of COVID-19 in public spaces?
- What are the public spaces that are likely to pose a threat to limiting the spread of the COVID-19 pandemic in Thohoyandou CBD?
- What are the urban management factors that are significant in COVID- 19 public spaces of Thohoyandou CBD?
- Which urban planning-based resilience framework. Will boost the ability of public spaces to respond to the challenges of a pandemic?

1.8.Significance of the study

This research holds significance as it explores urban viewpoints, effective methodologies, and approaches that urban design must embrace to effectively address the COVID-19 pandemic in the context of planning public spaces and strengthening cities' readiness and swift response capabilities during emergencies. The occurrence of the COVID-19 outbreak within urban settings underscores the critical nature of coordinating various stakeholders, including urban planners and those responsible for managing public spaces. This study aims to promote a holistic approach for the efficient management of public areas, advocating the seamless integration of fundamental principles of urban planning with the intricate complexities of addressing the diverse challenges presented by COVID-19.

1.9.The scope of the study

Using an urban planning perspective, the study seeks to assess the extent to which Thohoyandou CBD public spaces are ready to deal with covid-19 pandemic challenges. Public spaces that are targeted are streets (including the pavement and parking lots), public squares, parks, and public transport transit in Thohoyandou CBD.

1.10. Description of study

Geographical maps in terms of various locality maps that is situated the study area in context of South Africa, Map of Limpopo province, Vhembe district and Thohoyandou CBD (study area) see figure 1.1.

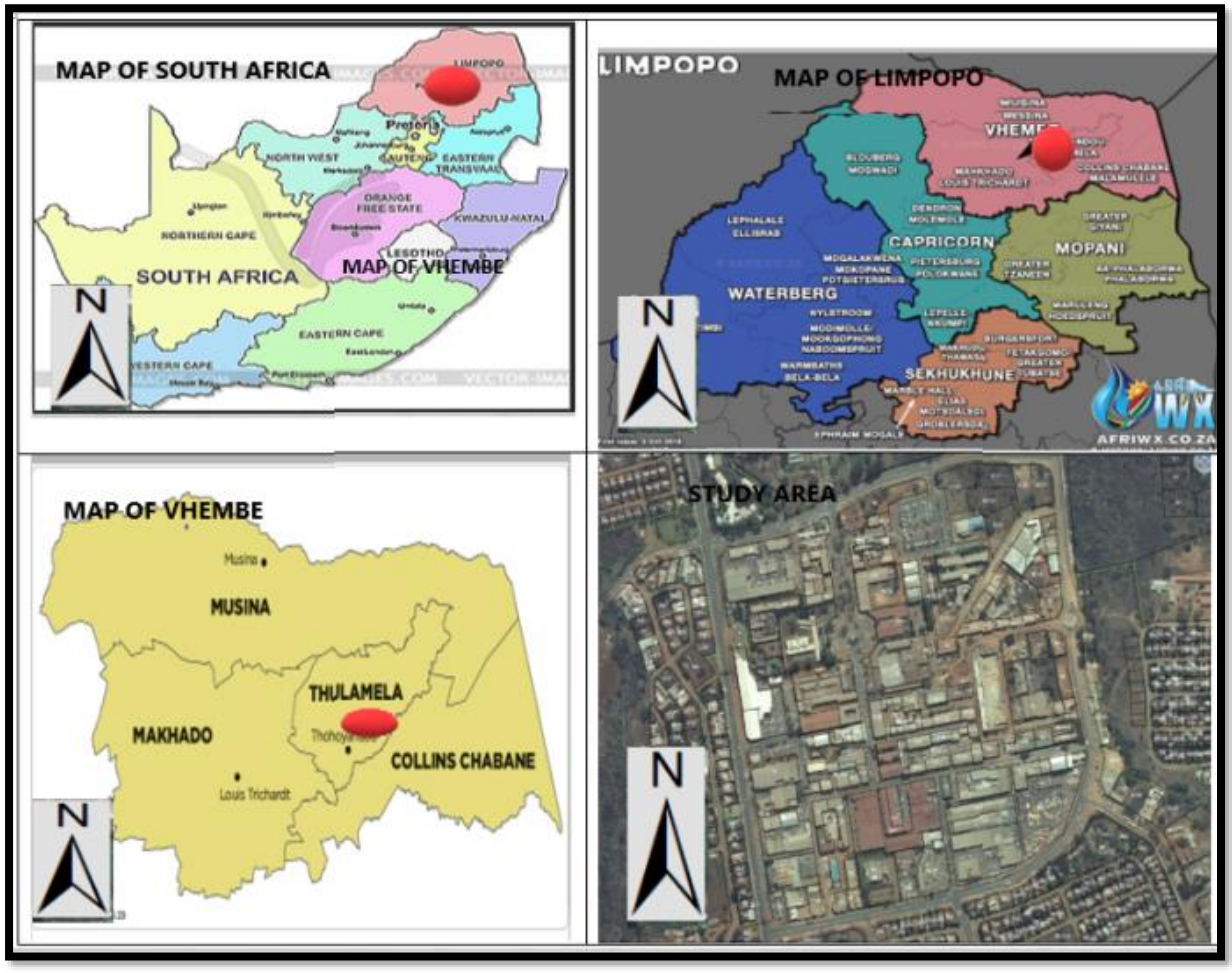

Figure 1. 1: locality map

Source: Author construct, (2022).

According to Census, (2011) stated that Thohoyandou is a town in South Africa (Limpopo province, with 69453 populations. Thohoyandou is the proud heart of the Vha-Venda people and the former capital of the independent homeland; its name means "head of an elephant" in Tshivenda. The town serves as the district's commercial, administrative, and legislative hub. It is administered by the Thulamela local municipality under Vhembe District Municipality,

Thulamela Municipalities was recognized as a category B municipality. Thohoyandou town central business centre (CBD) has become so crowded make it exceedingly challenging to keep sick people isolated and socially distancing.

1.11. Definitions of terms

COVID-19: Discovered coronavirus. The disease was discovered in China in December 2019 and quickly spread throughout the world, resulting in a public health crisis unprecedented in history (WHO, 2020)

Public space: A public space is an area that is typically accessible and open to the public. Commonly referred to as public places are streets (including paved ones), town squares, parks, and beaches. Public places are, to a limited extent, government structures that are accessible to the public, such as public libraries (Markusen, 2020). In Thohoyandou, public areas include sidewalks, parking lots, public squares, bus stops, taxi ranks and bays.

Urban design: Planning for the provision of municipal services to citizens and visitors, as well as developing and sculpting the physical aspects of cities, towns, and villages, is what this entails (Alter, 2020).

This chapter offers the urban planning viewpoint of Thohoyandou CBD's readiness to address COVID-19 concerns in its public urban areas. The problem statement, general research goal, specific research objectives, study scope, research design, and study area descriptions came next. The importance of the study, its limitations, and the definition of words are also covered in this chapter.

Proposed structure of the research

Chapter 1: This chapter focuses on the introduction, background of the study as well as the purpose of the study which includes the aims, objectives, and research questions.

Chapter 2: Presents literature concerning urban public spaces in dealing with the COVID-19 pandemic.

Chapter 3: Outlines the research methodology and tools which will be adopted in this study.

Chapter 4: This section presents data analysis and a discussion of findings.

Chapter 5: Covers on the conclusion and recommendations for future research

2. CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

To better understand the challenges surrounding the management of the COVID-19 pandemic in public spaces, a study of current publications relating to the broader notion of urban public space and the COVID-19 pandemic was conducted from various viewpoints. This review was then limited to focusing on its implications for the advancement of social status.

2.1.2. Conceptual framework

The conceptual framework is created in a way that makes it easy to comprehend the urban planning perspective on how prepared urban public places are to handle the COVID-19 pandemic. Concepts, variables from the research construct, and their external relationships are the primary factors that play vital critical roles. The study is guided by the conceptual framework to fulfil its primary objectives (see figure 2.1).

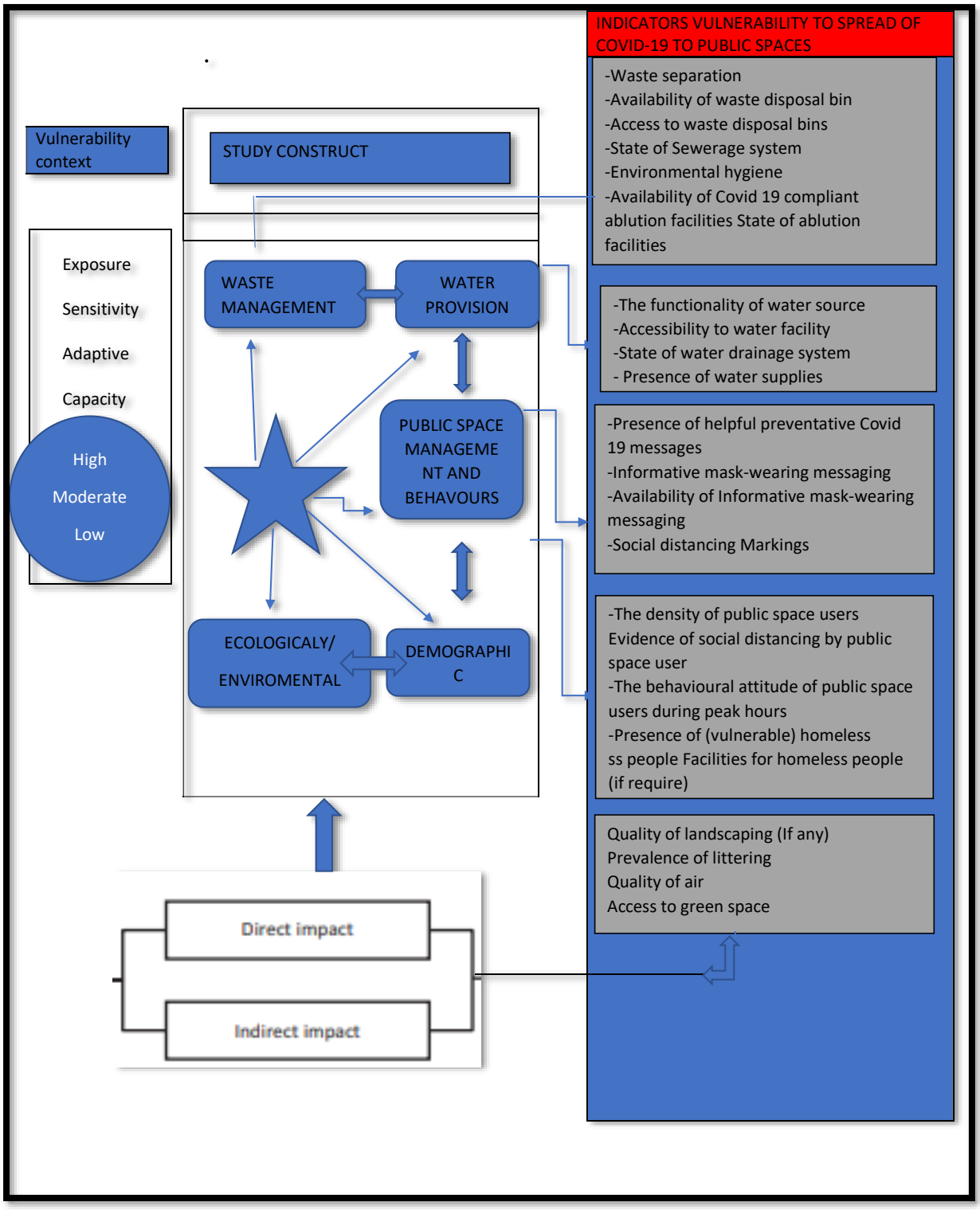

Figure 2. 1: Conceptual framework

Source: Author construct, (2022).

2.2. Conceptualizing the public space.

Public spaces are considered as being locations where "community" can legitimately develop and thrive because they are open to all users. The public realm serves as "our outside recreation area and open-air living room" (Lipton, 2002). The understanding and use of locations may also depend on gathering characteristics. For instance, the sociology of childhood acknowledges public spaces as locations where kids and young people can create a form of protection in their surroundings, away from the control and supervision of the family at home.

2.2.1. What is public space?

In urban planning, "open space" has typically been defined as the streets, parks and recreation areas, squares, and other freely owned and supervised outdoor places, as opposed to the private area of housing and employment (Tonnelat, 2010). The rising number and variety of semi-open places managed by private-open or private organizations, as well as recent improvements in urban settlement forms (Mangin et al., 1999). Today, public places should be thought of as being available to the broader populace rather than as being the same as people in the general region of the state and its subdivisions. Thus, a formal hierarchy between the avenues, boulevards, streets, alleyways, tunnels, and squares that make up the fundamental lexicon of urban planning is established by the urban project (Mangin et al., 1999).

2.2.2. Origins of public space

Even though public spaces have been a part of cities since before the time of Christ, the development of modern public spaces provision can be qualified to be a concern about the health and general living conditions of public space users in 19th-century, as cities expanded quickly to keep up with the Industrial Revolution (Freestone, 2000).

2.2.3. Evolution of the role of urban public space

Since the beginning of urban life, public places have played a vital role in expressing the character and purpose of towns and cities. Public spaces have a special and enduring value in this regard. From antiquity through the middle Ages and into the contemporary period, public spaces have remained a crucial component of the layout of towns and cities as well as the daily life of urban communities (Zambon et al., 2017).

In this regard, medieval-era European towns are highly interesting, Following the fall of the Roman Empire, several towns were built throughout Europe using urban planning and

organization concepts (Matthew, 1983). However, many towns were either established in crude radice (from a "raw root") or developed from already-existing human settlements and Roman military camps. Towns were typically built along or at the intersection of important transportation routes, and they helped to create a network of settlements in the area. These cities featured a market square in the middle of a regular grid of perpendicular roadways separating highly built neighbourhood's market squares served as the focal points of trade and commerce (Matthew, 1983).

Old towns have a distinct character that is expressed on their public spaces, which are distinguished by their architectural and urban design style and support the growth of social relationships and community integration. Public spaces are essential to the social life, culture, and traditions of ancient towns. In this time of crisis, urban planning and architecture are essential, but public places must have a historical feel for social interactions, according to Zagroba (2020).

Public spaces have been a crucial part of the urban fabric ever since urban development first began (Stanely et al., 2012). P public squares were the centre of municipal life even in antiquity. While the shape of architectural style of town squares have changed over time, they have remained an essential component of local character despite these changes. Both modern cities and medieval towns developed around town squares, and over time, their function has changed from being open spaces where traders set up their stalls to being the focal points of towns that are surrounded by the main governmental structures (Alves, 2017).

Old town squares serve as a living museum of the community's rich history and are the pillars of urban design (Torres Barchino, 2018). By exhibiting specific historical and cultural values included in architectural design, public spaces emphasize the significance of historical memory as a non-material asset (the dramatic events at the end of World War II contributed to the stormy history of the towns evaluated in the present study). To satisfy local needs and provide a feeling of place, attachment, and ownership for one's house, public spaces should be protected and conserved. For historical towns to function, public spaces serve important social and sociological purposes (Tolstykh, 2016).

Local communities have a variety of needs, including the desire for a healthy physical environment, high standards of living, leisure pursuits, and a high standard of living environment (Cotner, 2015). In small tow at the level of communities, social groups, or entire

societies, these factors contribute to the development of interpersonal bonds, public areas are crucial for regulating sociological factors (Akiyildiz, 2020).

Public areas in small towns serve to bring together members of the community, foster relationships, and serve as a testament to the town's rich history, which is reflected in its architecture and urban planning (Kobylarczyk, 2012).

The functionality of architectural and urban design, as well as their aesthetic order and spatial harmony, have a considerable impact on the quality of public spaces in small towns. Aesthetic elements, which are directly responsible for the appeal of public areas, and local development levels are related to spatial order (Van der Zwan, 2016). Interpersonal relationships are easier to form, residents feel responsible for and identify with their hometown in small communities with a large percentage of senior adults (Knox et al., 2010).

2.3. Traditional conceptualization of urban public spaces

Urban redevelopment initiatives frequently focus on enlivening public spaces and pedestrian-friendly settings (Lipton, 2002). It might be said that public space is derived from the utopian concepts of democracy, the ancient Greek agora, and the Roman forum. That activation is founded on the idealization of a decent public space (Lipton, 2002). When we think of public space, we typically picture it as an open area in the city that is used by all residents and has the ideal enclosed shape of a plaza. This type of space welcomes everyone and exemplifies the highest level of urbanity, or at least some of their public urban spaces, in relation to their territoriality however, shown that urban open spaces are made up of roads, routes through them, boulevards, squares, greenery (Lipton, 2002),

2.3.1. Utopian ideas by Ebenezer Howard

Despite lacking academic expertise in urban planning or architecture, Ebenezer Howard was a master at making public spaces. These locations are what Howard referred to as "magnets," places where people would want to live and work. His garden cities were designed with neighbourhood’s surrounded by green belts (parks), an open space with proportionately sized sections for homes, businesses, and farms. The garden city movement sought to solve the urban issues that were ailing the then-industrial city (Mitchell, 2003). The Garden City Concept was

a successful approach for improving the value of life in the public spaces that were crowded, filthy, and that will constitute a major threat to public health (Mitchell, 2003).

Howard made several additions that were connected to parks and other public areas, the greenbelt was incorporated into the Garden City model's urban planning and landscape design (Brown, 2013). Significant impact on planning theory and practice on public space is crucial because it serves as the physical hub for political debate and everyday contact in the city, which is at the heart of every citizen's right to be in Public space is crucial because it serves as the physical hub for political debate and everyday contact in the city, which is at the heart of every citizen's right to be in city public spaces (Mitchell, 2003).

2.3.2. Utopian ideas by Kevin lynch

According to Kevin Lynch's theory of Good City Form, regulations were developed for the interaction among citizens purpose with city form (Ford, 1999). A good city form theory is essential, emphasizing safety, harmony and smart, which means that it is accessible, well-organized, open, and remarkable with public spaces that are controllable, and resilient. A city's public spaces must have the ability to satisfy its surroundings based on psychological, cultural, and biological demands of its public space users and may be a good indicator of how effectively it functions.

2.3.3. Utopian ideas by Jane Jacobs

For public spaces in a city, Jane Jacobs advised streets, separating motor traffic into expressways, and sidewalks. Thus, in Jacobs' opinion, a busy roadway with sidewalks is safer than a park. Jane Jacobs identified a few physical requirements for vibrant urban life, including multipurpose neighbourhood areas and the encouragement of as many of its internal components as feasible. Necessity also serves secondary purposes (Kusmane, 2021). Jacobs, (2020) said that to ensure the safety of urban residents, trust between neighbours must permeate and identified a few physical requirements for vibrant urban life, including multipurpose neighbourhood areas and the encouragement of as many of its internal components as feasible. Necessity also serves secondary purposes, safety of urban residents, trust between neighbours must saturate every aspect of social life (Hill et al., 2017).

It is essential to have a suitable dense concentration of individuals, and this includes a dense concentration of public space users. Jacobs was in favour of aspect of social life (Hill et al., 2017). It is essential to have a suitable dense concentration of individual's public spaces.

2.3.4. Utopian ideas by Donald Appleyard and Alan Jacobs

Towards a New Urban Design Manifesto" since 1987. Based on Alan Jacobs and Donald Appleyard's theories, they proposed various structural attributes for a suitable urban environment since the idea they extract is crucial to urban physical characteristics (Hassan et al., 2014). Jacobs proposed isolating motor traffic on separate roadways. Jacobs, Jane

2.4. The COVID-19 conceptualization of public space

Liveability are qualities that need to be modified and exercised for a happy urban existence. Streets and neighborhoods make for a pleasant urban setting. To guarantee that people are healthy, characteristics and housing conditions should include clean air, light, spaces, safety, and serenity. People must be able to live comfortably in cities (Freser, 2009). Nowadays, people take their need for privacy, rest, food, relaxation, and self-restoration very seriously. To improve quality of life, a well-managed environment will prevent danger, pollution, noise, and other unwanted disruptions (Laurence, 2013). Public spaces must be part of the response to the virus whether to limit the spread of the virus or to provide ways for people to relax or sustain themselves. The COVID-19 pandemic and limitations on the use of public space have altered the association of public space users with their environment.

2.4.1. Progressive role of public space vs COVID-19

The effects of the global COVID-19 pandemic are still not fully known, but they will have lasting physical and social influence on open public spaces that will bind future generations. Urban planners always planned our towns in accordance with current technology and cultural trends an sanitary system was created because of lessons learned further om pandemic in the 19th century, and industrialization's increased demand for housing led to an overcrowding crisis (Hewitt et al., 2019).

The way that individuals interact with streets, public areas, and public facilities has significantly changed because of the COVID-19 pandemic, although we required to avoid the

worst public health effects, the limitations have disturbed daily life. This is especially disadvantageous to the urban poor, many of whom have lost their jobs, driving them to the brink and endangering the economy, safety and security, peace, and stability. The battle against the coronavirus has paralyzed numerous cities (UN-Habitat, 2020).

People need to be physically separated from one another in public areas. In developing nations where most people walk, expanding roadways can guarantee that physical separation is achievable on pavements, it is challenging to comply with the physical distancing requirements and solutions in slums and informal settlements due to the poor and congested footpaths. Putting water, sanitation, and hygiene facilities in strategic locations and educating people to stand as far apart as possible while queuing are important steps (Dantas et al., 2020; Filonchyk et al., 2020; Sharma et al., 2020; Kanniah et al., 2020).

Street vehicle traffic has drastically decreased, and in certain places, the number of people using public transportation has decreased by as much as 80%. Cities are temporarily or even permanently reserving car lanes on the roads for bicycles and pedestrians, alleviating traffic and adhering to the laws governing physical distance, to make walking, skating, and jogging safer, some communities are enlarging their pavements, by reducing CO2 emissions and increasing air quality, these actions enhance public health and wellbeing.

Public places must be versatile and flexible to relieve the congestion of traditional markets, temporary food markets can be set up in locations like parking lots, s mall neighborhood spaces can be repurposed into food distribution areas or food gardens for temporary community health centers and street vending on specific days or hours of the day, as well as leisure activities like watching movies or plays or organizing exercise classes, are all made possible by the shared use of streets and places (Jia et al., 2020; Zangari et al., 2020).

During a pandemic, public places and amenities can offer marginalized people crucial services such as functional water sources, provide handwashing facilities and clean restrooms, these plays a crucial role because it helps in wellness, reducing stress, support children's development and free mental health. To public spaces without running water can results in the spread of pandemic.

2.4.2. Urban public spaces of global cities

According to Calhoun (1996), who is cited by Aurigi and Graham (1997), one of the most significant social features of cities is the availability of public spaces where people who are relatively strangers can interact, observe one another, engage in debate, pick up political knowledge, and develop psychologically through a variety of contacts. However, there is another set of urban experts that link the contemporary problem of public spaces to the expanding use of electronic communication technologies in post-COVID-19 public space users' daily lives.

2.4.5. Government response to COVID-19: South Africa's perspective

In response to COVID-19, the administration of the nation has imposed a rigorous lockdown (Gettleman, 2020). This approach might not be workable for a long enough period to influence transmission in regions with dynamic populations and people who depend on daily wages. SARS-CoV-2 was controlled by herd immunity, there is still a high possibility that outbreaks may occur in most urban public areas in the cities, and ideally, vaccinations will be a solution. Urban planners must develop plans to minimize the effects on public areas and take urgent and brief action to decrease the possibility of urban outbreaks (Gettleman, 2020).

2.5. Urban public space and COVID-19 variables identification

Public observers are weighing waste management, water provision, public space management behaviour, demographic, and environmental factors as a key policy measure to reduce transmission of COVID-19 pandemic in urban public spaces (Jepson et al., 2017). The next section explained the importance of each factor and its variables.

2.5.1. Waste management attributes that define urban public spaces responsive towards COVID-19.

To avoid and guard against any infectious disease outbreaks, including the 2019 coronavirus infection (COVID-19), proper water supply, waste management, a sanitary atmosphere, and sanitation are necessary (Kanniah et al., 2020).

According to Dantasel (2020), there are amenities in urban public spaces that will aid in preventing the spread of viruses like SARS-CoV-2. These facilities include evidence-based and regularly used WASH and waste management methods. One of the most crucial

precautions to take to avoid contracting SARS-CoV-2 is practicing regular and proper hand hygiene (Sharma et al., 2020).

Urban designers must acquire the ability to learn from waste in order to create a new generation of buildings and places for the post-pandemic future, with the goal of reviving suburban areas and re-establishing a lost ecological balance (Kanniah, 2020). Current environmental policy is typically based on the 'waste management hierarchy' concepts, which aim to increase waste collection's effectiveness using proximity and personality principles. The optimal organizational method of waste management in urban areas identifies prevention as the better goal in terms of hierarchy, reuse and recycling preparation, various forms of recovery, and disposal come next, e ach phase consists of a variety of tasks (selecting, compacting, integrating, etc.) that must be done in order for physical spaces to be developed and incorporated into the existing fabric (Kanniah, 2020).

A global emergency has been imposed by the COVID-19 pandemic, and waste management procedures are now under scrutiny. During the pandemic, increased quantity of facemasks, gloves, used tissues, infectious wastes like food and plastic waste were widely distributed to urban public spaces, and these factors overloaded waste treatment facilities and necessitated emergency treatment. The study by Jenvman, (2021) also emphasizes the necessity for immediate, long-term, and intermediate approaches to waste management during the pandemic.

2.5.1.1. Waste separation

According to Sharma et al. (2020), indicated that regular of garbage collection prevents the spread of COVID-19 in urban public spaces, and waste collection must be handled by experts who understand waste separation. Dedicated routes, sanitized vehicles, waste tracking systems are required with drivers and professional waste parkers. It is necessary to provide specific training for personnel who will be exposed to COVID-19 waste separation, avoid congestion on the route and during the transportation period, and rapidly disinfect storage areas and vehicles during packing and dumping (Sharma et al., 2020). In addition, Sharma et al. (2020) indicated that the frequency of biodegradable garbage collection can be altered in accordance with the volume of waste in the area. See plate 2.1 adequate waste separation.

Plate 2. 1: Waste separation

Source:https://th.bing.com/th/id/OIP.iHeIfVbeTUpFUc3hiRSFcQHaEK?w=271&h=180&c=7&r=0&o=5&dpr=1.5&pid=1.7, accessed on 23/02/2023.10:44.

Urban solid waste management is a critical environmental concern that Iran has long acknowledged, and many developing nations are more exposed to coronavirus spread due to the unsustainable handling of garbage in public spaces (Nzediegw et al., 2020). For instance, in Iran, more than 18 million tons of solid waste are produced each year in public spaces, yet only 8% of that waste is recycled under a legal framework due to the country's poorly managed separation programs (Rupani et al., 2019), improper processing, separation, and disposal of urban waste pose a major threat to human health and will spread virus to public spaces.

2.5.1.2. Waste disposal bins

To address one of their basic/essential needs, safe and prompt garbage disposal municipalities provide waste management services, such as disposal bins to public places. However, these crucial services are frequently commonly caused by sickness outbreaks, such as the current coronavirus outbreak (COVID-19). Surgical musk, discarded gloves, and used tissues are frequently found in garbage disposal bins, which can cause hygienic difficulties or possibly the breakdown of entire municipal waste management systems, which can be frustrating and upsetting. This can lead to inappropriate waste storage and disposal, improper waste storage

and disposal, and improper waste disposal are all possible outcomes. An increased risk of infectious disease transmission in urban public places is one of the social, environmental, and health effects of improperly maintained trash cans, the good example of proper maintained disposal bins (see plate 2.2).

Plate 2. 2: Proper maintained disposal bins

Source:https://www.mirror.co.uk/news/politics/coronavirus-council-rubbish-tips-recycling-21941693, accessed on 23/02/2023.11:27

To stop the transmission of infectious illnesses in public settings, proper management of solid medical waste (SMW) bins and municipal solid waste (MSW) bins is essential. In Canada, landfilled disposal of disinfected SMW controlled with MSW differs by jurisdiction. The kind of trash and the level of local susceptibility both influence the potential severity of disease spread through poor waste disposal bin handling. In most metropolitan public places, COVID-19 disrupted and challenged municipal waste management systems, which were frequently already working inefficiently and unable to properly handle increased amounts of public space garbage and other issues brought by the pandemic. Almost every aspect of human existence was negatively impacted by COVID-19(WHO, 2020).

2.5.1.3. State of sewage system

Han et al. (2021) indicated that urban flooding, is regularly recorded in urban communities' public places combined with sewage overflows after the economy reopened in many nations, Urban flooding, which was usually accompanied by sewage overflows, endangered past virus-mitigation efforts by posing additional hazards in the public areas impacted (Han et al. (2021).This emphasized the roles of sewage overflow and sewage-contaminated aerosols easily spread pandemic in urban public spaces. Example of state of sewer that can easily transmit the spread of pandemic in public spaces (see plate 2.3).

Plate 2. 3: Overflow of sewage in public spaces.

Source:https://www.deccanherald.com/city/bengaluru-infrastructure/drainage-overflow-getting-worse-757184.html, accessed on 23/02/2023.12:51.

2.5.1.4. Environmental hygiene

Safe sanitation and hygiene conditions are critical for protecting human health during all infectious disease outbreaks, including the COVID-19 outbreak; however, ensuring good and consistent WASH and waste management practices in public spaces such as parks, street pavement, tax, bus rank, and marketplaces will help to prevent human-to-human transmission of the COVID-19 virus (WHO, 2020). WHO explained that one of the most important measures

that can be used to prevent infection of COVID-19 virus in urban public spaces is frequent and proper hand hygiene, and wash practitioners should work to enable more frequent and regular hand hygiene by improving facilities and using proven behaviour change technique (WHO, 2020). One excellent suggestion of provision of clean hands hygiene facilities in public spaces (see plate 2.4).

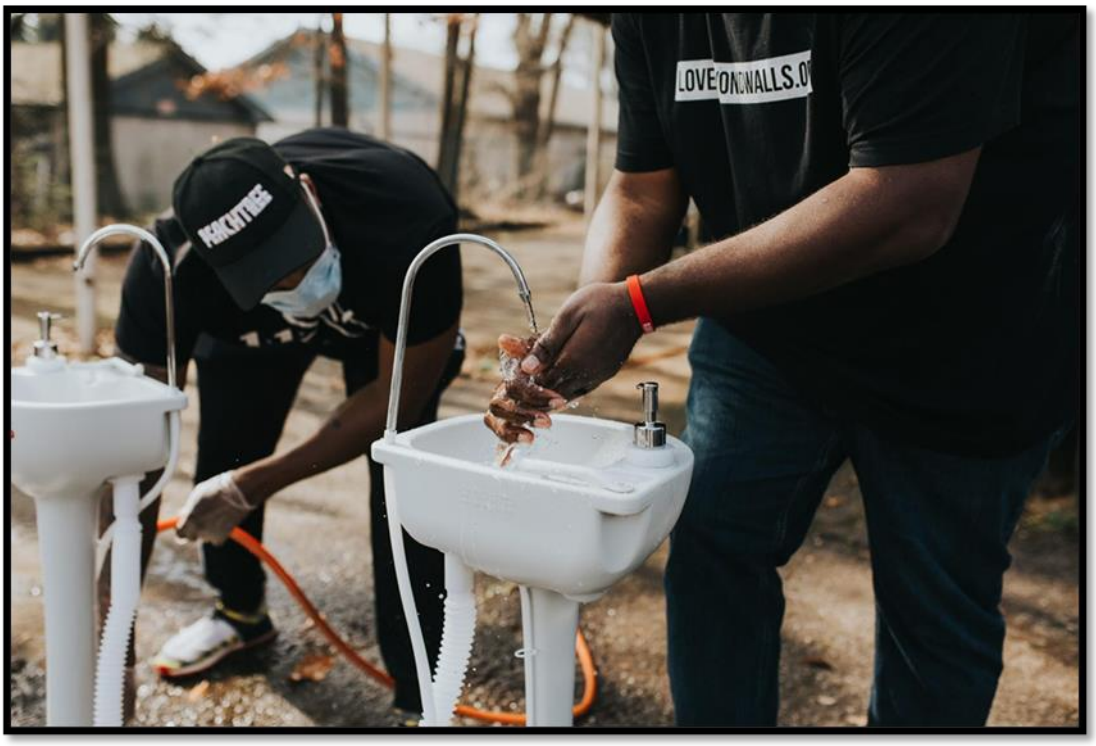

Plate 2. 4: Clean hand hygiene facilities.

Source: www.wvi.org/angola, accessed on 23/02/2023.12:20.

2.5.1.5. COVID-19-compliant ablution facilities

Users of public spaces with suspected or confirmed COVID-19 disease should have access to a rest room with a close door to separate them from the patient's room. Toilets must flush properly and have functional drain traps. When possible, flush the toilet with the lid down to avoid droplet splatter and aerosol clouds; however, if separate toilets cannot be provided, the toilet should be cleaned and disinfected at least twice daily by a trained cleaner wearing PPE such as a gown, gloves, boots, mask, and a face shield or goggles (WHO, 2006)+. One excellent suggestion of a clean and disinfected ablution facilities (well trained personnel wearing proper PPE) in public spaces ablution blocks (see plate 2.5).

Plate 2. 5: Cleaned and disinfected ablution facilities (well trained personnel wearing proper PPE).

Source:https://www.shutterstock.com/image-photo/disinfecting-public-toilets-prevent-covid19-1659398497, accessed on 23/02/2023.13:00

2.5.2. Water provision attributes that define urban public spaces responsive towards COVID-19

Around 42% of people who used public spaces in Sub-Saharan Africa had inadequate access to properly managed drinking water services in 2015, which is higher than the global average of 12% (World Health Organization and the United Nations Children's Fund (UNICEF), 2017). Greater than the world average, just only 7.2 percent of Sub-Saharan Africa's public spaces have access to safely managed sanitation facilities (32 percent). According to the World Health Organization and United Nations Children's Fund (UNICEF), people in these nations are unable to practice proper personal hygiene, which may make COVID-19 pandemic control ineffective. Due to poor vaccination, personal hygiene must be observed (Dantas et al., 2020).

2.5.2.1. The functionality of the water source

The COVID-19 pandemic may serve as a reminder to developing countries of the changes necessary to achieve Sustainable Development Goal 6 (SDG), which refers to access to clean water for all (Aboelnga et al., 2020). All levels of government should take advantage of this chance to encourage cooperation and agreements that will increase the accessibility of water in

urban public places. With the adoption of an ambitious SDG 6 in 2015, governments raised the bar higher than ever for improving water supplies, transitioning from unmanaged to properly monitored systems, and encouraging accessibility to these essential services for everyone. (Aboelnga, 2020). See plate 2.6.

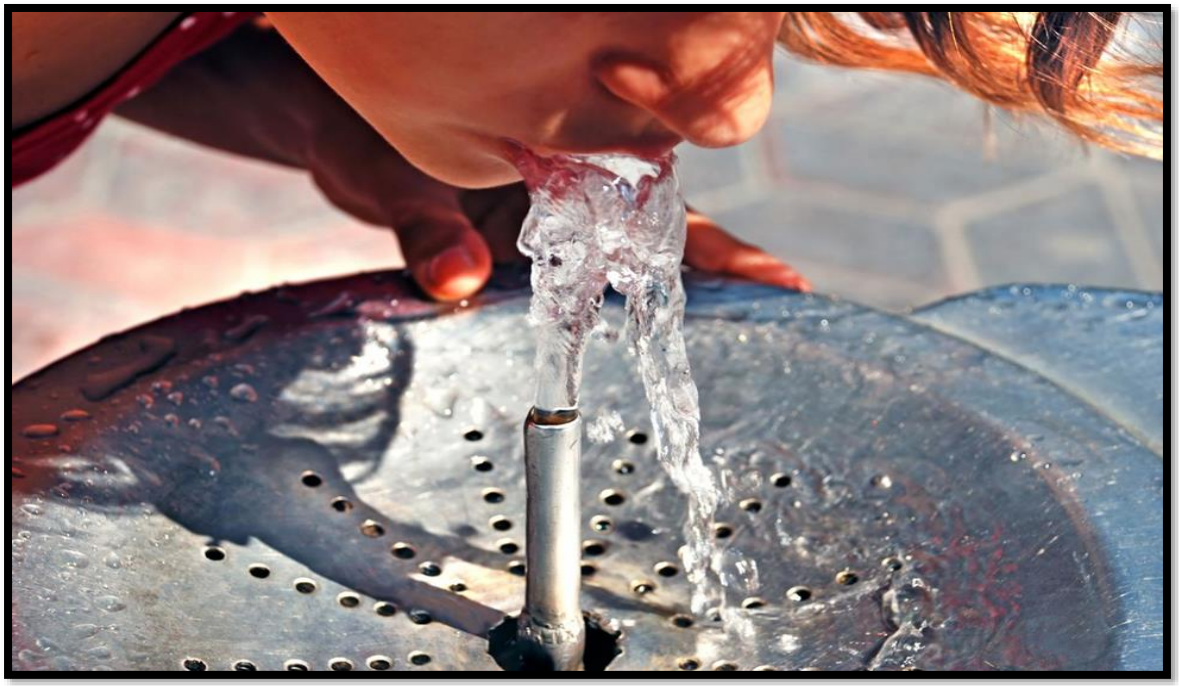

Plate 2. 6: Clean and proper managed drinking water.

Source: https://cdn.voxcdn.com, accessed on 23/02/2023.10:33.

The utilization of financial structures is required for long-term investments in improving water supplies in developing regions. However, because history has proven that infrastructure expenditures alone do not produce the essential change in the water sector, investments should not only focus on infrastructure development. Additionally crucial are investments in planning, implementation, and regulatory frameworks (Haddout et al., 2020).

Addressing the water issues in developing regions requires transformational and structural reforms in these municipalities. Policies that promote sustainable water resource development and their implementation are also critical to relive water stress in developing countries (Haddout et al., 2020).

2.5.2.2. Accessibility to water facility

Many people who utilize public spaces in underdeveloped nations lack access to clean water for drinking and washing hands, which is one of the best strategies to stop the fast-growing new coronavirus (COVID-19) from spreading (Water Research X 9, 2020). The recent global spread of COVID-19 has sparked a variety of measures, including the World Health Organization's "Safe Hands" challenge. People are urged to routinely wash their hands with soap although the "Safe Hands" campaign encourages the use of water and soap, most urban public places on the African continent still lack adequate hand washing facilities and have unstable water sources (Water Research X 9, 2020). Good example of access to water facilities (see plate 2.7.)

Plate 2. 7: Adequate access to water facilities in public spaces.

Source:https://www.adb.org/what-we-do/themes/environment/main,accessedon 23/02/2023.16:11

Reforms that are fundamental and transformative, would also enhance sustainable planning, savings in water infrastructure, and governance. It is advised that municipalities form public-private collaborations, to deliver both urgent and long-term water investments. This incident might make the city's water infrastructure more resilient to pandemics in the future (Luckson , 2020).

2.5.2.3. Presence of water supplies

The accessibility of water in urban public spaces is critical for the safety of millions of users. Users of urban public spaces in developing nations continue to be quite vulnerable as COVID-19 spreads, there in regions without consistent access to clean drinking water (Aboelnga et al., 2020). There is a consent that individuals in deprived countries do not have access to reliable handwashing and clean water services (World Health Organisation, 2020). Therefore, 2.1 billion people lack access to clean, safe water, worldwide, and many of them rely on unimproved sources or improved supplies that are contaminated and with dirt (World Health Organisation, 2016). One excellent suggestion of adequate water tank supplies in public spaces (see plate 2.8).

Plate 2. 8: Adequate water tank supplies in the public spaces.

Source:https://th.bing.com/th/id/OIP.CnSRaTIvtRlQosU2W93m4AHaE9?pid=ImgDet&rs=1.23/02/2023.10:34, accesed on 23/02/2023.12:40.

2.5.2.4. Water drainage system

According to Yunus et al., (2020), entailed that water with lower quality that used to prevent the spread of COVID-19 from residences, companies, and public areas, for example, regular handwashing will increase the amount of wastewater produced in urban public spaces.

The amount of wastewater necessary to safely release it to designated locations, including neighbouring water courses, increases the capabilities of sewer/drainage structures and wastewater treatment plants. This implies that there will be increased costs associated with the possible need for new drainage and treatment facilities in most metropolitan public areas, as well as in many emerging and underdeveloped nations. The amount and lower quality of wastewater will have a significant influence the damaging of water quality of surrounding bodies of water, including rivers and streams. (Yunus et al., 2007). (2020).Poor or unmaintained wastewater drainage system from some public space (see plate 2.9)

Plate 2. 9:Poor or unmaintained wastewater drainage.

Source;https://www.smartcitiesdive.com/ex/sustainablecitiescollective/why-map-open-drainage-and-how/28695/, accessed on 23/02/2023.12:45.

2.5.3. Public space management and behaviors attribute that defines urban public spaces responsive to COVID-19

The COVID-19 crisis's impact on urban public spaces, a component of the social fabric, has both positive and negative consequences on how people interact with one another there. According to WHO (2020), viral traits can affect how people interact with one another, upsetting established cultural and routine behaviours. Which can lead to tensions in public areas. The social and connecting aspects of public places are still significant and can help communities become more resilient. Examples include balconies over streets where residents congregate to socialize and newly renovated streets in neighbourhoods (WHO, 2020)

The coronavirus disease 2019 (COVID-19) pandemic has made serious effect in public spaces. Necessitating new strategies for the design of these urban environments such as functional design and human factors methodologies. This looks at ways that, in the event of a pandemic, the public spaces may be made safer and more easily accessible (WHO, 2020).

2.5.3.1. Presence of helpful preventative COVID-19 messages

According to Frieden and Lee (2020), the level of public awareness of COVID-19 influences how timely, accurate, and relevant communication is. A crucial aspect of promoting public health is providing health information to at-risk communities (Kreps et al., 2008). The public is informed about pandemics in a big way through the media.

Through the media, the public is educated about the COVID-19 pandemic (Farr et al., 2005; Rubin et al., 2010). One of the most essential functions of the media is the dissemination of crucial information that alerts people using public spaces to the virus and to healthy habits that can reduce individual-level risk of the pandemic (Frieden and Lee, 2020). One excellent suggestion of helpful preventative COVID-19 messages in public spaces (see plate 2.10).

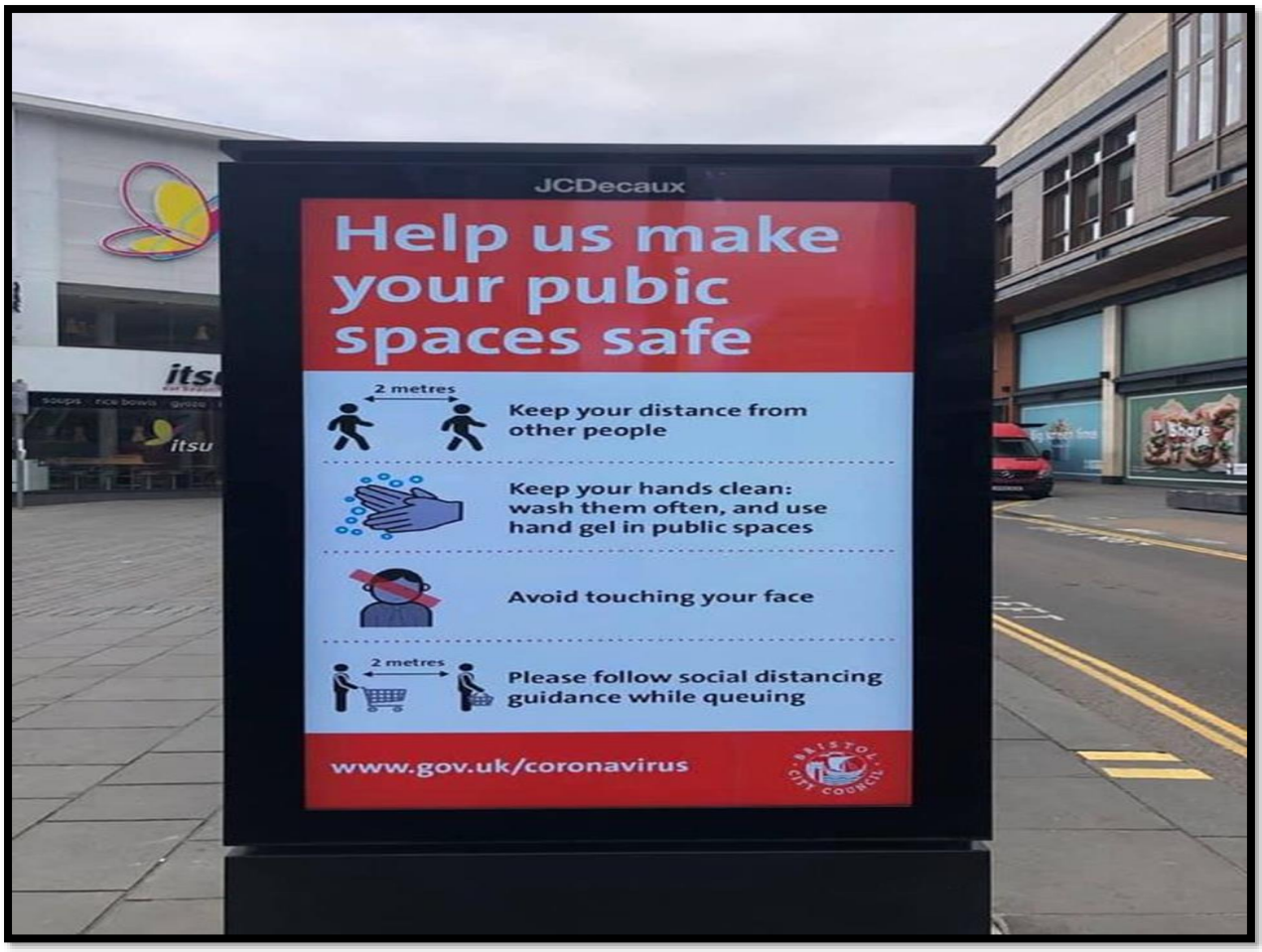

Plate 2. 10 : Helpful preventative COVID-19 messages in public spaces.

Source: https://www.bristolpost.co.uk/news/bristol-news/spoof-council-sign-asks-people-4197941, accesed on 23/02/2023.11:01

2.5.3.2. Informative mask-wearing messaging

Wearing a mask that covers the mouth and nose when in a public area is one of the fundamental strategies for battling a pandemic. It serves as both a means of personal defence and a symbol of social solidarity in the effort to contain the pandemic on a worldwide scale (Cheng et al., 2020). Due to COVID-19, most development sectors are obstructed lead to the development of drastic preventive measures, including mask wearing, are thought of to lessen the spread of this disease. One excellent suggestion of evidence of wearing mask in public spaces (see plate 2.11).

Plate 2.11: Evidence of wearing mask in public spaces.

Source: http// www.Al Jazeera.com, accesed on 23/02/2023.11:42.

According to reports, a production setup and wearing facemasks when in public places lower the chance of transmission. The establishment of a safe environment in a production setup and public spaces is possible because of an effective and affordable deep learning strategy (Wan X et al., 2020), The approach suggested in this study limits the uncontrolled spread of coronavirus by identifying people wearing masks and those not wearing them in public areas that are being monitored by live feed cameras. If a person is discovered without a mask on, the appropriate staff is informed, and the subject is given the alert sound message to "Wear the mask." Images of people wearing and not wearing masks are included in the collection, which is compiled from various sources.

2.5.3.2. Social distancing

Social distancing is described as remaining out of congregate situations, avoiding large gatherings, and keeping distance (approximately 2 meters) from individuals in public spaces wherever necessary, this means "no handshake and hugs, it is very important and probably obvious to keep a distance from a person who is showing indications of sickness, such as sneezing, coughing, and overheating. Regular handwashing is essential for protecting not only yourself but everyone around you as the virus can spread even when there are no symptoms (Frieden et al., 2020). One excellent suggestion of evidence of social distancing in public spaces (see plate 2.12).

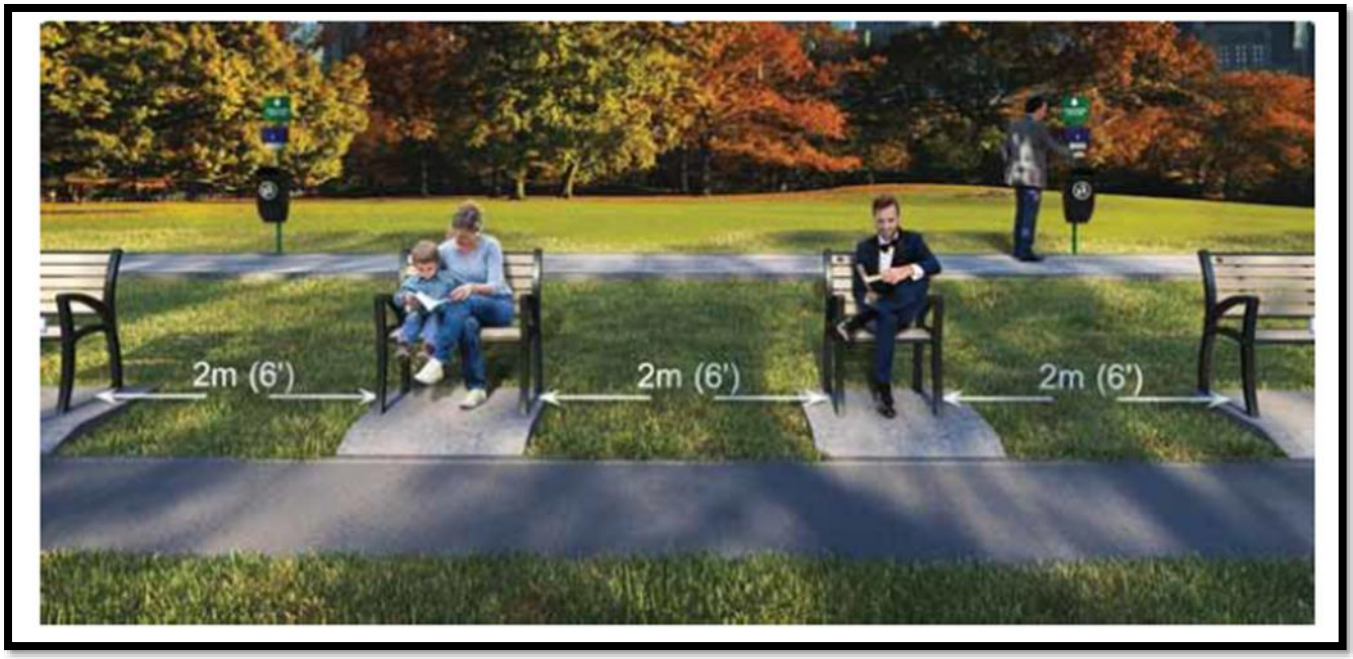

Plate 2. 11 : Evidence of social distancing in urban public spaces

Source: http// www.Al Jazeera.com, accessed on 23/02/2023, 12:13

It may be necessary for designers to include more locations and activities for individual use when creating green spaces, such as widening jogging paths and considering tiny neighborhood parks. One of the more recent options that enables people to participate in social distance circles while enjoying public parks many parks, including Brooklyn Park, Domino Park in New York, and Dolores Park in San Francisco, have previously implemented this (Wang et al., 2019). One excellent suggestion for green infrastructure (see plate 2.12).

Plate 2. 12: San Francisco Dolores Park

Source: Wang et al., (2019) p123.

While immediate responses demonstrated the transformative power of planned urbanism, pandemics provided a unique setting for city-scale experiments in San Francisco's Dolores Park regarding the use of public spaces. The experiments' measures to ensure social segregation are to be maintained post-pandemic, paving the way toward recovery (Frieden et al., 2020)

2.5.3.3. Availability of public space modern technologies

2.5.4. Demographic attributes that define urban public spaces responsive to COVID-19

Government officials targeted metropolitan public space cities as hotspots for the virus's propagation as COVID-19 cases increased across the globe. Larger cities saw a greater growth rate of COVID-19, related to city size, population, and connectedness. However, large metropolitan areas with a greater number of public spaces from different nations that are deeply linked economy and social with People who travel more frequently and live in cities with more connected public spaces are more at risk of pandemic outbreaks spreading because of these factors. The danger of infection increases with increased possibilities. This lends more credence to the claim made earlier in the chapter that pandemic spread is sped up by density.

2.5.4.1. The density of public space users

Population density is the most fundamental variables influencing the development of an epidemic, may require revision in city and urban planning, the risk of infection increases with population density (Gandy, 1999). Therefore, communities must examine suitable planning in order to achieve social justice and effectively battle outbreaks (Gandy, 1999). Regarding density, which required numerous precautions to combat the worldwide pandemic, it was important to look to history and draw lessons from lessons learned in the past when dealing with such a situation (Rinde, 2020). Picture shows the population density in urban public spaces (See plate 2.13)

Plate 2. 13 : Population density in urban public spaces.

Source:https://www.hindustantimes.com/cities/others/draft-master-plan-2041-focus-on-density-public-spaces-in-wake-of-covid19-101623263769224.html.Accessed on 23/02/2023.13:19

The first historical initiatives by urban planners were to stop the spread of impoverished, cholera-infected neighbourhoods, by widening of roads and parks, and establishing the initiative of sewage systems (Harning,2015). According to WHO guidelines, avoiding crowding and limiting public gathering areas including cafes, restaurants, theatres, shopping centres, park spaces, and schools will stop the pandemic from spreading (WHO, 2020).

2.5.4.2. The behavioral attitudes of public space users during peak hours

People are more motivated to contact one another the longer they remain in the public spaces, seniors experience challenges and barriers in the public area if it is not modified to meet their needs. However, in today's world, the COVID-19 pandemic can potentially arouse psychological dread associated with the possibility of infection. Until recently, the main causes of senior citizens' concerns about using public spaces had to do with crime.

A good management of public spaces could save lives under the current situation. Scenarios, flexible working hours can reduce the risk of exposure by limiting public space users to access public areas during peak hours /crowded times of the day. Like how controlling markets and public areas can reduce crowding, this has been a sign of how quickly space is being transformed, helped by smart technologies and ICT infrastructures, during transformational response (Forsyth, 2020).

2.5.5. Ecological /Environmental attributes that define urban public spaces responsive towards COVID-19 pandemic.

A change in how public space is used is necessary because it is predicted that the COVID-19 pandemic would significantly influence future public space design and utilization. Planning for the achievement of Sustainable Development Goals (SDG) numbers 3 and 11 (good health and well-being; and sustainable and resilient cities) requires understanding the impact of the environment on leisure activities (Honey-Roses et al., 2020). Equity must be considered when planning green areas for urban resilience in terms of availability and accessibility (Jennings et al., 2012; Suárez et al., 2020).

2.5.5.1. Quality of landscaping

Possibly the greatest pandemic in more than a century, COVID-19 has caused several challenges for urban public spaces. Pandemics have always influenced how urban public spaces are planned in most places, and the involvement of architecture and urban designers has been shown in several health concerns. (Blancafort et al., 2015). The worldwide pandemic may transform towns and metropolitan regions, but many people are still unsure of what will happen after the pandemic.

The increase in mortality and coronavirus infections may necessitate a reconsideration of conventional city planning techniques (Blancafort et al., 2015). This section will discuss Building design, city density, architects, green spaces, and street design are examples of aspects of city design and urban planning that are crucial to health of the people during the pandemic based on historical and contemporary perspectives. The COVID-19 pandemic directed recommendations throughout the realm of good urban design (Blancafort et al., 2015). One excellent suggestion of quality landscaping in public spaces (see plate 2.14).

Plate 2. 14 : Quality landscaping in urban public spaces.

Source: https://www.designrulz.com/design/2015/07/35-amazing-landscape-design-that-you-would-love-to-have-in-your-city, accessed on 23/02/2023.11:55.

The COVID-19 pandemic presents an opportunity to improve cities by incorporating social behaviour during a pandemic through planning and design. The diagram below shows the idea of putting a health viewpoint into the architecture of public places due of the epidemic, but it must be revived (Helton, 2020). To combat this epidemic, social behaviour and public knowledge are seen to be crucial variables (See figure 2.4). (Reyes, 2013).

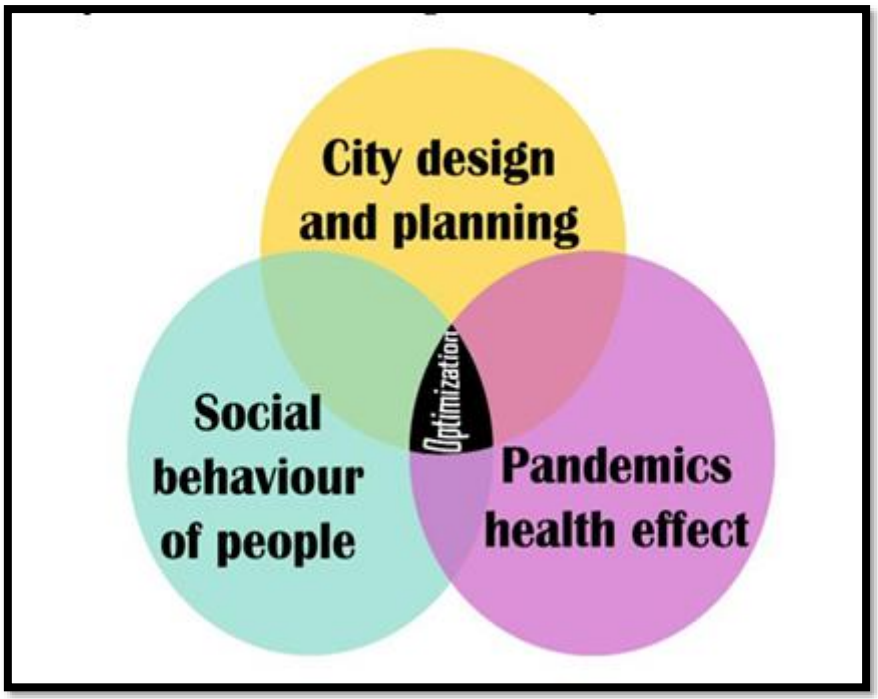

figure 2. 2: San Francisco's Dolores Park

Source: Reyes, (2013) p54.

The optimization of social behaviours for individuals and how pandemics spread after city design and planning are shown in Figure 2.4. Street redesigning, which adds additional lane for bikes and walkers with goals to produce healthier and more socially sustainable communities that alter residents' behaviours in times of pandemics, is a vital element of the answer.

Major public health issues in the twentyfirst century have prompted demands to reconsider di sease preventive strategies (Litman, 2020).

Many urban planners saw this as an excellent chance to reconsider the layout of the streets by excluding cars and making more space for walkers and bicycles, which turns the public space into low-carbon environment and green. This will enable more space between users and fulfil the social distancing principle (Anderson, et al., 2020). In reaction to the pandemic, many communities, including Vienna, Boston, Oakland, and Philadelphia, restricted some roadways to make more space for pedestrians and cyclists, cities like Barcelona have started to plan for the widening of their roadways (Alveano, 2018).

2.5.5.2. Prevalence of littering

Due to urbanization, inappropriate disposal of worn masks and tissues, and a lack of suitable infrastructure for processing plastic waste, the threat of plastic waste pollution in African countries' public spaces has greatly increased since the World Health Organization proclaimed the coronavirus infection pandemic. To limit the risk of exposure to the SARS-CoV-2 virus, which causes severe acute respiratory syndrome (SARS), lots of surface shields, surgical mask and other safety clothing must properly use daily (Benson, 2021)

Waste management and scientific communities in Asia advocate COVID-19-related waste management to lower the possibility of a pandemic and explore for strategies to mitigate the negative environmental effects of waste disposal (ACRPlus, 2020).Inappropriate disposal of surgical musk see plate (2.15,)

Plate 2. 15 : Inappropriate disposal of surgical musk in urban public spaces.

Source:https://www.scmp.com/comment/opinion/article/3137914/now-hong-kong-needs-fight-effects-covid-19-environment-economy-and, accessed on 23/02/2023.12:11.

2.5.5.3. Open spaces Vis air quality

In response to the pandemic, partial and total lockdowns were instituted across the world. These lockdowns provided scientists with an once-in-a-lifetime opportunity to investigate how large changes to production patterns and transportation policy measures may enhance urban air quality (Kerimray et al., 2020). One excellent suggestion of public spaces with fresh breathing air (see plate 2.16).

Plate 2. 16 : Breathing quality air in urban public spaces.

Source:https://www.ft.com/content/cbe0a278-1c2e-11e2-a14a-00144feabdc0, accessed on 23/02/2023,12:01.

Most studies on the impact of lockdowns on various pollutants have concentrated on Chinese cities. Comparing concentrations has mostly been used for studying how lockdown measures affect different pollution. According to the report, since the COVID-19 pandemic was declared, poor air quality has contributed to the spread of the pandemic.

2.5.5.4. Green space

Urban residents' health and well-being are improved by using green spaces and other nature-based techniques to improve urban environments, strengthen community resilience, and encourage sustainable lifestyles, a key element of these strategies of private and public spaces include vegetation, parks and playground that guarantee public space users with suitable,

maintained and safeguarded access urban diversity , however environmental risks like air pollution or noise are decreased by appropriate availability of green spaces in public areas (Hewitt et al., 2019). One excellent suggestion of sustainable green space in public spaces (see plate 2.17).

Plate 2. 17 : Sustainable green public spaces.

Source:https://techeridge.com/teche-ridge-living/parks-greenspaces, accessed on 23/02/2023,11:55.

We should integrate grey, green, and blue infrastructure using holistic strategies within the urban fabric, watersheds, woods, parks, and large open spaces as this can help cities in implementing emergency services and evacuation procedures. Urban parks were among the locations to experience an increase in traffic during the COVID-19 lockdown (Hewitt et al., 2019). The pandemic lockdowns show that city life may be significantly better without crowded streets, deafening noise, and polluted air. Will the virus, however, help with attempts to make cities greener? (Hewitt and others, 2019).

2.6. Theories and concepts of open spaces performances during the pandemic

This section addresses theories and concepts linked to public open spaces, as well as the relationship between these features and the spread of COVID-19.

2.6.1. The concept of a functional city

A functional city is one that was designed to provide its residents with the best urban living in public spaces, as well as to foster an enjoyable quality of life and facilitate daily living. It also offers top-notch services to everyone, whether they live in wealthy or poor neighbourhoods (Liu, 2018).

There is confidence between the people and the government because the city of Helsinki is relying on three fundamental pillars that firmly help with the administration of the current COVID-19 situation, such enables governments to address problems and achieves this more effectively. The first pillar is smart city. The provision of services in public areas is made simpler and more effective by modern technologies (Liu, 2018).

Comprehensive demonstrates how the community participates in creating and delivering public services, defining budget and investment priorities from adopted policies to public places, and the third pillar is the city's sustainability: According to the city plan (2017–2021), the plan's objective is to make the city's public places carbon-neutral by 2035 in accordance with the policies used to develop a combination of clean and smart measures. City after epidemic must increase the amount of public space for instance, has enhanced public walkways that encourage bikes and pedestrian (Liu, 2018). The study discovered that the best city planning, especially considering the current pandemic crisis, is based on three key pillars (see figure 2.5).

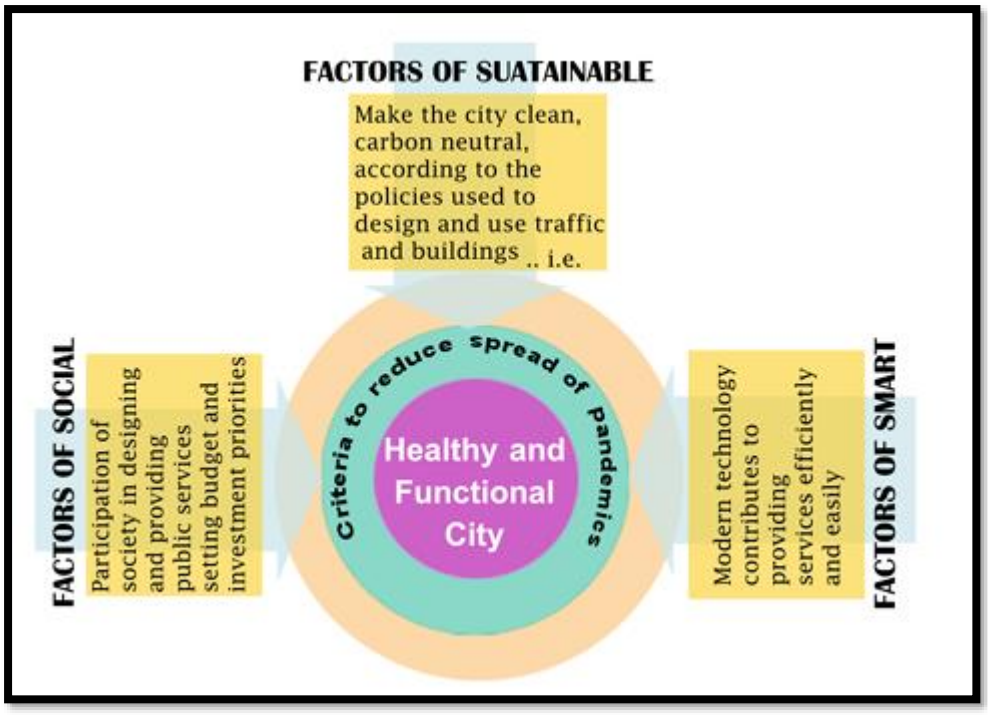

Figure 2. 3: Main pillars of the healthy and functional cities

Source: Liu, (2018) p79.

Figure 2.5. Depicts a city that is functional and healthy, limiting the spread of potential pandemics. It considers how smart, sustainable, and all-encompassing the city's public spaces, taking social design into account. These qualities will increase the effectiveness of the city's public spaces in the face of upcoming crises, (Liu, 2018). More research is needed on how to better the theory of disease prevention through the design of modern public spaces, as well as on health design techniques and how to construct buildings that can be used as a secret weapon against infectious diseases (Liu, 2018).

2.6.2. Hygiene concept

Safe management of hygiene (WASH), sanitation and water services are essential for preventing and protecting human health during outbreaks of infectious diseases such as the current COVID-19 pandemic (World Bank, 2020). The Regional Water Supply and Sanitation Office (OREPA) in Haiti and the Sustainable Rural and Small Towns Water and Sanitation Project, which is funded by the World Bank, have launched a significant public awareness campaign that promotes good handwashing habits and hygiene as one of the most doable ways to enhance disease outbreak readiness in public spaces, public health infrastructure, including water and sanitation systems (World Bank, 2020).

The ability of public spaces users to use wash-hand services and products (such as soap, water treatment, and hygiene products) has been made possible for the sanitation and water services quality. Some public areas uphold efficient hygiene standards that prevent the spread of COVID-19 in public spaces. If public spaces are poorly maintained, secondary effects, including potential disease outbreaks in public areas, can raise the danger of further spreading water-borne diseases (World Bank, 2020).

2.6.3. Garden city

According to E3S Web of Conferences 274 (2021), indicated that university students in Ankara planted thousands of trees to beautify the city's public areas, the garden-city concept has been implemented in Turkey. Global adoption of an ideas led to the planting of many billions of trees, and the movement is continuing strong today. According to the media, nations such as Turkey, China, and India are partnering with the town's social push to go green, public spaces will respond to COVID-19 equitably because of population dilution and the increase of the city centre and the surrounding green zones.

Wright noted in 1932 that emerging social tendencies are at crucial moments as they apply to experience and search for new development models. A new paradigm in architecture and urban planning that places the environment under sanitary, hygienic norms and rational shapes has been introduced globally because of COVID-19. It is vital to reconsider urbanism's fundamental ideas, innovative approaches as well as existing typologies, structural and functional organizations to architecture and urban design (3 E3S Web of Conferences 274, 2021).

Urban designers' ideas must integrate millennia past as well as those inspired by difficulties in daily living and address practical issues during redesign of public spaces. For the future part of earlier utopian ideals, long-term norms should be developed employing notions of architecture, urban development, and developing technology to the built environment (3 E3S Web of Conferences 274, 2021).

2.6.4. Smart city theory

South Korea's experience is one of those of countries that have so far managed the pandemic confrontation successfully, with the proposal, developed by South Korea, largely depends on artificial intelligence (AI) technology to combat the Middle East Respiratory Syndrome

(MERS) influenza in 2015 (Dantas, 2020).To track individuals sick with diseases, some governments are utilizing smart city technologies and may depend on digital data sources like mobile devices and remote sensors. COVID-19 in public spaces. The speedy creation of a COVID-19 testing kit was one of the elements that helped the project succeed (Dantas, 2020).

Although there is a substantial body of study on many areas of smart cities, Dantas (2020) indicates that information and communication technologies (ICTs) and big data analytics have revolutionized many parts of daily life. Due to the understudied nature of smart city solutions' contributions to urban resilience, the pandemic provided a once-in-a-lifetime chance to investigate both their actual and potential resilience-enhancing effects (Dantas et al., 2020). Public areas in many cities have embraced smart solutions in response to the pandemic for a variety of purposes, including locating diseased people, identifying virus hotspots, promoting social distance, and monitoring compliance with "stay home" and quarantine procedures. These have helped maintain certain levels of functionality, which has increased resilience (Dantas et al., 2020).

The physical urban environment, or smart physical infrastructure, acts as the structural framework for the digital tools enabling a smart city. This layer contains all of the physical components and assets of a city public spaces, such as streetlights, bus stops, parks, trash cans, and walkways (Rachmawati et al., 2015). Given that millions of people worldwide have their movements restricted, the design and usability of public places have drawn attention to the Smart City change that is accelerating (Angella et al., 2021). Public green spaces like parks and playgrounds, as well as shared infrastructure like bike lanes and footpaths, are crucial for promoting the resilience of local communities (Rachmawati et al., 2015).

According to Martnez (2021), the contemporary era of ICT has seen significant advancements. Major geographic difficulties and technical advancements are reflected in urban spatial planning. The reaction to the public health problem is one of the topics that has an impact on the practice of urban planning. Humans have been impacted by several disease outbreaks throughout history, including COVID-19, the Spanish flu, cholera, and the Black Death despite the fact that these diseases had detrimental effects on mankind, they also have an impact on how cities were planned for and managed. Outbreaks of cholera led to the development of contemporary urban sanitation systems (Zhongming et al., 2021).

2.6.5 Urban Planning Resilience Framework model

The scientific community has been working nonstop to evaluate the virus, its socio-environmental effects, regulatory/adaptation policies, and plans since the COVID-19 crisis began. The urgent need is to design for and manage public spaces in cities that are pandemic-resistant to combat infectious diseases during COVID-19. To prepare for new situations, such development entails rethinking unsafe public space infrastructure, risks, and socioeconomic imbalances. The improvement of human capacity and the response capacity of cities against potential outbreaks are the primary goals of the preparation phase. Sensitivity, exposure, and adaptation (UN-Habitat, 2020).

Exposure involves likelihood; it describes how vulnerable the environmental conditions in public areas of a system are to a possible threat, for example, because of the potential effects of harmful behaviours. Impact is what sensitivity measures, how much a system is impacted by COVID-19-related events in real time, adaptive capacity refers to how much, how easily, and to what extent a system can react to a pandemic (UN-Habitant, 2020).

2.7. Case studies of the extent to which urban public spaces are prepared to cope with the COVID-19 pandemic.

The cases of COVID-19 vs. urban public space performance during pandemics in other countries are discussed in detail in this section.

2.7.1. The International perspective

This section examines international case studies on how urban public spaces performed during the COVID-19 pandemic from an urban planning perspective view, as well as additional tactics and planning management implementation utilized to either slow down or speed up the pandemic's spread in public places. The final portion focuses on the lessons that may be drawn from how public places performed during the pandemic in other countries.

2.7.1.1. South Korea

This section seeks to provide urban public spaces' performance during pandemics and lessons learnt from an urban planning perspective (see box 1.1).

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Box 1. 1**:** South Korea experiences public spaces performance during COVID- 19

CASE STUDY 1	**PROBLEM**
Son, (2020) claims that illness propagation is accelerated in South Korean cities due to the crowded conditions present in most large cities' public spaces. They are also exposed to a variety of additional risk factors, such as overcrowding, poor sanitation, a lack of access to clean water, and other problems, which speed up the spread of infection. In addition to finding, it challenging to maintain physical distance in confined or congested areas of public spaces, many city dwellers commute between various sections of the city for employment, subjecting them to crowded public places.	. Through the quick propagation of the virus, COVID-19 demonstrated how linked people and public areas are to one another.
The data from the monitoring infrastructure was timely shared with citizens using smart devices, and this surveillance method was supported by pre-existing systems such as CCTVs, the GIS, and individual smart devices.	

Source: Authors Construct, (2022)

2.7.1.2. India

This section seeks to address urban public spaces' performances during the COVID-19 pandemic from an urban planning perspective view, how it affected the country's urban public spaces, and their interventions. Thus, box 1.2 focuses on lessons learnt from India’s experience.

Box 1. 2: India on public spaces performance during COVID- 19

CASE STUDY 2	**PROBLEM**
India's essential workers are facing specific risks in this pandemic, and they play a role in public spaces in gathering, collecting, and sorting waste littered by public spaces users.	Informal waste pickers in public spaces are at risk during the pandemic without adequate protection.
LESSONS LEARNT	

Governments have designed specific measures for vulnerable groups. For instance, In Pune (India), a collective of waste-pickers had been distributing gloves and masks to informal waste-pickers. In many cities, informal waste-pickers make an important contribution to waste management and are at heightened risk during the pandemic without adequate protection (Rachel et al., 2020).

Source: Authors Construct, (2022)

2.7.1.3. New York

This section seeks to address urban public spaces' performances during the COVID-19 pandemic from an urban planning perspective view, how it affected the country's urban public spaces, and their intervention. Thus, box 1.3 focuses on lessons learnt from New York's experience.

Box 1. 3: New York on public spaces performance during COVID- 19

CASE STUDY 3 NEW YORK	PROBLEM
WIEGO (2020) indicated that as cities got more crowded throughout the Industrial Revolution, concerns about crowding and the consequences of "air quality" increased. By the end of the nineteenth century, there was a huge need for public areas that offered a plenty of fresh air and natural light, as an alternative to the congested public spaces, this resulted in the creation of various urban green areas in the United States.	Cities became more crowded, concerns about crowding increased, and "poor air" hazards became more prevalent. As a result, there was a huge need for public areas
LESSONS LEARNT	
USA developed a glass-walled white- shed influenced the "hygienic" style of the modernist movement and its embrace of sunlight in the public spaces, and the United States serves as an example of the attempts undertaken to match urban design with public health concerns.	

Source: Authors Construct, (2022)

2.7.2. Regional case studies

This section examines regional case studies on how urban public spaces responded to the COVID-19 pandemic, as well as additional methods and planning management implementations utilized to either slow down or speed up the pandemic's spread in public areas. The final section will cover the conclusions from the following section's discussion of public space pandemic preparedness in various countries.

2.7.2.1. Cameroon

This section seeks to address urban public spaces' performances during the COVID-19 pandemic from an urban planning perspective, how it affected the country's urban public spaces, and their intervention. Thus, box 1.4 focuses on lessons learnt from Cameroon's experience.

Box 1. 4: Cameroon on public spaces performance during COVID- 19

CASE STUDY 3	PROBLEM
Cameroon's public spaces were the most obstructed country by the COVID-19 virus in Central Africa by mid-May.	While the COVID-19 pandemic continues to spread across the world, its impact on most of Cameroon's public spaces was found to be the crucial hotspot for transmitting the pandemic.
LESSON LEARNED	
Although there was no general lockdown, it was advised that employees in the public and private sectors work at home to reduce physical contact. The Ministry of Postal Services and Telecommunications implemented a new video-conferencing platform with an integrated messaging service, and the Ministry of Forestry and Fauna of Cameroon invested in new modems, software, and USB keys to support this suggestion (Nsangou, 2020).	

Source: Authors Construct. (2022)

2.7.2.2. Kenya

This section seeks to address urban public spaces' performances during the COVID-19 pandemic from an urban planning perspective view experience, how it affected the country's urban public spaces, and their intervention. Thus, box 1.5 focuses on lessons learnt from Kenya's experience.

Box 1. 5**:** Kenya on public spaces performance during COVID- 19

CASE STUDY 5	PROBLEM
Kenya has poor public space services, which are essential for a successful COVID-19 response. For the urban poor, slum dwellers, the homeless, and other vulnerable populations, the local government was not making any measures to provide safer access to public services (UN-Habitat., 2020)	The lack of sanitation facilities in most of Kenya's (Nakuru) public spaces in the urban areas resulted the spread of COVID- 19 pandemic to vulnerable groups of public space users (UN-Habitat., 2020
LESSON LEARNED	
Most public spaces and institutions in Nakuru include hand-washing stations for individuals who do not currently have access to water and sanitary facilities. Handwashing stations are permanent and connected to municipal water mains in Nakuru, Kenya, ensuring continuous water flow for handwashing. The upkeep of the stations is performed by young people from the community, generating employment possibilities. Providing free water can encourage efficient handwashing and hygiene habits, which can help to contain the virus's spread.	

Source: Authors Construct, (2022)

2.7.3. Local Context

This section reviews the local context of urban public spaces performances during the COVID-19 pandemic and further strategies and planning management implementation used to limit or increase the spread of the pandemic in public spaces. The last section focuses on lessons learnt from other countries' experience.

2.7.3.1. Accra (Ghana) and Johannesburg (South Africa)

This section addresses urban public spaces' performances during the COVID-19 pandemic from an urban planning perspective, how it affected the country's urban public spaces, and their intervention. Lessons were learnt on how Accra (Ghana) and Johannesburg (South Africa) reacted and solve the pandemic challenges in urban public spaces, (see box 1.6).

Box.1.6**:** Accra (Ghana) and Johannesburg on public spaces performance during COVID- 19

CASE STUDY 6	PROBLEM
The COVID-19 cases in Accra (Ghana) and Johannesburg (South Africa) and the actions taken to stop their spread have had a huge effect on the whole African continent, especially on the millions of urban poor. Because of the paucity of infrastructure and space in Africa, COVID-19 has already presented challenges to several nations with robust healthcare systems, raising concerns about what may transpire there and about the population's desire to support behavioural change. It's interesting to note that South Africa's stronger lockout regulations than Ghana's do not result in less social contacts or more hygiene practices.	lack of space and infrastructure in Ghana (Accra) and Johannesburg (South Africa) accelerate the spread of COVID-19 as social distances were difficult to practice in public spaces.
LESSON LEARNT	
The best ways to stop COVID-19 from spreading in public places without a vaccination are to practice social seclusion and preventative hygiene. Urban poor people reduce their risk of illness by maintaining good hygiene and adhering to social distance regulations (Akinwotu Afridi, 2020)	

Source: Authors Construct, (2022)

2.8 Chapter summary

This chapter explored relevant existing literature on how urban public spaces are coping with COVID-19 pandemic challenges from an urban planning perspective view. It outlines the four-study constructs; waste management, water provision, public space management behaviours, demographic and Ecologically/Environmentally these provide insights into the performance of urban public spaces whether decreasing or increasing the spread of COVID-19. This section also explored case studies of successful measures used to reduce the spread of COVID -19 in urban public spaces, in developing countries, in Africa, and the local lessons learned.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents different methods that were used when collecting data required to achieve the four objectives;(i)To analyse urban planning and urban management attributes that are critical in limiting the spread of COVID-19 in public spaces, (ii) To identify and categorize public places in Thohoyandou CBD that may represent a danger to containing the COVID-19 pandemic, (iii) To identify important urban management considerations in limiting the spread of COVID- 19 in public spaces of Thohoyandou CBD and to come up with an urban planning-based resilience framework that will boost the ability of public spaces to respond to the challenges of a pandemic of this study. The tools and methods used to gather, present, and analyse data are covered in this chapter. The chapter's goal is to describe the procedures followed in this research study and to emphasize their importance. The research methodology is an approach to considering and researching social reality. It can be described as a technique used by researchers to collect, examine, and evaluate data or investigate any phenomenon simply (Babbie, 2007).

3.2. Mixed methods approach

To better understand how prepared the public spaces in Thohoyandou CBD are for the COVID-19 pandemic, this study uses a mixed-methods research methodology that locates both qualitative and quantitative research and data.

With qualitative research techniques, theoretical ideas and social life's meanings can be described (Haq, 2015; Brick et al., 2015). Since this method is crucial to the study, an inductive approach was chosen, which helped define the theoretical domain, components, and variables that are crucial in determining how prepared public spaces are to handle the COVID-19 pandemic. As a result, data collection essential to characterizing the actuality and nature of preparation in dealing with COVID-19 as experienced in the public areas in Thohoyandou CBD was guided by the pattern or variables discovered from the literature. The gathering of information with profound implications for human use and interaction is the second justification for utilizing a qualitative approach in this investigation. During the COVID-19 outbreak, in public areas.

The study made use of qualitative data, including an observational checklist and photographs of public space infrastructure, this study uses quantitative research methods for both data

gathering and analysis. Quantitative related variables were found, necessitating the use of a quantitative data collecting tool like the structured observation checklist, which produced a set of numerical Likert scales to collect data. The use of this data in the study's statistical analysis, which includes regression analysis and hierarchical cluster analysis, is crucial for gaining understanding of the study's level of preparedness and making suggestions for managing Thohoyandou's public spaces in the event of the COVID-19 pandemic which are essential to the management of COVID-19.

3.2.1. Explanatory research design

An explanatory research design was determined to be the most appropriate to use because the study is predicated on the idea that specific public spaces have unique urban planning and design features that make them respond effectively to restricting the spread of the COVID-19 infections. The investigation was required to clarify why some urban public areas responded more favourably than others to stopping the spread of COVID-19 infections. Therefore, to enable the testing of such an implicit hypothetical assumption, an explanatory study design was necessary.

3.3. Sampling design

This study used a case study approach, with Thohoyandou CBD public spaces serving as the unique case study location. The use of case study research helped researchers develop a comprehensive understanding of how the public spaces in Thohoyandou CBD were prepared to reply to the COVID-19 pandemic in the actual world. Because it enables the collection of mixed data that offers thorough insights on the readiness of public spaces to deal with COVID-19 in Thohoyandou CBD, the researcher observes case study research as being ideal for this study.

3.3.1. Unit of analysis

The main spatial unit of analysis for this study is Thohoyandou CBD, particularly the public spaces as they are risk areas and have the possibility to increase the spread of the COVID-19 pandemic. Public spaces that are targeted include: (including the pavement and parking lots), public squares, parks, and public transport transit in Thohoyandou CBD.

3.3.2. Study population

The study population encompasses all items of interest, this study has as its primary focus. Hence 25 public spaces in Thohoyandou CBD, 75 public space users, the private sector, government officials, and municipal officials form part of the broader study population (Alves, 2017).

3.3.3. Determination of sample size

The sample size in this study refers to the number of identified public spaces in Thohoyandou CBD. The sample size is 25 public spaces in Thohoyandou CBD that were identified by the researcher as being areas of key interest in assessing the readiness of public spaces in dealing with COVID-19 in Thohoyandou CBD (see figure 3.1).

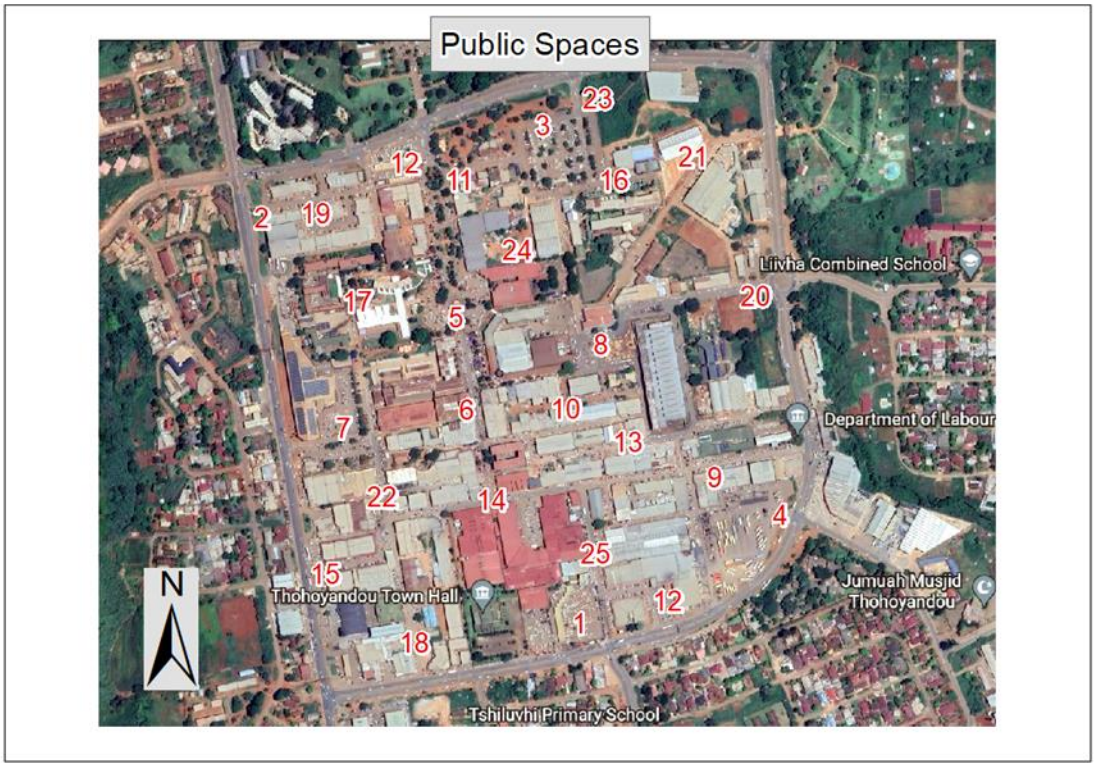


Figure 3. 1: Public spaces in Thohoyandou (25)

Source: Author construct, (2022).

Figure 3. 2: Series of photographs taken in some of the sampled public spaces in Thohoyandou CBD

Sources: Author construct (2022).

3.3.4. Sampling procedures

Non-probability sampling procedures which were employed in the study are convenience and purposive sampling. Convenience sampling is a method wherein the researcher undertakes data collection through observations of inaccessible public spaces in Thohoyandou CBD, sampling was employed in this study. It was used by the researcher based on her judgment in selecting key experts from the municipality, government, and other sectors, that are believed to be knowledgeable about the readiness of public spaces in dealing with COVID-19 in Thohoyandou CBD.

3.4. Statistical research design

This section discusses how the study variables were identified and specific variables measurement criteria that was used with the number of statistics analysed in this study.

3.4. 1. Study variable identification

According to Gondo (2021), the dependent variable is a measurement of the subject's or respondent's behaviours that reflects the impacts of the independent variable. A variable is a specific component of a testing condition that can change or adopt distinct characteristics under different conditions. However, the condition being altered or chosen is the independent variable. This study considered several characteristics that mostly connected to the subject and were influenced by the chapter 2 literature. To determine the public spaces factors that were either directly or indirectly related to the spread of the COVID 19 infection, a critical evaluation of topics, concepts and theories pertaining to public open spaces was conducted. There was a correlation between these factors and the spread of COVID- 19. See table 3.1, and 3.2.

Table 3. 1**: Identification of study constructs and specific variables**

Study construct	Specific study variables	Hypothetical relationship	Supporting references
Waste management attributes	Waste separation	• Uncontrolled dumping and disposal of infected COVID-19 personal protective equipment increase the likelihood of spreading COVID-19. • Dustbin with caps will limit the spread COVID-19 • Dustbin without a cap will accelerate the spread of COVID-19 • The risk of spreading COVID-19 is high in public spaces where drainage systems are not properly maintained.	Jepson et.al.,2017
	Availability of waste disposal bin		Hewitt et al.,2019
	Access to waste disposal bins		Kuffer, 2016
	State of Sewerage system		WHO, 2020.
	Environmental hygiene		
	Availability of COVID- 19 compliant ablution facilities		
	State of ablution facilities		
Water provision attributes	Availability of water tap	Hygiene practices limit the spread of COVID-19 in public spaces	Burki, 2020; WHO 2020
	The functionality of water source		
	Accessibility to water facility		
	State of water drainage system		
	Presence of water supplies		
Demographic attributes	The density of public space users	Overcrowding of people will accelerate the spread of COVID-19 Fewer people will limit the spread of covid-19	Alves, 2017.
	Evidence of social distancing by public space users		Honey-Roses, 2020
	The behavioral attitude of public space users during peak hours		Duggal, 2020
	Presence of (vulnerable) homeless people		
Ecological/Environmental attributes	Quality of landscaping (If any)	Quality green infrastructure will limit the Spread of COVID-19 and other associated illnesses, stress, and mental health issues	Ander et al., 2018.
	Prevalence of littering		
	Green space		
	Quality of air		
Public space management and behaviour's	Presence of helpful preventative Covid 19 messages	Social distancing reduces the spread of COVID-19 Wearing protective clothing limits the spread of COVID-19 in public spaces	
	Social distancing Markings		Dantas et al. 2020
	Informative mask-wearing messaging		Filonchyk et al., 2020
	Availability of common sitting infrastructure		UN-Habitat, 2020
	Availability of public space surveillance (cameras)		Florida et al., 2020
	Availability of thermal cameras to monitor temperature		Haq 2015
	Availability of security personnel to monitor public space user behaviour's		Bricki and Green, 2015

Table 3. 2**: Variables measurement criteria**

Study construct	**Code**	**Specific variables**	**Supporting literature**	**Measurement criteria**
Waste management attributes	WMA	1. Waste separation 2. Availability of waste disposal bin 3. Access to waste disposal bins 4. State of Sewerage system 5. Environmental hygiene 6. Availability of COVID-19 compliant ablution facilities 7. State of ablution facilities	Jepson et.al.,2017 Hewitt et al.,2019 Kuffer, 2016 WHO, 2020	Nominal ordinal
Water provision attributes	WPA	1. Availability of water tap 2. The functionality of water source 3. Accessibility to water facility 4. State of water drainage system 5. Presence of water supplies	Burki, T.,2020. Alves, F.B. 2017. Alves, 2017. Honey-Roses, 2020 Duggal, 2020 Ander et al., 2018	Scale
Demographic attributes	DA	1. The density of public space users 2. Evidence of social distancing by public space users 3. The behavioural attitude of public space users during peak hours 4. Presence of (vulnerable) homeless people	Alves, F.B. 2017. Alves, 2017. Honey-Roses, 2020 Duggal, 2020 Ander et al., 2018	Nominal ordinal
Ecological/Environmental attributes	EA	1. Quality of landscaping (If any) 2. Prevalence of littering 3. Green space 4. Quality of air	Ander et al.,2018.	Nominal ordinal, scale
Public space management and behaviors	U D A	**1.** Helpful preventive COVID-19 messages **2.** Social distancing **3.** Alternative public seating infrastructure use **4.** Public spaces Surveillance	Dantas et al. 2020 Filonchyk et al., 2020 UN-Habitat, 2020 Florida et al., 2020 Haq 2015 Bricki and Green, 2015	Nominal ordinal scale

		5. Cameras to monitor public spaces. 6. Thermal cameras monitor the temperatures of public space users.		

Source: Author construct, (2022).

3.4.2. Variable measurement

The technique of making conclusions to various objects is known as variable measurement. Five - Point Likert variables may have an impact on the types of analytical methods applied to the data and the conclusions that may be drawn from the data. Nominal, ordinal, interval, and ratio scales are among the four types of measurement. The Likert scales utilized in this study ranged from a 5-point scale. The adopted measurement aims to measure how much public spaces are reacting to the spread or cap COVID-19 in public areas.

3.5. Data collection

To understand how prepared Thohoyandou CBD public areas are for the COVID-19 pandemic, secondary data gathering techniques were used to gather information from governmental records, textbooks, and journal publications. The primary data collection techniques used in this study were expert interviews and observations. A few questions will be posed to the user of the public space where the questionnaire will be used regarding access to waste management facilities, such as access to water, visibility of COVID-19 signage, whether they feel safer from COVID-19 in that space compared to others, the ability to physically distance themselves on open spaces, factors that will limit the spread of COVID-19 on open spaces, and also identification of vulnerabilities in that public space that may contribute in limiting the spread of the COVID-19 pandemic.

3.5.1. Observational tool

The researcher collected qualitative data simply by observation. In this approach, the researcher used naturalistic observation techniques to collect qualitative data through systematic observations. This method calls for knowledgeable observational abilities and senses to obtain numerical data about the size of Thohoyandou CBD open spaces to combat the COVID-19 pandemic. Naturalistic observation can be employed to acquire both qualitative and

quantitative data; however, structured observation is more often used to obtain qualitative data than quantitative data.

3.5.2. Expert interviews

In this study, expert interviews with the aid of a structured interview guide were used. This helped the researcher to gather comprehensive information about how the Thohoyandou CBD's public areas were prepared to handle the COVID-19 outbreak. Among the important specialists who were spoken with were players from the private sector and municipal officials.

3.5.3. Subject recruitment

The researcher met with public space users and explained the study's purpose and research procedures. The participants in the public space were given a consent form and an information sheet, see (Appendix 1) and (Appendix 2). Public space users who signed up and agreed to participate in the study were interviewed.

3.5.4. Statistical analysis

To summarize and make conclusions, this requires a comprehensive evaluation of the research findings. The major software used to analyze qualitative data is called Statistical Package for Social Sciences (SPSS). In the following chapter, technical data interpretation and presentation of research findings are completed and provided in the form of statistics tables, graphs, charts, maps, and other visual aids to help the researcher to comprehend research findings and draw conclusions. The following data analysis techniques were used in this investigation.

3.5.5. Multiple Regression analysis

Regression analysis may be used to statistically to classify the factors that contribute to predict dependent variables that are the COVID 19 pandemic's super-likely or super-unlikely spread the pandemic the study seeks to assess what effects do different factors have on one another in the dependent variable, regression analysis represents the main variable that the investigation aims to comprehend or forecast. Regression model used to explain the relationships between dependent and explanatory variables.

This study used waste management, demographic, water provision, Ecology/ Environmental, and public space management and behaviours attributes as dependent and explanatory variables including the following: dustbin, dustbin cap, water tap, hand washing basin, the density of

people, vegetation, plantation, green infrastructure, beaches, social distance and signages further utilized to predict the precise outcome.

3.5.6. Hierarchical Cluster Analysis (HCA)

This strategy uses an algorithm that starts with each case (or variable) in a separate cluster and merges clusters until there is only one remaining to identify basically homogeneous groupings of instances (or variables) depending on selected criteria. Examining raw data is an option, or you may select from one of several standardizing modifications. The Proximities technique generates metrics of proximity or similarity. At each level, statistics are shown to assist you in choosing the ideal response.

A set of multivariate statistical techniques called hierarchical cluster analysis, or HCA, was created for the analysis of data gathered from dependent groups or clusters. HCA is often referred to as hierarchical modelling. With the aid of HCA, the researcher was able to think about the connection between public spaces and related outcomes as determined by how they affected COVID-19 pandemic problems. Conceptually, the analysis indicates related results. Of open space variables based on the regions. This outcome is represented in equations as a function of the individual open space's characteristics (Bryk et al., 1992).

The HCA strategy employed here is primarily a bottom-up process, wherein each public space in Thohoyandou CBD grouped on a linking algorithm that assigns dynamics and associated parameters to determine the closeness of different public places and cluster them according to their type (Legendre, 1998). To evaluate COVID-19 effects, the study employed the idea of hygiene as a benchmark indicator (Legendre, 1998).

Out of identifiable 25 open spaces in Thohoyandou CBD, the one with the same characteristic of likely posing a threat to the COVID-19 pandemic, each category of cluster public space must be grouped into homogenous groups depending on variable attributes using hierarchical cluster analysis. This may be used to determine which groups are most prepared to stop a pandemic from spreading.

3.5.7. Pattern matching Yin.

The study will use pattern matching as the preferred analytical method for comparing variables in each public space. Pattern matching convicts testing hypotheses about the characteristics of public spaces (which can be tested and considered the matching of public spaces based on the characteristics of variables through a pattern that is both predicted and observable in measured values and determining whether these hypotheses are true. (Jepson et al., 2017).In this study, Thohoyandou CBD open spaces are observed before the study to be ready to deal with COVID-19 pandemic challenges, which is made up of 25 public open spaces. Observed pattern and literature review suggest that are five attributes; waste management, water provision, demographic, Ecological/Environmental, and public space management, and behaviour attributes with different variables that are matched based on the characteristics (Jepson et al., 2017).

3.6. To analyze urban planning and urban management attributes that are critical in limiting the spread of COVID-19 in public spaces.

Under this objective, the study assumed that some urban public open spaces possess special urban planning and urban management attributes that are critical in limiting the spread of COVID-19. To identify and analyse such critical attributes, the study critically reviewed open space, issues, concepts, theories, and policy frameworks to identify important open-space themes that could be linked to the spread of COVID-19. The identification of such important themes was done through thematic mapping. Establishing connections and/or recognizable patterns of connection between such open space themes and the spread of COVID-19 was done through the method of pattern matching as proposed by Yin, (2009). When utilising such a method, the theoretical realm defines several open space COVID-19 related variables, as compared with the case study realm that comprised 25 public open spaces.

The comparison permitted identifying recognizable links between such variables and the spread of COVID-19 infections as guided by the hypothetical relationships presented earlier on in the table above. It is the comparison between the theoretical real and the case study / observational realm that will permit the research to conclude possible links between urban planning and urban management variables in each public space and the possible spread of COVID-19 as hypothesized in table1, a summarized analytical process flow leading to pattern matching that was adopted is given in figure 3.3.

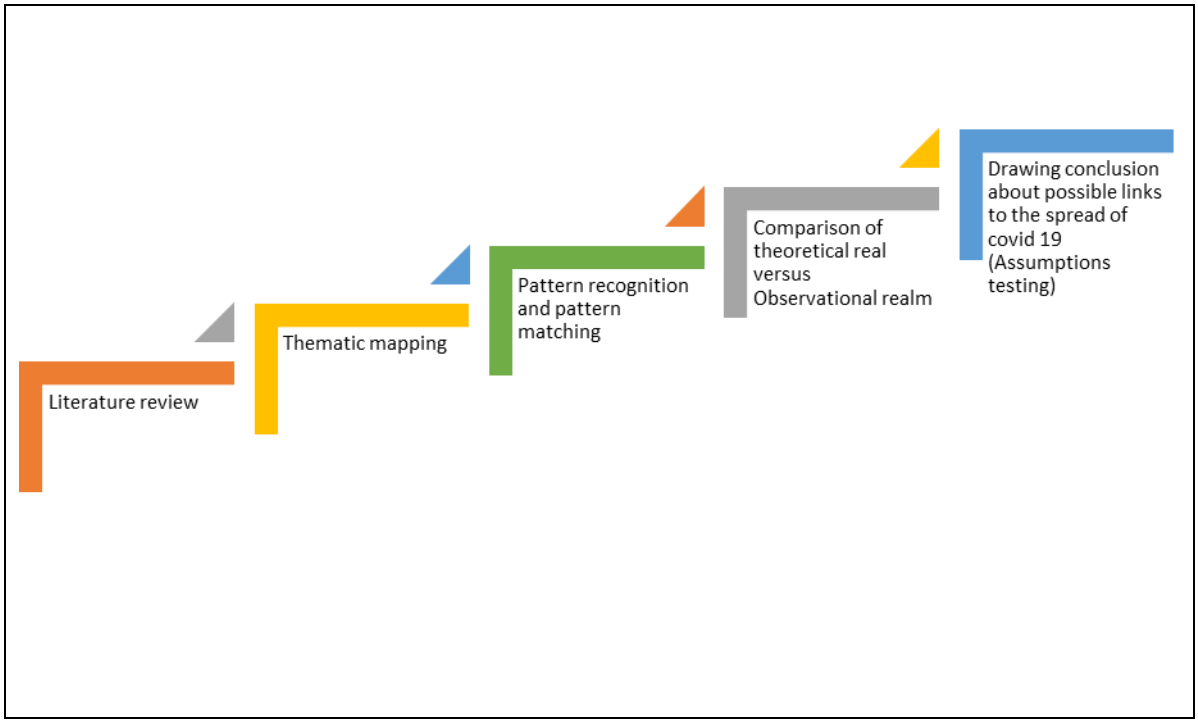


Figure 3. 3: Analytical process flow

Source: Yin,(2009)

Process flow for determining attributes that are critical in limiting the spread of COVID-19 in public spaces.

3.6.1. Two practical scenarios from the data observed were described as follows.

- ***Scenario 1: Presence of matching:*** Indicating the presence of favourable open space conditions that hypothetically would limit the spread of COVID 19. For example, using the study construct waste management, the researcher expected public spaces that have effective waste management systems in place to respond favourably to the spread of COVID-19. In other words, such spatial units would limit the spread of COVID- 19 as supported by various kinds of literature spelled out in Table 1.
- ***Scenario 1: Absence of matching:*** Indicating the absence of favourable open space conditions that hypothetically would limit the spread of COVID-19. For example, using the study construct waste management, the researcher expected open spaces that have poor waste management systems in place to respond unfavourably to the spread of COVID-19. In other words, such spatial units would accelerate the spread of covid 19 as supported by various literature spelled out in Table 1.
- Mathematically the two scenarios represented by a series of X – Y hypothetical relationships, where Y is the dependent variable (a dummy) indicating a favourable

COVID- 19 outcome variable (i.e., limiting the spread of COVID-19) and where X represents different study variables depicting factor conditions that define whether a public open space is vulnerable or not vulnerable to the spread of COVID-19. Thohoyandou CBD under pattern matching, therefore, became a case study realm where a series of such X-Y relationships were tested.

3.6.2. To identify and categorize public spaces that are likely to pose a threat to limiting the spread of the COVID-19 pandemic in Thohoyandou CBD

This study conducted comparisons that identify unexpected similarities and differences among different urban open spaces This enables the identification of urban planning and urban management attributes that explain why certain urban public open spaces are better placed to limit the spread of COVID-19 than others. More precisely such analysis helped in grouping together those urban public spaces that respond better to COVID-19 19 and isolating them from another grouping that responds poorly to the spread of COVID-19.

The study used a sample of 25 urban public areas in the Thohoyandou CBD will be analysed using HCA to determine their relative similarities and distances. A series of multivariate statistical methods known as HCA were created for the analysis of data gathered from dependent groups or clusters. In Thohoyandou CBD, HCA permitted the classification of public areas that might endanger efforts to stop the COVID-19 pandemic from spreading. Before commencing with HCA, raw data had to be treated for "homogenization" and "non-dimensionality," which is a prerequisite since problems about assessing the homogeneity of the distribution of the scaled values across instances may arise (Hall., 2003). The normalcy of the study constructs was initially examined.

Conceptually, The COVID-19 outcomes that are expected to occur in case (i.e., public open space) j are denoted as Yij by the HCA approach that was applied. Equation 1 shows this result as a function of the various urban planning and management characteristics, Xqij, and a model error, rij (Bryk et al 1992). The individual urban planning and management attributes, Xqij are in this case depicted by the various study constructs identified during the literature review, including, (X1) Waste management, (X2) Water provision, (X3) Public space management behaviour, (X4) demographic.

$$\mathbf{Y_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \ldots + \beta_{nj}X_{nij} + r_{ij}} \qquad \textbf{Equation one)}$$

where $\mathbf{r_{ij} \sim N\ (0,\sigma^2).}$

In this situation, the HCA technique is essentially a bottom-up process where public spaces and clusters of entities are gradually merged based on a linkage algorithm that uses the distance measures to evaluate the closeness of items and then clusters to one another. The equation required to complete such a step is found in Equation 2.

$d_{ij} = d(\{X_i\}, \{X_j\}) = \| X_i - X_j \|^2$). (Equation Two)

Where **d_{ij}** is the squared Euclidean distance between **x_i** and **x_j**.

A dendrogram, which resembles a tree, was used to depict the outcomes of hierarchical clustering.

3.6.3. To determine urban management factors that are significant in limiting the spread of COVID- 19 in public spaces of Thohoyandou CBD.

This objective required the researcher to perform a causality analysis to determine how significant the study variables identified were in limiting the spread of COVID-19. The perceived safety levels by public space users determined at the questionnaire stage were used to depict the dependent variable (Y), while a series of urban planning and urban management variables (**X_i**) were used as independent variables to explain the relative COVID- 19 safety experiences of each user in each public space. Determining which urban management is significant to the spread of COVID-19 in public spaces, multiple regression analysis RMA was found to be the appropriate model where COVID-19 safety measures variable (Y) was defined as continues variable because of the nature of the dependent variable, the (MRA) multiple regression model was used to depict such an association. The OLS model adopted assumed the following formula.

$$Y_i = f(X_i, \beta) + e_i$$

Where **Y_i** = The dependent variable depicting COVID-19 safety experiences shared by each by each public space user.

F = Function of each study variables as defined by each study construct in table 3.1

X_i = **Independent** study variables as defined by each study construct in Table 3.1.

β = unknown parameters to be estimated by the model

The above regression formular can alternatively presented as follows:

$$y_i = \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{ip} + \varepsilon_i,$$

$\mathbf{Y_i}$ = The dependent variable depicting COVID-19 safety measures as seen by each public space user.

$\mathbf{X_{i1}}$ = Waste management issues

$\mathbf{X_{i2}}$ = Water provision issues

$\mathbf{X_{i3}}$ = Public space management and behaviours

$\mathbf{X_{i4}}$ = Demographics

$\mathbf{X_{i5}}$ = Environmental/ecological issues

$\boldsymbol{\beta}$ = unknown parameters to be estimated by the model

P-Values from the regression model were used to depict the significance of each study variable (i.e the urban planning and/or urban management attribute). The recommended cut-off value is 0.05. All variables with a P-value < 0.05 were defined as significant.

Before applying the model, was evaluated for the goodness of fit using the R square change value as well as performing an ANOVA test. Collinearity diagnosis will also be done by calculating tolerance levels to make sure that there is no association between independent variables that may limit their overall explanatory power.

3.6.4. To come up with an urban planning-based resilience framework that will boost the ability of public spaces to respond to the challenges of a pandemic.

Results from HCA and MRA were used to identify study variables that may be defined as sensitive to the spread of COVID 19. Quasi-sensitive analysis approach helped the researcher to identify important resilience variables to be used in developing a resilience framework that will boost the ability of public spaces to respond to the challenges of a pandemic Thohoyandou CBD public spaces.

3.7. Summary of analysis of research objectives

Table 3.3, Presents the logic of how the researcher analysed data to achieve each research objective in this study.

Table 3. 3**: Research Matrix**

Objectives 1-4	Source of data	Methods of data collection	Methods of data analysis	Expected outcomes
To analyse urban planning and urban management attributes that are critical in limiting the spread of COVID-19 in public spaces.	Secondary data sources Field survey of 25 public spaces in Thohoyandou CBD	Review of secondary data Observation Checklist Photos	Pattern matching	Urban planning and urban management attributes are critical in limiting the spread of COVID-19 in public spaces.
To identify and categorize public spaces that are likely to pose a threat to limiting the spread of the COVID-19 pandemic in Thohoyandou CBD.	Field survey of 25 public spaces in Thohoyandou CBD	Naturalistic observation Observation Checklist Photos	Hierarchical Cluster Analysis (HCA)	A categorization of public spaces that are likely to pose a threat to limiting the spread of the covid-19 pandemic in Thohoyandou CBD.
To determine urban management factors that are significant to COVID- 19 in public spaces of Thohoyandou CBD.	Secondary data sources Primary data	Review of secondary documents Key expert interviews	Multiple Regression analysis	Urban factors that are significate of COVID- 19 in public spaces of Thohoyandou CBD are identified
To come up with an urban planning-based resilience framework that will boost the ability of public spaces to respond to challenges posed by a pandemic.	Secondary data sources Primary data	Review of secondary documents Observation Checklist Key expert interviews	Pattern matching, hierarchal cluster analysis, and Regression analysis	An urban planning-based resilience framework that will boost the ability of public spaces to respond to challenges posed by a pandemic is developed.

3.8. Ethical considerations

Ethical clearance was obtained from the University Research ethics committee before data collection commenced. The study was performed following the principles of the Declaration of Helsinki (2008) and the laws of South Africa. The participants were asked to sign informed consent forms after the researcher explained the study's aim and data collection procedure. See appendix 5 and 2.

3.9. Informed consent

Participants were informed about the nature of the study. No participant was forced to take part in the study. Participants had the option to leave the study whenever they wanted. There was no intimidation used; participation was chosen voluntarily. Each participant completed a permission form outlining the details of the study. See the appendix 1

3.10. The rights to privacy

The codes were used instead of the names of the participants. The interviews were conducted in each public space individually to ensure privacy and confidentiality. The participants' questionnaires were kept safe; the researcher handled all answered questionnaires to ensure confidentiality. Codes were used instead of participants' names to ensure anonymity. The lists of codes with names were recorded on a separate sheet.

3.11. Voluntary participation

Participants were informed of the questionnaire's questions. Because participation in the study was voluntary, individuals were free to leave.

3.12. Limitations of research methodology

The researcher faced different limitations which hinder the research. Time was one of the biggest challenges since the researcher had limited time to do this research because the researcher had to balance research with academic activities which also needed time. While distributing the questionnaires, the researcher had to explain some of the words used in the questions. Municipal officials had limited time to assist the researcher and answer the questions which best suited them. Furthermore, accessing some municipal maps was a challenge.

3.13. Honest reporting

During conducting and analysing the investigation, and when presenting the study's conclusions, honesty was used. All university research ethics committee laws, rules, and procedures as well as accepted professional standards and norms were strictly adhered to. Language editing was also done as part of honestly reporting the originality of research findings (see appendix 4).

3.14. Plagiarism

The researcher acknowledged that it was improper to replicate another person's assignment and that submitting in identical work to others. The researcher used correct in-text citations, quoted sources, and checked for plagiarism (see Appendix 6).

Table 3. 4 Proposed research schedule.

Activities	2022(Semester 1)				2022 (Semester 2)						
	Jan	Feb	Mar	Dec	Jan	Jun	July	Apr	Aug	Sept	Dec
Proposal Writing											
Proposal Draft											
Ethics Submission											
Contact authorities											
Print Questionnaires											
Data collection											
Data analysis											
Article Writing											
Submission											

Sources: Author Construct, (2022).

CHAPTER 4: DATA PRESENTATION AND ANALYSIS

4.0. Introduction

This chapter presents results based on the study objectives. This study seeks to provide an interpretation and analysis of research findings on the extent to which Thohoyandou CBD public spaces are ready to deal with COVID-19 pandemic challenges. In this study, the following five phases of analyses were used:

Section 1: Social demographics

Section 2: Descriptive statistics

Section 3: Statistical analysis (data screening) Normality test results

Section 4: Results of Hierarchical Cluster Analysis (HCA)

Section 5: Regression analysis

4.1 Social demographics

This section summarises the characteristics of the sample that was obtained based on 3 variables where N=71 public space users. Responsive will always vary based on public space user's responses. The number of socio-demographics of public space users that are significant was identified, and several socio-demographic variables that are considered significant in shaping the perception of public space users were identified as follows: gender, age of public space users, and educational qualifications of public space users.

4.1.1. Gender of public space users

The gender of public space users was analysed to know the male and female ratio of public space users. Figure 4.1.1. shows the gender of public space users' outcome of gender profile.

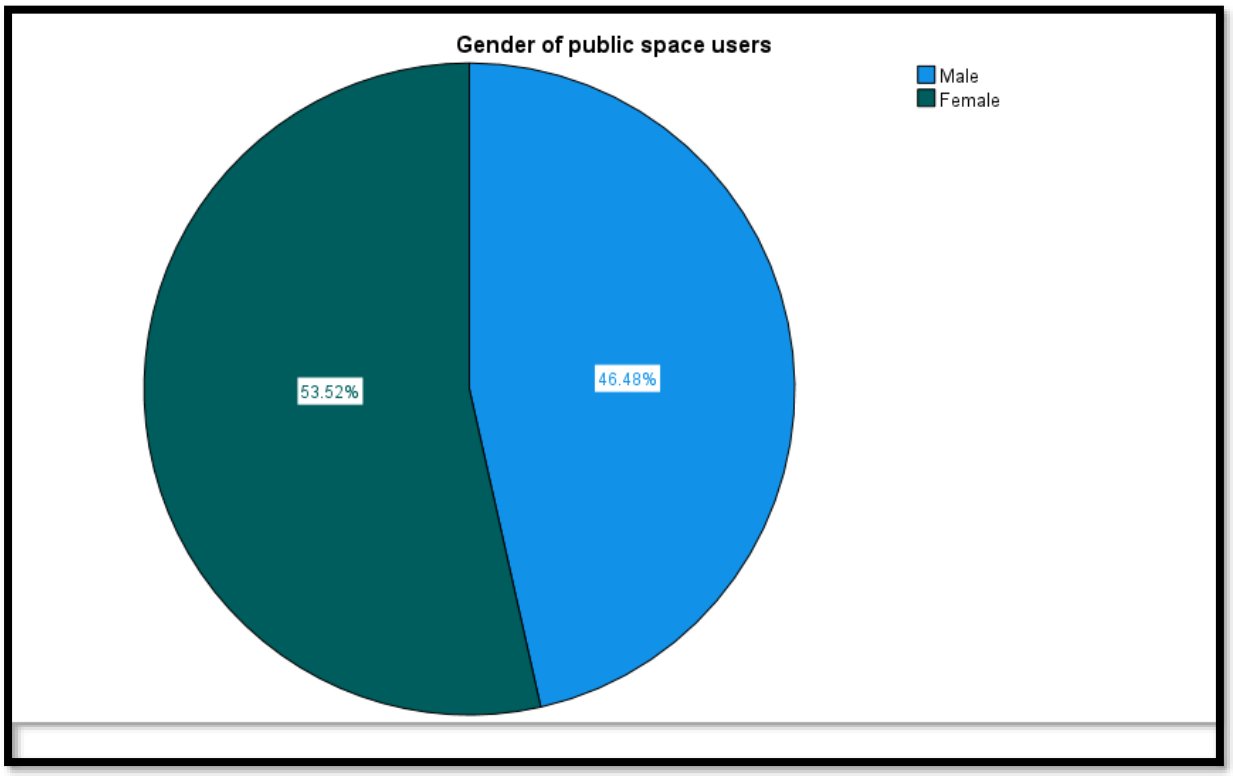


Figure 4.1 1: Gender of public space users.

N=71 public space users

Sources: Author Construct, (2022).

The result of the analysis indicated that 46.5% of public space users are males and 53.5% of public space users are females. These results show the current mean perception is slightly biased towards females.

4.1.2. Age of public space users

The study targeted different age groups to determine the extent to which Thohoyandou CBD public spaces are ready to deal with COVID-19 pandemic challenges. The results of the analysis of the age of public space users are summarized in figure 4.1.2.

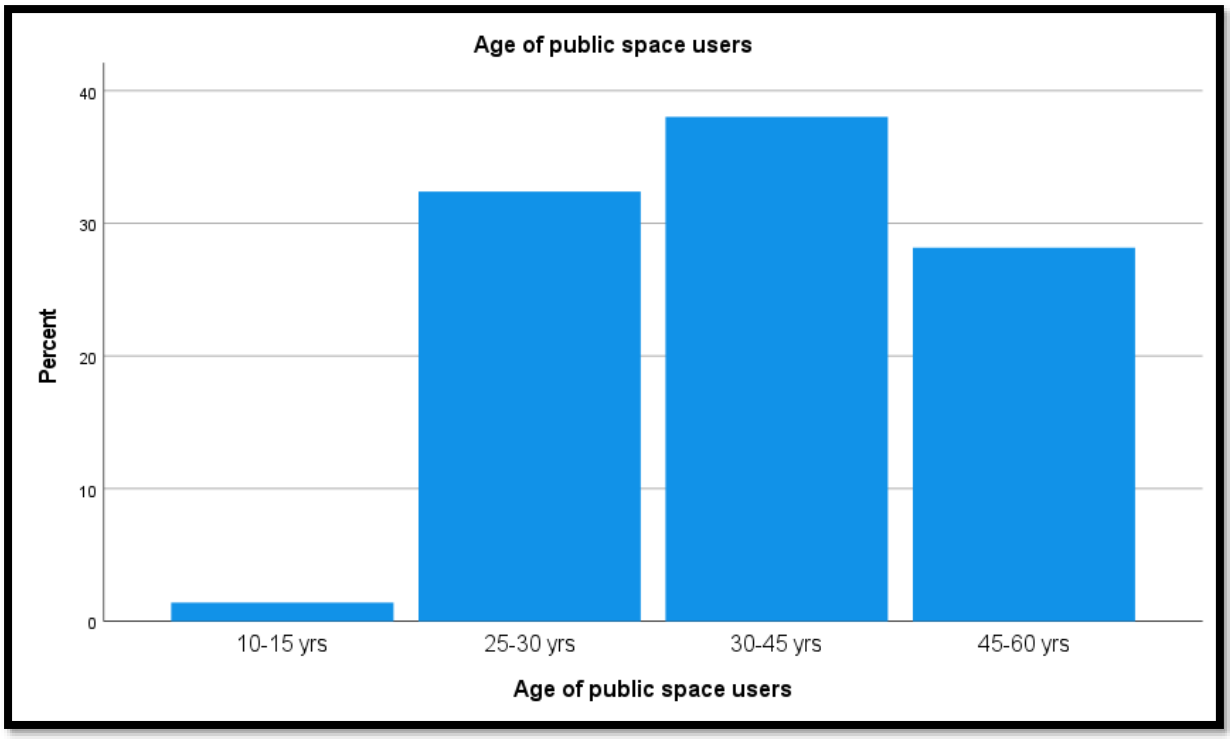


Figure 4.1 2: Age of public space users

N=71 Public space users

Sources: Author Construct, (2022)

The findings indicate that the most dominant age group is 35-45 which accounts for 38% of public space users, followed by the age group of 25-30 years (32.4%), public space users of 45-65 years accounting 28.2%. The least age group is 1.4% for those in the range 10-15 years, this is probably because this age group is composed of pupils and interviews were conducted during school hours.

4.1.3 Educational qualifications

It was possible to obtain information on the educational qualifications of public space users, results are shown the figure 4.1.3.

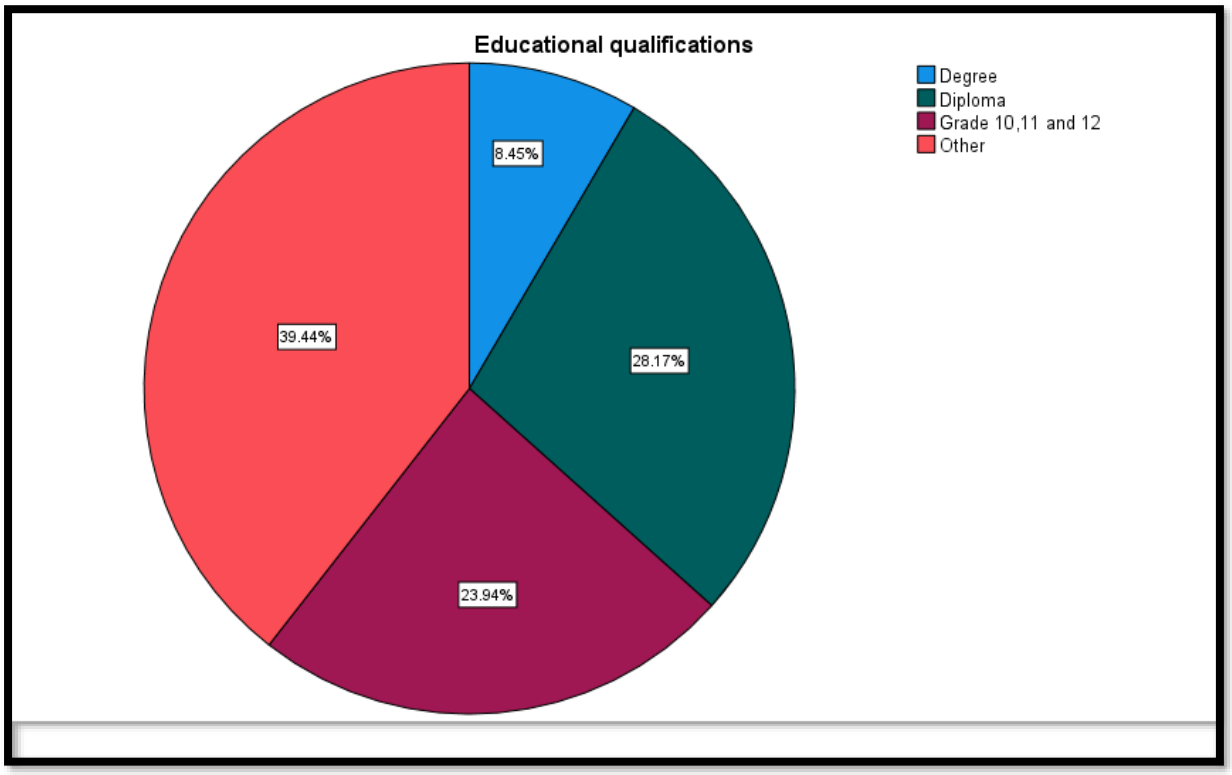


Figure 4.1 3: Educational Qualifications

N=71 public space users

Sources: Author Construct, (2022).

Results indicated that most dominant public space users have other qualifications (less than grade 10) that account for 39.44%, this result shows that most public space users do not have a tertiary qualification.

4.2: Data screening

This study used several statistical methods of analysing data which included descriptive statistics, Hierarchical Cluster Analysis, Cluster descriptions, and Regression analysis. Also, the use of the Likert scale, and the use of ANOVA testing. There was a need for data screening to test the normality of data. This section present findings related to the normality test coducted.

Normal distribution

The data were checked for normality before HCA conducted. This is since many of the statistical methods used in HCA make the assumption that the data have a normal distribution. As indicated in Table 4.1, the study made use of indices produced from the skewness test and kurtosis test, as shown in Table 4.1.

Table 4. 1: Normality test results

DEPENDENT STUDY CONSTRUCTS					
STUDY CONSTRUCTS	CODE	STUDY VARIABLES	SKEWNESS	KURTOSIS	DECISION (Retain/Reject)
1. Critical urban planning management attribute that ares limiting the spread of COVID-19	CUPM1	Improved waste management conditions	1.343	-0.202	Retain
	CUPM2	Improved access to water	-0.263	-0.639	Retain
	CUPM3	Reduced density of public space users	-0.966	0.752	Retain
	CUPM4	Improved environmental conditions	1.158	-0.680	Retain
	CUPM5	Improved public space management practices	0.791	-0.206	Retain
2. Critical waste management attributes that are limiting the spread of COVID-19	CWMA1	Separation of waste	1.158	-0.680	Retain
	CWMA2	Availability of Waste disposal bin	-0.051	-0.938	Retain
	CWMA3	Waste disposal bin with a cap	-1.277	2.072	Retain
	CWMA4	Running drainage system	-1.892	5.643	Reject
	CWMA5	Availability of bathrooms	-0.874	-0.199	Retain
	CWMA6	Clean public space	-0.769	-1.451	Retain
3. The significance of water provision attributes critical in limiting the spread of COVID19	SWPA1	Availability of water	1.343	-.202	Retain
	SWPA2	Well-functioning water facilities	0.261	-1.989	Retain
	SWPA3	Improved water supplies	1.805	1.293	Retain
	SWPA4	Excellent water drainage system	-1.685	1.849	Retain

	SWPA5	Presence of hygienic water facilities	1.949	5.340	Reject
4. Significant public space management and behaviours -	SPMB1	The presence of helpful preventative COVID-19 massages	-0.571	-.704	Retain
	SPMB2	Improved common infrastructure	1.805	1.293	Retain
	SPMB3	A presence of social distancing marking	0.029	2.058	Retain
	SPMB4	Availability of surveillance cameras	-0.336	-.695	Retain
5. Important demographic attributes	IDLSC1	Reduced density of public space users	-0.054	1.948	Retain
	IDLSC2	A good behavioural attitude of public space users during peak hours	1.671	-0.591	Retain
	IDLSC3	The presence of (vulnerable) homeless people	0.000	5. 566	Reject
	IDLSC4	Facilities for homeless people (if required)	0.633	-1.647	Retain
	IDLSC5	Existing social distancing by public space users	-.202	-2.017	Retain
6. Importance of ecological/environmental demographic	IEDA1	Quality of air	1.555	0.430	Retain
	IEDA2	Access to green space	0.700	-1.555	Retain
	IEDA3	Prevalence of littering	-0.769	-1.451	Retain
7. Public spaces which are likely to pose a threat to limiting the spread	PSTLS1	Street and pavement	-1.774	2.568	Retain
	PSTLS2	Parks	-0.700	-1.555	Retain
	PSTLS3	Taxi	2.503	4.388	Reject
	PSTLS4	bus rank	-1.565	2.565	Retain
	PSTLS5	Public squares	1.555	0.430	Retain

8. Helpful intervention that will limit the spread of the pandemic in common public space --	HISPP1	Improved public awareness	0.840	-1.332	Retain
	HISPP2	Improved urban planning measures	2.503	4.388	Reject
	HISPP3	Environment hygiene campaigns	3.431	10.053	Reject
	HISPP4	Shutting down public spaces	-0.063	0.666	Retain
	HISPP5	Limiting access to public spaces	0.086	2.051	Retain
	HISPP6	Limiting the use of shared facilities	-0.769	1.451	Retain
	HISPP7	Uninterrupted supplies of water	-0.769	-1.451	Retain
INDEPENDENT STUDY CONSTRUCTS					
STUDY CONSTRUCTS	Code	STUDY VARIABLES	SKEWNESS	KURTOSIS	DECISION (Retain/Reject)
Waste management attributes (WMA)	WMA1	Waste separation	2.491	4.563	Reject
	WMA2	Availability of waste disposal bin	-3.298	9.647	Reject
	WMA3	Access to waste disposal bins	-3.298	9.641	Reject
	WMA4	State of Sewerage system	0.822	0.401	Retain
	WMA6	Environmental hygiene	1.070	-1.447	Retain
	WMA7	Availability of Covid 19 compliant ablution facilities	2.491	1.663	Retain
	WMA8	State of ablution facilities	0.819	-1.310	Retain
Water provision attributes (WPA)	WPA1	Availability of water tap	-0.719	-1.556	Retain
	WPA2	The functionality of water source	2.491	4.563	Reject
	WPA3	Accessibility to water facility	5.000	25.00	Reject
	WPA4	State of water drainage system	0.434	-0.669	Retain
	WPA5	Presence of water supplies	5.00	25.000	Reject

Public space management and behavior (PMB)	PMB1	Presence of helpful preventative COVID 19 messages	0.621	-1.762	Retain
	PMB2	Informative mask-wearing messaging	1.297	-0.354	Retain
	PMB3	Social distancing Markings	1.597	0.593	Retain
	PMB4	Availability of common sitting infrastructure	2.497	4.563	Reject
	PMB5	Availability of public space surveillance (cameras)	1.227	0.507	Retain
	PMB6	Availability of thermal cameras to monitor temperature	1.044	-0.998	Retain
	PMB7	Availability of security personnel to monitor public space user behavior	0.621	-1.762	Retain
Demographic Study construct (DSC)	DSC1	The density of public space users	-0.523	-1.694	Retain
	DSC2	Evidence of social distancing by public space users	1.584	1.841	Retain
	DSC3	The behavioral attitude of public space users during peak hours	1.597	0.593	Retain
	DSC4	Presence of (vulnerable) homeless people	-3.298	9.641	Reject
	DSC5	Facilities for homeless people (if require)	3.298	9.641	Reject

Ecological/Environmental Attributes (EEA) -	EEA1	Quality of landscaping (If any)	0.530	-0.503	Retain
	EEA2	Prevalence of littering	-1.359	0.525	Retain
	EEA3	Quality of air	1.297	-0.354	Retain
	EEA4	Access to green space	0.435	-1.976	Retain

Sources: Author Construct, (2022).

Section 2: Descriptive Statistics

4.3: To analyze urban planning and urban management attributes that are critical in limiting the spread of COVID-19 in public spaces.

Public space must be responsive to the COVID-19 pandemic, the researcher identified a study construct that linked COVID-19 with urban design management by employing critical analysis. To achieve this objective, this study developed a series of study constructs that it classified as follows: waste management construct, water provision, public space management behaviour construct, demographic, and ecological/environmental construct.

The main assumption was that study constructs were critical in limiting the spread of COVID-19, this assertion has been supported by numerous other studies (UNICEF) and significant World Health Organizations (WHO), African diseases control, and others. Empirical evidence to analyse the extent to which urban planning and management attributed are limiting the spread of COVID-19 in public spaces were obtained from the structured observational checklist and structured questionnaire. The structured observational checklist sort to analyse the significance of urban planning and management attributes from the planner's expert point of view. The structured questionnaire sort to analyse public space users' points of view.

The mean was employed as a statistical measure to analyse urban planning and urban management attributes that were hypothesized to have an impact on the spread of COVID-19 in public spaces. Such a “mean analyse approach” was found to be a deal since most urban planning and management variables under analysis were captured using 5 points Likert scale (where one is the lowest score and 5 is the highest score). Results of analysis are presented in the following section.

4.3.1 Waste management as a critical attribute to limiting the spread of COVID-19.

In the context of waste management, four critical variables were analysed using disaggregated means approach. Waste management as defined by these four variables was analysed using a five-point Likert scale. On each scale, 1 (one) represented an unfavourable condition. a 3-point and 4-point Likert scale were however used to study variables "availability of COVID-19 ablution facilities" and "state of ablution facilities" respectively in both cases the upper limit score values of 3 and four representing the most favourable conditions, the highest value represented the most favourable conditions. The calculated mean score value is shown in table 4.3. A disaggregated means analysis that utilized mean score values for each waste management variable was conducted, and the results are shown in table 4.3.1.

Table 4.3. 1: Mean score values of waste management as critical in the spread of COVID-19.

Waste management Variables	Mean	Std. Deviation
State of Sewerage system	2.72	.500
Environmental hygiene	2.00	.900
Availability of COVID -19 compliant ablution facilities	1.72	.600
State of ablution facilities	1.48	.800

N=25 public spaces

Source: Author Construct, (2022).

The study results show that all 25 samples of public space are characterized by the favourable state of the sewage system as shown by a relatively high score of 2,72. The flow mean score value of 2.0 indicates that on average environmental hygiene conditions in simple public spaces are poor not performing this is a worrying statistic given that good environmental hygiene is critical in the spread of COVID-19. Ablution facilities that may help limit the spread of COVID-19, "COVID-19 compliant" are

available as shown by a mean score value of 1.72. However, a low mean score value of 1.48 indicate their state is poor. This presents another area of concern since COVID-19 compliance with ablution facilities required that all facilities are in a good state. Plate 4.1shows the state of the CBD.

Plate 4. 1 : Spoilage sewer around street pavement in Thohoyandou CBD

Source: Author Construct, (2022)

Data from public space users sort to collaborate with the above observation. Public space users were asked to indicate their perception of which waste management variables were critical in limiting the spread of COVID-19. A Likert scale was used where 1 presents unfavourable and 5 present's favourable results as shown in the table 4.3.2.

Table 4.3. 2**: Mean score values of waste management as a critical factor in the spread of COVID-19**

Waste management attribute	Mean	Std. Deviation
Improved access to water	4.24	.643
Separation of waste is critical in limiting the spread of COVID-19	4.25	.438
The availability of waste disposal bins is critical in limiting the spread of COVID19	4.38	.544
The disposal bin is critically limiting the spread of COVID-19	4.41	.709
The availability of bathrooms is critical in limiting the spread of COVID-19	4.55	.580
Clean public space is critical in limiting the spread of COVID-19	4.68	.471

N=71 public space users

Source: Author Construct, (2022)

The results indicated that public space users have a positive perception towards the improvement of waste management variables as they categorized them as critical in limiting the spread of COVID-19 which is shown by the favourable mean score for all the waste management variables of between 4 and 5. Their perception was very positive with the highest favourable results.

4.3.2 Mean score values for water provision as a critical factor in the spread of COVID-19

In the context of water provision, four critical variables were analysed using disaggregated means approach. Water provision as defined by these four variables was analysed using a 5-point Likert scale used for the state of the water drainage system. On each scale, 1 (one) represented an unfavourable condition, a 3-point and 2-point Likert scale were however used to study variables "the functionality of water source"," accessibility to water facility "and "availability of water tap" respectively in both cases the upper limit score values of 3 and four representing the most favourable conditions, the highest value represented the most favourable conditions. The calculated mean score value is shown in table 4.3.3. A disaggregated means analysis that utilized mean score values for each water provision variable was conducted, and the results are shown in Table 4.3. 3.

Table 4.3. 3: Mean score values for water provision as a critical factor in the spread of covid-19

Water provision Variables	**Mean**	**Std. Deviation**
The functionality of water source	2.28	.900
Availability of water tap	1.16	.400
Accessibility to water facility	1.56	.60
State of water drainage system	1.92	.800

N=25 Public spaces users

Source: Author Construct, (2022)

The study results show that all 25 samples of public space are characterized by the favourable functionality of the water source as shown by a relatively fair score of 2.28. The low mean score value of 1.16 indicates that on average availability of water in simple public spaces is poor, not performing this is a worrying statistic given that the availability of water taps is the most critical variable in spreading the COVID-19 pandemic in most public spaces however state of water drainage has a low mean score value of 1.92 indicate their state is poor as shown by a series of photographs taken in some of the sampled public spaces see plate 4.2 This presents another area of concern

since COVID- 19 compliance with the state of water drainage required that all facilities are in a good state.

Plate 4. 2 : Blockage of water drainage

N=25 Public space

Source :(Author Construct 2022)

Public space users' point of view on the water provision

Data from public space users sort to collaborate with the above observational results. Public space users were asked to indicate their perceptions towards importance of water attributes in limiting the spread of COVID- 19 in common public spaces, where four variables were analysed using a 5-point Likert scale 1 (one) representing strongly disagree and 5 representing strongly agree.

Table 4.3. 4: Mean score values for water provision as a critical factor in the spread of COVID-19

Water provision variables	Mean	Std. Deviation
Water availability is critical in limiting the spread	4.23	.421
The functioning of water facilities is critical in limiting the spread	4.44	.499
Improved water facilities are critical in limiting the spread	4.17	.377
An excellent water drainage system is critical in limiting the spread	4.10	.740

N=71 Public space users

Source: Author Construct, (2022)

The findings show that public space users have a positive perception of the improvement of water attributes in limiting the spread of COVID-19 in common public spaces in Thohoyandou CBD. Their perception was very positive with the highest favourable results, this is an indication that public space users see improvement of water facilities around 25 public spaces in Thohoyandou CBD as a critical component.

4.3.3: Mean score values for public space management behaviors critical to limiting the spread of COVID-19

In the context of public space management behaviour, five critical variables were analysed using disaggregated means approach. Public space management behaviour as defined by these five variables was analysed using a 3-point Likert scale. On each scale, 1 (one) represented an unfavourable condition respectively in both cases the upper limit score values of 3 represented the most favourable conditions, and the highest value represented the most favourable conditions. The calculated mean score value is shown in Table 4.3.5.

Table 4.3. 5: Mean score values for public space management behaviour as critical in limiting the spread of COVID-19.

Public space management behaviour Variables	Mean	Std. Deviation
Informative mask-wearing messaging	1.24	.436
Presence of helpful preventative COVID-19 messages	1.20	.408
Social distancing markings	1.30	.690
Availability of public space surveillance (cameras)	1.42	.714
Availability of thermal cameras to monitor temperature	1.24	.436
Availability of security personnel to monitor public space user behaviours	1.40	.500

N=25 public spaces

Source: Author Construct, (2022)

The results reveal that all five variables including informative mask-wearing messaging, presence of helpful preventative COVID-19 messages, social distancing markings, availability of public space surveillance (cameras), availability of thermal cameras to monitor temperature and availability of security personnel to monitor public space user behaviours are characterized by unfavourable conditions thus indicate that most of public space users behaviour in Thohoyandou CBD is poorly managed and monitored this was shown by a relatively (mean score value of 1 (one)). Such is also supported by a series of photographs taken in some of the sampled public spaces see plate 4.3.

Plate 4. 3 : Absent of Security personnel to monitor public space user behaviours.

Source: Author Construct, (2022)

Public space users' point of view

Data from questionnaire survey collaborate with the above observation. Public space users were asked to indicate their perception on what weather public space management behavioural variables were critical in limiting the spread of COVID 19 in public spaces (See table 4.3.6).

Table 4.3. 6**: Mean score values for public space management behaviour as critical in limiting the spread of COVID-19**

Public space management behaviour variables	Mean	Std. Deviation
Helpful preventive COVID-19 massages are critical in limiting the spread	4.35	.678
Improved common infrastructure is critical in limiting the spread	4.17	.377
The presence of social distancing marking is critical in limiting the spread	4.49	.504
The availability of surveillance cameras is critical in limiting the spread	4.27	.654

N=71 Public space users

Source: Author Construct, (2022)

All five public management behaviours variables, including informative mask-wearing messaging, presence of helpful preventative COVID-19 messages, social distancing markings, availability of public space surveillance (cameras), availability of thermal cameras to monitor temperature and availability of security personnel to monitor public user behaviours by space users were found to be critical issues responsible for spreading the virus.

4.3.4: Mean score values for demographics that are critical to limiting the spread of COVID-19

In the context of demographic, three critical variables were analysed using disaggregated means approach. This included population density, evidence of social distancing and behavioural attitude of public space users. Such variables were analysed using a five-point, four-point and three-point Likert scales. On each scale, 1(one) represented an unfavourable condition and the highest value represent the most favourable condition (see Table 4.3.4). The calculated mean score value is shown in table 4.3.4.

Table 4.3.4: Mean score values for demographics as critical in limiting the spread of COVID-19

Demographic Variables	Mean	Std. Deviation
*The density of public space users	3.28	.936
**Evidence of social distancing by public space users	1.32	.557
***The behavioural attitude of public space users during peak hours	1.12	.332

*5-point Likert scale: 1 = unfavourable; 5 = Most favourable condition

**4-point Likert scale: 1 = unfavourable; 4 = Most favourable condition

***3-point Likert scale: 1 = unfavourable; 3 = Most favourable condition

N=25 public spaces

Source: Author Construct, (2022)

Results reveal that population density in sample public spaces was not a serious issue as shown by a high mean-score value of 3.28. This is probably because most public space users are increasingly getting aware that congested spaces are the main drivers for the spread of COVID-19. Despite this, isolated cases of congested public spaces were observed. Plate 1 (one) shows a public space that is congested. Such spaces make it difficult for users to practice social distancing.

A low mean-score value of 1.32 reveals that social distancing in most public spaces is a big problem. These results are also supported by isolated cases of photographs taken (see plate 4.4.) in some of Thohoyandou CBD public spaces.

C

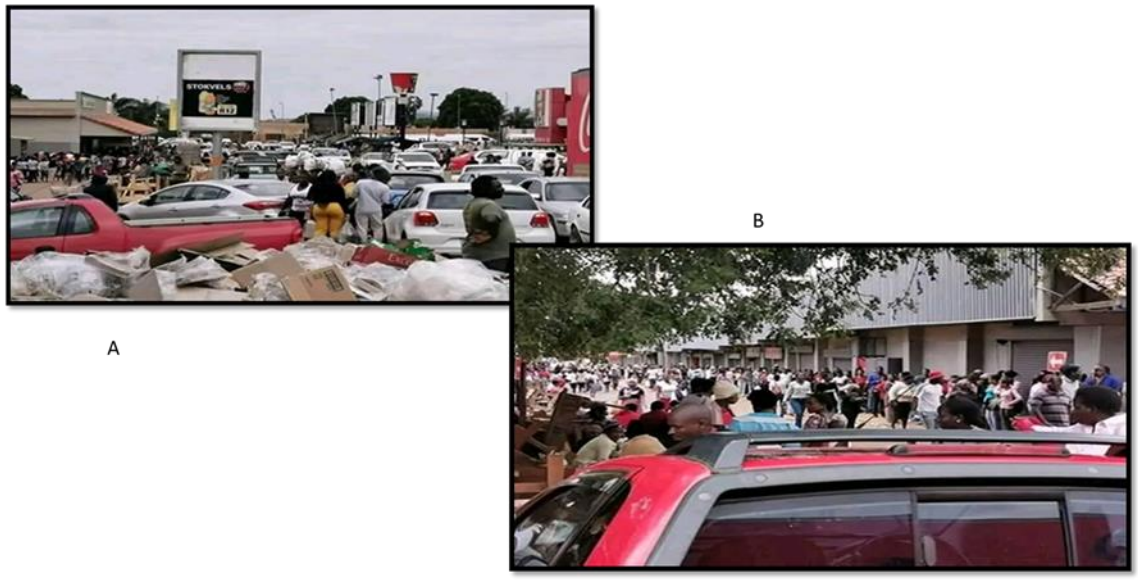


Plate 4. 4 : A and B -Population congestion in public and C- Street trade vendors occupy street pathways in Thohoyandou CBD

Source: Author construct, (2022).

Peak hour behavioural attitude by space users was found to be a critical issue responsible for spreading the virus. A low mean-score value of 1.12 shows that the attitude of space users during peak business hours was not helpful in limiting the spread of COVID-19. Public space users were asked to indicate their perceptions on whether demographic variables were critical in limiting the spread of COVID 19 in public spaces. See table 4.3.5

Table 4.3.5: Public space users' opinion on how critical demographics are in limiting the spread of COVID-19

Demographic Variables	*Mean	Std. Deviation
Reduced density of public space users	3.99	.463
The behavioural attitude of public space users during peak hours.	4.00	.655
Facilities for the homeless people.	4.35	.481
Social distancing by public space users	4.55	.501

*5 point Likert scale: 1 = strongly disagree; 5 = strongly agree

N=71 public space users

Source: Author Construct, (2022)

All three demographic variables, including reduced density, behavioural attitude, and social distancing were seen to be critical in limiting the spread of COVID-19 as evidenced by high mean score values. An additional demographic variable of facilities for homeless people was also found to be an important factor in limiting the spread of COVID-19 (Mean score value = 4.35).

4.3.5: Mean score values for ecological/environmental issues critical to limiting the spread of COVID 19.

In the context of ecological/environmental study construct, four critical variables were analysed using the disaggregated means approach. Four study variables linked to the spread of COVID 19 were analysed. These include quality of landscaping, prevalence of littering, quality of air and access to green space. Different types of measurement scales were employed as shown in Table 4.3.6.

Table 4.3.6: Mean score values for ecological/environmental as critical in the spread of COVID-19

Ecological/environmental Variables	Mean	Std. Deviation
*Quality of landscaping (If any)	2.2344	.94516
**Prevalence of littering	2.4800	.71414
***Quality of air	1.2400	.43589
****Access to green space	1.4400	.50662

*5-point Likert scale; 1 = very poor, 5 = excellent

**3-point Likert scale; 1 = non, 3 = Very prevalent

***2-point Likert scale; 1 = poor, 2 = good

****3-point Likert scale; 1 = poor, 3 = good

N=25 public spaces

Source: Author Construct, (2022)

Study results show that the quality of landscaping, quality of air and access to green space influence on the spread of COVID 19 in Thohoyandou CBD public spaces as supported by low mean score values. There is a serious problem of littering in most public spaces as supported by a mean-score of 2.48. Such is also supported by a series of photographs taken in some of the sampled public spaces (see Plate 4.5)

Plate 4. 5 : Littering in Thohoyandou public spaces.

Source: Author Construct, (2022)

It was also possible to ask space users about whether such four ecological variables were critical in limiting the spread of COVID 19. Their views are summarized in table 4.3.7 below.

Table 4.3. 7**: Public space user opinion on how critical ecological / environmental issues in are limiting the spread of COVID-19**

Ecological/environmental Variables	*Mean	Std. Deviation
Quality of air is critical in limiting the spread	4.20	.401
Access to green space is critical in limiting the spread	4.34	.476
prevalence of littering is critical in limiting the spread	4.68	.471

*% 5-point Likert scale; 1 = strongly disagree, 5 strongly agree.

N=71 public space users.

Source: Author Construct, (2022)

Survey results indicate that all public space users on aggregate agreed that these four variables were critical to limiting the spread of COVID 19. The most critical variable among these was identified as prevalence of littering as shown by the highest mean-score value of 4.68.

4.4. To identify and categorize public spaces that are likely to pose a threat to limiting the spread of the COVID-19 pandemic in Thohoyandou CBD

Hierarchical Cluster Analysis (HCA) was used as a statistical tool to identify and categorize public spaces that are likely to pose a threat to limiting the spread of the COVID-19 pandemic in Thohoyandou CBD. The clustering was done using five study constructs hypothesized in literature to be linked to the spread of COVID 19. These study constructs include, waste management, water provision, public space management behaviours, demographics and ecological or environmental issues. The main assumption behind this analysis was that "there common attributes associated with certain public spaces that make them more susceptible / prone to the spread of COVID-19". Each derived unique cluster will then allow us to analyse such characteristics posing a threat to the spread of the virus.

Since scale variables were utilized in this research. All clustering algorithms can assess whether an item is more likely to be in the same cluster as it or not by using some form of distance metric. The size of the variables naturally influences these distance

measurements. Prior to doing clustering, the variety of scales utilized in this research were normalized using z-scores. The results of analysis are discussed below.

4.4.1 Number of distinct clusters

The study used a two-clustering process to determine the number of distinct clusters showing common levels of vulnerability to the spread of COVID-19. Results are shown in figure 4.4.1.

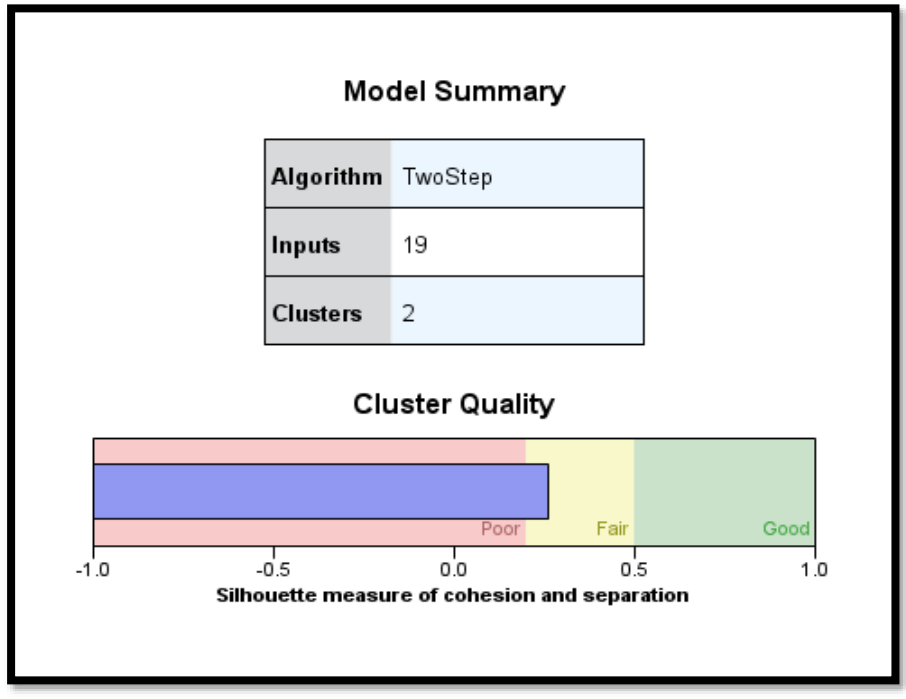


Figure 4.4. 1: A two-step clustering results showing a 2-cluster solution.

Source: Author Construct, (2022)

A two-cluster solution was generated using 19 input variables that depicted COVID-19 related urban planning attribute. Because the correlation structure in HCA assumes that data are correlated with a group or cluster, but independent between groups or clusters, checking the relative stability of the final, the two-silhouette measure of cohesion and separation was used to access the generated two clusters solution, the results revealed acceptable level of stability this implies no overlapping between two

categories of public spaces. Such distinct categories of public spaces are shown in figure 4.4.2. Using the dendrogram as a data display tool.

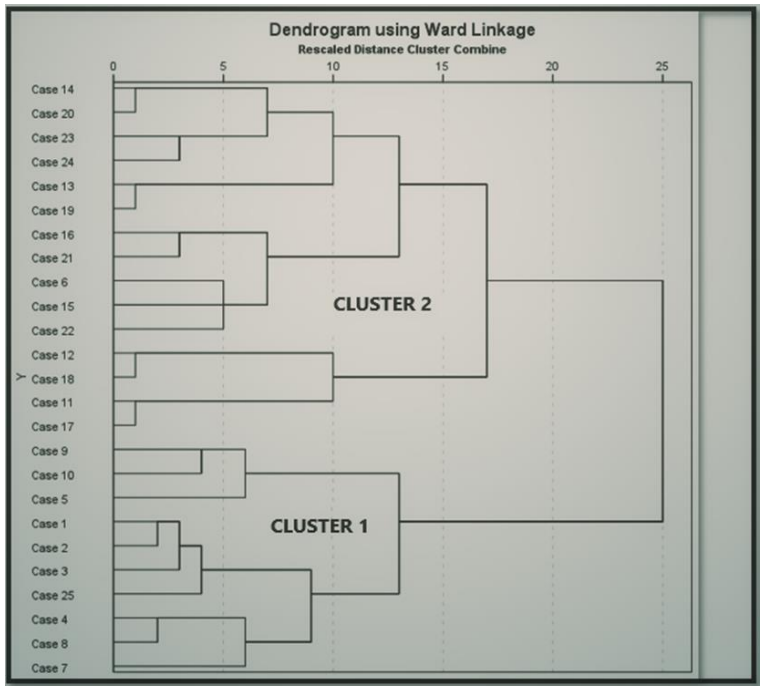


Figure 4.4. 2: A dendrogram showing a two-cluster solution.

Source: Author Construct, (2022)

4.4.2. Cluster composition

The relative composition of each cluster is shown in the Table 4.3.8.

Table 4.3. 8**: Cluster composition**

Cluster type (Categories of unique public spaces)	Frequency	Percent (%)
Type/Category 1	10	40
Type/Category 2	15	60
Total	25	100

N=25 Public space

Source: Author Construct, (2022)

It is clear from the cluster results in the table 4.3.8. That out of the 25 public spaces in Thohoyandou CBD, Clusters. Cluster 1 is made up of 10 public spaces accounting for 40% percent of the total. Cluster 2 is made up of 15 public spaces, accounting 60% of the total. It was possible to analyse spatial distribution to get a sense of weather they are any spatial attribute associated with such distribution and the results are shown in figure 4.4.3.

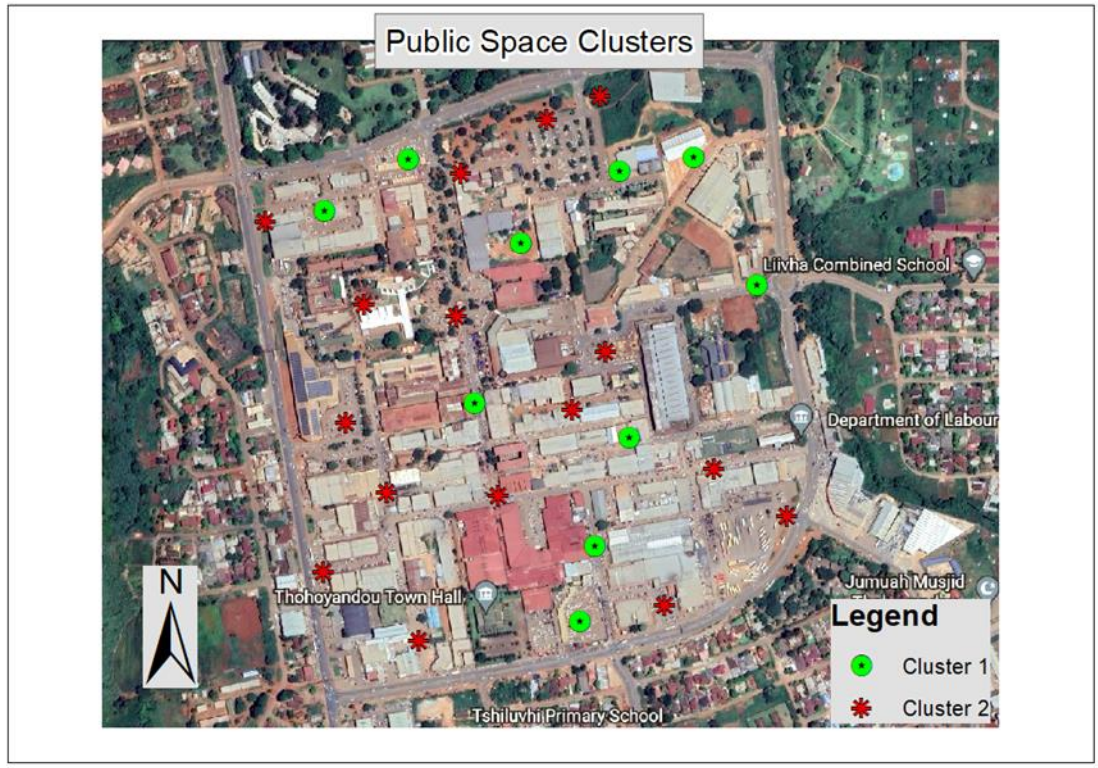


Figure 4.4.3: Spatial distribution of public spaces defined according to COVID-19 related to urban planning attribute.

Source: Author construct (2022)

Majority of cluster 2 type public space are located on the lower south-eastern section of the CBD and on the other hand the majority of cluster 1 type are located on the eastern half CBD which is usually categorized by high population of pedestrians.

4.4.3. Cluster description

To aid the description of each cluster according to how vulnerable public spaces are to the COVID-19 pandemic, the study computed standardized z-mean score values. Standardized scores were generated since nominal mean score values could not be objectively compared as they came from different data measurement scales.

This section seeks to describe the characteristics of each cluster presented using such standardize mean score values by assessing the cluster performance of the 2 clusters that were identified in Thohoyandou CBD. Results of such analysis are given below.

4.4.3.1. Cluster performance according to specific study constructs

Table 4.3.9 indicates cluster performance according to specific study constructs.

Table 4.3. 9**: Cluster performance according to specific study constructs**

Study construct	Cluster	
	1	2
WMA	-0.2	0.3
PMB	-1.06	.44
WPA	-0.4	0.6
DSC	-0.1	0.1
EEA	-0.5	0.2

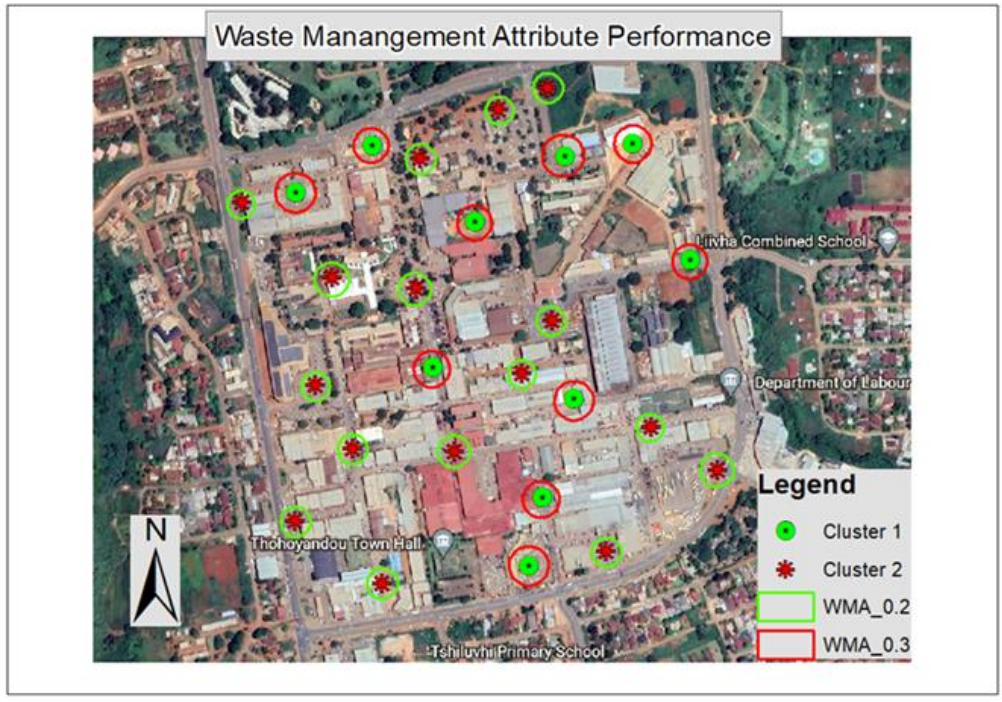
N= 25 Public spaces

Source: Author Construct, (2022)

Cluster 2 type of public spaces are generally performing relatively well in responding to the COVID-19 pandemic as evidenced by positive and high standardized mean score z values when compared to cluster 1 (one) type of public spaces. Cluster 2 type of public spaces were found to be highly responsive to COVID-19 pandemic in relation to demographic and water provision study constructs, where high mean score

z values were recorded. Despite positive z score values the relative performance of such public spaces was poor when it comes to waste management, environmental and public space management behaviours study constructs.

On the other hand, cluster 1 (one) type of public spaces were found to be constrained in all five study constructs. Serious constraints were observed in public space management behaviours and environmental study constructs where the highest negative means score z values were recorded. The spatial distribution of cluster performances according to various study construct shown in figure 4.4.3.



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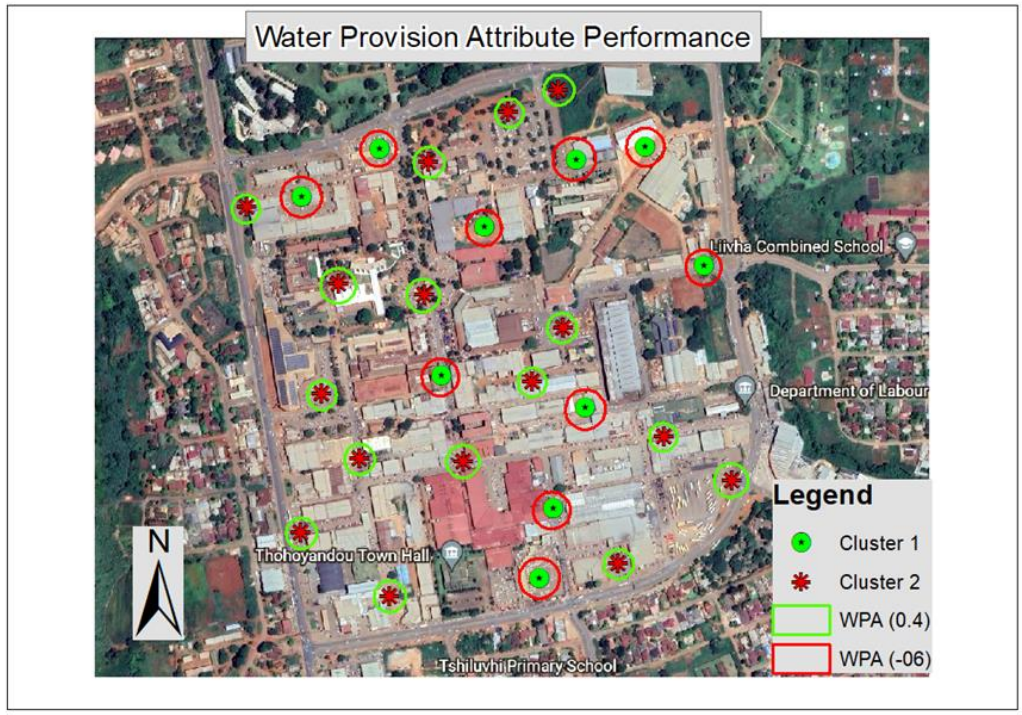

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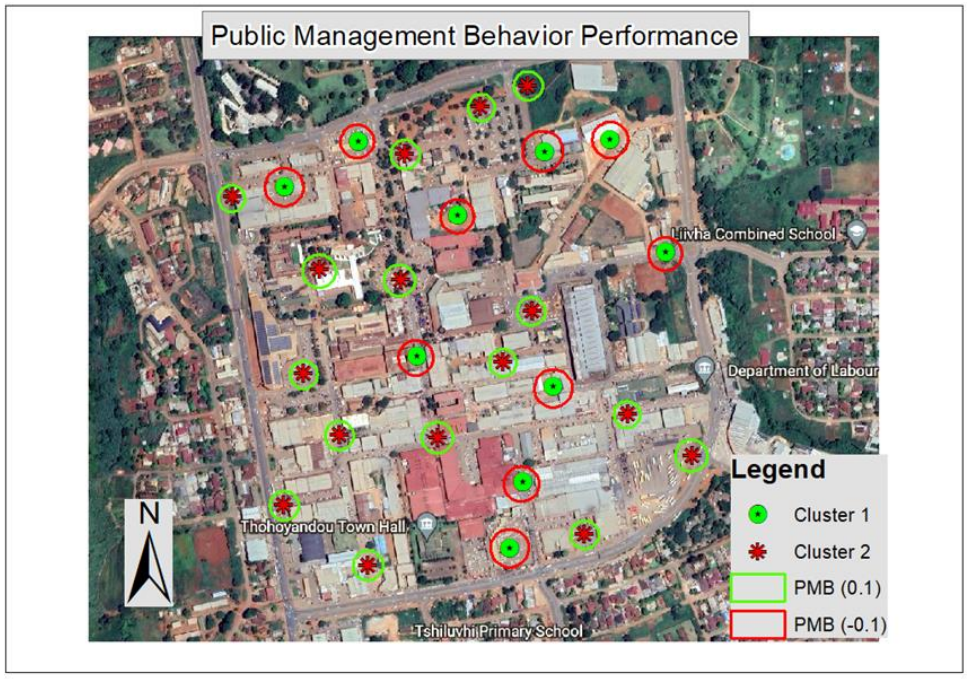

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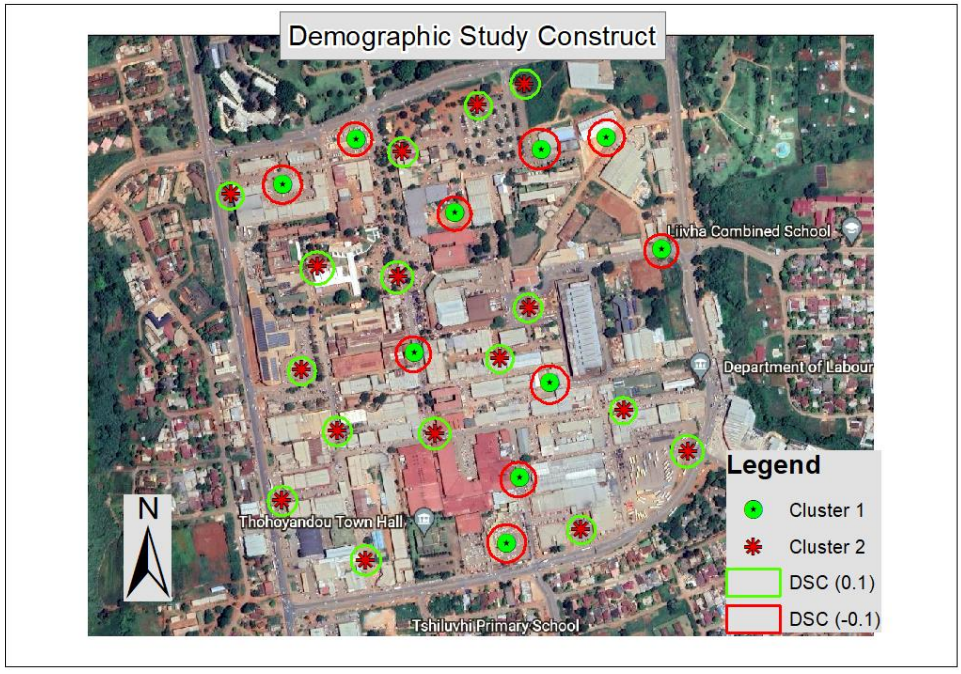

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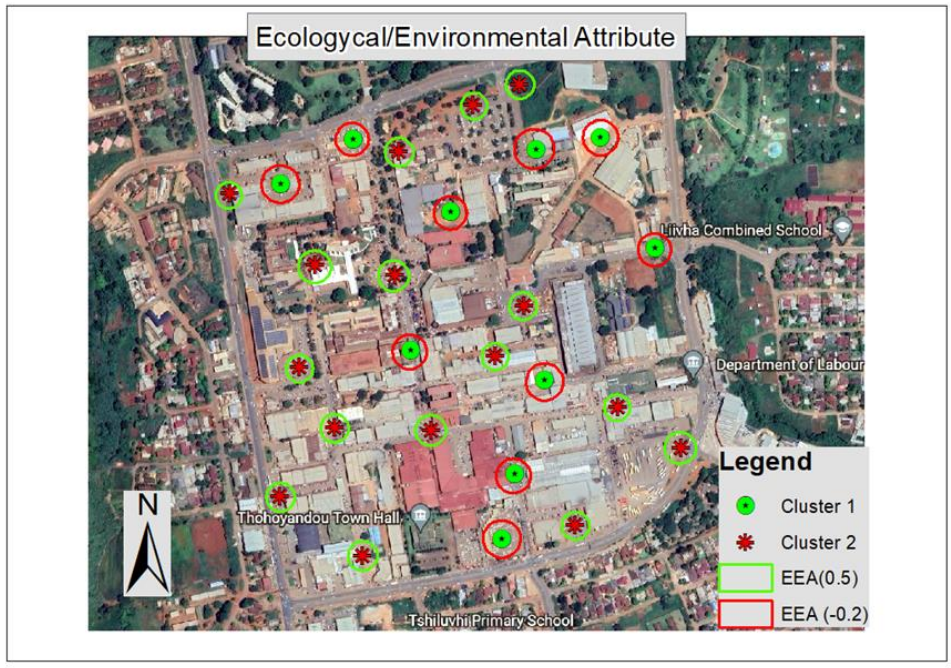

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Figure 4.4. 3:Spatial distribution of cluster performance according to (a) Waste management attribute performance (b) Water provision attribute performance (c) Public space management behaviour attribute performance (d) Demographic attribute performance and (d) Ecological/Environmental attribute performance.

Source: Author Construct, (2022)

A detailed analysis of cluster performance according to specific COVID-19 variables related to each study construct is given in the next sections.

4.4.3.2. Detailed cluster description

This section gives a detailed analysis of cluster performance according to specific COVID-19 variables. Such analysis is performed using standardized mean score z values since different types of Likert scales were used to capture observation on the field. Study results are discussed in the following subsections.

4.4.3.2.1. Cluster performance according to waste management study variables

In the context of waste management attributes, four critical variables were analysed based on standardized z mean score values. Study findings are summarized in table 4.4.1.

Table 4.4.1: **Cluster performance according to waste management study variables**

Waste management study variables.	Cluster type *	
	Type 1	Type 2
State of Sewerage system	-.84378	.11506
Environmental hygiene	1.46059	-.19917
Availability of COVID- 19 compliant ablution facilities	-.63003	.08591
State of ablution facilities	1.44258	-.19672

N=25 Public space

*Cluster type description based on standardized mean score z values

Source: Author Construct, (2022)

Cluster type 1(one) findings indicate that variables such as state of sewage system and availability of COVID-19 compliant ablution facilities in Thohoyandou CBD public spaces are responding poorly to COVID-19 pandemic as shown by negative z score values. Such findings present another area of concern since COVID- 19 compliance with the state of sewerage and ablution facilities requires that all facilities are in a good state. On the other hand, results revealed that cluster 1 (one) type of public spaces are performing relatively better in relation to environmental hygiene and state of ablution facilities. The positive z mean score values show that cluster 1 type public spaces are responding relatively well to COVID-19 pandemic with regards to this two waste management variables.

Study findings also revealed that type 2 public spaces are performing poorly on environmental hygiene and state of ablution facilities as shown by negative z mean

score values. This is an area of serious concern since type 2 public spaces constitute 60% of all public spaces that were investigated. Additional evidence from pictures taken in the field also shows that the environmental hygiene situation of some type 2 public spaces needs attention (See plate 4.6).

Plate 4. 6: Evidence of poor environmental hygiene practices in type 2 public spaces (Public Square)

Source: Author Construct, (2022)

Plate 4.6 portrays poor environment hygiene practices in Thohoyandou CBD public spaces in a way that has negative consequences for the environment and will increase the spread of COVID-19 pandemic.

4.4.3.2.2. Cluster performance according to water provision study variables

In the context of water provision attributes, two critical variables were analysed using cluster description based on standardized Z score values. Study findings are summarized in the table 4.4.2.

Table 4.4.2: Cluster **performance according to water provision study variables.**

Water provision study variables	Cluster type *	
	Type 1	Type 2
Availability of water tap	-0.16	-1.00
State of water drainage	-0.10	0.67

N=25 Public space

*Cluster type description based on standardized mean score z values

Source: Author Construct, (2022)

Cluster type 1(one) findings indicate that variables such as availability of water tap and state of water drainage in Thohoyandou CBD public spaces are responding poorly to COVID-19 transmission as shown by negative Z score values this presents another area of concern since water utility plays key role in curbing spread of Coronavirus. Study findings also revealed that type 2 public spaces are performing relatively better in relation to availability of water tap and state of water drainage as shown by positive Z score values. Additional evidence from pictures taken in the field also shows that the unavailability of water facilities in Thohoyandou CBD public spaces of some type 2 public spaces need attention (See plate 4.6).

Plate 4. 6 : Unavailability of water facility in Thohoyandou Bus rank ablution blocks.

Source: Author Construct, (2022).

Plate A illustrates ablution blocks in Thohoyandou CBD with inadequate water facilities, on the entrance a red arrow indicates the use of bucket by public space users, poor access of water is another area of concern as sanitation and hygiene wash services are an essential part of preventing the spread of COVID-19 pandemic.

4.4.3.2.3. Cluster performance according to public space management behaviour study variables

In the context of public space management attributes, six critical variables were analysed using Cluster description based on standardized Z score values. Study findings are summarized in the table 4.4.3.

Table: 4.4.3: Cluster performance according to public space management study variables

Public space management behaviour study variables.	Cluster type *	
	Type 1	Type 2
Informative mask-wearing messaging	**0.37**	**-0.24**
Presence of helpful preventative COVID-19 messages	**0.49**	**-0.33**
Social distancing markings	**0.98**	**-0.66**
Availability of public space surveillance (cameras)	**0.28**	**-0.21**
Availability of thermal cameras to monitor temperature	**0.32**	**-0.21**
Availability of security personnel to monitor public space user behaviours	**0.80**	**-1.73**

N=25 public spaces

*Cluster type description based on standard based z mean score values

Source: Author Construct, (2022)

Cluster 1(one) type findings indicate that variables such informative mask-wearing messaging, presence of helpful preventative COVID-19 messages, social distancing markings, availability of public space surveillance (cameras), availability of thermal cameras to monitor temperature and availability of security personnel to monitor public space user behaviours analysed using cluster description based on standardized Z score values in Thohoyandou CBD public spaces are responding relatively better to COVID-19 transmission as shown by positive Z score values.

Study findings also reveal that type 2 public variables are responding poorly to the spread of COVID-19 pandemic were analysed using cluster description based on standardized Z score values as shown by negative Z score values in Thohoyandou CBD public spaces are responding poorly to COVID-19 transmission as shown by negative Z score values. This presents another area of concern since management of

public space users behaviour considered as a significant factor in curbing spread of coronavirus. Additional evidence from pictures taken in the field also shows absent of preventative COVID-19 massages (see plate 4.8) and absent of mask wearing by public space users (see plate 4.7).

Plate 4. 7: Absent of preventative COVID-19 massages in Thohoyandou bus rank.

Plate 4. 8 : Absent of mask wearing by public space users in Mvusuludzo street walkway and side parking.

Source: Author Construct, (2022).

Findings portrayed in plate 4.8 and Plate 4.9 shows absence of preventative COVID-19 massages and absence of mask wearing by public space users is another area of concern as adhesive backed COVID-19 labels are perfect solutions to inform public space users' protocols such as to enforce wearing of masks. This will stop the spread of pandemic in Thohoyandou public spaces.

4.4.3.2.4. Cluster performance according to demographic study variables

In the context of demographic attributes, four critical variables were analysed using cluster description based on standardized Z score values. Study findings are summarized in the table 4.4.4.

Table4.4.4: Cluster performance according to demographic study variables

Demographic study variables	Cluster type *	
	Type 1	Type 2
Density of public users	**-0.34**	**-0.23**
Evidence of social distancing by public space users	**-0.39**	**0.26**
Behavioural attitude of public space users during peak hours	**-0.36**	**0.24**

N=25 Public spaces

*Cluster type description based on standard based Z mean score values

Source: Author Construct, (2022)

Cluster type 1 (one) findings indicate that variables such as evidence of social distancing, and density of public space, behavioural attitude of public space users using cluster description based on standardized Z score values in Thohoyandou CBD public spaces are responding relatively poor to COVID-19 transmission as shown by negative Z score values. This presents another area of concern; demographic characteristics are highly associated with severe death rates due to the spread of COVID-19 in public spaces.

Study findings also reveal that type 2 public spaces, two variables density of public space, behavioural attitude and evidence of social distancing are responding better to the spread of COVID-19 as shown by positive z score values, whereas one variable density of public space is responding poorly to COVID-19 transmission as shown by negative Z score values this presents another area of concern since density of public spaces is considered as a significant factor in curbing spread of coronavirus. Additional evidence from pictures taken in the field also shows evidence of high population in Thohoyandou CBD public space (street walkways) see plate 4.9.

Plate 4. 9: Evidence of high population density in Thohoyandou Public space (street walkways)

Source: Author Construct, (2022)

Evidence of high population density in Thohoyandou CBD public space street walkways shown by respectively high concentration of public space users performing different economic activities in the public space (street walkways), they are hotspots of COVID-19 infections and will increase the spread of coronavirus.

4.4.3.2.5. Cluster performance according to ecological/environmental study variables

In the context of ecological/environmental attributes, four critical variables were analysed using cluster description based on standardized Z score values. The findings are summarized in the table 4.4.5.

Table 4.4.5: Cluster performance according to ecological/environmental study variables

Ecology/environmental study variables	Cluster type *	
	Type 1	Type 2
Quality of landscaping	-0.40	0.26
Prevalence of littering	- 0.16	0.11
Quality of air	-0.32	0.21
Access to green space	-0.28	0.18

N=25 public spaces

*Cluster type description based on standard based z mean score values

Source: Author Construct, (2022)

Cluster type 1 (one) findings indicate that variables such as quality of landscaping, prevalence of littering, quality of air and access to green space using cluster description based on standardized Z score values in Thohoyandou CBD public spaces are responding relatively poor to COVID-19 transmission as shown by negative Z score values. This presents another area of concern since management of environmental aspects are considered as a significant factor in curbing spread of coronavirus. Study findings also reveal that type 2 public spaces are responding better to spread of COVID-19 as shown by positive Z score values. Additional evidence from pictures taken in the field also indicate poor landscaping in Thohoyandou CBD public spaces (see plate 4.11).

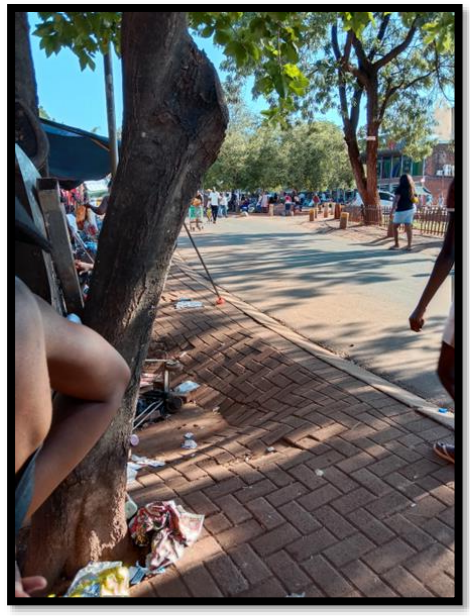

Plate 4. 10 : Poor quality of landscaping in Thohoyandou CBD

Source: Author Construct, (2022)

Thohoyandou CBD public spaces have poor quality landscaping and the significance offering accessible green space contribute to health wellbeing of public space users however 75 % 0f Thohoyandou public space are paved and less green space infrastructure, see plate 4.11.

Plate 4. 11 **:** Thohoyandou public spaces (Taxi rank).

Phase 5: Regression analysis

4.5: To determine urban management factors that are significant in limiting the spread of COVID- 19 in public spaces of Thohoyandou CBD

Regression analysis was used as a statically tool to perform a causality analysis to determine how significant the study variables identified were in limiting the spread of COVID-19. The perceived safety levels by public space users determined at the questionnaire stage were used to depict the dependent variable (Y), while a series of

urban planning and urban management variables ($\mathbf{X_i}$) were used as independent variables to explain the relative COVID- 19 safety situations of each user in each public space. Because of the nature of the dependent variable, the multiple regression analysis (RMA) model was used to depict such an association. The results of analysis are discussed below.

4.5.1. Model evaluation

Model was evaluated for the goodness of fit using the R square change value as well ANOVA testing. Collinearity diagnosis was done by calculating tolerance levels to make sure that there is no association between independent variables that may limit their overall explanatory power. Results reveal that MRA is the most ideal regression model to use. Data from both analysis square value (see table 4.5.2.) and ANOVA test results (Table 4.5.1.) show that the goodness of fit results are significant P-value < 0.005.

Table 4.5.1: Model evaluation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.813[a]	.661	.572	.327	.661	7.414	5	19	<,001
a. Predictors: (Constant), EEA, WMA, WPA, DSC, PMB									

Sources: (Author Construct 2022).

Table 4 5.2: ANOVA test results.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.967	5	.793	7.414	<,001[b]
	Residual	2.033	19	.107		
	Total	6.000	24			
a. Dependent Variable: Safety of Public Space						
b. Predictors: (Constant), EEA, WMA, WPA, DSC, PMB						

Sources: (Author Construct 2022).

R square value of 0.661 shows that the model predictors can explain 66.1 % of the variation in the safety situation characterizing 25 public spaces

4.5.2. Multiple Regression Analysis (MRA) Regression results

As mentioned in methodology section perceived safety levels by public space users was used as the continues dependent in MRA. The relative perceived safety levels among the two generated clusters of public spaces are shown in figure 4.51.

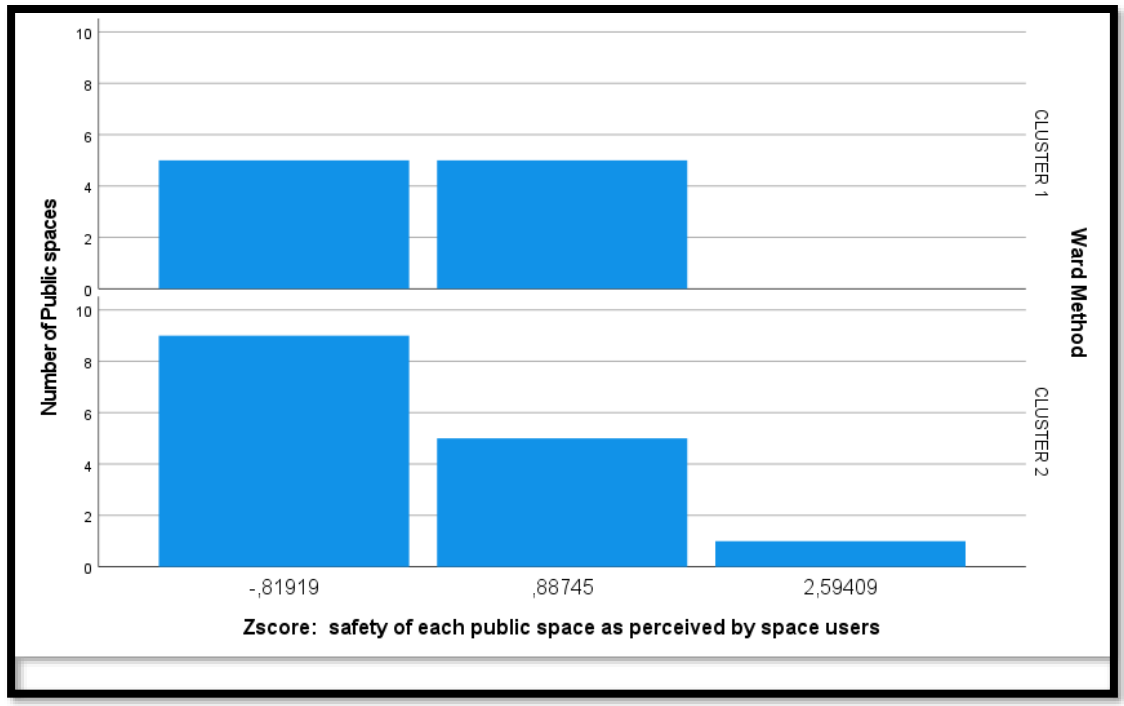

Figure 4.5. 1: Regression, Public space safety according to each cluster

Source: Author Construct, (2022).

Fourteen public spaces were unsafe by public space users, nine belonging to cluster 2 type and five belonging to cluster 1 type. Both clusters have 5 public spaces that are defined as moderately safe. Only one public space was defined as very safe in cluster 2 type.

The study used a recommended cut-off value of 0.05 to perform MRA. All variables with a P-value < 0.05 will be defined as significant factor defining safety in public spaces of Thohoyandou CBD spaces. Results are shown in table 4.5.3.

Table 4.5.3: Ordinal least squares (OLS) Regression results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.600	.065		24.456	<,001		
	WMA	.233	.160	.253	1.457	.161	.593	1.686
	PMB	-.027	.214	-.028	-.126	.901	.371	2.695
	WPA	.482	.140	.649	3.445	.003	.503	1.990
	DSC	-.108	.167	-.110	-.643	.528	.610	1.640
	EEA	.284	.213	.272	1.332	.199	.427	2.342
a. Dependent Variable: Safety of Public Space								

Source: Author Construct, (2022).

The most significant factor defining safety in public spaces of Thohoyandou CBD is water provision since it has a P-value <0.05 this implies that any interventions targeted at improving COVID-19 safety need to prioritize water provision.

Data from HCA has also revealed the importance of waste management, environmental quality, and user behaviours in curbing the spread of COVID- 19 in public spaces to come up with an urban planning-based resilience framework that will boost the ability of public spaces to respond to the challenges of a pandemic.

4.6. Objective 4: To come up with an urban planning-based resilience framework that will boost the ability of public spaces to respond to the challenges of a pandemic.

Results from HCA and MRA was used to identify study variables that may be defined as sensitive to the spread of COVID-19. Quasi-sensitive analysis approach helped the researcher to identify important resilience variables used in developing a resilience framework that will boost the ability of public spaces to respond to the vulnerability of a pandemic and helping public spaces in Thohoyandou CBD to get through and overcome hardship caused by COVID-19 pandemic.

To come up with urban planning-based resilience framework the researcher recommends Resilience framework model which will reduce COVID-19 exposure and sensitivity, to stimulate public space capacity to adapt or withstand the spread of COVID-19. The researcher cluster each study variables vulnerability according to each cluster in terms of exposure, sensitivity, and adaptability factors of Urban based

Resilience framework model to measure COVID-19 risk exposure, see table 4.6.1 and figure 4.5.2.

Table 4.6.1: Urban Planning Resilience Framework model vs COVID-19 risk exposure measurement.

Indicator layers	**Variables indicator**		**Highlights of findings**	**Urban planning resilience framework innervations**
Exposure layers	**Cluster type 1** • State of sewage system • Poor environmental hygiene • Social distancing and wearing of mask.	**Cluster type 2** • Prevalence of Littering • State of water drainage	• There is a serious problem of littering in most Thohoyandou CBD public spaces. • Availability of water in sample public spaces is poor not performing. • Poor state of water/sewer drainage	. • Provision of Public space monitoring and maintenance. • Redesign of public spaces • Providing waste management functional core urban services • Enforcing Safely managed water, sanitation, hygiene (WASH) services and promoting hygienic practice
Sensitivity indicator	• Availability of COVID- 19 compliant ablution facilities • Poor air quality	• Inadequate water facilities • Access to water taps	• Poor performance of quality of landscaping, quality of air and Poor access to green space in • Thohoyandou CBD public spaces. • Unfavourable conditions thus indicate that most of public	• Monitoring of public space user's behavioral change. • Enforcement of informative sign boards to educate the public on basic hygiene in public spaces.

		• Limited access to green space • State of ablution facilities	space users' behaviour in Thohoyandou CBD is poorly managed and monitored.	• Placement of multiple bins around public spaces, educate public space users
Adaptive capacity indicator	• Limited public spaces • Absent of informative COVID-19 massages	• High population density • Poor landscaping • Absent of public space • Absent of cameras to monitor public spaces	• Congested public spaces were observed. • Difficult for public space users to practice social distancing	• Implementation of Smart technologies. • Provision of campaign and awareness • Increase number and diversity of trees, • Provision of inclusive good amenities and infrastructure • Provision of inclusive design

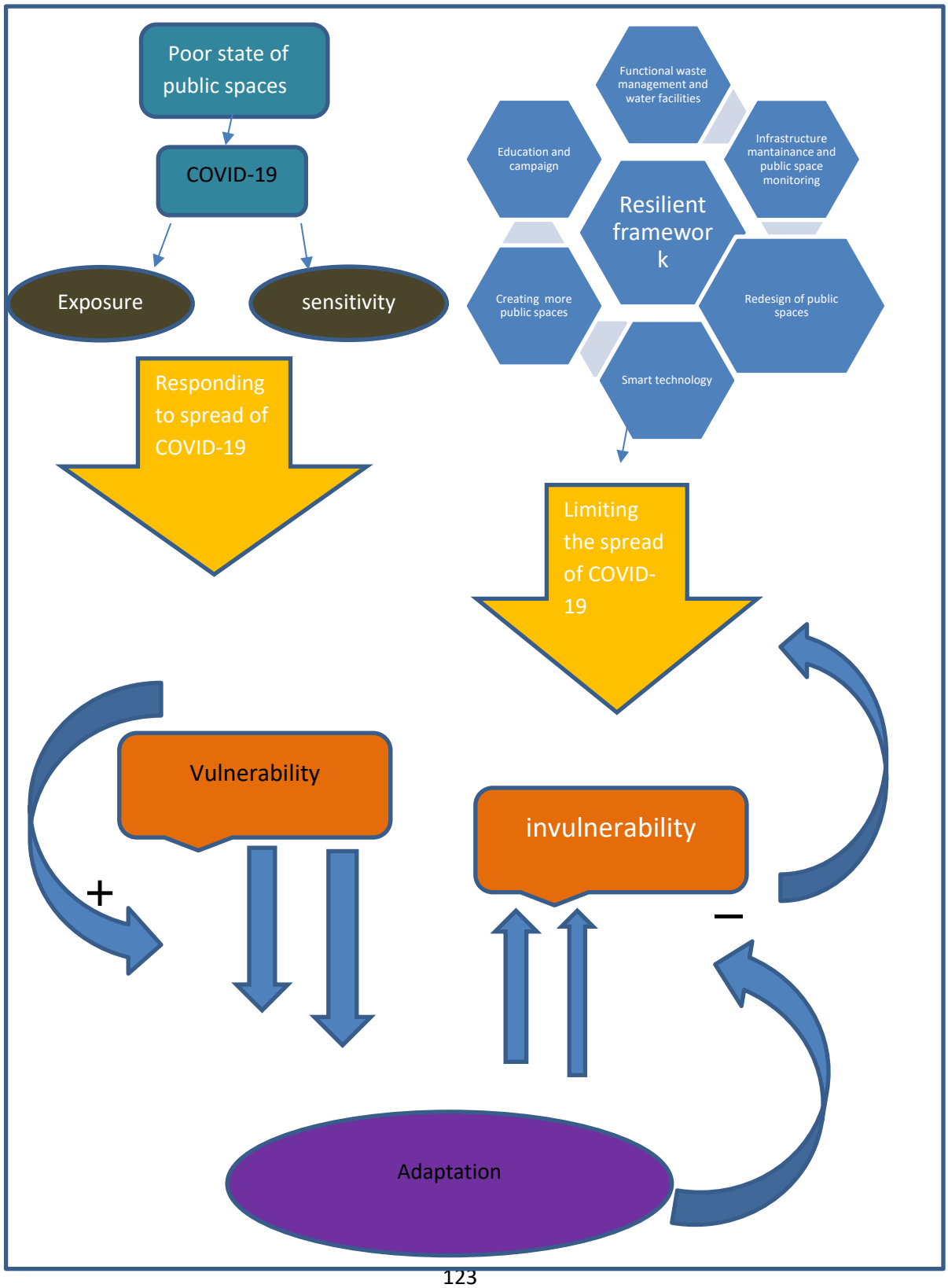

Figure 4.5. 1: Urban planning resilience framework model

Sources: (Author Construct 2022).

4.7. Chapter summary

This chapter analysed, presented, and interpreted data related to the urban planning perspective of public spaces dealing with COVID-19 pandemic, the aspects that were covered in this chapter include the descriptive statistical analysis include normality test, HCI and regression analysis, study constructs variables that used for accessing of public spaces performance for COVID-19. Data was then presented with respect to the research objectives.

CHAPTER 5: CONCLUSION AND RECOMMENDATION

5.0. INTRODUCTION

The chapter is divided into the following major sections.

- Background of the study
- Summary of major findings
- Recommendations
- Areas for future research

5.1. Background of study

The objectives of the study were as follows: To analyse urban planning and urban management attributes that are critical in limiting the spread of COVID-19 in public spaces, To identify and categorize public spaces that are likely to pose a threat to limiting the spread of the COVID-19 pandemic in Thohoyandou CBD, To determine urban management factors that are significant in limiting the spread of COVID- 19 in public spaces of Thohoyandou CBD and To come up with an urban planning-based resilience framework that will boost the ability of public spaces to respond to the challenges of a pandemic.

Three structured questionnaires and an observational checklist were used to collect raw data. The Statistical Package for Social Sciences (SPSS) version 27 was used to analyse quantitative data in the form of descriptive statistics. The data was presented in the form of tables, frequency tables, and pie charts, which were generated by the latest version of SPSS (V27). The next section summarises the findings of the study.

5.2. Summary of major findings

5.2.1. To analyze urban planning and urban management attributes that are critical in limiting the spread of COVID-19 in public spaces.

The first objectives were to analyse urban planning and urban management attributes that are critical in limiting the spread of COVID-19 in Thohoyandou CBD public spaces this was achieved by literature review and identified emerging issues. Recognizable patterns of connection between such public space themes and the spread of COVID-19 were done through the method of pattern matching as proposed by Yin, (2009).

To identify and analyse such critical attributes, the study critically reviewed public spaces issues, concepts, theories, and policy frameworks to identify important open-space themes that could be linked to the spread of COVID-19. The identification of such important themes was done through thematic mapping.

- In such a method, the theoretical realm defines several open space-COVID-19-related variables, as compared with the case study realm that comprised 25 public open spaces. The comparison permitted identifying recognizable links between such variables and the spread of COVID-19 infections as guided by the hypothetical relationship. It is the comparison between the theoretical real and the case study / observational realm that permits the research to conclude possible links between urban planning and urban management variables in each public space and the possible spread of COVID-19 as hypothesized.

Summary of findings

Public space must be responsive to the COVID-19 pandemic, the researcher identifies a study construct that linked COVID-19 with urban design management by employing critical analyses. To achieve this objective, this study developed a series of study constructs that it classified as follows: waste management construct, water provision, public space management behaviour construct, demographic, and ecological/environmental construct, these were sourced from literature (Jepson et.al., 2017; Burki, 2020; WHO, 2020; Alves, 2017; Honey-Roses, 2020; Duggal, 2020; Dantas et al., 2020; Filonchyk et al., 2020; UN-Habitat, 2020; Bricki and Green, 2015).

Public spaces performance to COVID-19 pandemic according to study constructs

A review of responsive public spaces to COVID-19 pandemic was performed using mean as a statistical measure to analyse urban planning and urban management attributes that were hypothesized to have an impact on the spread of COVID-19 in public spaces. Such a "mean analyse approach" was found to be a deal since most urban planning and management variables under analysis were captured using 5 points Likert scale (where 1 (one) is the lowest score and 5 is the highest score).

5.2.1.1. Waste management issues

Analysis of findings reveal that environmental hygiene conditions in simple public spaces of Thohoyandou CBD are poor and this is a worrying statistic given that good environmental hygiene is critical in the spread of COVID-19. Results show favourable state of the sewage system as shown by a relatively high score of 2,72, and results show poor performance of public spaces in terms of COVID- 19 compliance and ablution facilities.

5.2.1.2. Water provision issues

Analysis of findings shows the low mean score value of 1.16 indicates that on average availability of water in public spaces in Thohoyandou CBD is poor. This is a worrying statistic given that the availability of water taps is the most critical variable in spreading the COVID-19 pandemic in most public spaces, state of water drainage has a low mean score value of 1.92 indicate their state is poor.

5.2.1.3. Public space management behaviors

Informative mask-wearing messaging, presence of helpful preventative COVID-19 messages, social distancing markings, availability of public space surveillance

(cameras), availability of thermal cameras to monitor temperature and availability of security personnel to monitor public space user behaviours are characterized by unfavourable conditions thus indicating that most of public space users behaviour in Thohoyandou CBD is poorly managed and monitored this was shown by a relatively (mean score value of 1).

5.2.1.4. Demographics

Analysis of results shows that population density in sample public spaces of Thohoyandou CBD was not a serious issue, this was probably because most public space users are increasing getting aware that congested spaces are the main drivers for the spread of COVID-19. Congested public spaces were observed and such spaces make it difficult for users to practice social distancing.

5.2.1.5. Ecological/environmental issues

Analysis of findings shows that quality of landscaping, quality of air and access to green space influence the spread of COVID 19 in Thohoyandou CBD public spaces. There is a serious problem of littering in most Thohoyandou CBD public spaces.

Table 5.1. Summary of public space performance to COVID-19 pandemic in Thohoyandou CBD

Where it is performing	**here it's NOT performing**
Waste management • **Favourable state of the sewage system is performing.** • **Availability of COVID-19 ablution facilities** • **Water provision** **favourable functionality of the water source** **Demographic**	Waste management • Environmental hygiene conditions in simple public spaces are poor not performing. • Absent of COVID- 19 compliance with ablution facilities Water provision • Availability of water in sample public spaces is poor not performing. • Poor state of water drainage

• **Population density in sample public spaces in some of public spaces was performing.**	Public space management behaviours • All the variables are characterized by unfavourable conditions thus indicate that most of public space users' behaviour in Thohoyandou CBD is poorly managed and monitored. Demographic • Congested public spaces were observed. • Difficult for public users to practice social distancing. Ecological/environmental • Poor performance of quality of landscaping, quality of air and access to green space, • There is a serious problem of littering in most Thohoyandou CBD public spaces.

Sources: (Author Construct 2022).

5.2.3. To identify and categorize public spaces that are likely to pose a threat to limiting the spread of the COVID-19 pandemic in Thohoyandou CBD

HCA was used as statical tool to identify unexpected similarities and differences among a sample of 25 urban public spaces in Thohoyandou CBD spaces. This enables the identification of urban planning and urban management attributes that explain why certain urban public spaces are better placed to limit the spread of COVID-19 than others in Thohoyandou CBD public spaces. More precisely such analysis helps in grouping together those urban public spaces that respond better to COVID-19 and isolating them from another grouping that responds poorly to the spread of COVID-19 in Thohoyandou CBD public spaces.

HCA allows the categorization of public spaces that are likely to pose a threat to limiting the spread of the COVID-19 pandemic in Thohoyandou CBD. Before conducting HCA, raw data was processed for "homogenization" and "non-dimensionality" which is a standard requirement as there can then be questions of examining the homogeneity across cases of the distribution of the scaled values (Hall, 2003). Study constructs were first tested for normality. The results of hierarchical clustering are visualized using a tree-like structure known as a dendrogram.

Summary of Findings

Study reveals two main cluster type of public spaces in Thohoyandou CBD as presented to the following section:

5.2.3.1. Cluster type 1 (one) findings

An analysis of the study results shows that waste management study construct variables such as state of sewage system and availability of COVID-19 compliant ablution facilities in Thohoyandou CBD public spaces are responding poorly to COVID-19 pandemic whereas public spaces are performing relatively better in relation to environmental hygiene and state of ablution facilities.

Results of findings shows that water provision study construct variables such as availability of water taps and state of water drainage in Thohoyandou CBD public spaces are responding poorly to COVID-19 transmission. Public space management behaviour variables such as informative mask-wearing messaging, presence of helpful preventative COVID-19 messages, social distancing markings, availability of public space surveillance (cameras), availability of thermal cameras to monitor temperature and availability of security personnel to monitor public space user behaviours as in Thohoyandou CBD public spaces are responding relatively better to COVID-19 transmission.

Demographic study construct variables such as social distancing, and density of public space behavioural in Thohoyandou CBD, public spaces are responding relatively poor

to COVID-19 transmission. Ecological/Environmental study construct variables such as quality of landscaping, prevalence of littering, quality of air and access to green space using cluster description based on standardized Z score values in Thohoyandou CBD public spaces are responding relatively poor to COVID-19.

5.2.3.2. Cluster type 2 findings

Results of findings shows that waste management study construct variables, public spaces are performing poorly on environmental hygiene, and this is a cause for concern since type 2 public spaces constitute 60% of all public spaces that were investigated. Water provision variables are performing relatively better in relation to availability of tap water and state of water drainage.

Public space management behaviour variables are responding poorly to the spread of COVID-19 pandemic were analysed using cluster description based on standardized Z score values as shown by negative Z score values in Thohoyandou CBD public spaces are poorly responding. Density of public space behavioural attitude and evidence of social distancing are responding better to spread of COVID-19, variable density of public space is responding poorly to COVID-19 transmission.

Table 5.2. Summary of cluster performance

Cluster type performance	Cluster type 1	Cluster type 2
Waste management	• Poor performance of state of sewage system and availability of COVID-19 compliant ablution facilities. • Public spaces are performing relatively better in relation to environmental hygiene and state of ablution facilities.	• Performing poorly on environmental hygiene and state of ablution facilities
Water provision	• Availability of water taps and state of water drainage in Thohoyandou CBD public spaces are responding poorly.	• Availability of water tap and state of water drainage performing better

Public space management behaviours	• Informative mask-wearing messaging, presence of helpful preventative COVID-19 messages, social distancing markings, availability of public space surveillance(cameras), availability of thermal cameras to monitor temperature and availability of security personnel to monitor public space user behaviours are responding better	• All variables are responding poorly
Demographic	• Poor social distancing, and density of public spaces Behavioural	• Density of public space Behavioural attitude and evidence of social distancing are responding better to spread. • Density of public space is responding poorly.
Ecological/Environmental	• Poor quality of landscaping, prevalence of littering, quality of air and access to green space	• Public spaces are responding better to COVID-19 pandemic

Sources: (Author Construct 2022).

5.2.4. To determine urban management factors that are significant in limiting the spread of COVID- 19 in public spaces of Thohoyandou CBD

Regression analysis was used as a statically tool to perform a causality analysis to determine how significant the study variables identified were in limiting the spread of COVID-19 in Thohoyandou CBD public spaces. The perceived safety levels by public space users determined at the questionnaire stage were used to depict the dependent variable (Y), while a series of urban planning and urban management variables ($\mathbf{X_i}$) were used as independent variables to explain the relative COVID- 19 safety situations of each user in each public space. Because of the nature of the dependent variable, the multiple regression analysis (MRA) regression model was used to depict such an association.

Values from the regression model were used to depict the significance of each study variable (i.e. the urban planning and/or urban management attribute). The recommended cut-off value is 0.05. All variables with a P-value < 0.05 will be defined as significant factor to limit the spread of COVID-19 pandemic in Thohoyandou CBD.

Before applying the model, it was evaluated for the goodness of fit using the R square change value as well as performing an ANOVA test. Collinearity diagnosis was done by calculating tolerance levels to make sure that there is no association between independent variables that may limit their overall explanatory power.

Summary of findings

Fourteen public spaces were unsafe by public space users, nine belonging to cluster 2 type and five belonging to cluster 1 (one) type. Both clusters have 5 public spaces that are defined as moderately safe. Only one public space was defined as very safe in cluster 2 type. The most significant factor defining safety in public spaces of Thohoyandou CBD is water provision since it has a P-value <0.05. This implies that any interventions targeted at improving COVID-19 safety need to prioritize water provision.

5.3. Recommendations

This section of study seeks to outline the recommendations as drawn from the study conclusion of urban planning perspective of public spaces dealing with COVID-19 pandemic. The study recommends the use of an urban planning-based resilience framework that will boost the ability of public spaces to adequately respond to challenges of pandemic. The development of such urban planning perspective was guided by the analysis results from HCA and MRA such a quasi-sensitive analysis approach will help identify important resilience framework that will boost the ability of public spaces to respond to the challenges of a pandemic. Thus, it was concluded that there are two unique clusters of public spaces with associate with responding

differently to COVID-19 challenges. The following recommendations below will be presented according to cluster type.

5.3.1. Cluster type one recommendations

Cluster 1(one) is made up of 10 public spaces accounting for 40 % of the total as such the measure constrains associate with poor performance of public spaces dealing with COVID-19 pandemic. The following constrains have been identified as major challenges in cluster 1: limited public spaces, overpopulated, poor waste management, absent of informative COVID-19 massages, inadequate water facilities, poor hygiene, and pollution. To create public spaces that are responsive to the challenges posed by the COVID-19 pandemic, we conclude by recommending the implementation of a public space resilient framework that builds on several pillars, providing more public spaces to reduce the chances of overcrowding, providing functional core urban services such as waste management and the provision of water to promote hygienic practices. Informative sign boards are also required to educate the public on basic hygiene in public spaces. Safely managed water, sanitation, and hygiene (WASH) services are an essential part of preventing and protecting human health during infectious disease outbreaks, including the current COVID-19 pandemic. Safely managed WASH services are also critical during the recovery phase of a disease outbreak to mitigate secondary impacts on public space user's livelihoods and well-being. There is need to reduce air pollution, which makes them potentially more vulnerable to adverse health impacts, including COVID-19.

5.3.2. Cluster type 2 recommendations

Cluster 2 is made up of 15 public spaces accounting for 60 % of the total as such the measure constrains associate with poor performance of public spaces dealing with COVID-19 pandemic. The following constraint have been identified as a major challenge in cluster 2: lack of COVID-19 compliances, poor hygiene, littering, population density, poor land scapping, limited green space, poor management of public space user's behaviours, poor infrastructure, absent of innovative/smart

technologies and no social distancing. To create public spaces that are responsive to the challenges posed by the COVID-19 pandemic, the study recommends raising awareness and encouraging the public to desist from entering public spaces that are already congested. In addition, the study recommends a supply of sanitation in Thohoyandou and a large-scale public awareness campaign, which encourage good handwashing behaviours, hygiene, physical distancing, and the use of face masks using posters, videos, social media messages, radio announcements, and recordings broadcasted from cars and motorbikes. Frequent and proper hand hygiene is one of the most important measures that can be used to prevent infection with the COVID-19 virus.

By enhancing facilities and employing tried-and-true behaviour change strategies, wash services should promote more frequent and regular hand hygiene. The probability of COVID-19 transmission will decrease with lower population density. Redesigning public areas with the addition of smart city technologies like security cameras, streetlights, and creative landscaping to all Thohoyandou public places is also advised. The public areas in Thohoyandou CBD are recommended to be designed as follows in the post-pandemic period to be prepared to handle any pandemic in the future (see figure 5.1 and 5.2).

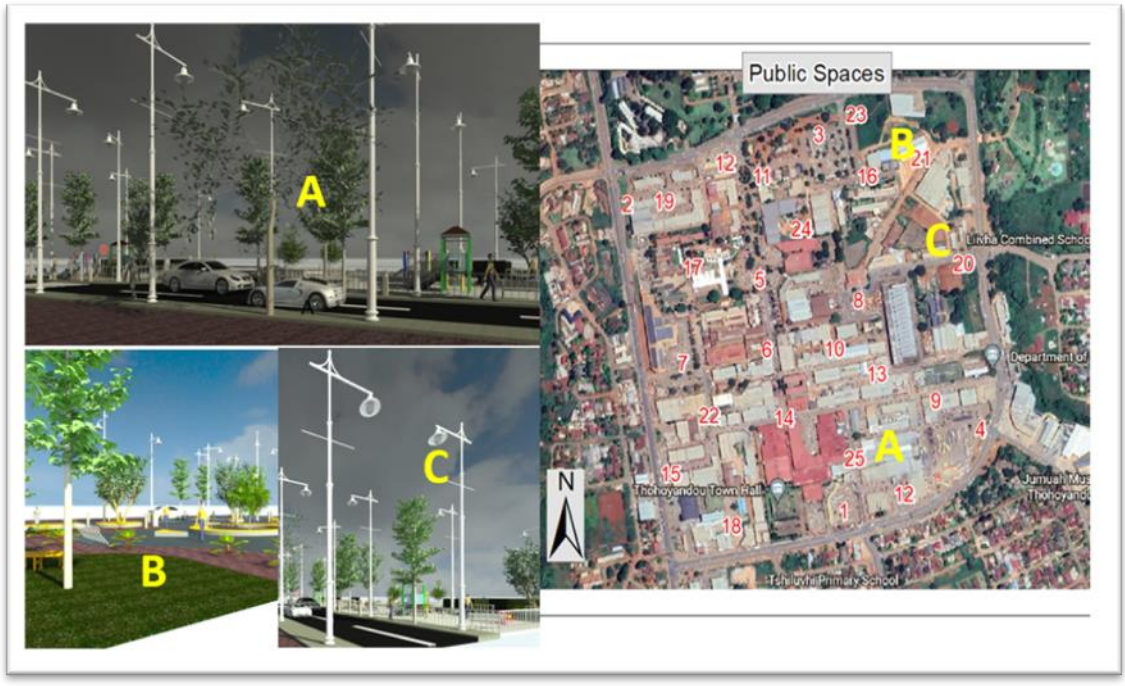

Figure 5. 1: Proposed public space smart technology Thohoyandou CBD

Sources: Author Construct 2022).

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Figure 5. 2: Proposed landscaping, functional water facilities and green spaces in Thohoyandou CBD public square.

Sources: (Author Construct 2022).

Table 3.3.: Summary of recommendations

Cluster type	**Main challenges**	**Urban planning-based resilience framework**	**Responsible authority**
Cluster type1 Taxi rank (Mvusuludzo) Bus rank Public square (Thohoyandou magistrate) Side parking	Limited public spaces	Provision of more public spaces	Private and public entities, Municipality
	Overpopulated	Encouraging the public to desist from entering public spaces that are already congested	Private and public entities, Municipality
	Poor waste management	Providing waste management functional core urban services	Private and public entities, Municipality
	Absent of informative COVID-19 massages	Enforcement of informative sign boards to educate the public on basic hygiene in public spaces.	Private and public entities, Municipality
	Inadequate water facilities	Water provision functional core urban services	Private and public entities, Municipality
	Poor hygiene	Enforcing Safely managed water, sanitation, and hygiene (WASH) services and promoting hygienic practice	Private and public entities, Municipality
	pollution	Limiting burning of garbage, planting many trees	Private and public entities, Municipality
Cluster type2 Walkways path Park (Thulamela municipality) Taxi rank (Plaza)	Lack of COVID-19 compliances	Educating and frequently conduct campaign awareness	Private and public entities, Municipality
	Poor hygiene	Provision of wash basin in every public space	Private and public entities, Municipality
	Littering	Placement of multiple bins around public spaces, educate public space users	Private and public entities, Municipality

	Running sewer	Enforcing long-term maintenance	Private and public entities, Municipality
	High population density		Private and public entities, Municipality
	Poor landscaping	Promote preservation of nature, regeneration of populated area, storm water management.	Private and public entities, Municipality
	Absent of public space management and maintenance	Promoting alternative to over policing, align government with community vision. Enforcing daily operation of physical space.	Private and public entities, Municipality
	Limited green space	Increase number and diversity of trees,	Private and public entities, Municipality
	Poor infrastructure	Provision of inclusive good amenities and infrastructure	Private and public entities, Municipality
	Absent of innovative/smart technologies to monitor public spaces	Provision of inclusive design	Private and public entities, Municipality

Sources: (Author Construct 2022).

5.4. Areas for future research

This study presents the significance and value in designing resilience future urban public spaces. The pandemic always shaped urban public spaces, it had a direct effect on the foundation of urban planning and the behaviour of public space users. Similar research can be conducted in areas such as Thavhani mall, University of Venda campus, Phangami mall and Sibasa town based on the perspective urban design strategies that will boost public spaces to cope with pandemic challenges. Furthermore, the other areas of study may include the following:

(i) The importance of public spaces during COVID-19

(ii) Innovative conceptual public space designs post-pandemic

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APPENDIX 1: LETTER OF INFORMATION

Title of the Research Study: **An urban planning perspective on the readiness of Thohoyandou CBD public spaces in dealing with the covid-19 pandemic *in Thulamela Municipality, Vhembe District: Limpopo Province.***

Principal Investigator/s/ researcher: Ratshilingana MM, B.URP

Co-Investigator/s/supervisor/s: Mr. Gondo T and Prof. P Bikam

Brief Introduction and Purpose of the Study:

The aim of the study is by using an urban planning perspective, the study seeks to assess the extent to which Thohoyandou CBD public spaces are ready to deal with covid-19 pandemic challenges.

Outline of the Procedures: a questionnaire will be used to collect data from each public space around Thohoyandou CBD in Thulamela Municipality, the recommended sample size is 25 public spaces, and 75 participants will be involved in the study. no treatment will be given to participants. All participants who are willing to participate in this study will be given consent forms to sign before the commencement of the study. Children under the age of 18 years will be included in the study after their parents/legal guardians have signed consent forms and the mothers have signed the assent forms. **Risks or Discomforts to the Participant**: there will be no foreseeable risk for the participants. A questionnaire will be used for data collection during an interview.

Benefits:

Your participation in this study is completely voluntary and you may refuse to answer any question or choose to stop participating at any time. There will be no compensation for your participation in the study. The information provided in this study will be a part of my master's degree project. The collected information could be used for the improvement of public space in Thohoyandou CBD, and help in bringing new intervention strategies to reduce the spread of COVID-19. The results of this study will also be published as a dissertation and manuscript in a peer-reviewed accredited journal.

Reason/s why participants may withdraw from the study: Participation in this study is voluntary. Refusal to participate will result in no penalty or loss of benefit to

which a participant is otherwise entitled. Participants have the right, therefore, to withdraw at any time from the study without any adverse results.

Remuneration: Participants will not receive any monetary or other types of remuneration.

Costs of the Study: No cost of the study will be expected to be covered by participants.

Confidentiality: All information provided by the participants during the research study will be kept confidential and codes will be used during data collection. Personal information will be handled with a high level of confidentiality and will be safely stored in a locked facility, hence, only the researchers will have access to this information.

Research-related Injury: the study does not pose any risk to the participants; No compensation will be offered for research-related injuries.

Persons to Contact in the Event of Any Problems or Queries:

- Mr. Gondo T and Prof. P Bikam (my supervisor and co-supervisor)
- The researcher, Ratshilingana MM, on tel. 0818561927

The University Research Ethics Committee assistance administrator on 015 962 9058

- Complaints can be reported to the Director: of Research and Innovation.

APPENDIX 2: CONSENT FORM

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, *Ratshilingana Mudanalo Maryline*, about the nature, conduct, benefits, and risks of this study - Research Ethics Clearance
- I have also received, read, and understood the above-written information (*Participant Letter of Information*) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, and educational status will be anonymously processed into a study report.
- Given the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and, of my own free will, declare myself prepared to participate in the study, and
- I understand that significant new findings developed during this research, which may relate to my participation, will be made available to me.

Full Name of Participant Date Time
Signature

I, ……. …… ……

……..

I, *Ratshilingana Mudanalo Maryline*, herewith confirm that the above participant has been fully informed about the nature, conduct, and risks of the above study.

Full Name of Researcher Date Signature

…… ……

……..……..

Full Name of Witness (if applicable) Date Signature

…….. ……..

…….

Full Name of Legal Guardian (if applicable) Date Signature

…… ……..

…….

APPENDIX 3: QUESTIONNAIRE

University of Venda

FACULTY OF ENGINEERING, SCIENCE, AND AGRICULTURE

SCHOOL OF ENVIRONMENTAL SCIENCES

DEPARTMENT OF URBAN AND REGIONAL PLANNING

Your participation in this study is completely voluntary and you may refuse to answer any questions or choose to stop participating at any time. There will be no compensation for your participation in the study. The information provided in this study will be a part of my master's degree project. The collected information could be used for the improvement of public space in Thohoyandou CBD

Researcher: **Ratshilingana MM**

Student No: **11635987**

Supervisor: **T Gondo**

Co-Supervisor: **P Bikam**

Administration information

Date: **……**

Questionnaire no: **…….**

SECTION A: Socio-demographic information

Male		Female	
	1		2

1. Sex

1. **Age**

15-25		25-30		30-45		45-60	
	1		2		3		4

2. **Educational Qualification**

Degree		Diploma		Grade10,11 and 12		Other	
	1		2		3		4

3. **Place of Interview**

Taxi rank		Bus rank		Plaza		Public Square	
	1		2		3		4

SECTION B: PUBLIC SPACE MANAGEMENT AND THE SPREAD OF COVID 19

4. **Do you feel safe from covid 19 in this public space?**

Very unsafe		Unsafe		Safe		Very Safe		Not Sure	
	1		2		3		4		5

5. **On a scale of 1 to 5 do you agree that the following urban planning and management attributes are critical in limiting the spread of covid 19 in**

common public spaces? Indicate your answers using the following 5- point scale.

1= Strongly disagree 2=Disagree 3=Not sure 4= Agree5= Strongly Agree

	Study construct	**1**	**2**	**3**	**4**	**5**
1.	Improved waste management conditions					
2.	Improved access to water					
3.	Reduced density of public space users					
4.	Improved environmental conditions					
5.	Improved public space management practices					

SECTION C: WASTE MANAGEMENT AND COVID 19 IN PUBLIC SPACES

6. **On a scale of 1 to 5 do you agree that the following waste management attributes are critical in limiting the spread of covid 19 in common public spaces? Indicate your answers using the following 5- point scale.**

1= Strongly disagree 2=Disagree 3=Not sure 4= Agree5= Strongly Agree

	Waste management attributes	**1**	**2**	**3**	**4**	**5**
1.	**Separation of waste**					
2.	**Availability of Waste disposal bin**					
3.	**Waste disposal bin with a cap**					
4.	**Running drainage system**					
5.	**Availability of bathrooms**					
6.	**Clean public space**					

SECTION D: WATER PROVISION AND COVID 19

7. **On a scale of 1 to 5 do you agree that the following water attributes are critical in limiting the spread of covid 19 in common public spaces? Indicate your answers using the following 5- point scale.**

1= Strongly disagree 2=Disagree 3=Not sure 4= Agree5= Strongly Agree

	Water provision attributes	1	2	3	4	5
1.	**Availability of water**					
2.	**Well-functioning water facilities**					
3.	**Improved water supplies**					
	Excellent water drainage system					
	Presence of hygienic water facilities					

SECTION E: PUBLIC SPACE MANAGEMENT AND BEHAVIORS VERSUS COVID 19

8. **On a scale of 1 to 5 do you agree that the following public space management and behavioural attributes are critical in limiting the spread of covid 19 in common public spaces? Indicate your answers using the following 5- point scale.**

	Public management and behavioral attributes	**1**	**2**	**3**	**4**	**5**
1.	**A present of helpful preventative COVID-19 massages**					
2.	**Helpful preventative COVID-19 massages**					
3.	**Improved common infrastructure**					
4.	**A presence of social distancing marking**					
5.	**Availability of surveillance cameras**					

SECTION F: DEMOGRAPHIC

9. **On a scale of 1 to 5 do you agree that the following Demographic attributes are critical in limiting the spread of covid 19 in common public spaces? Indicate your answers using the following 5- point scale**

	DEMOGRAPHIC	1	2	3	4	5
1.	Reduced density of public space users					
2.	A good behavioral attitude of public space users during peak hours					
3.	The presence of (vulnerable) homeless people					
4.	Facilities for homeless people (if required)					
5.	Existing social distancing by public space users					

SECTION G: ECOLOGICAL/ENVIRONMENTAL

10. **On a scale of 1 to 5 do you agree that the following Ecological/ Environmental attributes are critical in limiting the spread of covid 19 in common public spaces? Indicate your answers using the following 5- point scale.**

	ECOLOGICAL/ENVIRONMENTAL	1	2	3	4	5
1.	Quality of air					
2.	Access to green space					
3.	Prevalence of littering					

SECTION H: PROPOSED INTERVENTIONS

11. **The following public spaces are likely to pose a threat to limiting the spread of the COVID-19**

Please indicate your answers using the following 5- point scale

1= Strongly disagree 2=Disagree 3=Not sure 4= Agree5= Strongly Agree

	Public spaces	**1**	**2**	**3**	**4**	**5**
1.	Street and pavement					
2.	Parks					
3.	Taxi					
	bus rank					
4.	Public squares					

12. The following interventions are likely to help limit the spread of covid 19 in common public spaces.

1= Strongly disagree 2=Disagree 3=Not sure 4= Agree5= Strongly Agree

	Intervention	**1**	**2**	**3**	**4**	**5**
1.	Improved public awareness					
2.	Improved urban planning measures					
3.	Environment hygiene campaigns					
4.	Shutting down public spaces					
5.	Limiting access to public spaces					
6.	Limiting the use of shared facilities					
7.	Uninterrupted supplies of water					

13. Any additional comments……

……

……

……

Thank you!!!

APPENDIX 4: LANGUAGE EDITOR REPORT

mawokomayi@gmail.com

Date: 22/01/2023

RE: TO WHOM IT MAY CONCERN

This letter serves to confirm that I have edited an Honours dissertation titled:

URBAN PLANNING PERSPECTIVE ON THE READINESS OF THOHOYANDOU CBD PUBLIC SPACES IN DEALING WITH COVID-19 PANDEMIC A CASE STUDY OF THOHOYANDOU CBD

By

RATSHILINGANA MUDANALO MARYLINE

(11635987)

I carefully read through the dissertation, focusing on grammatical errors and spelling mistakes.

Please do not hesitate to contact me for any queries.

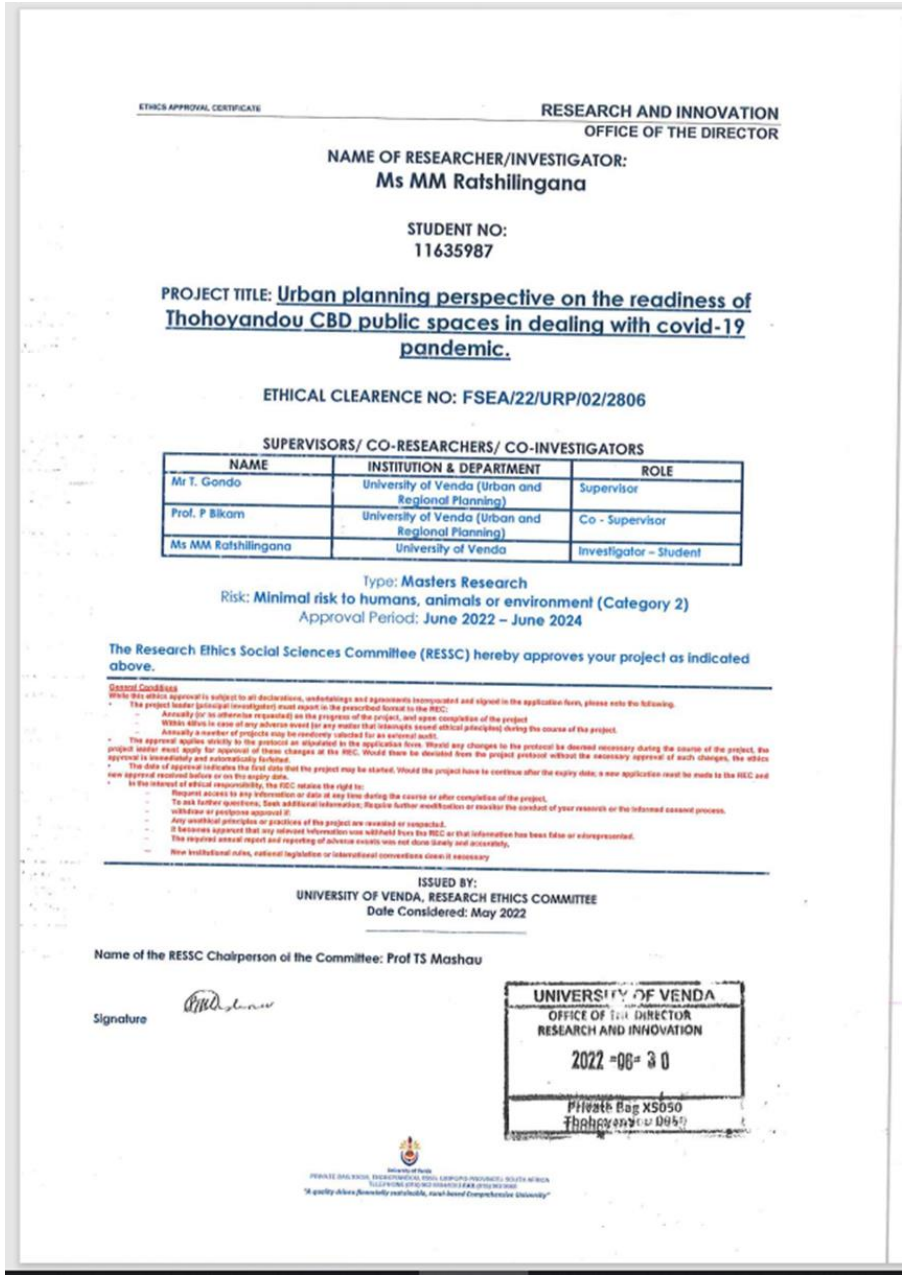
Yours sincerely,

Dr B. Moffat

Member, Professional Editors' Guild

Ph.D, Communication, Master of Social science, Communication, (University of Fort Hare)
B.A. Honours, Literature & Media Studies (University of Venda), B.A. Media Studies (University of Venda).

APPENDIX 5: ETHICAL CLEARENCE



ETHICS APPROVAL CERTIFICATE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Ms MM Ratshilingana

STUDENT NO:
11635987

PROJECT TITLE: Urban planning perspective on the readiness of Thohoyandou CBD public spaces in dealing with covid-19 pandemic.

ETHICAL CLEARENCE NO: FSEA/22/URP/02/2806

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Mr T. Gondo	University of Venda (Urban and Regional Planning)	Supervisor
Prof. P Bikam	University of Venda (Urban and Regional Planning)	Co - Supervisor
Ms MM Ratshilingana	University of Venda	Investigator – Student

Type: Masters Research
Risk: Minimal risk to humans, animals or environment (Category 2)
Approval Period: June 2022 – June 2024

The Research Ethics Social Sciences Committee (RESSC) hereby approves your project as indicated above.

General Conditions
While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following.
- The project leader (principal investigator) must report in the prescribed format to the REC:
  - Annually (or as otherwise requested) on the progress of the project, and upon completion of the project
  - Within 48hrs in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.
  - Annually a number of projects may be randomly selected for an external audit.
- The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the REC. Would there be deviation from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the REC and new approval received before or on the expiry date.
- In the interest of ethical responsibility, the REC retains the right to:
  - Request access to any information or data at any time during the course or after completion of the project.
  - To ask further questions, Seek additional information, Require further modification or monitor the conduct of your research or the informed consent process.
  - withdraw or postpone approval if:
  - Any unethical principles or practices of the project are revealed or suspected.
  - It becomes apparent that any relevant information was withheld from the REC or that information has been false or misrepresented.
  - The required annual report and reporting of adverse events was not done timely and accurately.
  - New institutional rules, national legislation or international conventions deem it necessary

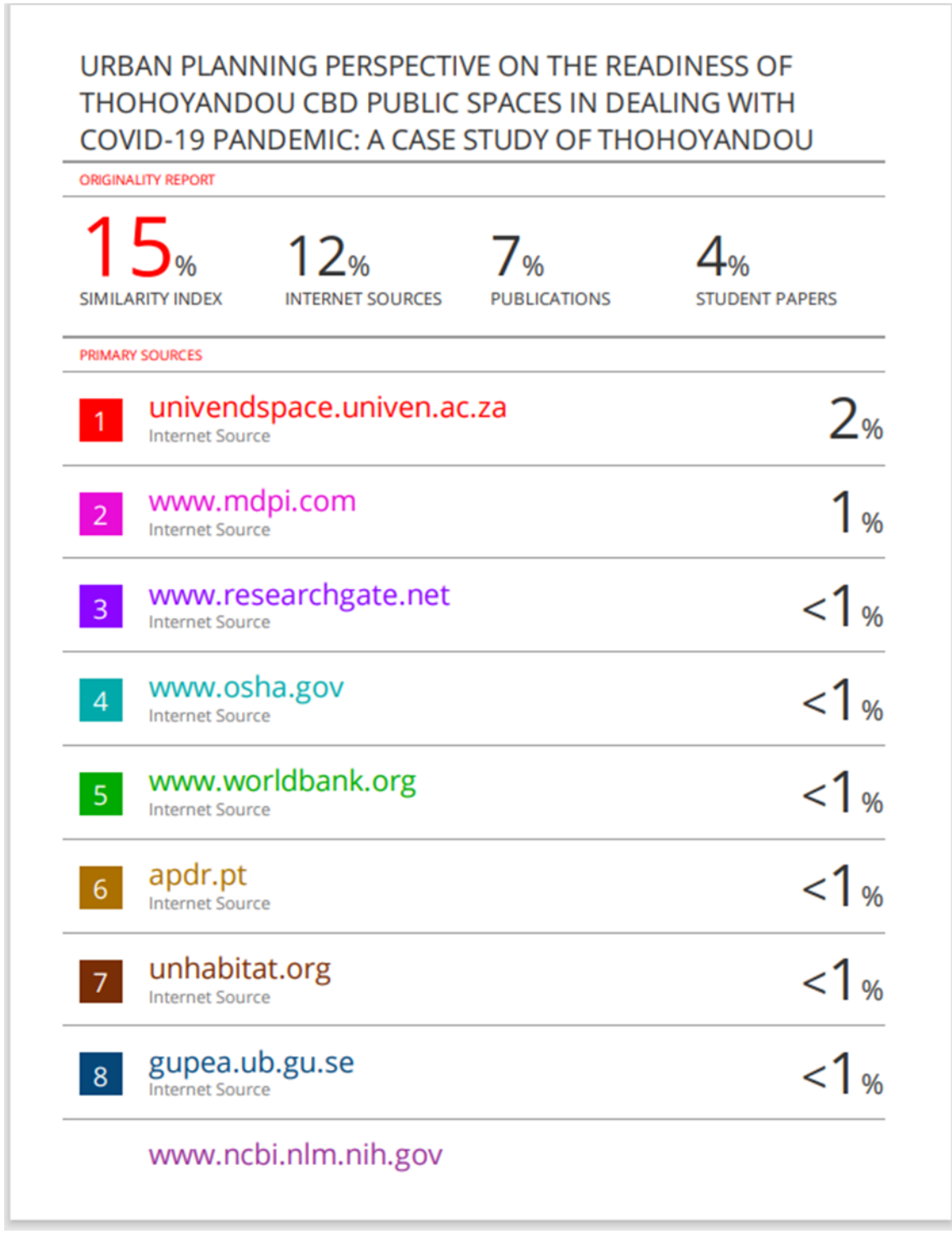
ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE
Date Considered: May 2022

Name of the RESSC Chairperson of the Committee: Prof TS Mashau

Signature

UNIVERSITY OF VENDA
OFFICE OF THE DIRECTOR
RESEARCH AND INNOVATION
2022 -06- 30
Private Bag X5050
Thohoyandou 0950

APPENDIX 6: PLAGIRISM REPORT



URBAN PLANNING PERSPECTIVE ON THE READINESS OF THOHOYANDOU CBD PUBLIC SPACES IN DEALING WITH COVID-19 PANDEMIC: A CASE STUDY OF THOHOYANDOU

ORIGINALITY REPORT

15%	12%	7%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	univendspace.univen.ac.za Internet Source	2%
2	www.mdpi.com Internet Source	1%
3	www.researchgate.net Internet Source	<1%
4	www.osha.gov Internet Source	<1%
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6	apdr.pt Internet Source	<1%
7	unhabitat.org Internet Source	<1%
8	gupea.ub.gu.se Internet Source	<1%
	www.ncbi.nlm.nih.gov	

APPENDIX 7: Observation Checklist

Date of Observation…….. Checklist ID #.....
Observer…… Site Observed…….

STUDY CONSTRUCT: WASTE MANAGEMENT

Public Space ID Number			**STUDY VARIABLES**						
	Nature of public space	Waste separation	Availability of Waste disposal bin	Waste disposal bin status	Access to waste disposal bins	State of Sewerage system	Environmental hygiene	Availability of COVID-19-compliant ablution facilities	Sate of ablution facilities
	1 = Taxi rank 2 = Bus rank 3 = street walkway 4 = Parking 5= Public square. 6 = Park	1= None 2 = Yes	1 = None 2 = Yes	1 = N/A 2= Not secured 3 = Secured	1 = poor 2 = fair 3 = accessible to a few 4 Accessible to many.	1 = Very poor 2 = Poor 3 = fair 4= Good 5 = Excellent	1 = Very poor 2 = Poor 3 = Fair 4 = Good 5 = Excellent	1 = Not available 2 = Available but not compliant 3 = Available and compliant	1 = N/A 2 = poor 3 = fair 4 = Good
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STUDY CONSTRUCT: WATER PROVISION

Public Space ID Number	**STUDY VARIABLES**						
	Nature of public space	Availability of water tap	The functionality of water source	Accessibility to water facility	State of water drainage system	Presence of water supplies	Nature of the water facility
	1 = Taxi rank 2 = Bus rank 3 = street walkway 4 = Parking 5= Public square. 6 = Park	1 = Not available 2 = Available 3 = Mobile tank	1 = Not working 2 = Working	1 = difficult to access 2 = Accessible to some 3 = Accessible to All	1 = Very poor 2 = Poor 3= Fair 4 = Good 5= Excellent	1 = No supplies 2 = Supplies available	1 = Not hygienic 2 = Hygienic

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STUDY CONSTRUCT: PUBLIC SPACE MANAGEMENT AND BEHAVIORS

Public Space ID Number		**STUDY VARIABLES**						
	Nature of public space	Presence of helpful preventative COVID-19 messages	Informative mask-wearing messaging	Social distancing Markings	Availability of common sitting infrastructure	Availability of public space surveillance (cameras)	Availability of thermal cameras to monitor temperature	Availability of security personnel to monitor public space user behaviors
	1 = Taxi rank 2 = Bus rank 3 = street walkway 4 = Parking	1= None 2 = Available but not clearly visible 3 = Available and clearly visible	1= None 2 = Available but not clearly visible 3 = Available and clearly visible	1 = None 2 = Present but not clearly visible 3 = Present and visible	1 = None 2 = Yes, a few 3 = Yes, many	1 = Not available 2 = Available but not working 3 = Available and working	1 = Not available 2 = Available but not working 3 = Available and working	1 = Not available 2 = Available for other purposes 3 = Available for monitoring behaviors

	5= Public square. 6 = Park							
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STUDY CONSTRUCT: DEMOGRAPHICS

Public Space ID Number	**STUDY VARIABLES**					
	Nature of public space	The density of public space users	Evidence of social distancing by public space users	The behavioral attitude of public space users during peak hours	Presence of (vulnerable) homeless people	Facilities for homeless people (if require)
	1 = Taxi rank 2 = Bus rank 3 = street walkway	1 = Low 2 = Medium 3 = High	1 = Non-existent 2 = Existent sometimes	1 = problematic 2 = Fairly - acceptable	1 = Present 2 = Absent	1 = N/A 2 = Not available 3 = Available

	4 = Parking 5= Public square. 6 = Park	4 = Very high	3 = Existent always	3 = Acceptable		
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STUDY CONSTRUCT: ECOLOGICAL / ENVIRONMENTAL

Public Space ID Number	**STUDY VARIABLES**				
	Nature of public space	Quality of landscaping (If any)	Prevalence of littering	Quality of air	Access to green space
	1 = Taxi rank 2 = Bus rank 3 = street walkway 4 = Parking 5= Public square. 6 = Park	1 = Very poor 2 = Poor 3 = Fair 4 = Good 5 = Excellent	1 = very prevalent 2 = Prevalent 3 = None	1 = Poor 2 = Good	1 = Poor 2 = fair 3 = Good
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