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RESEARCH REPORT

The climate change adaptation potential of public spaces in Tshwane: Muckleneuk Commons Communal Garden.

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DECLARATION OF ORIGINALITY

I declare that the mini dissertation, The climate change adaptation potential of public spaces in Tshwane: Muckleneuk Commons Communal Garden.

which has been submitted in fulfilment of part of the requirements for the module of Design Investigative Treatise, at the University of Pretoria, is my own work and has not previously been submitted by me for any degree at the University of Pretoria or any other tertiary institution.

I declare that I obtained the applicable research ethics approval to conduct the research that has been described in this dissertation.

I declare that I have observed the ethical standards required in terms of the University of Pretoria's ethic code for researchers and have followed the policy guidelines for responsible research.

Signature:  ……

Date: …24/07/2023……

29 September 2023

Abstract

Climate change is a global unsettling phenomenon that determines the prosperity of natural systems. It influences natural systems, posing risks to the health of living organisms and the socio-economic conditions they live in (Van Vuuren et al., 2014:374). Understanding climate change is crucial for response strategies and the well-being of these systems. Public spaces reflect their climate fuunctionalist5y and adaptation potential. This study reviews literature and conducts a case study to assess Muckleneuk Common's climate change adaptation potential, its impact on the local context, and the role of spatial and material characteristics. The aim of the study is to contribute to the climate change discourse in Tshwane. The study reveals a gap between the site's intention and its current performance and underutilisation.

Public spaces are crucial indicators of a community's climate change adaptation capacity and well-being. Their design should align with the local needs and foster social interaction, inclusivity, and diverse activities. The success of climate adaptation relies on the community involvement, tailoring strategies to the context. Muckleneuk Commons, while facing challenges like low occupancy, shows promise through initiatives like the 'adapt-a-spot' project. It's social role and growth potential may contribute to climate resilience and community cohesion during emergencies. As cities evolve, effective public space design and community engagement will be key to successful climate adaptation and urban sustainability.

Keywords:
Climate change, Climate change adaptation, public space, Place making, regenerative spaces, Thermal comfort, Heat Island Effect, Well-being, Health

Table of Contents

1.	Introduction	6
2.	Literature Review	12
3.	Methodology	20
4.	Findings	25
5.	Discussion	43
6.	Conclusion	49
7.	References	52
8.	Appendix	56
	8.1. Ethics Permission letter	56
	8.2. List of Interviewees	57
	8.3. Research tools and protocols	58

List of Figures

Figure 1. Sustainable Development Goals (UN News Centre, 2015). 6
Figure 2. Place diagram by PPS (PPS 2003b, cited in Santos Nouri & Costa, 2017). 14
Figure 3.Regenerative Design Diagram (Du Plessis, 2023). 19
Figure 4. Muckleneuk Commons and the Telkom Tower (Author, 2023) 22
Figure 5. Climate adaptation risk framework (Simpson et al., 2021). 25
Figure 6. Climate adaptation risk framework of Muckleneuk Commons (Author, 2023). . **Error! Bookmark not defined.**
Figure 7. Zoning Map (Author, 2023). 27
Figure 8. 0,5km Zoning Diagram (Author, 2023). 28
Figure 9. 1 km Zoning Diagram (Author, 2023). 28
Figure 10. Income demographic (Author, 2023). 28
Figure 11. Transpiration Routes (Author, 2023). 30
Figure 12. Travel time from Muckleneuk Commons to City Centre (Author, 2023). 31
Figure 13. Parking facilities (Author, 2023). 30
Figure 14. Muckleneuk Commons: Concrete Bench (Author, 2023). 31
Figure 15. Muckleneuk Commons: Public Art (Author, 2023). 31
Figure 16. Diagram with physical assets (Author, 2023). 31
Figure 17. Western Boundary (Author, 2023). 32
Figure 18. Southern Boundary (Author, 2023). 32
Figure 19. Northern Boundary (Author, 2023). 33
Figure 20. Southern Boundary (Author, 2023). 33
Figure 21. Drinking Fountain (Author, 2023). 34
Figure 22. Site surfaces (Author, 2023). 34
Figure 23. Materiality and surface coverage map (Author, 2023). 34
Figure 24. On-site demographic_Gender & age (Author, 2023). 36
Figure 25. On-site demographic _income (Author, 2023). 36
Figure 26. On-site demographic _ethnicity (Author, 2023). 36
Figure 27 Off-site demographic Gender & Age (Author, 2023). 36
Figure 28. Off-site demographic _income (Author, 2023). 36
Figure 29. Off-site demographic _ethnicity (Author, 2023). 36
Figure 30. Static & Dynamic use of the site (Author, 2023). 37
Figure 31. Movement Diagram (Author, 2023). 38

Figure 32. Vignette capturing rich vegetation, reducing visibility of users (Author, 2023)......38

List of Tables

Table1. Table of On-site demographic observations. 37
Table 2. Table of Surrounding-site dempgraphic observations......37

List of Abbreviations

B.C.E.	Before common era
IPCC	Intergovernmental Panel on Climate Change
SDG	Sustainable Development Goal
UN	United Nations

1. Introduction

1.1. Background

Global warming stands as one of the most significant challenges in the modern world, marked by rising temperatures and a surge in extreme climate events worldwide, amplifying the vulnerability and risk faced by citizens (Kimemia, 2020). The *Intergovernmental Panel on Climate Change* (IPCC) in their Fifth Assessment Report of 2022 expressed concerns regarding the physical and psychological well-being of people worldwide due to these extreme climate changes (IPCC, 2022:8-15). They noted, "Climate-related risks for natural and human systems are higher for global warming of 1.5°C than at current conditions, but lower than at 2°C" (IPCC, 2022:10). Furthermore, the heat island effect, particularly in urban areas and public spaces, intensifies significantly with climate change, posing health risks (Foshag et al., 2020). This escalating heat effect raises substantial concerns for cities worldwide.

The United Nations (UN) compiled 17 Sustainable development goals (SDG's) to promote compact environmental revitalization in cityscapes and create healthier communities (*Figure 1*) (UNDP, 2022). The built environment has the potential to address these challenges to achieve the desired outcomes outlined by the UN.

Figure 1. Sustainable Development Goals (UN News Centre, 2015).

1.2. The role of the built environment

The built environment has an imminent role to play in creating healthier and more liveable environments. A paradigm shift is needed in the current built environment discourse with the long-term aim to change policies, ensuring better and healthier living environments (IPCC, 2022:8-15). Our cities are currently experiencing social and environmental challenges which can be addressed in the built environment, through regenerative and adaptive design thinking. Rapidly changing climate change conditions critically affect the urban fabric. Built environment specialists must address this by focussing on current and future infrastructure. Interest in re-thinking adaptation strategies to mitigate heat gain is growing, especially in developing countries like South Africa, with the aim to improve the health and well-being oof public space users (Pieterse, 2011).

Public space is a key indicator of the social cohesion and overall well-being of citizens. Reiling (2006) describes *public spaces* being physical environments symbolising intangible assets of space such as safety and performance. These intangible assets can determine the *safety climate* of public space that can be measured parallel to the behaviour of users. Intangible assets can influence the *safety climate* of public spaces, which can be assessed in tandem with user behaviour. (Kleeman, cited in Reiling, 2006). *Safety climate* is the subjective notion of how safety is perceived within an environment (Arzahan, Ismail and Yasin, 2022). Intangible assets, such as safety *climate*, contribute greatly to the occupation and overall success of public space. This creates a risk and potential vulnerability to public space, determining the climate adaptation potential of a space. The climate adaptation potential of public spaces hinges on community participation, context-specific conditions, and design intentions. These spaces serve as windows to determine a site's adaptability, reflecting local needs and the necessary social interactions and activities for site occupancy. The criteria for climate change adaptation potential are influenced by context-specific design goals. The climate adaptation capacity of public spaces can be gauged through their community and social roles, along with the identification and reduction of the site's existing vulnerabilities and risks. The site's social function and growth potential will enhance climate resilience and community cohesion during emergencies. As cities grow, effective public space design and community engagement will be vital for successful climate adaptation and urban sustainability. Rapidly changing climate conditions demand immediate attention specialists,

focussing on current and future infrastructure. Interest in re-thinking climate adaptation strategies, particularly in developing countries like South Africa, aims to enhance the well-being of public space users.

1.3. South African Context

The current cityscape and public space design in South Africa, particularly Tshwane, fail to support climate action or create a safe environment, raising concerns for its citizens. The city of Tshwane is characterized by Peres, du Plessis, and Landman (2017) as a metropolitan urban system within one of South Africa's most urbanized provinces. This city has witnessed expansion into the eastern and southern suburbs due to the significant development that has taken place in the 21st century (Peres, du Plessis & Landman, 2017). Alongside the transformation of the urban fabric, there has been a significant shift in the city's socio-economic environment. This shift impacts both the tangible and intangible experiences of cityscape users. The city experiences great socio-economic strain with almost 3 million citizens and more than 135 000 households with no secure income (Peres, du Plessis & Landman, 2017:691). This deteriorated Tshwane's inner city, raising the *heat island effect* due to climate change, and lowering the safety climate experienced by users, ultimately reducing thermal comfort for occupants. The urban expansion and its outcomes observed in Tshwane's city centre emphasize the necessity of rethinking urban planning to accommodate the frequent changes experienced by city residents. The built environment bears significant responsibility in regulating the intricate relationship between users and space. It possesses the power to establish a sustainable relationship between living and non-living systems, leading to a prosperous future.

"*For most of us, design is invisible. Until it fails…when systems fail, we become temporarily conscious of the extraordinary force and power of design. Every accident provides a moment of awareness of real life, what is happening, and our dependence on underlying systems of design"* Bruce Mau.

The study aims to investigate the relationship between users, public space, and the climate adaptation potential of public space. Acknowledging the significance of this connection and understanding its complexities, this study has three primary research objectives that will serve as its foundation.

1.4. Research Objectives

Intervention is necessary to improve both the socio-cultural health of communities and the socio-ecological health of our cities, as these two aspects are interconnected. This study seeks to explore the correlation between users their health and well-being, public spaces, and their climate adaptation potential. It will investigate the climate adaptation potential of public spaces in Tshwane, using Muckleneuk Commons Communal Garden as a case study, while also assessing the influence of climate adaptation measures on public space utilisation. The study has the following objectives to analyse the

a) current, and future, climate change adaptation potential of Muckleneuk Commons and how it will affect the climate change risk of the space itself and its surrounding context,
b) the effect of the development of Muckleneuk Commons on its current climate change adaptation potential in its local context, and finally
c) establishing the effect of spatial and material characteristics and climate change adaptation potential, on the use of Muckleneuk Commons.

The study seeks to enrich the broader climate change conversation by examining the role public spaces play in enhancing the climate resilience of our cuties. The study takes a specific approach by assessing the climate change adaptation potential of Muckleneuk Commons based on factors like occupancy, social function, and ecological impact. The study has established specific delimitations that form the framework through which Muckleneuk Commons' climate change adaptation potential is analysed.

1.5. Delimitations

Muckleneuk Commons serves as the primary focus of this field study, despite its relatively small footprint. The study's concentration is directed towards activities and perspectives within the site's boundaries. It involves an observation and analysis of the site through the eyes of users and interviewees, emphasizing site *assets*, user *demographics*, *activities*, and limitations from a user perspective. The study's primary aim is to investigate the critical vulnerabilities posed by climate change to public spaces and their users.

This study addresses the gap between current sustainable design and future climate adaptation strategies, emphasizing occupancy, utilization, and user experience. It investigates the urban heat island effect's impact on user comfort in public spaces, specifically Muckleneuk Commons, with a focus on thermal comfort. While it doesn't include external temperature data, it lays the groundwork for future research. The study acknowledges other climate-related issues like rainfall and flooding risks but doesn't incorporate them due to the need for topographical and rainfall data, which is outside the scope of this study. The Tshwane Greenbook is used to inform the risk and vulnerability assessment of Muckleneuk Commons, providing valuable insights for future research expansion. Event thought the study has set its own boundaries in which research takes place, the study has faced various limitations that altered the outcome and findings.

1.6. Limitations

This study is based on analysing one sample site and public space in Tshwane, known as Muckleneuk Commons. Muckleneuk commons is a communal garden, hidden on a hilltop, overlooking the city of Tshwane. This public space is situated on the outer banks of the city centre and is considered as a pocket of greenery within a mostly residential, high-class area. The public space is more functional than used for leisure purposes. Because of its location and the site's programmatic function, which lends itself more towards a throughway, it was difficult to identify a specific user and programme. With little movement, and the site being dormant for large periods of time, it limited the quantity of 'live data' captured in terms of use and user perception. The site was found empty on most occasions during the study and observational period. The surprisingly low occupancy led to limited user interaction and interview opportunities.

The site's location makes it a unique public space for the surrounding neighbourhood, a tranquil green oasis within the community. Its location lends itself to a specific user, the residents of Muckleneuk, which has been found to be untrue. The demographic of site users indicates a gap in the analysis with little insight gained from the direct community. Interviews conducted on-site involved individuals from neighbouring communities rather than the immediate Muckleneuk community. This opened the opportunity to find a way of connecting with the Muckleneuk community off-site, initiating community participation through an online platform of google questionnaire forms reflecting the same questions asked in the on-site interviews. This limited

participation from the Muckleneuk Community limited the study. The data collection period also created a limitation to the study as the data was collected during 7 site visits, with a time constraint of one month in which data was collected.
The site visits to Muckleneuk Commons, offered an "outsider perspective" that resulted in initial impressions, influencing assumptions regarding Muckleneuk Commons' social role and ecological impact.

1.7. Assumptions

Muckleneuk Commons preforms well to the climate adaptation strategies implemented on site by the ‘Adopt-a-spot’ project. Upon close examination of the Tshwane Greenbook, it becomes evident that on-site adaptation measures have been implemented to enhance the future climate adaptation potential of Muckleneuk Commons. These measures will be discussed in greater detail in the findings and discussion section. The site boasts several promising elements, including abundant vegetation, heat-absorbent surfaces, numerous trees that offer natural shading, and a water fountain providing water access to the public. These components align well with the risks and vulnerabilities identified in the Tshwane Greenbook.

The strong performance of Muckleneuk Commons in implementing on-site climate adaptation strategies aligns with the broader concept of well-designed urban environments. As Gehl and Svarre (2013) highlight, these environments prioritize the interaction between users and their surroundings, encompassing both public life and space. Healthy cities thrive when this interaction seamlessly integrates with the physical, environmental, and social framework rather than opposing it. This study, with its focus on the Community Park and the employment of various data collection methods, contributes to our understanding of how public life and space coalesce in urban settings, shedding light on the intricate dynamics that make cities more resilient and sustainable. The study investigates the public realm in which space functions in the city. It is therefore important that proper ethical considerations are considered when working in a public space and with people of the community.

1.8. Ethics

This study relies on ethical practices during the data collection process, and general good practices and protocols are followed as set out by the ethics application. This project is granted ethical clearance (EBIT/267/2022). Research ethics conditions involve taking photographs and conducting interviews. Good practices must be followed to safeguard the anonymity of users, and participants should sign consent forms to allow the use of research gathered during fieldwork. The researcher has also completed a researcher's declaration form. Since the study heavily relies on user perceptions, it is crucial for the research to reflect this by valuing participants' willingness to contribute openly and sincerely to capture live and accurate data, all while respecting their anonymity and privacy.

1.9. Document structure

This document aims to explore the topic of public space, climate change, heat stress, and well-being through a literature review. The primary goal of this literature review is to position this study within the current discourse on climate adaptation and public spaces, with the purpose of establishing the climate change adaptation potential of public space. The research methodology, which will be elaborated on further in this report, is designed to determine how data will be collected and analysed, ultimately addressing the gap between research, literature, and reality.

The ongoing discourse on regenerative design thinking emphasizes the importance of understanding climate change and how design can contribute to the health and well-being, providing insights into both the tangible and intangible aspects of the urban environment’s climate. To gain a deeper understanding of this discourse, its functionality, and its impact, literature and theory are thoroughly reviewed.

2. Literature review

2.1. Public Space

Public Space is a significant node of urban design and a component of sustainable and resilient cities. The UN identified this as a Sustainable Development Goal (SDG) to create more sustainable cities and communities. The United Nations' 11th SDG (SDG 11) thus sees public space as a critical aspect of the sustainable development of cities. This goal promotes inclusive, sustainable urbanization, mitigating natural disaster risks, fostering greener cities, ensuring safe public spaces, and enhancing urban greenery access (UNDP, 2022). Given the ongoing climate change threat, cities must adapt and build resilience, including their citizens. Public spaces play a crucial role in enhancing urban adaptation capacity. Public spaces have played important roles in city making dating back as far as 7500 B.C.E. *The Charter* is a Public Space Policy introduced by the City of Naples in Europe (Garau & Siragusa, 2015), considers the influence of *climate change adaptation,* with similar values of public space design to this research report, such as *inclusivity*, *safety*, *resilience,* and *sustainability* (Garau & Siragusa, 2015). Public Space is defined by the Charter of Public Space as "*environments that are publicly owned and used, which is accessible to all citizens without a profit incentive"* (Garau & Siragusa, 2015:6).

Public spaces perform as pockets of activity within cities, exiting between the building fabric and infrastructure of cities. These pockets become thresholds to interaction between living systems and public placemaking. Public spaces play a significant role in enhancing the social cohesion of a community and promote diversity (Peters, Elands & Buijs, 2010). "Good" public space is a subjective concept because it is intricately linked to the emotional and physical relationships users have with the environment. Santos Nouri and Costa (2017) highlights criteria by which public space can enhanced, focusing on *sociability*, *users and activities*, *access and linkages*, and *comfort and image*. Public space becomes a critical component to the operation of cities. Cities that function well have good public spaces that align with the criteria established by Santos, Nouri, and Costa (2017). Good public space can be defined as an environment that fosters sociability among users, enhances space occupancy through diverse activities, promotes inclusivity, ensures easy access with strong connections to key city nodes, and provides a comfortable and safe experience for users. This emphasises the importance of public space as a crucial component to high functioning cities.

Public space is vital in cities because it directly impacts the socio-cultural aspects of urban life, regulating the multi-functionality of the urban fabric, and promoting diversity in users, activities, and overall utilization (Foshag *et al*., 2020). Public space not only serves an economical system with commercial activities, but also creates opportunities for social cohesion in communities by creating moments of recreation, regeneration, memory, and conviviality between users (Garau & Siragusa, 2015). The global promotion of climate change adaptation necessitates practitioners to contemplate how these practices integrate with contemporary placemaking or the creation of public spaces (Santos, Nouri & Costa, 2017). Contemporary placemaking emphasizes the creation of collective communities, socialization, and urban experiences through interdisciplinary strategies (Santos, Nouri & Costa, 2017). This approach transforms public space from a linear entity into a conjunction of three main factors: *climate-environment, built-environment, and human-environment.*

Public space is also an indicator of the socio-economic and socio-environmental characteristics of its local community. Participation is a key driver for public space, as it can gauge the success of the public space itself (Garau & Siragusa, 2015). Studies show that public spaces with the following qualities can improve the social cohesion of communities: (a) multi-purpose spaces that are adaptable and allows for temporality, diversity, and inclusivity to create a space for connection between all citizens, (b) good connection and accessibility that enhances participation, and (c) regenerative design thinking that reduces vulnerability and risk for its local environment (Garau & Siragusa, 2015). Each public space is unique to its context with specific *spatial, historical, environmental, social,* and *economic frameworks* (Garau & Siragusa, 2015). To achieve social cohesion, this intricate connection needs to be studied within the local context through *climatology, biometeorology*, and *physiology.* (Santos Nouri & Costa, 2017).

Climate significantly influences the way public spaces are experienced and operated. The impact of climate change is evident in the increasing intensity of the heat island effect in urban areas, including public spaces (Foshag et al., 2020). The *heat island effect* predominantly impacts the spaces between buildings in cities, potentially turning them into heat islands if not properly regulated. Inadequate regulation and planning can lead to reduced thermal comfort for citizens in these public spaces. Given the escalating intensity of the *heat island effect* in cities, public spaces

could become obsolete and unusable without the development and implementation of appropriate adaptation measures to mitigate heat stress in these environments (Foshag et al., 2020). Conversely, public spaces also play a role in regulating the overall urban climate (Foshag et al., 2020), presenting an opportunity to cool down cities from within by evaluating the adaptive capacity of public spaces within urban areas.

Public space has a physiological and psychological effect on users. *Contemporary placemaking* initiates a user-based approach to designing space (*Figure 2*). Santos, Nouri, and Costa (2017) base this design approach on the social needs of the local community, identifying the relationship between *comfort, safety*, and *activity* in relation to the meteorological conditions of the site. Comfort, safety, and activity indicate behavioural patterns of users under specific climate conditions, serving as site-specific design criteria for public spaces. This underscores the importance of sensitivity in public space design, where tailored solutions and opportunities must be identified, rather than applying a generalized approach to all sites, which could render public spaces unsustainable and shorten their lifespan. As our climate changes, so does user behaviour. Climate change necessitates the adaptation of public spaces to align with the resilience of their users, ensuring their continued use and viability. The following factors affect the behaviour or psychological response to an environment; (1) Thermal comfort, (2) Physical Assets and (3) Activity.

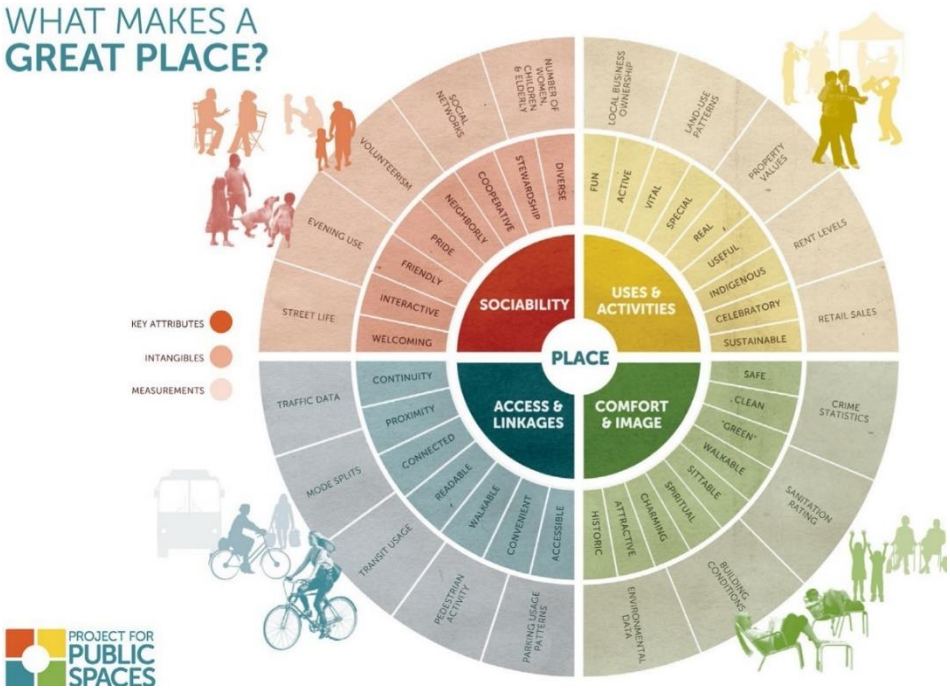

Figure 2. Place diagram by PPS (PPS 2003b, cited in Santos Nouri & Costa, 2017).

Thermal comfort is the measure of comfort experienced by users in a specific climatic environment and is influenced by factors such as *air temperature*, *wind speed*, and *cloud density (*Kapwata, Gebreslasie & Wright, 2018). The built environment significantly influences the psychological response of users, as its physical attributes enable thermal adaptation that can shape users' perception of a space or environment (Santos Nouri & Costa, 2017). Comfort thresholds are also influenced by physical assets and user choices. It's important for public spaces to offer users the option to interact with the site as they choose. One of these factors is exposure, which directly affects movement within a space, determining both static and dynamic behaviour as well as the thermal comfort experienced on the site (Santos, Nouri & Costa, 2017). With increased exposure, users experience higher thermal stress. Therefore, there is a direct relationship between exposure and occupancy, as thermal stress is inversely proportional to occupancy. This establishes a direct link between the built environment and users' experiences Studies conducted by Zachariasm Sathopoulos & Wu (2004) revealed interesting data concerning the impact of the built environment (physical assets) on user behaviour. It is worth noting that public spaces that promote choice tend to increase the duration of users' stays. With limited choice, both occupancy and the duration of space usage decrease.

Tangible elements introduced by the built environment and infrastructure are not the sole physical assets in a space, nature also contributes to the physical environment experienced by occupants. People drawn to nature and natural environments. Studies have shown that public spaces lacking trees and natural vegetation mainly encourage short obligatory activities, such as using a public space as means of pass from point A to point B, while lush vegetated spaces invite users to linger for longer leisurely stays (Thorsson *et. al.*, 2007). The perception of microclimates, including *safety climate*, in urban areas are directly impacted by the usability of public spaces (Foshag *et al*., 2020). Proper adaptation measures can ensure the social function of public spaces in cities in the future (Foshag *et al*., 2020).

Activated public spaces directly influence the recreational and leisure activities of citizens (Foshag *et al*., 2020). Activities and programs are directly linked to the utilization and adaptation of public space based on user experience. As such, public space plays a significant role in shaping the socio-environmental character of cities. In alignment with a climate responsive objective, this study aims to contribute to the overall sustainability and regenerative qualities of public spaces, thereby enriching the discourse on climate change.

2.2. Climate Change

Climate Change is a global phenomenon with increasing implications for future development. This report specifically addresses the impact and the risk of increased temperature fluctuations resulting from climate change. Climate change affects temperatures, weather patterns and disrupts various sectors, primarily driven by human activity (IPCC, 2023). One of its significant consequences is heightened due to the 'heat island effect' (Kapwata *et al*.,2018). This effect exacerbates extreme heat wave events, driven by climate change and the built environment, creating urban heat islands (Kapwata *et al*., 2018). The intensity of heat island effect within cities, especially in urban regions and public spaces, escalates significantly with climate change (Foshag *et al*., 2020).

"Global climate change and its effects are expected to intensify in the coming decades, affecting numerous social and biophysical systems such as population health, urban infrastructure, energy demand and water supply" (Foshag *et al*., 2020:8). Kapwata *et al*. (2018) emphasize the importance of comprehending climate change and Its temperature-related consequences. This understanding is pivotal for devising effective adaptation strategies. The urgency to address how the built environment can mitigate heightened risks and vulnerability in living conditions is growing rapidly.

This report aims to identify how public spaces can adapt to reduce the 'heat island effect' caused by climate change, enhancing urban resilience. Resilience in an urban context, as defined by Satterthwaite *et al.*, (2020:144), is the city's ability to function so that its residents thrive despite various stresses and shocks. Climate adaptation strategies can bolster the resilience of public spaces in the face of rising temperatures, contributing to reduced heat stress in microenvironments.

Addressing urban heat stress in public spaces requires multifaceted solutions that consider microclimate, ecology, design, sociology, and economics simultaneously (Foshag et al., 2020:9). These strategies target urban environments, the built environment, and individual behavior (Adegun, Mbuya & Njayike, 2022). Users' behaviour is significantly influenced by their health and well-being, making it imperative to address heat stress, which directly impacts their well-being and, in turn, their behavior in an environment.

2.3. Heat Stress and Health & Well-being

The built environment has an impact on the health and well-being of public space users. Public space mirrors the general well-being of communities. Health and well-being can be determined by the interconnection of thermal comfort, *climate safety* and overall public life and sociability in public thresholds. Health and well-being are considered a principal factor in the longevity of sustainable cities as it is indicated as one of the 17 SDG's (UNDP, 2022).

Heat stress has a significant impact on its local environment and the health of occupants, therefore raising the importance of adapting public spaces to combat heat stress within cityscapes (Okyere & Kita, 2015). The average human body temperature is 36ºC but is personified and subjected to individual activity (Kovats & Hjat, 2008). *Heat stress* occurs when the body's core temperature rises above a maximum threshold and can at first lead to symptoms such as physical fatigue and sickness, but can lead to loss of consciousness and eventually, if the core body temperature isn't lowered, be fatal (IOWA, 2022). Heat stress is intensified by increasing temperatures and humidity and the prolonged exposure thereof (Parks, Buzan & Huber, 2022). Not only do rising temperatures have a profound impact on people's physical health, but they also affect their psychological health and emotional well-being (Kapwata *et al*., 2018). With an annual rise in temperatures the health risks and implications grow exponentially. The question is therefore, how can we decrease health risks and implications despite the unavoidable increasing temperatures? The built environment can create safer environments that protects and ensures the propensity of users and their well-being.

One of the vital ideas in creating healthier communities is *safety*. Reiling (2006) describes physical environments (public spaces) as signifiers of safety and performance.
A study conducted by Ulrich and Zimming (cited in Reiling, 2006) provides evidence of the impact of the physical environment on safety and performance of individuals. Spaces can significantly shape the behaviour of users (Kleeman, cited in Reiling, 2006). Creating a *safety climate* within a public realm would be an enhancer of the well-being of citizens. Arzahan, Ismail and Yasin (2022) describe *safety climate* as how users perceive safety within an environment. Establishing a strong sense of safety and security is important in any public intervention (Reiling, 2006). Architecture should aim to establish a place of safety through a public interface. The built environment can initiate healthier living conditions for people as adaptation measures can ensure

the social function and sustainability of public spaces in cities in the future (Foshag *et al*., 2020). It can be asserted that the *safety climate* in public space is crucial for the overall heat health of individuals, contributing not only to the physical health of users but also the psychological well-being. The flexibility and adaptability of *safety climate* is a key component to create regenerative spaces.

2.4. Regenerative Spaces

The sustainability and regenerative properties of public space plays a role in the socio-ecological condition of a city with a climate-responsive objective. This project aims to address identified SDG's, to mitigate the impact of climate change.

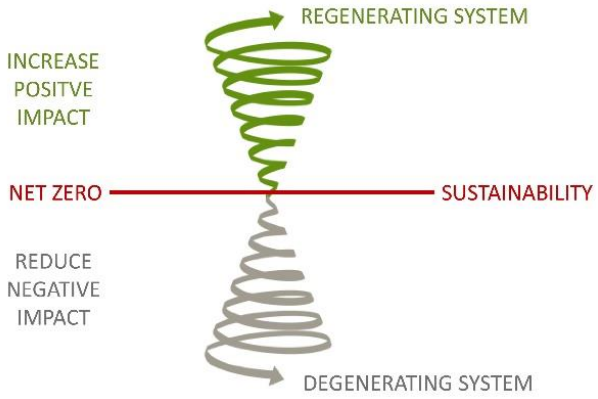

Figure 3.Regenerative Design Diagram (Du Plessis, 2023).

A paradigm shift is required in the consideration of suitable development and adaptation strategies. Simply adhering to sustainable principles is insufficient to enhance the liveability of cities. Instead, we must think more expansively, adapt to change and foster a new way of thinking, as advocated by Du Plessis (2023) in moving beyond sustainability (*Figure 3*). Climate-resilient environments, viewed as having the potential for climate change adaptation are forged through the adoption of sustainable urban development strategies in cities (Foshag *et al*., 2020).

Nature is a fundamental informer to regenerative design thinking, with the aim to create architecture that reconnects with nature and using bio-based technology. This is inspired by Janine Benyus (cited in Du Plessis, 2023) Nature's design Principles; *a). Nature is powered by sunlight, b) Nature uses only the energy it needs, c). Nature fits from function and d). Nature relies on diversity.* Applying these principles reacts to regenerative design that promotes the well-being of users.

Climate adaptation is a global agenda encouraged to be integrated into placemaking (Santos Nouri & Costa, 2017). Santos Nouri & Costa (2017) further emphasize that adaptation strategies should not only contribute to placemaking, but also place- keeping. *Place keeping* relies on user-orientated adaptation measures, such as co-design (Santos Nouri & Costa, 2017). The co-design of climate change adaptation measures has proven to be successful in the design of public space (Foshag *et al*., 2020). During the co-design process, particularly in the design of public space, it is essential to identify relevant stakeholders, such as the community, city planners, local experts, interest groups and initiatives and the local government (Foshag *et al*., 2020). Studies on climate change and adaptation strategies are pertinent to the discourse of the Built environment (Foshag *et al*., 2020).

The aim of the study is to assess the potential of climate adaptation in public spaces, its impact on space utilization, and the well-being of its users. This study specifically examines the interplay among space, users, and the climate adaptation potential within the local context of a public garden in Tshwane (Muckleneuk Commons). The reviewed literature underscores a clear link between the broader effects of climate change on public spaces, their users, and usage patterns. It's important to note that while the literature contributes to the study's general objective, the adaptation potential of public spaces is inherently tied to their local context and community. The resilience of a community is thus contingent on its specific circumstances. This underscores the significance of placemaking and place-keeping within the urban landscape to establish the climate adaptation potential of public spaces, ultimately promoting healthier environments.

As placemaking and place-keeping are subjective and greatly influenced by collaboration with the local community, they ensure the prosperity of a regenerative community and environment. The community possesses the capacity to adapt public spaces to its needs, thereby fostering regeneration and ultimately contributing to peacekeeping for a more sustainable and healthier city.

Ultimately, our study underscores that climate adaptation's potential in public spaces is inextricably linked to the local context and community. Resilience, as we've discovered, is context specific. Placemaking and place-keeping, influenced by collaboration with the local community, become powerful tools in fostering regenerative communities and environments. This

collaboration empowers communities to adapt public spaces to their unique needs, promoting regeneration and contributing to the long-term sustainability and health of our cities.

The discussion highlights the importance of community collaboration and context in shaping climate adaptation in public spaces, emphasizing their role in fostering resilient communities and environments. This collaborative approach empowers communities to tailor public spaces to their unique needs, promoting regeneration and long-term urban sustainability.

To deepen our understanding of these principles in real-world contexts, this study employs a Case Study research method. This method rigorously analyses specific phenomena within existing environments, revealing insights into their practical determinants and broader implications. This comprehensive research approach aims to uncover valuable insights at the intersection of climate adaptation, public spaces, and community engagement.

3. Research methodology

This study follows a Case Study research method, involving a rigorous analysis of a specific area of interest or phenomenon that sits within an existing environment (Saunders *et al,.* 2016). This approach enables a deeper comprehension of how a specific phenomenon operates within a real-life context and adapts to its environment, and the effect of it in a broader context (Yin, 2014).

Case study research offers flexibility with multiple approaches, depending on the desired outcome. Many professionals use this method to gain a broad understanding of a field of study, while researchers take a more rigorous approach in collecting data and comparing data, exploring the subject in depth to identify patterns and methods that facilitate further research (Yin, 2014). To enhance data collection and analysis, a Pragmatist approach is employed. However, Creswell and Plano Clark (2011) note a potential limitation of this approach, as it introduces some uncertainty when observing reality Therefore, it's crucial to maximize data certainty to ensure the feasibility of research output. Research within a Pragmatist paradigm adopts a *mixed method approach*, using both quantitative and qualitative data to reflect reality (Cresswell & Plano Clark, 2011). Additionally, this study incorporates supporting grey literature to deepen our understanding of the site and how it is perceived and how it is perceived and experienced by the local and surrounding communities.

3.1. Site

Muckleneuk Commons is a Communal Garden, located in the old east of Pretoria, South Africa. It is located close to the city centre at 3,6km. The site is easily accessible from the City Centre with travel times of 9 minutes by car, 7 minutes by bicycle, 23 minutes by bus and 43 minutes walking, according to Google Maps. Muckleneuk Commons is situated on a hilltop in a well-established neighbourhood within a variety of restorative projects, projecting renovation opportunities for the new market of homeowners (54%), noted by Makoni (2018) in 2018, between the

Figure 4. Muckleneuk Commons and the Telkom Tower (Author, 2023).

ages of 18 - 35 years. Approximately 50% of the sellers are older than 65 years (Makoni, 2018). This indicates an influx in young, active professionals within Muckleneuk, changing the demographic of the local context. The change in demographic inspired a regeneration of the neighbourhood, where the community took initiative with this previously derelict old site and initiated the 'Adopt-a-spot' programme with the main goal to "*encourage social responsibility, environmental injustice, taking ownership of the environment*" (Ngobeni, 2017).

Muckleneuk Commons is a communal garden. It is mostly an empty site with a lawn that can host multiple programmes. The site is a relatively young garden that is well-kept and maintained. The garden is approximately 50m^2, with a variety of lawn areas, pedestrian paths, and garden beds. The site is relatively young as noticed by the young trees on the site. The park has a tranquil experience, raised on a hilltop being an oasis from the busy city life. It sits beneath one of Pretoria's signature landmarks, the Telkom Tower, grounding the site within its greater context (*Figure 4*).

3.2. Data Collection and Analysis

The study of public life, as advocated by Gehl and Svare (2023), is essential for comprehending urban environments and city dynamics. The define well-designed urban spaces those fostering interaction between suers and their surroundings, resulting in healthy cities where such interaction seamlessly integrates with the physical, environmental, and social framework. This evaluation and analysis centred on Muckleneuk Commons, utilizing three primary data collection methods: desktop research, observational analysis, and on-site interviews.

The desktop study involved various mapping exercises and thorough literature reviews, as per Hugo, du Plessis & Masenge (2021). These activities aimed to provide a comprehensive understanding of the context, community relationships, and on-site environmental experiences. The study encompassed multiple scales, including the neighbourhood, surrounding context, and the park itself, with a focus on assessing factors influencing the public space. These factors included temporal aspects, spatial characteristics, sectoral responses, and their corresponding impacts. Tangible assets, comprising the physical environment, demographics, and on-site

activities, influenced users' physiological well-being, affecting exposure and thermal comfort. In contrast, intangible assets, such as the perceived safety climate and user experiences, played a vital role in driving activity and space utilization. Both types of assets contributed to assessing local context risk and vulnerability, ultimately guiding the analysis of the public space's adaptation potential within its urban environment. The findings were visualized and overlaid to facilitate qualitative data interpretation.

An observation analysis was used to establish the *sense of place* of the site. Observation is defined as to "*watch or study something or someone with care and attention in order to discover something*" (Gehl & Svarre, 2013:5). Observation is a fundamental tool for studying public life, as it enables the determination of activities and user behaviour. Observing city life through one's own eyes provides a deeper and more meaningful understanding of the space (Gehl & Svarre, 2013). Regular site visits were conducted at different time periods. These visits included observations at 30-minute intervals to ensure consistency in data collection, measurement, and comparison. During this process the documentation of the tangible elements such as physical components and the public space footprint were considered. An analysis focussed on the spatial conditions of the site as well as the representation of materiality found on the site. This analysis involved observations and utilized graphic methods, including photographs. The observation analysis aimed to identify intangible elements that influence on-site activities, user behaviour, and their experiences within the public environment. Observations were done by *counting, tracking, tracing,* and *mapping* (Gehl & Svarre, 2013). This systematic process ensures continuity throughout the data collection process, to gather more reliable data to establish the impact of these collective elements on the occupancy, comfort, and climate change adaptation potential of the site (Gehl & Svarre, 2013). The analysis aimed to give a greater understanding of patterns identified on site with regards to the user demographics, programmes, and daily use thereof. To contribute to the understanding of the *sense of place*, user movement was observed. Another layer, aimed at comprehending the tangible and intangible components of the public space, centres on the users, making them crucial informants.

In *contemporary placemaking* the user becomes a main driver, establishing a *user-based-approach* to placemaking (Santos Nouri & Costa, 2017). Semi-structured interviews were held with community members, drivers, and maintainers of the 'adopt-a-spot' initiative to gain understanding on the narrative of the site and the history thereof. An additional set of semi-

structured interviews with public space users were done to determine different patterns and expectations with regards to the different microclimatic environments between a public space. A random sampling method was used to identify participants. As supported by the literature discussed earlier, users are integral components of public spaces, and interviews were conducted to gain a firsthand understanding of the space. This process contributed to the observational analysis.

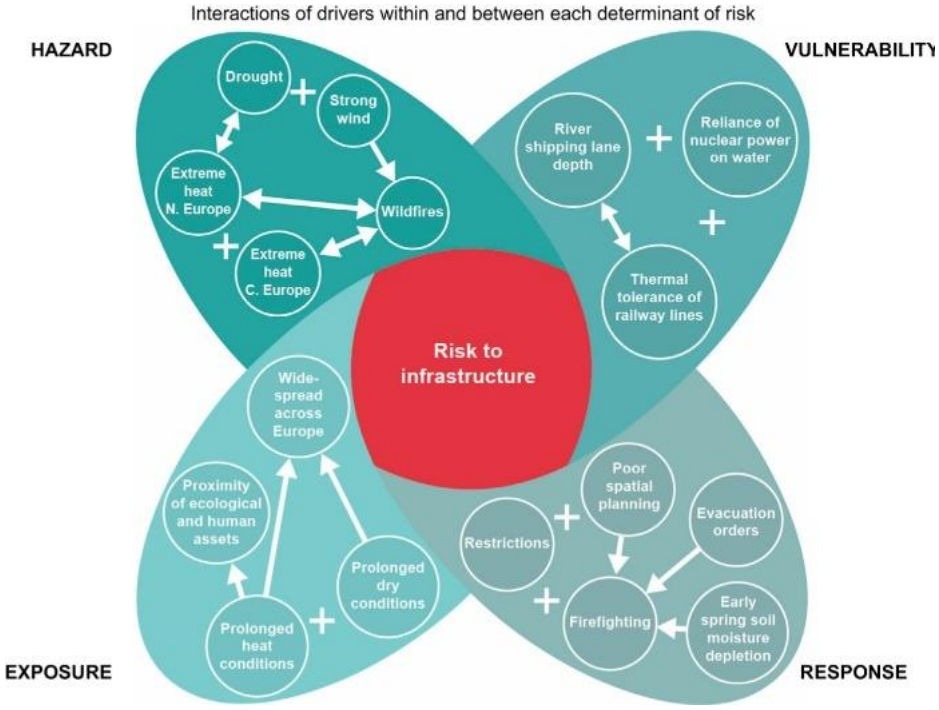

Figure 5. Climate adaptation risk framework (Simpson et al., 2021).

This collective study aimed to build upon a Risk and Vulnerability Framework developed by Simpson et al. (2021). The goal was to assess the climate risk and vulnerability of the site and determine its climate adaptation potential (Figure 5).

All data collected adhered to ethical practices, including as general good practices and protocols outlined in the study's ethics application. Photographs were taken with careful consideration for

the anonymity of park users. Interviews were conducted with a strong sense of responsibility and in accordance with general good practice, with participants signing consent forms. Given the sensitivity of the data which often involved sharing vulnerable and personal experiences, the primary objective was to safeguard the privacy and anonymity of the participants. The data gathered and analysed gave insight to the climate adaptation potential of a public space in Tshwane, Muckleneuk Commons, and what the effect thereof is on the use of the site and well as the health and well-being of its users The data collected contributes to the study's goals by providing insights into usage patterns. The study's objectives are as follows: a) Analyse the present and future climate change adaptation potential of Muckleneuk Commons and its impact on the space's climate change risk and its surroundings. b) Investigate how the development of Muckleneuk Commons affects its current climate change adaptation potential within its local context, and c) Determine how spatial and material characteristics influence climate change adaptation potential and their effects on the utilization of Muckleneuk Commons.

This study assesses the climate adaptation potential of a particular public space and its broader implications. It evaluates the interplay between the climate adaptation potential of public spaces, space utilization, and their impact on users. This research aims to contribute to the development of more sustainable and regenerative urban environments. The rigorous data collection methods, literature review and ethical considerations detailed in the previous sections have provided us with a robust foundation for examining the climate adaptation potential of Muckleneuk Commons. With an emphasis on understanding the interplay between climate adaptation, space utilisation, and user experiences, we now delve into the findings that emerge from our comprehensive analysis of this public space. These findings will shed light on how the site currently responds to climate challenges, its vulnerabilities, and the opportunities it presents for enhancing its climate resilience.

4. Findings

A variety of data was gathered with the aim to give insight to the climate adaptation potential of public space and the effect it has on how the space is perceived, experienced, and used. The data was collected using three main methods such as desktop study, an observational analysis and interviews held on site. These methods contributed to gain a better understanding on the result of the project aim, focussing on the general discourse, mostly elaborated by reviewed literature, and then a context specific study where insight was gained through observation and interviews. One of the research objectives is to determine the current and future climate adaptation potential of Muckleneuk Commons and how it will affect the climate change risk of the space itself and its context.

4.1. Desktop Study & Mapping

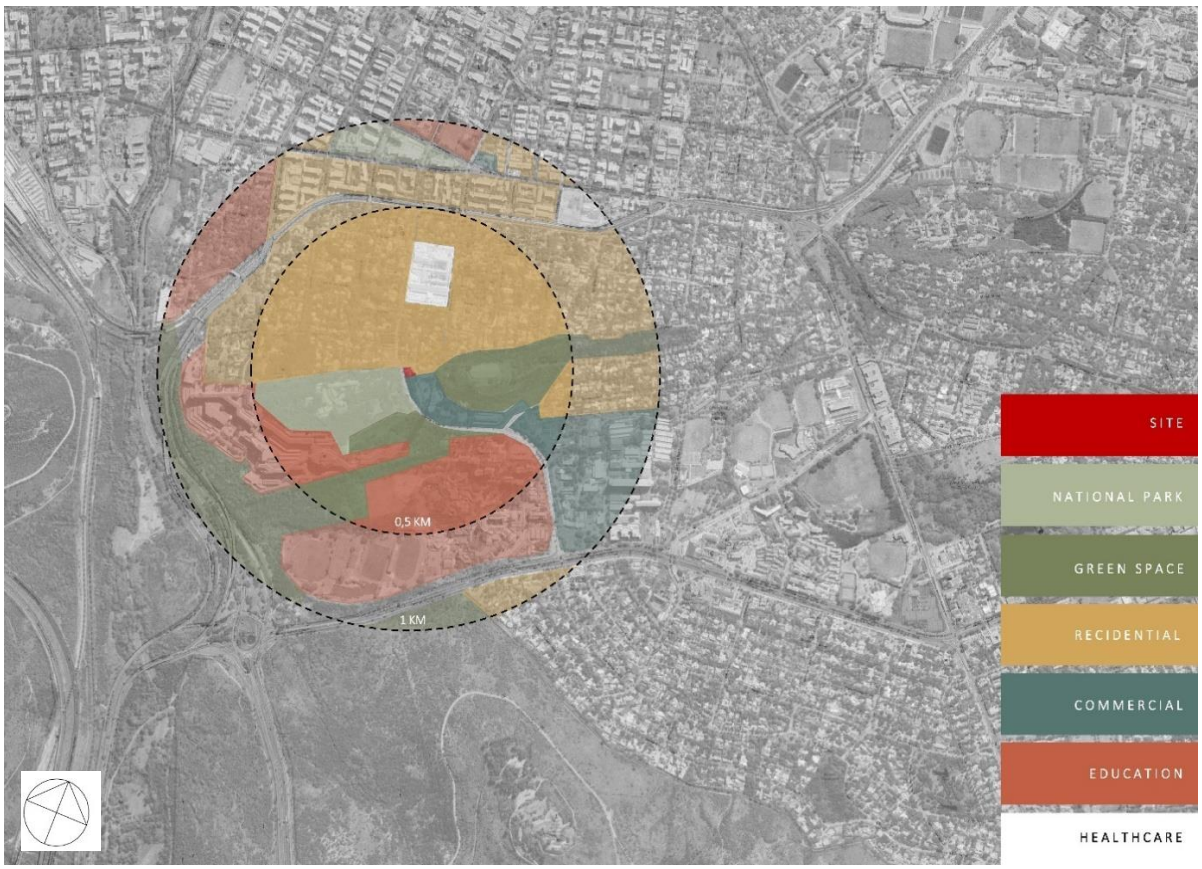

Figure 6. Zoning Map (Author, 2023).

The desktop study and mapping identified the following zoning areas that influence the site such as residential and commercial areas, healthcare facilities, greenspace, and national parks (*Figure 7*). Two scales are used for zoning, 0,5km and 1km, as these will have a direct impact on the local context. Within a 0,5km radius (*Figure 8)* the following areal zoning revealed that 55% of the area is dedicated to Residential houses with only 5% of the area allocated to commercial activity. Greenspaces and green infrastructure make up 15% of the area and 10% is dedicated to National Parks and protected greenspace. Educational institutions take up 12%, with healthcare services in 5% of the area. 1km Radius (*Figure 9*) has an estimated walking time of 10 minutes. Within this walking time the following zones are identified; 45% of the zones are allocated to residential areas with 10% of the area dedicated to commercial areas. Educational institutional grounds sprawl out into 20% of the area with health care facilities taking up 5%. Green infrastructure and greenspace cover 13% of the area with 7% of the area dedicated to National Parks.

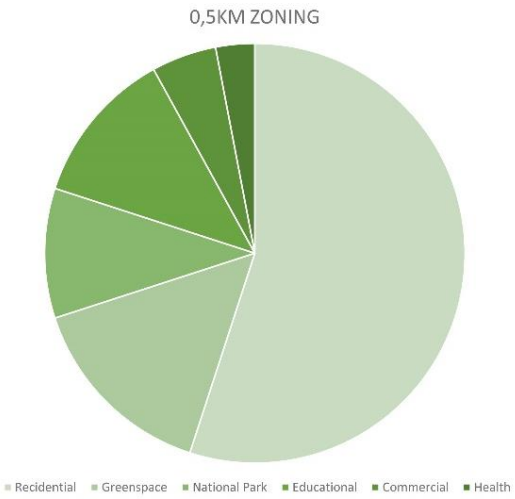

Figure 8. 0,5 km Zoning Diagram (Author, 2023).

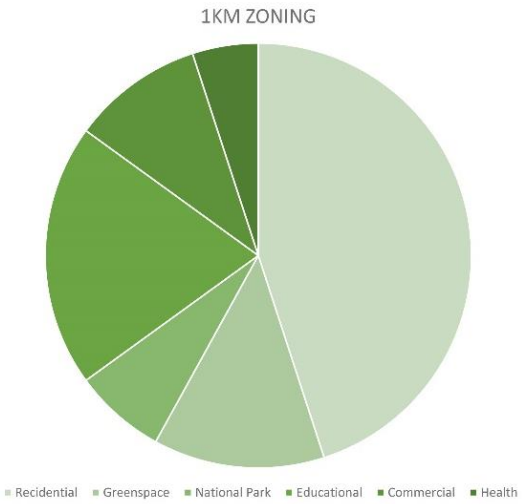

Figure 9. 1km Zoning Diagram (Author, 2023).

The mapping reveals the socio-economic framework, with a focus on residential areas, which influences the overall perception of the site (*Figure 10*). Within proximity to the site (within 0,5km) the residential area is occupied by high income residents. Sprawling further the diversity of socio-economic environments increases including high income, middle income, and low-income residential activity within 1 to 3 km radius around the site. With most of the spatial zoning consisting of residential houses, it is an indication that the local community would be fixed users

with a long-term connection to the site, having little to non-fluctuation in demographic and use. It is important to note that the surrounding community is mostly considered high-income to middle-income, with large residential plots and ample square metres of private outdoor space in their front and backyards. This has an impact on the demographic and use of the park as a public space for the local community. Most surrounding residential areas being of middle to low-income, brings a different demographic to the site as well as different activities. With little to no public greenspaces within the surrounding context, an increase in users, demographic and use is expected in the park.

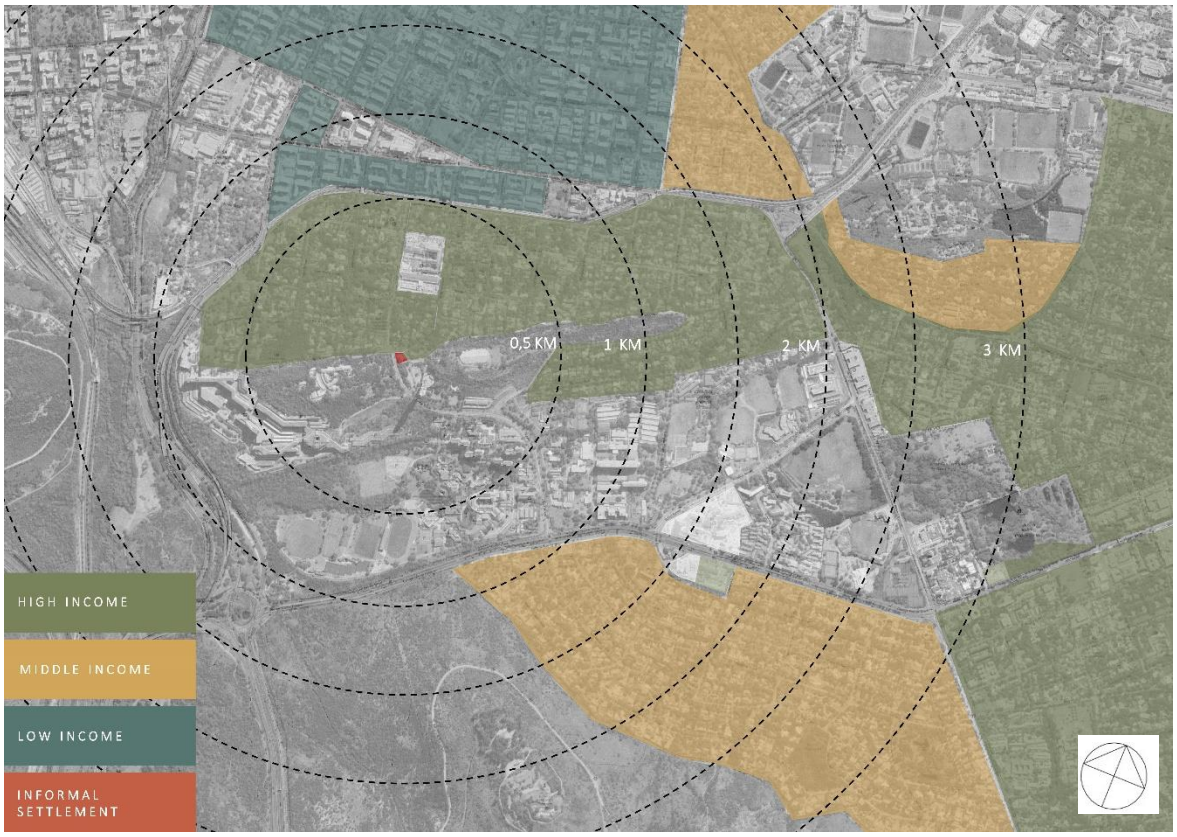

Figure 10. Income demographic (Author, 2023).

The mapping of access routes reveals that the site is accessible through walking paths and suburban car routes within a 0,5km radius (*Figure 11*). Within a 1km radius the site can be accessed by walking paths, suburban car routes, main car roads, and train tracks from the Gautrain. Within an estimated 40-minute walk or 3 km radius the site can be accessed by walking paths, suburban car routes, main car roads, highways, and train tracks from the Gautrain. Walking

or cycling to the site may be more convenient as there is no official car parking. Within 1,5km radius there are no public parking facilities, and beyond that there are limited public parking facilities (*Figure 13*). As reported in the site-section, the site is well-located within 3,6km of the City Centre. Travelling between the site and City Centre depends on the means of travel (*Figure 12*). The shortest travel time is by bicycle and can be reached within 7 minutes, 9 minutes by car, 23 minutes by bus and 43 minutes walking. This data indicates that the site is generally accessible to the public. Access directly to the site is encouraged by walking, cycling or public transport, with little to no consideration made for private vehicles because of inadequate parking facilities. Good accessibility encourages more diverse users (local and non-local) and this in effect generates more probability of diverse activities taking place and general increase in activity and duration by user.

***F**igure 11. Transportation Routes (Author, 2023).*

The desktop study portrays the site as an inclusive, well-positioned public space that not only encourages the local community to socialise and participate, but also invites surrounding communities to ultimately inspire an inclusive public space that encourages diversity. Because it is nestled within a residential community, it has the potential to become a community beacon for gathering, encouraging placemaking and ultimately place keeping, where ownership by the community can cultivate a regenerative community and public space.

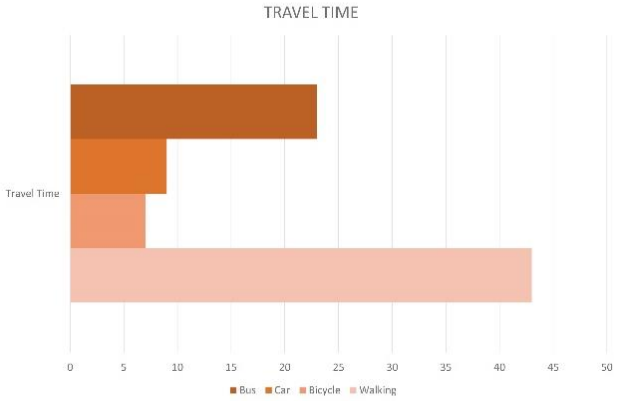

Figure 12. Travel time from Muckleneuk Commons to City Centre (Author, 2023).

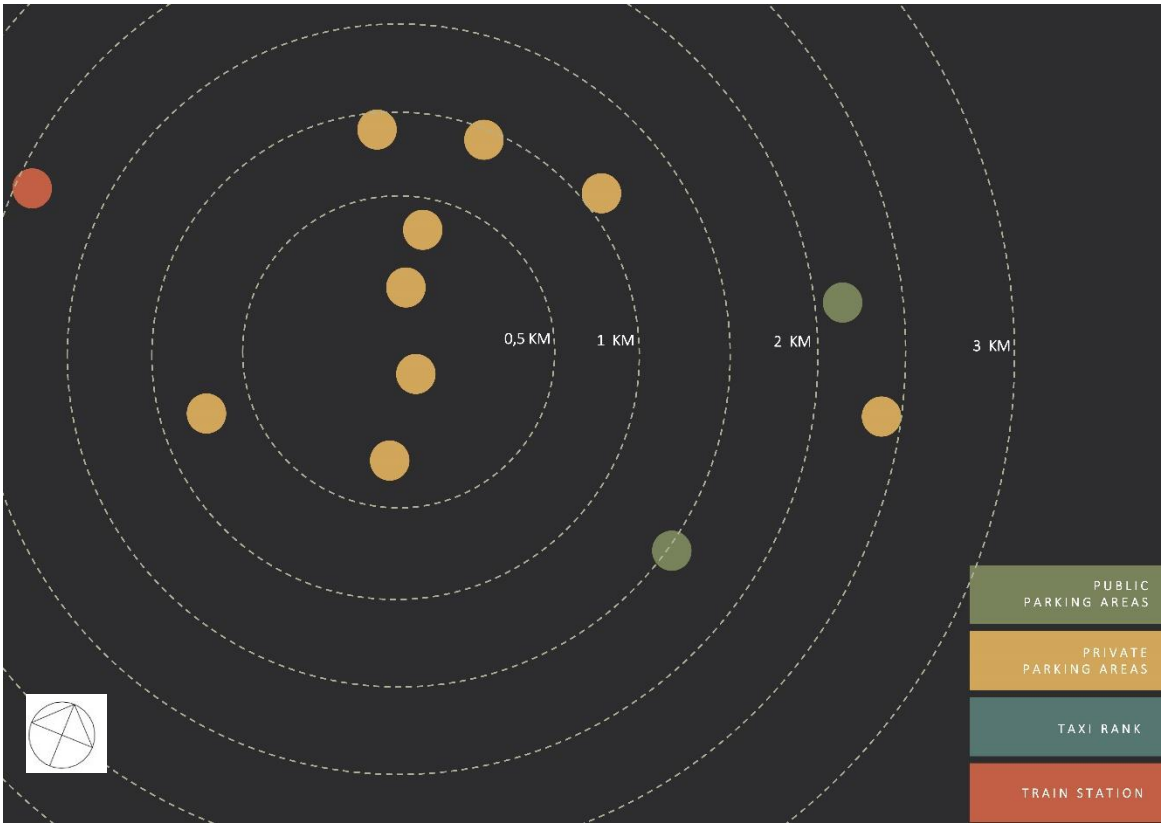

Figure 13. Parking facilities (Author, 2023).

4.2. Observational Analysis

Assets

The site is generally well-maintained, with no signs of vandalism or littering. Site visits are done between 7 March 2023 to 1 April 2023. During the autumn season in Pretoria, rain becomes less regular, but the site has no signs of drought or water scarcity. During the site visits, no additions to physical assets have been documented. The site has limited furniture assets, with only 2 concrete benches in the absence of tables and artificial shading (*Figure 14*). The concrete benches become part of the narrative as it portrays the story of the community that came together and regenerated this formerly dormant patch of land, as an intangible asset. Another layer to the intangible asset is the public art piece (*Figure 15*) tying in with the narrative of the space.

Figure 14. Muckleneuk Commons: Concrete Bench (Author, 2023)

Figure 15. Muckleneuk Commons: Public Art (Author, 2023)

The site is accessible to the public with no controlled access. The existing boundaries do not interfere with the accessibility. The site can be accessed by four formal access points and one informal access point (*Figure 16*). There are four main forms of boundaries on the site: the garden bed, rock wall and garden bed, the Clearview fence, and the rope-and-bollard border. The garden bed creates a boundary between the park and Leyds Street (*Figure 17*). The garden bed is 2m in width. The garden bed is planted with a variety of plant species like grasses, shrubs, and aloe. All three species are known to be low in maintenance and self-sustaining. The rock wall is low and follows the natural fall and infill of the site, acting as a retaining wall with a garden bed below, of

2m in width (*Figure 18*). This wall creates a boundary between the park and Bourke Street, on the Western edge of the park. The Clearview fence separates the site from the Telkom centre, on the eastern edge of the site. The Clearview fence is in a good condition at 2,6m high, with 500mm electrical wire above (*Figure 19*). The fence creates a definite boundary, eliminating access, but its materiality allows for good visibility through the site. The rope-and-bollard border creates a boundary between Devenish Drive and the site, on the Northern edge of the park (*Figure 20*). The concrete bollards are in good condition at 600mm high. The suspended rope in between is non-functional, not creating any obstruction for access.

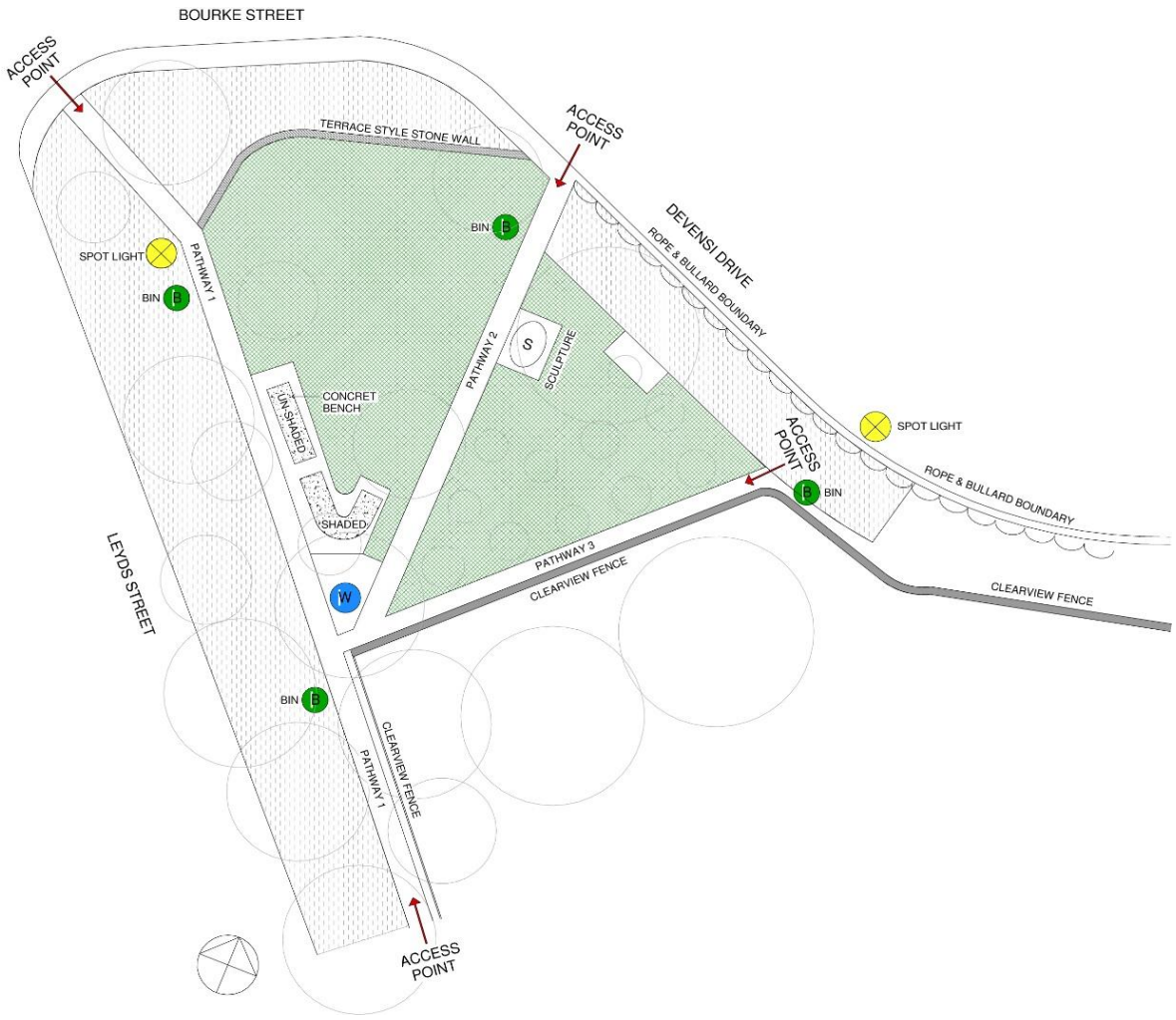

Figure 16. Diagram with physical assets (Author, 2023).

Figure 17. Western Boundary (Author, 2023).

Figure 18. Southern Boundary (Author, 2023).

Figure 19. Northern Boundary (Author, 2023).

Figure 20. Southern Boundary (Author, 2023).

The site has limited amenities. There are no public ablution facilities on the site, or in proximity. During observation four dustbins are counted that can contribute to the overall cleanliness of the site (*Figure 16*). Two Lamp posts are notes on the Southern edge of the park, on Leyds Street (*Figure 16*). On the southern point of the park, is a water fountain, providing fresh water for the public (*Figure 21*). Vegetation makes up most of the site with almost 80% green infrastructure of the typology of the site, with grass, gardens, and trees. The trees are relatively young and indicate the age of the regenerated site (*Figure 15*). The green infrastructure does not cater for food production and doesn't exhibit a natural water body on the site itself. The park consists of four surfaces: grass (65%), paving (10%), loose gravel (5%) and natural greenspace (20%) as seen in Figure 22 and 23.

The overall amenities are limited which influences the longevity of occupancy within the space. The groundcover however encourages spontaneous appropriation of the space which encourages a more inclusive and personal environment for the users to occupy. The rich vegetation, physically and psychologically, separates the users from the busy city life, and boundaries set out by income-classes. The large grass areas allow users the opportunity to connect and disconnect, depending on their needs. This encourages a larger demographic to use the park.

Figure 21. Drinking Fountain (Author, 2023).

Figure 22. Site Surfaces (Author, 2023).

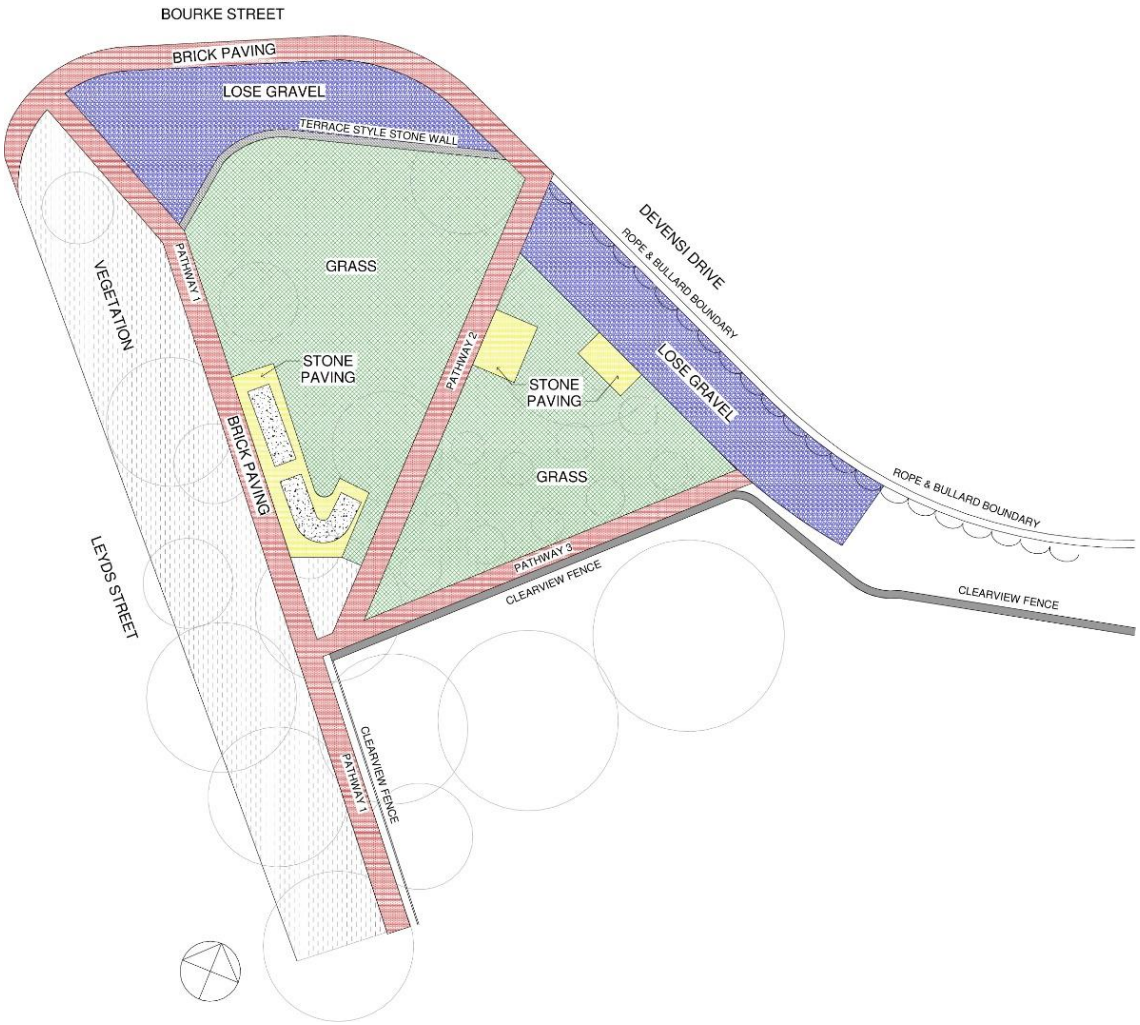

Figure 23. Materiality and surface coverage map (Author, 2023).

Demographic

The overall experience of the site in terms of demographic is greatly impacted by the general occupation of the site. The site is quiet compared to other public spaces within the city. The site is quite unutilised and dormant with no users for periods of time. The site has a varying demographic. During the four weeks of observation, demographic patterns are noticed. The users in and around the park are mostly adults (working class) fro m Sunnyside and Arcadia (surrounding communities) passing through the site during the week mostly in mornings and afternoons (*Table 1 & 2*).

Site Visit			Demographic													
			On Site													
Date	Day	Time	General					Income			Ethnicity					
			Inclusive (a	Overall Us	Men	Women	Children	Elderly	High	Middle	Low	Black	White	Indian	Asian	Other
07-Mar	Tue	10:00	√	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Mar	Wed	17:00	√	8	5	2	1	0	0	√	√	4	4	0	0	0
17-Mar	Fr	11:00	√	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Mar	Thu	06:20	√	11	11	0	0	0	0	√	√	11	0	0	0	0
28-Mar	Tue	16:10	√	14	12	2	0	0	0	√	√	13	1	0	0	0
28-Mar	Tue	08:10	√	9	8	1	0	0	0	√	√	8	1	0	0	0
01-Apr	Sat	11:00	√	15	5	7	3	0	0	√	√	15	0	0	0	0
			√	57	41	12	4	0	0	71%	71%	51	6	0	0	0

Table 1. Table of On-site demographic observations.

Site Visit																
			Surrounding context (seen from site)													
Date	Day	Time	General					Income			Ethnicity					
			Overall Us	Men	Women	Children	Elderly	High	Middle	Low	Black	White	Indian	Asian	Other	
07-Mar	Tue	10:00	3	1	2	0	0	0	√	√	3	0	0	0	0	
15-Mar	Wed	17:00	17	8	5	4	0	√	√	√	14	3	0	0	0	
17-Mar	Fr	11:00	4	3	1	0	0	0	√	√	3	1	0	0	0	
23-Mar	Thu	06:20	19	16	3	0	0	0	√	√	18	1	0	0	0	
28-Mar	Tue	16:10	15	12	3	0	0	0	√	√	15	0	0	0	0	
28-Mar	Tue	08:10	6	3	3	0	0	0	√	√	4	2	0	0	0	
01-Apr	Sat	11:00	10	3	5	2	0	0	√	√	6	4	0	0	0	
			74	46	22	6	0	14%	100%	100	63	11	0	0	0	

Table 2. Table of Surrounding site demographic observations.

Over weekends the park attracts more people from the neighbourhood when organised events are held. During the seven site visits of 30-minutes each a total of 57 users were noted on the site, with various activities. The analysis indicates that 72% of the users are men, 21% are women, 7% are children, with no indication of elderly citizens visiting the park (*Figure 24*). Based on observation, none of the high-income residents visited the site during this time with the users estimated as 71% middle-income and 89% lower-income (*Figure 25*). There is also a visible pattern of ethnicity identified within the demographic of users as being 89% black and 11% white (*Figure 26*). It can thus indicate that men use the site the most.

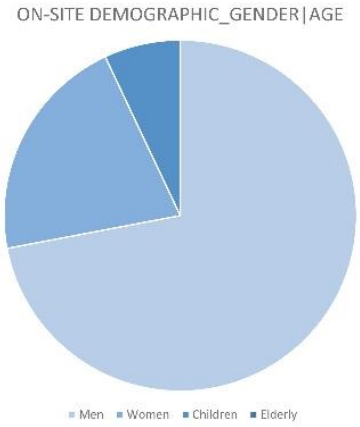

Figure 24. On-site demographic _Gender & age (Author, 2023).

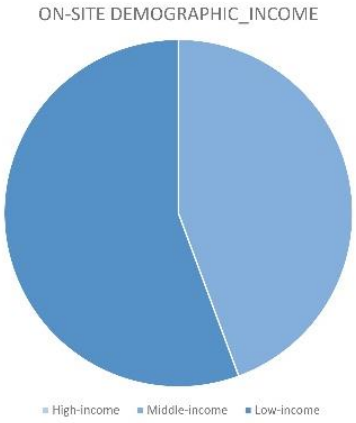

Figure 25. On-site demographic _income (Author, 2023).

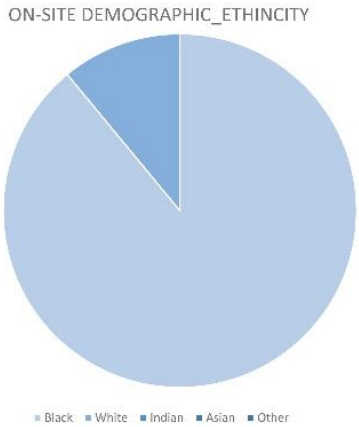

Figure 26. On-site demographic _ethnicity (Author, 2023).

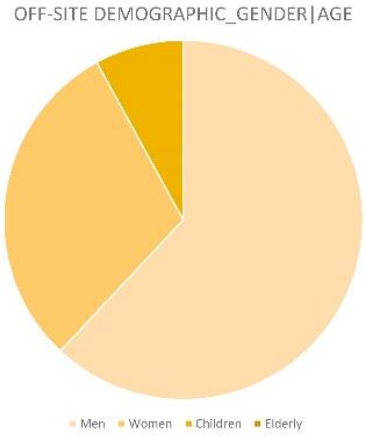

Figure 27. Off-site demographic _Gender & age (Author, 2023).

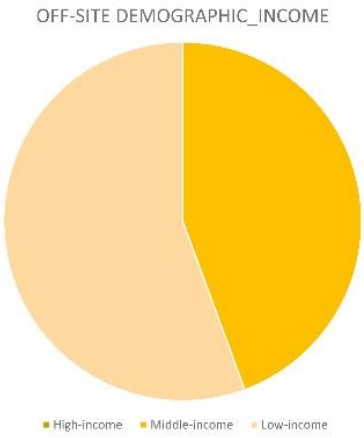

Figure 28. Off-site demographic _income (Author, 2023).

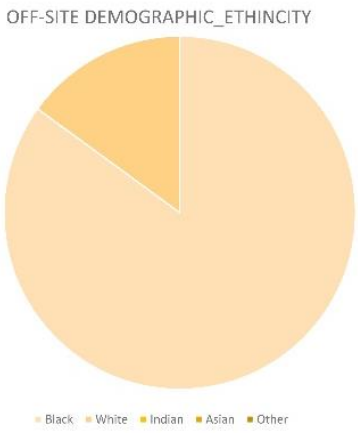

Figure 29. Off-site demographic _ethnicity (Author, 2023).

Another layer to the documentation of the demographic focuses on the users moving within the local context, around the site as observed from the site. 74 users are counted on the seven site visits, moving around the site. 62% of the users are noted to be men, 30% of them are women and 8% are children (*Figure* 27). No elderly citizens were observed. It is noted that the citizens were from middle-income and low-income groups (*Figure 28*). The ethnicity of the observed community, active in the local context as 85% black and 15% white citizens (*Figure 29*). An

interesting observation was the pattern of gender and use. It is observed that men are more inclined to walk through the site towards and from Bourke Street. Women would occasionally walk through the site but are more inclined to walk along the car route around the site, rather than through it. It is clearly visible that the park users contrast the demographics of the surrounding community.

Activities

The site functions differently during different times of the week, influenced by the different demographic use of the park during different times. The surrounding community, like Sunnyside or other areas, uses the park more during the week as a means of thoroughfare or resting place. The park is not a very active public space, occupying none to three people at a time, over 30-minute intervals. The site is often quiet with no movement, use or activity taking place. Two of the seven site visits had no users visit the site in that time while being observed. Individuals that use the park rarely stay longer than 30 minutes. The park is mostly used during the week as a thoroughfare which people use to get from one point to another. The use of the park is thus most obligatory and specific. It is noted that 70% of users use the park as a thoroughfare and 30% of the users spend time on the site (*Figure 30*). The community of Muckleneuk uses the park more over weekends with organised events like markets, movie-nights, and other community-initiatives. The site provides users with physical features to lower the risk and vulnerability of the users. Concrete benches create a resting place which is mostly naturally shaded. The water fountain is a large attraction point to the site and is used by most users. It is observed that 80% of the users stop at the water fountain to drink water and refill water bottles. Movement patterns indicate that the pathways are the most used on the site (*Figure 31*). The use of the pathways can be ranked from most used to least used; pathway 1, pathway 2, and pathway 3.

Figure 30. Static & Dynamic use of the site (Author, 2023).

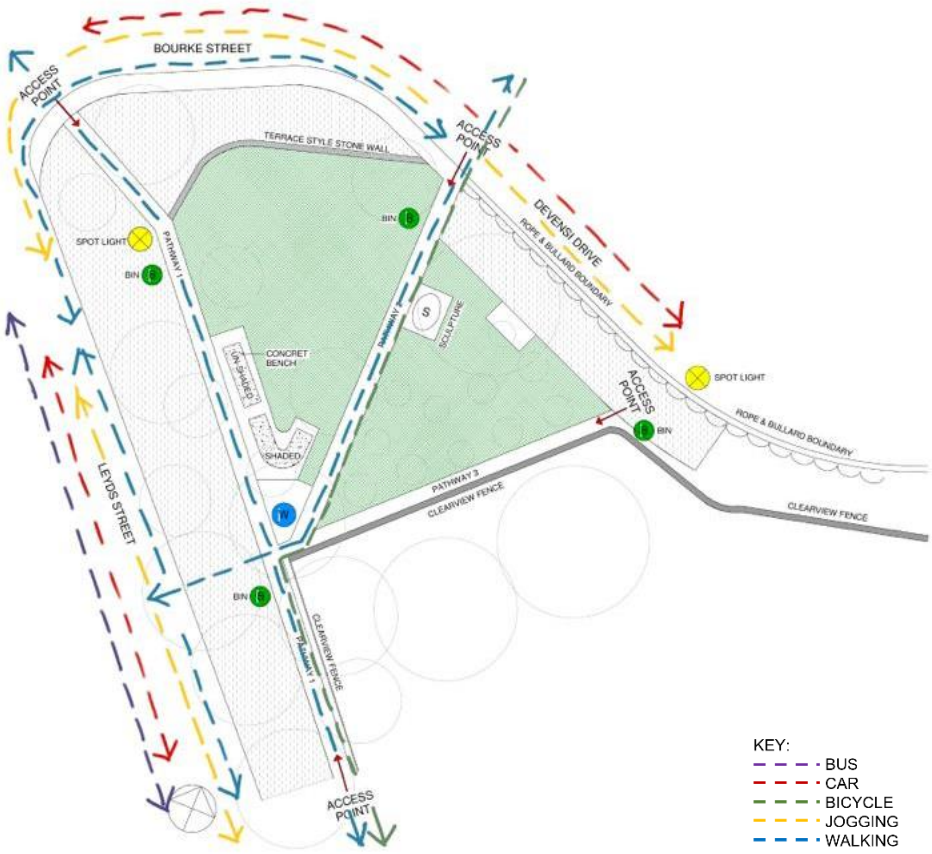

Figure 26. Movement Diagram (Author, 2023).

User perspective: Site limitations

The site is perceived as comfortable, with good natural air flow that regulates the site and improves the thermal comfort of the site. The site allows for multiple occupants and activities, with room for multi-functional and temporary programmes. The overall *safety climate* is observed to be positive, however the demographic, visibility and other aspects may contribute to reducing the *safety climate* experienced throughout the site. The following risks may influence the safety climate; the overall visibility of the site is good. The southern corner of the site is not perceived as highly safe as it does not have good visibility (*Figure 32*). There is no controlled access, with no monitored activity on the site. With that the limitation of surveillance can influence

Figure 27. Vignette capturing rich vegetation, reducing visibility of users (Author, 2023).

crime. In case of emergencies, there are no security offices or officials in proximity. The site is mostly used by men rather than women. This is an indication of the safety perception of the site itself.

4.3. Interviews

The interviews give an understanding of the personal user-experience of the tangible and intangible components of the public space. Semi-structured interviews held with community members, drivers, and maintainers of the 'adopt-a-spot' initiative gives deepened understanding on the narrative of the site and the process of how the site is regenerated. An additional set of semi-structured interviews with public space users are done to understand the user-experience as perceived by users. Because the site is experienced quiet and mostly empty, an online questionnaire is distributed throughout the community, to gain their experience of the site as well. The demographic analysis indicates that most occupants are from surrounding communities. This leaves a gap in analysis to gain the direct community's experience. On-site interviews were held with users from surrounding communities, and online questionnaires gave the local community an opportunity to voice their experience.

Assets

The interviews and questionnaire indicated that the most used physical assets on the site are the concrete benches, pathways, and the drinking fountain. There is no shelter against weather conditions on the site and influences the use and feasibility of the site. Users identify the need for artificial shading or shelter. The art (*Figure 15*) on the site carries great importance to the community as most community members are familiar with the narrative thereof. It is a focal point on the site and sparks interest by users from surrounding communities.

Demographic

The demographic is described by the users and the community as being mostly adults, of working-class age, from surrounding communities like Sunnyside and Arcadia, North-West of the site. The site is mostly used as thoroughfare to move between the city and the larger transport nodes. Over the weekends, the demographic tends to shift slightly towards the community, especially during

organised activities. There is a distinct gender dominance on the site, as it is predominantly used by men.

Activities

The site is mostly an open public park with a non-specific programme. Used mostly as a threshold between the city and other communities, the site accommodates mostly obligated walkers that would pass through the site and make use of the water fountain. During the week the site is most activated in the mornings from 7am to 8am, and afternoons from 4pm to 6pm, when people travel to and from work. During early afternoons from 12pm to 2pm, the site experiences an increase of activity. Weekends are noted to be more flexible and unpredictable as it is strongly influenced by arranged gatherings by the community like markets, movie nights and more. Users from surrounding communities see an opportunity for a pop-up informal or formal economy. The demographic analysis shows a low number of children that use the park. The community identifies the need for a local play area for children.

User perspective: Site limitations

The site is perceived as predominantly inclusive. The safety climate is perceived subjectively. When walking through the site, the site feels primarily safe, but the increase of static users, more specifically men, the *safety climate* shifts. Improving the safety climate for users indicates a rise in boundaries, encouraging controlled access and better visibility in so-called ‘blind spots’ on the site. Most responses note that the public space is not prone to abuse by users. The site is overall experienced as a successful greenspace and public space by users.

Even though the site presents itself as inclusive and safe, the occupancy thereof does not always align with this perception. This highlights the gap between research, literature, and reality. Studying public life and public space is greatly influenced by its local context. For public spaces to adapt into regenerative spaces, it is crucial to understand the context; its climate conditions, its demographic and users, and its use and programme, to ultimately understand the climate risk and vulnerabilities of the space. It becomes more evident that when determining the climate adaptation potential of public space, there is no generic set of principles to consider, but rather finding the balance between general indicators and finalising components through a context specific response. Interpreting the data and findings through a discussion helps to identify gaps within research, and more site-specific responses to the project aim; determining the climate

adaptation potential of a public space and the effect it has on its users and programme, and how it can respond to the climate risk and vulnerabilities of a community.

4.4. **Risk Assessment**

A climate risk and vulnerability assessment are done by evaluating data collected through site observation, interviews as well as a desktop study with particular focus on the Tshwane Greenbook as tool and guideline to the climatic properties of the context. The following climate risk and vulnerability assessment is done through a method by Simpson et.al (2021) in the diagram below (*Figure 6*).

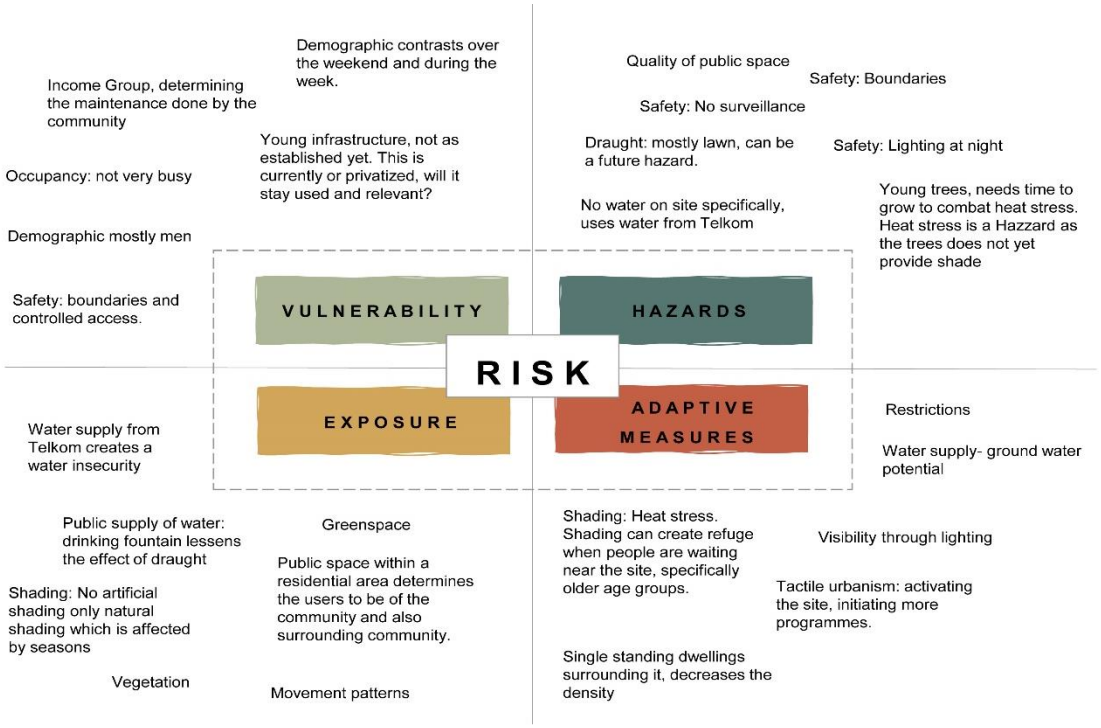

Figure 35. Climate adaptation risk framework of Muckleneuk Commons (Author, 2023).

The biggest risk identified in terms of vulnerability is the relatively young infrastructure. Because the site is nestled within a residential context, it is currently public and not privatized. The risk thereof of if they site will stay relevant and used through passing time. The maintenance is also

depending on the community therefore the income groups create a vulnerability. The age of the site creates a hazard in the current capacity of the site to combat heat stress. The trees are young and does not create any shade. This however will not be a hazard in the future, as full-grown trees will create natural shade on the site, lowering the overall heat stress experienced. The site is currently exposed to little water. The only water supply is from Telkom which can create water insecurity in the future. The implementation of the water fountain exposes the public to fresh drinking water, which lessens the risk of heat stress experiences by users during drought seasons. Adaptive measures such as the addition of artificial shading can create a refuge for users during weather conditions such as extreme heat and rain. This will also increase the occupancy of the site, as artificial shading will create a designated waiting area for users using public transport. This adaptation measure will lower the risk experienced by especially older age groups. Implementing tactile urbanism will also activate the site by initiating more programmes.

Before delving into the discussion of the findings, it's crucial to emphasize the significance of understanding the climate adaptation potential of public spaces within urban environments. This understanding not only aids in identifying vulnerabilities and risks but also serves as a foundation for designing effective adaptation strategies. In the following discussion, this report will explore how the findings shed light on the climate adaptation potential of Muckleneuk Commons and its implications for urban planning and design.

5. Discussion

The Project for Public Space diagramme looks at the following principles to determine the success and *climate adaptation capacity* of a public space such as *sociability*, *users and activities*, *access and linkages*, and *comfort and image* (Garau & Siragusa, 2015). Climate change adaptation plays an important role in how these principles are adjusted or accommodated in public space (Santos Nouri & Costa, 2017).

The current infrastructure is vulnerable to risk because of the young age of the regenerated public space. The surrounding community is highly privatised, making the relevance of the public space a vulnerability. The current site gets water from Telkom. This relationship can create future water insecurity and make water supply a future vulnerability. The local community is vulnerable to the climate change risk framework of the site, as the larger community of Muckleneuk does not want the park to become part of a larger initiative to include surrounding communities. The Muckleneuk community does not encourage the use of the park by surrounding communities, even though they do not use the park themselves, thus leaving the park's future use vulnerable. This vulnerability is connected to a large discrepancy between the view of the park by the community and its intended use and programme, and the actual use of the park by surrounding communities like Sunnyside.

It is evident through the study that exposure is a climate change risk in the park. The biggest risk of exposure on this site is addressed through the provision of shading and protection against natural elements. This exposes the site to fluctuation in different users (changing demographic) based on seasonal and climatic changes. The climate adaptation risk framework identified further adaptive measures that would increase the use of the site. The Tshwane Green Book indicates groundwater potential that contributes to future water supply (Greenbook, 2021). Shading will combat heat stress experienced on the site, creating a refuge for pedestrians. The water fountain is a successful adaptive measure, addressing the vulnerability of pedestrians travelling far and unprotected from the natural elements, through the site to nearby transport nodes. Spatial and material interventions encourage the climate change adaptation potential of public space, contributing to the climate change discourse. Contemporary placemaking synergizes with climate adaptation, and identifying these measures through a *user-orientated* perspective can advance placemaking into place keeping, encouraging future appropriation of public space (Santos Nouri & Costa, 2017).

Climate adaptation potential is found to be subjective to a specific context. Climate adaptation is well correlated to the community, who are key role players in placemaking and ultimately place keeping. Placemaking is essential in creating a collective community and encourages social activity (Santos Nouri & Costa, 2017). Good placemaking is subject to the connection between the *climate-environment*, *built-environment,* and *human-environment*.

5.4. **Impact of the climate**

The park consists of 80% of greenspace that encourages ecological regeneration on the site. With the high volume of vegetation on the site, it contributes to the natural air flow of the site which regulates the thermal conditions on the site. Global climate change does affect the local context, which has the potential to increase the intensity of the heat island effect, especially in urban areas such as Muckleneuk Commons (Foshag *et al.,* 2020). The site's location and typology naturally lower the influx of the heat island effect, as the park is situated in a residential area with little to none, high rise buildings in proximity. This building fabric supports the microclimatic conditions in regulating the thermal comfort of the park. Larger residential plots, has a larger ratio of building fabric to greenspace. The larger ratio of private greenspace acts as a natural temperature regulator, absorbing large quantities of heat rather than reflecting it. This in effect cools down to the local environment.

With the 'adapt-a-spot' initiative, the regeneration of the site improved the socio-ecological nature of the site. The planting of more young trees will regulate the overall urban climate increasingly in the future (Foshag *et al.,* 2020). The regeneration of this site contributes to the climate adaptation capacity of the site. Increasing biodiversity and urban typology can act as a climate adaptation strategy, increasing the resilience of the public space (Satterthwaite *et al.*,2020). The site also provided a water point that improved the heat stress resilience. The South African heat health policy promotes drinking fluids and water as a critical to lower heat stress mortality (Kapwata *et al*., 2018). This incentive contributes to the climate adaptation potential of the site. Another interesting incentive subtly introduced, is the little consideration made for private vehicles because of inadequate parking facilities. This incentive responds to the general climate adaptation potential because it is reducing the carbon footprint left by cars and public transport, encouraging a more walkable or cyclable city.

5.5. **Impact of the demographic**

Establishing a regenerative public space is greatly determined by the users. Muckleneuk Commons does not have a fixed programme and allows for multi-functional activities. The resilience of this space is influenced by the adaptability thereof (Garau & Siragusa, 2015). The site allows for temporary interventions, diversity, and overall inclusivity. The current demographic observed indicates the diversity of this site, with most of the users residing in surrounding communities. The difference in income level noticed in the users, also contributes to the diversity of the site. Through observation the site has shown itself to be adaptable to the needs of its users. During the week the site acts as a thoroughfare used by the surrounding communities for getting from one point to the next, and water point on the journey. The drinking fountain became an important node on the site that encourages users to walk through the site, rather than around it. Over weekends the site becomes transformed into a social hotspot in the community with dedicated activities and initiatives for public participation. This changing environment also influences the longevity of user interaction with the site, where obligatory activity forces shorter time spent on the site and leisure activities encourages longer stays in the park (Santos Nouri & Costa, 2017).

The site responds well to the intangible connection with the community to establish placemaking within a public space. The detailed piece in the concrete benches creates a sense of identity within the community, anchoring the site and contributing to the relevance and care of the site. The influx of a younger community enhances the regeneration of the community. The well-being of communities is seen in the operation of public space within the community. Muckleneuk Commons portrays a relatively healthy community by the *safety climate* observed on the site. The experience on site provokes a feeling of comfort and safety, however the demographic may reduce this feeling. Observations indicated that the site is predominantly used by men and thus influences the behaviour of users. Women prefer to walk along the road, around the site, instead of using the site as a thoroughfare. The static occupancy of men on the site, shortens the time spent by women on the site. This observation indicates the overall safety perception of the site. The use of the site by women is generally a good indicator of the safety of a site. Jiang *et. al.,* (2017) elaborates further that the disproportion of genders (male and female) is usually more profound in areas where occupancy is low and where there are little visible safety measures such

as security, surveillance, and general good visibility. This makes women good indicators of how a space is perceived, as the lack of women in a space indicates the increased risk of safety (Jiang *et. al.,* 2017).

Introducing more controlled access and lighting can initiate a perception of a safer environment. Access control often generates a feeling of safety and more deliberate surveillance with the aim to limit the chance for criminal activity. Good visibility increases the *safety climate* of space, therefore sufficient lighting, especially at night, will increase the safety climate and directly increase the use of the site. Thus, adding tangible assets, can encourage adaptation in the psychological perception that will enhance the safety climate of the site, and as result encourage an increase in occupancy (Santos Nouri & Costa, 2017). The consequence with large boundaries and strict access control might create a feeling of exclusivity, especially for users from surrounding communities who are not familiar with the overall *safety climate* of the site. This runs the risk of changing the nature of the space from being inclusive and allowing for temporary placemaking, to becoming more rigid and limiting in free-use and occupancy. It is important to remember that each site is subjected to its own community's response in the increase or decrease of tangible assets. With a particular focus on Muckleneuk Commons, which increased lighting will enhance the occupancy of the site during dark, but initiating stricter boundaries and access control will have a more radical consequence on the occupancy of the site, as the site is mostly used as thoroughfare during the week.

5.6. **Impact of Built environment**

The built environment has a physiological and psychological effect on users (Reiling, 2006). Tangible assets or the infrastructure determines the comfort threshold perceived by the users. The site is in majority exposed to elements. This level of exposure impacts the use of the site, determining the length of occupancy. Exposure increases the thermal stress experienced by users as the site can only cater for a small number of people during full sun and none during rainy conditions. It is evident that the increase of exposure leads to the decrease in occupancy. The site is mostly used as a thoroughfare along path A (figure), as these are the main directions of movement around the site. On this path is also the water fountain which is regularly used by most occupants moving along this path. The longevity of the occupancy of the users, are limited. People

who tend to linger and stay in the park for a period prefer to sit on the curved bench, which is naturally shaded by adjacent trees. This bench also gives a good view of the site, with the users' backs facing towards a thick shrub, creating a natural shield or wall of protection. The planting of trees acts as adaptation measures, as these trees can provide natural shading and protection against the elements once fully grown. Thus, lowering the exposure will increase the occupancy.

Mapping observations indicated that 50% of the building fabric is allocated to residential homes. Muckleneuk is part of the old East of Pretoria and is known for its spacious lots. The high-income community has sufficient private outdoor space and thus the public space is not a necessity, thus the low occupancy. The surrounding communities host mostly middle-income and low-income families. Multi-story apartment buildings stacked, or row housing is observed in these areas. The footprint of person per square metre of building fabric increases, decreasing the private outdoor space, inclining users to occupy public spaces. Because the site is nestled within a high-income neighbourhood there is limited public transportation to the site. The unavailability of parking facilities also decreases the occupancy of the site. Transportation frameworks currently excludes users from other communities and aims for privatisation of the public space, establishing an increased social cohesion between the community themselves. Yet arguably the lack of public transportation facilities and parking in proximity contribute to the phenomenon of pedestrianizing cityscapes. Pedestrianizing cities encourages the community to increase physical activity, like walking and cycling. Not only does this initiative enhance the health of the community, but also minimises the emission of toxic greenhouse gases that increases climate change. The only noise pollution observed is the traffic. By limiting the traffic, the serenity of the public space increases, adapting the public space into a wholesome environment. Prioritising pedestrian activity is an adaptation measure that can contribute to the regeneration of cities. It is both beneficial to encourage pedestrian activity in the neighbourhood and limit access to the area by private vehicles.

Regenerative design thinking encourages designers to work with nature (Du Plessis, 2023). The site has four types of boundaries, where two of them are nature: the garden bed, and the rock wall and garden bed. The garden bed creates a boundary between the park and Leyds Street, both rather than becoming an obstacle it creates a buffer between the road (traffic) and the serene park (*Figure 17*). The rock wall is low and acts as a retaining wall with a garden bed below. The rocks for the wall are locally sourced and the garden below creates another buffer between the road and the site (*Figure 18*). Using nature to buffer users against the environment, creates a

pocket of life within a city, regenerating the city from the inside-out. Working with nature is another climate adaptation measure this site enforced successfully.

The climate change risk of the site and its surrounding context is determined. Safety, drought, and heat stress are the most prominent hazards that contribute to the climate change risk. Safety is connected to the boundary conditions of the site, uncontrolled access, and limited lighting at night. The park is in a healthy condition and drought is not a hazard at present but could be a risk for future resilience because of the large lawn. Heat stress is a common hazard in public spaces. The young trees currently have a limited capacity to limit exposure to the hazard of heat stress. Once the trees grow, this will not be a future hazard. Vulnerabilities contributing to the climate change risk are the demographic and infrastructure. The current demographic does not show activity of elderly people. With the limited transportation access to the site and the typography of the site's location identifies the elderly as a vulnerable community. The site was not noticed to be visited by older demographic groups, mostly a younger demographic group. This indicates the vulnerability of elderly people's access to the park, greatly because of the limited transportation access and a direct response to the topographical location of the site.

The study aims to contribute to the general climate change discourse in terms of the role that public spaces play in the climate change resilience of our cities. Public space has climate adaptation potential that enhances the regeneration of more climate responsive cities, which promotes better health and well-being of citizens. Public space that adapts to climate conditions promotes the occupancy of the space, and climate adaptation measures increase thermal comfortability of users, encouraging the longevity of use and social interaction between users. The overall comfort of users does determine the occupancy and use of public space. Not only does climatic comfort play a role, but also the perceived safety climate. It is this important to ensure a close relationship between these tangible and intangible components. It is evident through this study that the relationship between a space, its users and its programmes is intricate and integral to the climate change adaptation capacity of a public space.

6. Conclusion

Climate adaptation contributes to the sustainability and regeneration of socio-ecological and socio-cultural discourse. Climate adaptation allows new ways of thinking beyond improving liveable conditions in our environment. This study aimed to determine the relationship between users, public space, and the climate adaptation potential of these environments. This study aimed to investigate the climate adaptation potential of public spaces within Tshwane, through an analysis of Muckleneuk Commons Communal Garden, and determine the impact the climate adaptation measures will have on the use of the public space. The study was set out by three objectives that set out and analysed the

a). current, and future, climate change adaptation potential of Muckleneuk Commons and how it would affect the climate change risk of the park itself and its surrounding context,

b). the effect of the development of Muckleneuk Commons on its current climate change adaptation potential in its local context, and finally

c). established the effect of spatial and material characteristics and climate change adaptation potential, on the use of public space.

These objectives resulted in the following conclusions.

Climate change adaptation improves regeneration and sustainability as the space can absorb shocks and disruptions allowing for better sustainability. Applying this new paradigm of thinking on public spaces, a healthier urban environment will spread into regenerating our cities. Muckleneuk Commons is a relatively young site and promises good climate adaptation potential. The current development not only establishes but encourages even more climate change adaptation. Creating healthier, safer, and comfortable public environments increases the occupancy of these environments, establishing a stronger social cohesion within cities. The site however promotes little social cohesion at this moment, as it acts disjointed during the week and over weekends, where the identity, use and demographic changes completely. The public space becomes a place of contrast. This indicates a disjointedness within the direct and surrounding community, portraying the socio-cultural dynamic and health of the city itself. With more interconnection between different classes, social cohesion will improve, not only in the community, but ultimately spread into the city.

In conclusion, public space serves as a crucial indicator of a neighbourhood or community's climate change adaptation capacity and overall well-being. While the principles of public space remain constant, its implementation is subject to the unique context and needs of the local community. Effective public space design fosters social interaction, accommodates diverse activities, and promotes inclusivity through accessibility and comfort. The success of climate change adaptation measures in cities are influenced by the active involvement of pacemakers and place-keepers, who must customise these strategies to the specific context to ensure ongoing regeneration. Muckleneuk Commons is however controversial. The 'adopt-a-spot' project demonstrates efforts to address climate risks and vulnerabilities, despite challenges related to low occupancy. This is quite controversial as there are no antisocial strategies observed that affect the ultimate use of the site. Nevertheless, the site's social role and potential for future growth and resilience suggest that over time, it may become an integral component in promoting climate resilience and fostering social cohesion during climate emergencies. As communities and cities continue to evolve, embracing the principles of effective public space design and involving community members in the process will be essential for successful climate change adaptation and the sustainable future for cities.

This study of Muckleneuk Commons emphasizes the need for a holistic approach to public space design and management. To enhance climate resilience, it recommends strategies such as increasing green infrastructure, fostering community engagement, and conducting regular assessments. These steps can create public space that enhance climate adaptation potential, promote well-being, and contribute to sustainable and resilient urban environments.

This study has illuminated several avenues for future research in the realm of climate adaptation, public spaces, and user experiences. The complexity of urban environments calls for ongoing investigations into the dynamics between climate adaptation potential, user behaviour and space utilisation. Further studies could expand the scope to encompass a broader range of public spaces, climates, and demographic factors. Additionally, exploring innovative design interventions and community engagement strategies could enhance our understanding of regenerative approaches in urban planning. The knowledge gained form such research endeavours can contribute significantly to the creation of more resilient and user-centric cities, ultimately promoting healthier and more sustainable urban environments.

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8. Appendix

8.4. Ethics Permission Letter

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en Inligtingtegnologie / Lefapha la Boetšenere, Tikologo ya Kago le Theknolotši ya Tshedimošo

19 February 2023

Reference number: EBIT/267/2022

Dr JM Hugo
Department: Architecture
University of Pretoria
Pretoria
0083

Dear Dr JM Hugo,

FACULTY COMMITTEE FOR RESEARCH ETHICS AND INTEGRITY

Your recent application to the EBIT Research Ethics Committee refers.

Conditional approval is granted.

This means that the research project entitled "The climate change adaptation role of regenerative public spaces" is approved under the strict conditions indicated below. If these conditions are not met, approval is withdrawn automatically.

Conditions for approval:

Photographs taken at the public space should exclude people otherwise consents (to be included in the photos) need to be obtained. No minors are to be photographed.

All field workers (students) need to sign the researcher's declaration forms and the principal investigator needs to keep these forms for the next 5 years.

This approval does not imply that the researcher, student or lecturer is relieved of any accountability in terms of the Code of Ethics for Scholarly Activities of the University of Pretoria, or the Policy and Procedures for Responsible Research of the University of Pretoria. These documents are available on the website of the EBIT Ethics Committee.

If action is taken beyond the approved application, approval is withdrawn automatically.

According to the regulations, any relevant problem arising from the study or research methodology as well as any amendments or changes, must be brought to the attention of the EBIT Research Ethics Office.

The Committee must be notified on completion of the project.

The Committee wishes you every success with the research project.

Prof K.-Y. Chan
Chair: Faculty Committee for Research Ethics and Integrity
FACULTY OF ENGINEERING, BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY

8.5. **List of Interviewees**

Date	Time	Place	Gender
28/03/2023	8:00	Muckleneuk Commons	Female
28/03/2023	8:00	Muckleneuk Commons	Male
28/03/2023	11:30	Muckleneuk Commons	Male
1/04/2023	11:00	Muckleneuk Commons	Female
1/04/2023	11:00	Muckleneuk Commons	Male
1/04/2023	14:30:52	Online: Google Questionnaire Form	Unknown
1/04/2023	14:37:47	Online: Google Questionnaire Form	Unknown
1/04/2023	14:45:30	Online: Google Questionnaire Form	Unknown
1/04/2023	15:26:14	Online: Google Questionnaire Form	Unknown
1/04/2023	23:32:14	Online: Google Questionnaire Form	Unknown
2/04/2023	19:40:14	Online: Google Questionnaire Form	Unknown
3/04/2023	16:51:24	Online: Google Questionnaire Form	Unknown
5/04/2023	21:18:21	Online: Google Questionnaire Form	Unknown

8.6. **Research tools and protocols**

8.6.1. **Mapping**

1. Macro Scale Mapping: Community and surrounding community.

a) Zoning
b) Transportation Routes
c) Income demographic
d) Parking Facilities

2. Micro Scale Mapping: Site

a) Assets
b) Spatial properties
c) Accessibility
d) Movement & Activity
e) Materiality and Surface coverage

8.6.2. **Site Observation**

General Observations:

1. Does the site feel safe? Y | N
2. Is the site well maintained? Y | N
3. Is the site clean? Y | N
4. Is there seating? Y | N
5. Is there shading? Y | N
6. Is there any public art? Y | N
7. Is there an informal economy currently operating on site? Y | N
8. Does the site have a specific programme? Y | N
9. Is the site accessible? Y | N
10. Are there any amenities? Y | N
11. Is 80% of the site considered a green environment? Y | N
12. Are there any blue spaces? Y | N

13. Is this public space comfortable? Y | N
14. Noise level: is the public space quiet? Y | N
15. Are there pedestrian paths? Y | N
16. Is it an age-friendly site (suitable for all age groups)? Y | N
17. Is there good visibility throughout the site? Y | N
18. Is there any signage or directions of the site? Y | N
19. Are there physical boundaries on the site? Y | N
20. Is there any food production? Y | N
21. Is there controlled access to the site? Y | N
22. Is the public space under surveillance? Y | N

Specific Observations:

Counting (30min intervals)

People (on site)	
General	
Users	
Men	
Women	
Children	
Elderly	
Income demographic	
High class	
Middle class	
Low class	
Ethnicity	
Black	
White	
Indian	
Chinese	
Other (note)	
Activities	
Walking	
Specific Activities (note)	
Non-specific activities	
Physical assets	
Vegetation	

Gardens	
Trees	
Grass (%)	
Paving / Walkways (%)	
Natural green space (%)	
Water bodies	
Food production gardens	
Urban Furniture	
Artificial Shading	
Seating (benches)	
Tables	
Public Art	
Amenities	
Toilets	
Drinking fountain	
Clean running water points (taps)	
Dustbins	
Spotlights / Lamp posts	
Safety	
Access points	
Security guards	
Security office	
Surveillance	

29 September 2023

People (surrounding site- seen from site)	
General	
Users	
Men	
Women	
Children	
Elderly	
Income demographic	
High class	
Middle class	
Low class	
Ethnicity	
Black	
White	
Indian	
Chinese	
Other (note)	
Activities	
Walking	
Specific Activities (note)	
Non-specific activities	
Physical assets	
Urban typologies	
Residential homes	
Commercial buildings	
Medical buildings	
Educational buildings	
Protected green areas	
Vegetation	
Gardens	
Trees	
Grass (%)	
Paving / Walkways (%)	
Natural green space (%)	
Water bodies	
Food production gardens	
Urban Furniture	
Artificial Shading	
Seating (benches)	
Tables	

Public Art	
Amenities	
Toilets	
Drinking fountain	
Clean running water points (taps)	
Dustbins	
Spotlights / Lamp posts	
Safety	
Access points	
Security guards	
Security office	
Surveillance	

Descriptive Analysis

General	
Perception of space	
Feeling of comfort	
Feeling of safety	
Smell / Air quality	
Visibility	
Noise quality	
Public Furniture	
Material	
Shaded/Non-shaded	
Type	
Quality	
Amenities	
Type & Material	
Shaded/Non-shaded	
Quality	
Boundaries	
Type & Material	
Quality / Efficiency	
Height	
Access	
Parking facilities	
Vegetation	
Food production types	
Types of plants	
Tree quality (do they provide shade etc.)	
Typology	
Greenspace type	
Pedestrian routes	
Surface quality (accessible & inclusive)	
Surface material & coverage type	

8.6.3. **Interview Questions**

Assets:

1. What physical assets would you say is something that gets used in this area the most?
2. What physical assets do you think is needed in this area?
3. Do you know the story behind the sculpture in this park?

Demographic:

1. What group of people have you noticed visiting this area?
2. Who would you say is the community that used this area the most?
3. Are the more men than woman visiting the site?

Activities:

1. Are there any activities that you have noticed take place in this area?
2. Do you think there is a need for more specific activities to take place in this area?
3. What times would you say this site has the most activities happening?
4. Do people linger / stay at the site, or do they mostly only walk or run through?
5. Would you say the park gets abused often? (People drinking, smoking etc.).
6. What is the site used as?
7. Do you think this area should be a public space that encourage the public on sustainable vegetation, gardening, and food production measures?

Needs:

1. Do you feel safe in this area?
2. How can this area make you feel safer?
3. Does this park feel inclusive? Do you feel welcome here?
4. What do you think this area needs to make it feel more welcoming or inclusive?
5. Do you think this park is a successful public space?