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RESEARCH REPORT

Urban Community Gardens

as a

Climate Change Adaptation strategy

Student:

Tlamelo N G Mojaphoko

15045219

Supervisor:

Dr Jan Hugo

Department of Architecture

Faculty of Engineering, the Built Environment and Information Technology

University of Pretoria

South Africa

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DECLARATION OF ORIGINALITY

I declare that the mini-dissertation, **Urban Gardens as a Climate Change Adaptation strategy** which has been submitted in fulfilment of part of the requirements for the module of **Design Investigative Treatise 801**, 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 in order 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 ethics code for researchers and have followed the policy guidelines for responsible research.

Signature:……

Date:……29 September 2023……

ABSTRACT

Public spaces in the City of Tshwane, are spaces for social cohesion and knowledge exchange. However, the treatment of open greenspaces has been lacklustre in recent years, perpetuating the idea that closing them off to the public will be easier to maintain by controlling their accessibility. Therefore, we need to look at new ways of establishing impactful and productive open green public spaces that promote social cohesion, tackle issues that arise from climate change and create a better urban environment for the residents of our city.

This study aims to close the gap between public space use and function, particularly concerning climate change adaptation strategies. Additionally, it stives to give insight into how spaces that are geared towards urban agriculture, just as Moja Gabedi is, can achieve the objective of being climate change adaptation strategies and become positive climate, and social contributors to the communities around them.

A mixed method case study of the Moja Gabedi Gardens in Hatfield, Pretoria has been selected for this research; with study tools ranging from desktop studies to observational mapping of the site, its activities, and its users. This method was ideal for understanding how spaces and their users interact and affect each other while confronting the biases that researchers may have when working in vulnerable communities.

The findings of this study reveal that Moja Gabedi not only offers beneficial therapeutic services to its users, but it also contributes to the physical wellbeing of the urban context in its immediate vicinity. This became evident in the manner in which it does not entirely depend on municipal infrastructure to be successful; the tangible change it has developed in the users from Reliable House; and the health and economic benefits it has given to the users in Rissik Park.

This report aims to contribute to the current discourse in the architectural and climate research sectors. It demonstrates that small urban food security initiatives are twofold, in that they tackle food concerns and improve the physical, mental, spiritual, and economic well-being of the city and its residents. It is through this transforming of negative spaces into green spaces, that we can add value to urban context while ameliorating the impacts of climate change, which are the highest in cities.

Keywords: Public space, urban agriculture, mental health, climate change adaptation.

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List of Abbreviations

COSUP: Community Orientated Substance Use Programme

CPUL: Continuous Productive Urban Landscape

RH: Reliable House

UA: Urban Agriculture

UP: University of Pretoria

1. Introduction and background

1.1 Background

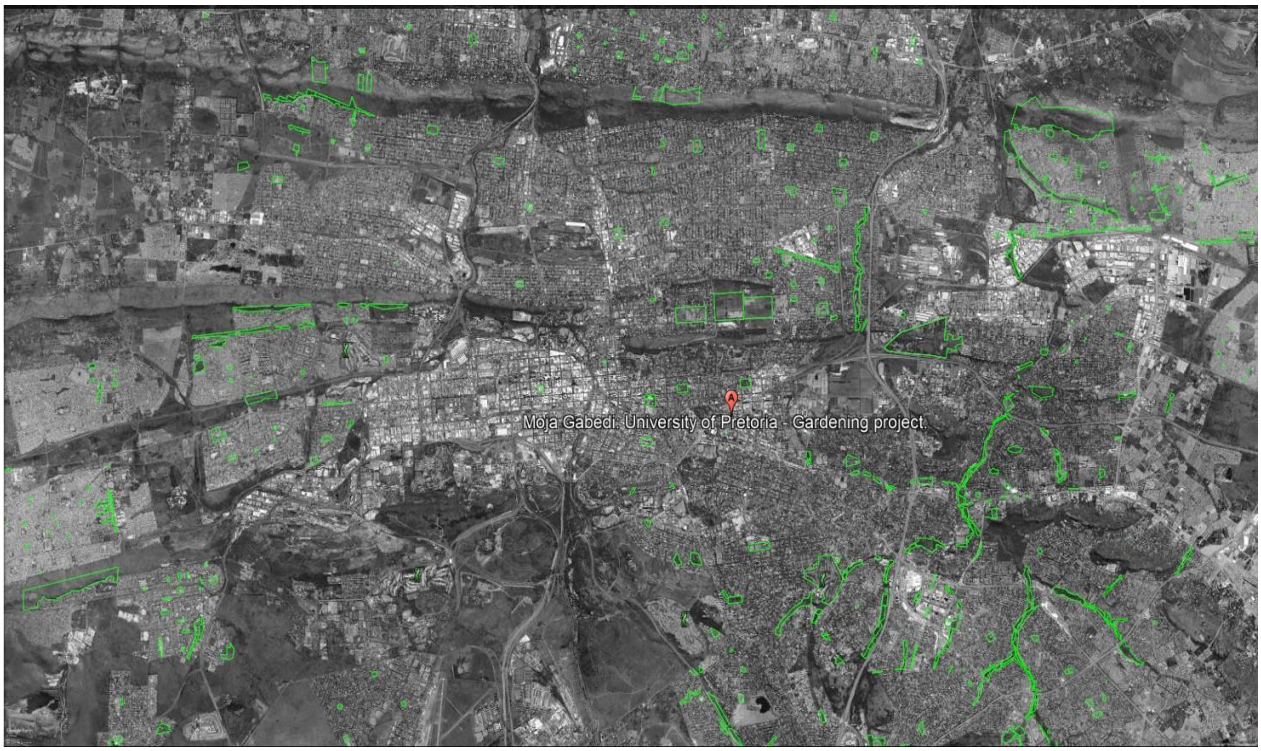
Climate change has global implications of permanent changes across different sectors and industries. The built environment is no exception to these changes and has been modified to mitigate the effects of climate change. We can see these changes, particularly in the construction industry; in terms of the spatial material conditions of the spaces we create. These changes need to be seen in the establishment and development of open public spaces, as these have a direct and indirect correlation with the well-being of urban residents and cities at large.

This new practice in the built environment requires us to not only design sustainable buildings but to also understand the needs of the public realm concerning the required changes for urban spaces in the future (Liu, Chen, Yang, Sandanayake, Miao, Shi, Ya, 2022). As a result, considerations of climate change adaptation must be included in our design processes.

The researcher not only be looking at the impact of climate change in our urban context, but also the role that open public spaces play in the climate change adaptation of said urban contexts. It is already known what climate change mitigation is within the discourse, but what is climate change adaptation? According to the IPCC Assessment Report (AR) 6 (2022, p 5), 'adaptation plays a role in reducing exposure and vulnerability to climate change. The ecological system includes autonomous adjustment through ecological and evolutionary processes. In human systems, it is the anticipation or reaction and increment and/or transformation.' We need to see climate change as not only a physical environmental problem but also an impact at the social and socio-economic levels. This is particularly important in the health sector. In this report, the researcher will be looking at the health risks posed by 'food insecurity, hunger, malnutrition, and air pollution' as well as how these affect the mental and occupational health of the population, particularly in the urban landscape. (Ziervogel, New, van Garderen, Midgley, Taylor, Hamann, Stuart-Hill, Myers, and Warburton, 2020 p. 610).

In order to understand how public spaces can play a role in the adaptation towards climate change impacts in our cities, we must realise that public spaces must integrate processes that include community integration, cheap/quick and temporary interventions, a reiterative and adaptive design process, and support of a diverse range of users and activities. These are the principles and processes adopted by community embers in developing many urban agricultural projects. (Napawan, 2015, p 39) as is with our case study. Therefore, the role of

all public spaces is to create and foster social cohesion, with authors such as Peters, Elands and Buiss (2010) highlighting research that provides insight into whether urban spaces can indeed facilitate this social cohesion in urban neighbourhoods. In this report we will then need to understand the added layer of how these spaces play a role in climate change adaptation and their effects on our urban spaces, especially to combat the effects of the physical characteristics of cities such as scarce vegetation, the prominence of impermeable surfaces and anthropogenic heat sources that contribute to urban heat island effect (Brown, Vanos, Kenny and Lenzhoczer, 2015).



Map 1: Aerial Imagery of Public Spaces [highlighted in green] in the City of Tshwane. (Google Earth, 2023).

1.2 Research problem

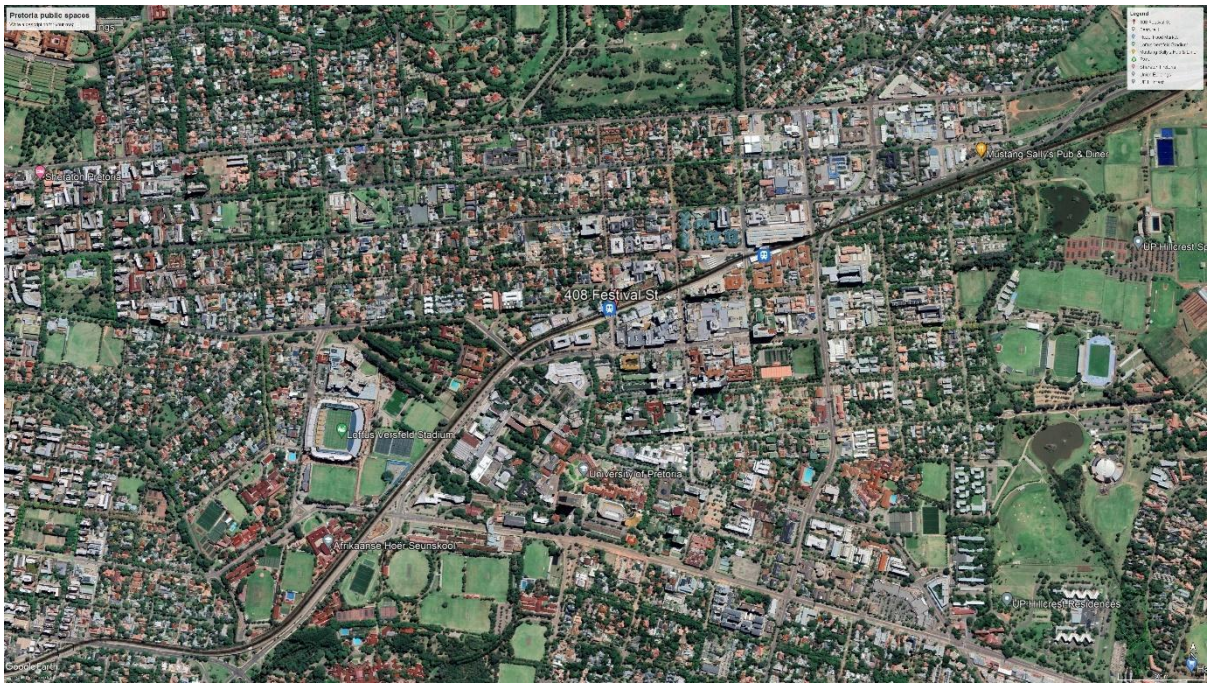
Landman (2015) and Ghel (2011) describe public spaces as places that not only provide opportunities for recreation and relaxation but also “contribute to the greening of cities”. In addition to this, we need these spaces within our urban spaces, as seen in Map 1, as they also provide an opportunity for social interaction and cohesion, especially with the growing population diversity that makes up our urban social landscapes. As Carmona, Heath Orc and Tiesdell (2003) sates, we can place them into two categories:

1. *Public Spaces*: buildings or open green spaces, generally owned by the state or municipal developers. Example: , Hospitals, museums, or nature reserves.

2. *Quasi-public spaces*: Building or open green spaces that are on privately owned land. Example: community Schools, Office Blocks, and retail centres and gardens.

With this new understanding of what a public space is, we can begin to recognise how different public space typologies play certain roles within the urban context. As shown in Map 2, the Hatfield Precinct where Moja Gabedi is located, is rife with green spaces. However, in most of these cased, these are on private land, unlike Moja Gabedi, which is situated is publicly owned land, belonging to the city of Tshwane. However, due to the nature and organisation of the spaces, it can constitute a quasi-public space, and it has a limited accessibility due to the design and management of the space.

Globally we need to address food security as climate change is, and will in future, severely impact the food production sector. This needs to be addressed on a human scale. This can be focused, particularly in the urban framework, through urban agriculture initiatives. This has led to a rising increase in the establishment of urban agricultural spaces in cities across the globe. Urban agriculture as an industry has been growing exponentially in recent years, particularly in the global north, though it has slowly been gaining traction in the global south, particularly as a solution to the challenges of the global south (Battersby & Marshak, 2013, p 448).



Map 2: Aerial Imagery of Open Green Spaces in and around the Hatfield Precinct, City of Tshwane. (Google Earth, 2023).

Urban Community Gardens as a Climate Change Adaptation strategy

In the global north, Urban gardening has been seen as an effective way of combatting urban decay. However, in the global south, the issues that urban agriculture aims to combat, go beyond just urban decay, as these stem from migration movements as well as rapid urbanisation for economic development. In this region, urban agriculture has the potential to change people, places, and their sense of belonging (Battersby & Marshak, 2013, p 448).

Therefore, how do we address the issue of food insecurity within the Tshwane urban context while integrating the policies of climate change adaptation?

Locally, through the Tshwane climate action plan *(City of Tshwane*, 2021) and National Climate Bill B9-2022 (Parliament of South Africa, 2022), the implementation of these adaptation responses is not always evident. However, in recent years it is becoming more evident that they have become more prevalent in the discourse, in our cities despite institutional barriers. These can be in the form: of funding issues, lack of adequate government personnel, poor communication between departments and the need for support bodies- such as the Council for Scientific and Industrial Research- CSIR- to do the needed assessments that will perform continuous assessments to update these policies at a real time basis. (Ziervogel. G et al., 2020 p. 613). In light of this, public spaces like Moja Gabedi Gardens, do demonstrate the potential and possibility of establishing healthy and resourceful public spaces regardless of the lack of resources needed to typically accomplish this.

In addition to this, how most urban gardens are established, as with Moja Gabedi Gardens, there is a level of uncertainty in modern legislation towards their validity, though one can argue that urban gardening is ‘‘as old as African cities themselves’’ (Maxwell and Zziwa 1992, p. 13). With that, there is also evidence that they have been a tool for combatting not just urban decay, but poverty in our cities, urban agriculture also provides additional household income through the sale of produce from the gardens (Foeken 2006)

We know of the Tshwane Climate Action Plan, an example of policy that now carries importance in the planning of the city and its new spaces. However, for these policies to be successfully implemented, that requires the involvement of developers and corporations. Guy Lamb makes an argument for this, stating that, in particular to public spaces, there is a need for open green spaces to be protected against the pressures that densification tends to have toward these spaces being utilised in the residential and commercial spaces to accommodate the population increases around the city (Lamb, 2018). In addition to this, Lamb advocates for the need for policy and legislation that protects these spaces against the acquisition of public land for private development, such as the National Environmental Management: Protected

Areas Act, 2003 (Act 57 of 2003). Frameworks like the New Urban Agenda, strongly advocate for an increase in safe, accessible, and green public spaces (United Nations, 2016) that promote social cohesion in addition to investing in the social capital that these spaces provide opportunity for. With all of this in mind, the study aims to unpack the climate change adaptation potential of selected public spaces in this case a regenerated space that accommodates urban agriculture.

1.3 Research questions

Main question:

How does the climate change adaptation potential of the Moja Gabedi Gardens affect its use?

Sub-questions:

I. What is the current, and future, climate change adaptation potential of the Moja Gabedi and how does it affect the climate change risk of Moja Gabedi itself and its immediate context?

II. How does the establishment and development of the Moja Gabedi affect its current climate change adaptation potential in its immediate neighbourhood?

III. How do the spatial and material characteristics and climate change adaptation potential affect the use of the Moja Gabedi?

1.4 Limitations, delineation, and assumptions of the study

In terms of limitations, due to the programme schedule the data collection was carried out over one month resulting in a smaller sample size. With this in mind, the researcher assumes that seasonal variations will affect the use. Therefore, further research can expand on the period of data collection. The research was also limited to the case study, Moja Gabedi and Rissik Park, to observe how the spatial layout of the sites impact useability.

The delineation undertaken in this study was in understanding how the interaction of users and public spaces play a role in the climate change impacts of the space on its environment and said, users. For this to be feasibility, the study was conducted through multiple site visits, limited to one hour each. In addition to this, the climate change impact to study area is based on those specified in the Tshwane GreenBook.

The assumptions of the study was that there is existing literature on the type of study, that could be applied to the site, Moja Gabedi. This assumption was also applied to the climate

change adaptation role of the site, and that the observations of this would be based on the reviewed literature.

2 Literature review

As previously stated, this study intended to find out the climate change adaptation potentiality of public spaces in the city of Tshwane and how it affects their use. In this section, the researcher will explore the literature that has been published on public spaces, climate change and adaptation responses that are required for these spaces to be successful. First, to understand how and why public spaces are established in cities, and the role public spaces (parks, nature reserves, plazas, and squares etc.) play in the livelihood of people. This chapter also focuses on literature that explores the role open public green spaces, urban gardens in particular, have on the regeneration and revitalisation of spaces in our cities, and the climate change adaptation role they have in the urban environment. The literature also shows the necessary frameworks needed in the design of public spaces that aim to combat climate change impacts. It was also necessary to understand the position of the discourse regarding how climate change impacts the mental well-being of public space users.

2.1 Public Spaces

Public spaces play a significant role in the health and wellbeing of the city and its inhabitants. The definition of public spaces is noted as “all areas that are open and accessible to all members of the public in a society...” (Neal, 2010, p 214). That being said, public spaces need to foster social integration that can simulate social cohesion through their use as well as understanding the specific characteristics of social interactions in these spaces (Peters et al., 2010). They provide opportunities for recreating and relaxation, adding to the green infrastructure of the city (Ghel, 2011; Landman, 2015). Landman (2015) further states that public space is critical in the urban environment to improve the health and wellbeing of communities and individuals.

These spaces promote physical health, help to reduce stress, and improve psychological wellbeing. In addition, there is also economic opportunities in these public spaces as they attract corporate enterprises, and these green open spaces are seen to be beneficial to their employees’ physical and psychological well-being (Lamb, 2018). This characteristic of public spaces lends credence to the importance of green infrastructure in the urban landscape. The same can be said, in particular, of urban agricultural gardens.

Implementing urban agricultural gardens and farms has, in recent years, grown in popularity within the cities of the global south, given the aforementioned issue of food insecurity. Battersby and Marshak (2013) also mention how these spaces deal with the use of

wastewater and urban solid waste, and “address some of the waste management challenges of developing cities” (Gutberlet, 2018; Ferronato & Torretta. 2019). Other researchers have recognised the importance of urban agriculture as spaces that enable vulnerable communities to improve their livelihood and wellbeing (Cantor, 2010; Costa et al., 2015; Batitucci et al., 2019) and expand the probability of knowledge exchange within the communities and as well as with other urban populations external to them.

The design and layout of public spaces can play a major role in the use and function of these spaces. Landman (2015) expands on this characteristic of open public spaces and how their built form and surface condition can inform function. This is because while it is ideal for public space design to have the ultimate use of the space in mind, some public spaces, such as public squares and botanical gardens are more focused on the aesthetic quality of the space than their function. Because of this, their function stems from the physical elements within the spaces such as the seating arrangements, plant arrangements and interactive spaces.

While some spaces are organically designed, allowing the existing landscape to dictate its form, function, and circulation; some spaces are formally designed with symmetrical structuring (Landman, 2015). The type of design, therefore, influences how the space is ultimately used, particularly in terms of movement through the space; although we know from studying human movement patterns that people will take the shortest route from point A to point B. Whether it be in safety, distance, or ease (physical impact on the body) they will take the easiest path (Ghel and Svarre, 2011).

This is also evident in how the design and function then attracts the different user types within the spaces. This, therefore, adds to the aforementioned benefits that open public spaces bring to their users, as they contribute to the social vibrancy and urban well-being of the residents by building trust and reducing fear between people (Lamb, 2018). In so much as stating the social benefits of public spaces in our cities, a truly successful regenerative public space is holistic in its approach towards the urban landscape. “Thus, the above-the-line approaches are not just about a change in the processes and products of design, but also in the mind of the designer themselves – new ways of being leading to new ways of doing.” (du Plessis, 2022). In this, truly regenerative public spaces demonstrate greater environmental benefit to the city; in that, these spaces bring change, even in how we treat the physical-ecological- environment of the urban landscape through these open public spaces (Mang & Reed, 2020).

Beyond just the issues of water use and land use of these spaces, open green spaces "create an opportunity for plant conservation… improving the urban ecology and biodiversity and mitigate the air pollution challenges… to create a pleasant environment" (Okolo and Okolle, 2010, p. 125). Open public spaces play a significant role in the improvement and revitalisation of vegetative space, regenerating the physical health of these spaces, and creating liveable spaces (Okolo and Okolle, 2010). In South Africa, through these public spaces, there is hope in the architectural and conservation sectors to expand protected and environmentally sensitive areas by 2050 and to improve our biological and physical ecosystems through adaptation strategies (Ziervogel. et al., 2020, p. 611).

However, to successfully implement these strategies, we must understand that "climate impacts and risks exacerbate vulnerability, and social and economic inequities and consequently increase persistent and acute development challenges, especially in developing regions and sub-regions... This in turn undermines efforts to achieve sustainable development, particularly for vulnerable and marginalized communities" (IPCC, 2022, p 29). This new understanding therefore aids designers in creating climatically adaptive open public spaces with a holistic approach (DeKay, 2011).

2.2 Climate Change

According to the IPCC, "climate change changes in the state of a climate that can be identified in changes in variabilities and averages of its properties in the extended period, typically of decades or longer" (IPCC, 2007). As is previously mentioned, climate change has and will in the future impact the global south in particularly devastating ways. Various sectors in the built and natural environment are particularly vulnerable to the impacts of

climate change, as it threatens the lives and livelihoods of many living in extreme poverty (Ray, 2021). The added fact that Africa is the smallest contributor of greenhouse gas emission globally, but the most impacted by their effects, speaks to the need for not only mitigation but adaptation reform (Ray, 2021; Ziervogel et al., 2020).

That being said, for the global south, particularly in Africa, those variables have a larger impact on the sustainability and longevity of healthy livelihoods and urban landscapes. This then requires us as researchers and the built environment industry to understand the interconnected impact of climate change across many sectors of industry. The identified sectors that are impacted by climate change in South Africa are biodiversity, water, agriculture, health, and cities (Ziervogel et al., 2020).

2.2.1. Biodiversity

Research in South Africa has prioritised the protection of species and ecosystems as this reveals the potential changes in key biodiversity indicators (Zievogel et al., 2020). By identifying the environmental threats, we can address the issue more succinctly and also develop appropriate responses to these issues, for the current and future variables that come with the changes in the climate (Hannah et al., 2002) For the central interior of a climatically diverse country like South Africa, concerns towards climate change go beyond just the rising sea level, but also include extreme temperatures (Parenti et al., 2020). Add to that, the human contribution to these issues exacerbates the impact of climate change on the physical environment, particularly in our urban landscapes, leading to issues such as UHIE (Brown et al., 2015).

The human impact on biodiversity goes beyond just the destruction or agronomy of ecosystems, this can be seen in the inclusion or lack thereof of biodiversity and ecosystem services in the green infrastructure planning of our cities (Breed, 2015). These infrastructure implementations, according to Breed (2015), require there to be a value placed on green infrastructure as a societal norm; therefore, understanding the current industry perceptions and practices that influence the value of green infrastructure in our cities. Biodiversity is not isolated, however, in the known impacts of climate change as an environmental sector. It, in turn, influences the agricultural sector, as the climatic impacts on biodiversity will determine the propensity of the agricultural sector, what is commonly known as cascading impact.

2.2.2. Agriculture

Agriculture is critical to Africa's economic health, and with that, the changes in temperatures and precipitation lead to reduced food production due to a lack of infrastructure and support systems that can be seen in the global north (Ray, 2021). Further in this point, the role agriculture has played in the livelihood of African economies goes far into history, and what we are experiencing today as a society it's what Marx called the 'metabolic rift'. This is the argument that "the development of capitalism and its attendant urbanisation has alienated humans from the natural environment and disrupted our traditional forms of social metabolism, changing the biophysical environment for social reproduction" (McMlintock, 2010, p 192).

This then stands to reason that the impacts of climate change in the agricultural sector exceed just the concept of food security in our lives, but also affect the social congruence that comes with the industry of agriculture. In turn, this has affected how we relate to nature, no longer being in harmony with it, but being exploitative of it, through our cultivation methods as well as our tendency to eradicate natural habitats to accommodate the demands of commercial agriculture. Further, we are seeing the way this separation between humanity and nature is exploitative, and in addition to it, the stresses our industrialised practices have on the land and the water we need to sustain it. These practices include the use of chemicals for crop health and propagation (Napawan, 2015) as well as the increased demands on water resources that mechanical irrigation has exacerbated (Ziervogel et al., 2020).

2.2.3. Water

Concerning water, our use and management of this commodity have been at the forefront of climate change research and mitigation responses. In this regard, water is at the forefront of the discourse, due to how our water health- quality and quantity- affects every aspect of our daily lives. In our cities, these studies look at how land uses are significant in water catchment resources, and how they place greater demands on said resources if the climate were to become drier (Wardurton, Schulze and Jewitt, 2012). These climatic impacts on our water resources are noted by the IPCC as causing ‘substantial damages and increasingly irreversible losses, in terrestrial, freshwater, and costal and open ocean marine ecosystems” (IPCC, 2022). This then means that the damage to our water resources will in turn affect the health and wellbeing of our environments; subsequently, affecting our health and wellbeing. In addition to this, wastewater management, has become increasingly concerning, particularly regarding urban agricultural gardens and in tackling the challenge of food security and further, the health sector. In recent years the need for water management in municipalities has led to the use of grey water in urban landscaping, to maximise the use of municipal water- grey water tanks used to water large fields and estate lawns; there is potential to use the same water when addressing food insecurity within the urban context.

Due to the possibility of wastewater being used in urban gardens to mitigate water consumption in our cities, this can, in turn, cause resistance to urban agriculture as it presents health concerns such as cholera and malaria (Simatele and Binns 2008) This issue, however, causes further misunderstanding in water use and management, in that “critical information that has not been explored between changes in water quality and quantity and the combined impacts, and such changes might have an impact on various

types of water use, e.g., irrigation, domestic consumption or aquatic ecosystems support" (Ziervogel et al., 2020, p 609).

As a climate change risk or response, the treatment of water is therefore important concerning open public spaces as it impacts not only the biodiversity and cooling effects from vegetation, but also affects the health of public space users.

2.2.4. Health

As previously mentioned, the greatest climate change impact on society is that cumulative changes will result in increased health risks. Among the aforementioned health issues that are likely to arise in these situations are "natural disasters; air pollution; communicable diseases… non-communicable disease; high injury burden; mental health; and occupational health" (DEA, 2013). This in turn is affected and sometimes exacerbated by the age of the population as certain environmental factors coincide with how climate change impacts a population.

These concerns are found particularly in the health and growth of children due to low precipitation affecting the food insecurities experienced not only in urban regions but increasingly in the rural landscape. In this, Ray (2018) states how the effects of climate change in "rural areas often lead to dislocation of rural populations to urban areas". This unfortunately results in the exponential rapid urbanization, which in turn leads to pressure being placed on the improvement of living standards, which unfortunately, tends to be overlooked in Southern Africa (Ray, 2018) due to the lack of properly managed resources.

2.2.5. Cities and the built environment

In light of all of this, we come full circle, back to the need for sound and effective legislation and policy implementation in our city planning. These are in particular important in identifying, establishing, and maintaining of open public spaces (Landman, 2015). This then requires a delicate hand and mind in creating a space for inter-disciplinary cohesion in how we plan our urban spaces moving forward. On the other end of the spectrum, it has been noted, from available research, that cities are the greatest contributors to CO_2 emissions, with buildings accounting for 40 per cent of these (USGBC, 2018). Therefore, combating the effect of these changes requires that built environment professionals see the spaces they create as positive contributions to the health and well-being of our cities. Our cities tend to create large amounts of thermal energy and this has led to the phenomenon of the urban heat island effect. Due to the rapid population increase that cities experience, as well as the global and local impacts of climate change such as temperature rises and changing weather

patterns; this combination has led to the increase in UHIE (Brown et al, 2015). All this also affects the social of the urban landscape, as it means the health and well-being of city residents are negatively affected if these conditions are not properly addressed and dealt with.

DeKay (2011) puts forth this notion of a mindset change in urban planning, through the concept of Integral Sustainable Design. This approach goes beyond policy and place making but integrates- as it suggests- the holistic world view of placemaking as not form follows function, but rather that of form as process. That form or spaces are influenced not just by the designers and policy makers, but by the communities that inhabit said space. In that respect then, for change to be implanted in the way we participate in the health and wellbeing of our cities, particularly the influences of the built environment; it is therefore essential to understand and integrate the individual as well as the communal participation of the inhabitants in the creation, and there after the maintenance of the city and its spaces.

2.3 Social Impact of Climate Change

As has been previously mentioned, population increase in urban spaces due to economic opportunities has resulted in the need for spaces that promote mental wellbeing and social cohesion in our urban landscapes. Hematian and Ranjbar (2022) state that three factors are required for mental health in public spaces: social relationships, safety, and social surveillance. Beyond that there is also the concern toward mixed land use, public transportation, attractiveness, street edge activity, etc and the impact they have on mental health. (Hematian and Ranjbar, 2022). That being said there are also concerns about the way our urban spaces affect the public wellbeing of city residents. The inadvertent thermal comfort of the urban environment tends to cause discomfort, low-productivity, and health hazards in circumstances such as heat waves (Brown et al, 2015). Therefore, it is essential for the societal wellbeing of all that there be effective ways to adapt the spaces created with the impacts of climate change in our cities at the forefront.

2.3.1 Safety and Security

Research has found that urban spaces- public open spaces in this regard- are prone to becoming crime hot spots, especially in instances where these spaces are not properly managed, underutilised, and maintained due to the policies implemented by municipalities and how they are used by city residents (Lamb, 2018). In the context of Tshwane, these concerns about safety stem from visible alcohol and drug use in some public spaces. This is

due to the treatment and management of certain parks within the city being neglected by the municipality, and in turn, creating perceivably unsafe spaces due to their neglected condition. An added layer to this is that though the South African constitution guarantees freedom of movement in public space, it also entrenches a right to safety and security for said public space users (Landman, K. 2010, p 162).

With this in mind, it is therefore good for the creation of liveable and prosperous cities, realising the role that regenerative spaces such as urban community gardens play in the safety and security of their users. Schukoske (2000, p. 378) gives an example of how the legislative history of growth of community gardening within New York, has contributed to crime-reducing benefits, reaped as a result of transforming vacant lots into community gardens.

That being said, cities need to invest in maintenance to promote a perception of safety as this requires significant number of resources poured into identifying, establishing, and maintaining of good public spaces (Landman, 2015). Mandeli explains further the importance of this; the design and organisation of these spaces can cause disorder in the public life of users in these spaces and in turn, this “reduces the required safety and security measure, in turn limiting both the presence of people in public spaces and pattern of activities” (Mandeli, 2010, p. 169).

However, the responsibility of this does not fall solely on either the user communities or the municipality, but on the cooperative relationship between these two parties, to create these liveable and prosperous cities.

2.4 Climate change Adaptation

As previously mentioned, though climate change research has been an ongoing study since the 1970s (Le Treut, Somerville, Cubasch, Ding, Mauritzen, Mokssit, Peterson and Prather, 2007), climate change adaptation has only been a concept of implementation in recent decades, with a rapid increase in publications, particularly in Africa, with regards to climate change adaptation strategies (Baninla, Sharifi, Allam, Tume, Gangtar, & George, 2022). The focus, therefore, on the adaptation responses is still on reducing the vulnerabilities to present-day climate exposure. This can be seen as disaster risk reduction, early warning systems and water demand management. In so doing there is then little implementation in long-term climate change adaptation; and where there is any, it is only on a small scale (Ziervogel, 2020, p. 610).

According to the City of Tshwane Climate Response Strategy, Climate change Adaptation is wide-ranging, impacting most sectors. This means ensuring that different stakeholders are aware of the climate risk and vulnerability studies as they need to understand the scope and scale their sector can be impacted, especially when these sectors are integrated within the development of a project. Open green spaces guarantee cooler cities and better stormwater management (COT, 2022). This calls back to the previous statement of not leaving the responsibility of creating healthy cities to a single body of authority, “although several studies note the climate change vulnerability of urban environments” (Brandt et al. 2021), it is the urban parks and greens spaces that have the potential to provide thermally comfortable environments and help reduce the vulnerability to heat stress (Brown, Vanos, Kenny, Lenzhoczer, 2015).

The need for cities to invest more abundantly into frameworks like the Tshwane Climate Action Plan to promote the development of climate change adaptations strategies shows that although there is growth in the discourse towards these strategies, it is still quite evident that there is a gap that needs to be bridged between public space use and climate change adaptation. This, however, does not mean there is no evidence of this beginning to happen. An example of this is the urban agricultural sector, where crop cultivation changes in certain areas can promote soil fertility and food security concerns. Ziervogel (2020) states that these practices promote the cultivation of different crops that can withstand the temperature change where current crops no longer can; whereas in other spaces farming methods were changed and the water storage capacities increased. Napawan (2015) does, however, state that there will still be concerns about layering public space with food production in the urban context, as there is a concern about how typical crop farms for commercial sale may use chemical applications unsafe for public exposure. Therefore, we have to be careful in the design of public spaces that cater to urban agriculture as there is a responsibility in ensuring the safety of the space users as well as the healthy maintenance and production of the crops cultivated in said spaces.

2.5 Conclusion:

Despite the steps that are being taken in the industry, there remains a gap in connecting climate change adaptation to the built environment, particularly in public spaces, that still needs to be closed due to poor implementation of these strategies. It has become clear that the impact of climate change traverses many sectors. However, the greater concern for the effects of climate change is within our cities. Therefore, there is an increased need for

collaboration and implementation of climate change adaptation strategies with and between stakeholders in the built environment, the municipality and city residents.

The gap in literature, though still vast in terms of public spaces as climate change adaptation strategies; is slowly being closed through the works of Napawan (2015) and Brown et al (2015). However, these, among others are mostly focused on strategies geared towards the global North.

Fortunately, designers in the global South, can and should learn from these strategies, and adapt them for implementation in these regions. Therefore, there is a general consensus, globally, that climate change adaptation is dependent on successful implementation of sound green infrastructure which is “believed to possess considerable potential to adapt cities to come emerging climate change impacts” (Byrne, Lo and Jianjun, 2015).

3. Research method

The intentions of this study are to identify the role the public spaces, Moja Gabedi Gardens, plays in its community as it stands. The research method of this study used the principles of public life studies, put forward by Ghel and Svarre (2013). The research method chosen due to this being a case study, and this aids the researcher to better understand the climate change adaptation potential of the Moja Gabedi Gardens and how this can affect its use.

This study was carried out as a mixed-method study focusing on qualitative method with quantitative evidence to substantiate some of the findings. Some researchers have established that a mixed method approach is effective in improving the accuracy of the represented data by "[producing] a more complete picture" (Denscombe, 2008, p. 272) of the study area. Ghel and Svarre, (2013, p. 13) state this as "making a qualitative assessment by counting how many people do something makes it possible to measure what might otherwise seem ephemeral: city life". Therefore, the study of the case study aims to understand how the planning of a public space like Moja Gabedi affects its use and its users.

3.1 Study area and context

The study area is the Moja Gabedi Gardens, in Hatfield in the City of Tshwane. This garden is situated in the Hatfield suburb of the city of Tshwane. By understanding the role, space plays, one can then begin to formulate ways in which the use of space can influence its adaptation potential. The context of this case study is situated near a higher learning institution (University of Pretoria), surrounded by student accommodation and commercial or retail spaces.

The Moja Gabedi Gardens is an example of a continuous productive urban landscape. As an urban agriculture project, it provides a place for urban regeneration in the city, as well as a space that promotes social cohesion, interaction as well and integrations of its users through its programs and activities. In addition to this, to better understand the climate change adaptation potentiality of the case study site, the researcher also looked at Rissik Park, as shown in Map 3, to compare how unprogrammed open green spaces and programmed open green spaces are impacted by climate change as well as how these impacts then affect the users of the spaces respectively.

Map 3: Map of the case study area- Moja Gabedi [Red], Rissik Park [Blue] (Google Earth, 2023

3.2 Research strategy/ approach

Being a case study, this research project followed a mixed method approach using several methods, over a month. There was a total of eight site visits through March, at varying times of the day. This allowed the researcher to study public space activities and also helped the researcher understand how the time of day and different weather conditions affect the use of the space as argued by Ghel and Svarre (2013). Having a varying sample of days to perform this study allowed one to document "[t]he difference[s] between weekdays and weekends and in general, [how] patterns change on days leading to holidays" (Ghel and Svarre, 2013, p. 22). This helped create a better picture of how the use of the space varied due to the availability of the users. This will be further explored in the findings section of this report.

The research method for this case study was done through mixed-method data collection. This paradigm- the pragmatism paradigm- "provides a set of assumptions about knowledge and inquiry that underpins the mixed methods approach" (Denscombe, 2008, p. 273). This helps the researcher develop analysis and building on findings using contrasting data and methods. The benefit of this method, is in the existing communities' knowledge of what works in practice (Ziervogel, 2020, p. 611). On the other hand, because of a need to actively

include the community in the research; being the residents of the Reliable House initiative- who use the site, Moja Gabedi Gardens, the methods used for the study need to be flexible, permeable, and multi-layered to accommodate the variety of motives researchers may have for the approach and to subsequently address the biases researchers may have towards the field of study.

3.3 Research methods/ instruments

The tools used for the study consisted of desktop studies, observation mapping, people tracing, photography and keeping a diary.

3.3.1 Desktop study

The study used google earth and maps to analyse the site and its context. These layers of the context assisted the researcher in understanding the different aspects of the context and how they correlate to the position, use and function of the public space. Upon this knowledge, I was able to later translate the work done in the observation mapping process to further contextualise the information gathered through Observation Mapping. The desktop study also allowed the researcher to study the site on different scales. This helped the researcher understand how the site relates to its immediate context, as well as how it relates in functionality and suitability in comparison to similar spaces in the urban context around it (Figure 3). By delving into this part of the study the researcher can focus on whether or not the public spaces have the potential to add to its urban context.

3.3.2 Observation Mapping

The observation period of the study was done for the data collection with regards to the users, activities, and site elements: materials and building structures and technologies used on site, that contextualise the role of the public space. This method resulted in maps that will be presented in the results section, and these “do not present one single clean narrative about [the] space, but instead require exploitation”, (Taylor et al. 2020, p. 3) building on the desktop work to give broader and clearer image of the site, its context and the players involved in it.

Photography is used to provide supplementary information to the observation of the site and its actors and activities (Ghel and Svarre, 2013). This is helpful in positioning and contextualising the mapped information to allow the researcher to review said information, should they have missed anything while on site. These photographs were obtained through

group site visits with other researchers (du Plessis, 2023; Mnguni, 2023) that studied the site during the researcher's study period. These site group site visits allowed the researcher to focus on the observational mapping without losing the added information the photographs provide.

3.3.3 Counting and Tracing

The activity of counting and tracing helped to visualise the site users and how they move though the site, how they use the site and how it can affect the function and success of the site and its programming. Ghel (2013) states that this method assists planners in quickly "evaluating whether the initiatives resulted in more life in the city" (Ghel and Svarre, 2013, p. 25), providing the researcher with a broader understanding of the demographics that are affected by and affect the site. Ghel (2013) explains how tracing helps us understand the paths of movement that users tend to use within the site, though it is not exact, it does help understand how many people move through it at any given time.

The above then leads to generating maps to get a comprehensive understanding of the numbers and positioning of actors on the site. After this, the researcher translated the information through a GIS desktop software to visualise maps reflecting observational mapping, counting, and tracing of the site and its users.

3.3.4 Interviews

Semi-structured interviews were used to give weight to the intangible essence and information that cannot be observed visually within the site. The conducted interviews provided a history of the public space and the motivations behind its establishment. Later during the one-on-one interviews, the researcher was able to ascertain the end user experience of the site and its contexts. These then also provided an understanding about the limits of the of how site is experienced by its day-to-day users, as well as the potential for change or improvement that they believe will make the site even more successful.

3.3.5 Sample selection

Another benefit of pragmatism methodology is that the sample selection from which the communities of study are part, need not be large and consequently, researchers can then focus on the acquisition of knowledge, looking to initiate responses that create solutions for identified shared problems (Denscombe, 2008, p. 27). Researchers are likely to have a bias; therefore, the approach deals with this through participation of the study community. This

method nullifies, though not completely, biases a researcher may have towards the community they are studying while appropriately informing them of the misconceptions that researchers tend to have about said communities. This effectively allows research results to be based more on facts than assumptions (Denscombe, 2008).

The sample selection for interviews was based on the availability of site users, which majority consisted of males, ages 24 to 45. These interviews were organised through the management of Moja Gabedi Gardens and Reliable House as the respondents are from vulnerable populations. The researcher liaised with a representative from the management team first, organising the possible respondents for these interviews, then once the researcher was given a list of names of willing participants, would organise a date and time for the interviews.

A second set of interviews was later conducted off-site with vendors. These vendors are female, ages twenty-one to forty-five and willingly volunteered for the interviews. The purpose of this second set was to have a holistic understanding of the use of not only the site itself but how it is viewed by the surrounding community as well as how the site has, if any, impact in its immediate context from the user's perspective. This will be discussed further in later sections.

3.3.6 Climate risk assessment

A climate risk and vulnerability assessment, according to Simpson et al. (2020), is an effective research tool that provides an added layer to observation mapping that brings new understanding about the needs designers and planners must address when establishing or developing public spaces and the users will, by and large, be impacted by these spaces. There is a need for these for climate risk assessments to be conducted when dealing with public spaces as this will help to better "explain why decision-makers sometimes do not take actions to reduce risk arising from climate hazards…" (Simpson et al., 2020, p 429-430). In addition to this, understanding the benefits and consequences of these decisions will have on the integration of multiple sectors and the move towards a more integrally sustainable future (Al-Dahir, Kang, Bisley, 2009). Because of this, we begin to understand not only the positive and beneficial responses to the climate conditions that affect the use and function of a site but also the adverse outcomes the vulnerabilities it and its users may experience. This understanding of the hazards, vulnerabilities and exposure experienced in any given space, helps provide a foundation on which to build the climatic responses needed to develop the climate change adaptation strategies required in any project (Simpson et al., 2020).

3.4 *Ethical Considerations*

To comply with ethical best practices data were anonymised, this was especially needed for this study as the researcher is dealing with a site that primarily caters to a vulnerable community. The users of this space are either homeless and or recovering addicts. Though the space is a publicly accessible space, it is programmed as a therapy garden geared towards rehabilitation and reintegration of its primary users being the Reliable House residents. Therefore, it was necessary in the interview phase of the study; for there to be a signed and consented recorded interview to be conducted. For use of photographic documentation, these had to be taken from places that are freely accessible and if not with the consent of any subject in the photograph. These rules are set to "protect individuals from invasion of privacy and to protect the freedom of [researchers]… to freely gather information." (Ghel and Svarre, 2013, p. 6).

3.5 Conclusion

The mixed method approach is beneficial to this research study as it allows the researcher to have a rich insight into the case study, that cannot be fully understood by only using qualitative or quantitative methods. It is through this integration of multiple data sources that the researcher was able to better understand the complex issues that come with urban agricultural projects that deal particularly with the rehabilitation of our city's vulnerable population (Dawadi, Shrestha and Giri, 2021). Therefore, going forward, understanding the data collected with regards to the study does not just become about understanding what is there, but being able to understand what this means and how it can address the objective of the study.

4 Results

This section presents the results of the mapping and interview processes. The role of public spaces in South Africa has been seen as only providing spaces for social cohesion and interaction. Through this, these spaces have become essential in the urban life of our cities, and subsequently, the life of its inhabitants (Landman, 2015). With this in mind, we as a research group looked at four case studies within the city of Tshwane, to study the role of these spaces within their context and the communities within them, and their potentiality to be a form of climate change adaptation strategy in the city. For this report, the researcher will be focusing on the Moja Gabedi Gardens, located in Hatfield, Pretoria, South Africa.

4.1 History and Origin story

The Moja Gabedi Gardens were established in an empty site, in Hatfield following the construction of the Festival's Edge student accommodation. The building was completed in 2016, as seen in Figure 1, and the site of this case study was also used as the construction yard for that project.

Figure 1: Aerial images of the Hatfield and Arcadia context surrounding the site of study, showing how it has changed up until the construction of Festival's Edge to the North of the case study site. Top left to bottom right; 2002, 2010, 2015, 2016 (Google Earth).

As shown in timeline between Figure 1 and Figure 2, between 2016 and 2019, this space was left empty and neglected by the city, subsequently becoming a hub for criminal activities in the precinct.

The space now considered a negative space, the Reliable House Initiative, in partnership with COSUP (Community Orientated Substance Use Programme) – an initiative between the UP-Family Medicine, the city of Tshwane and the Gauteng departments of Health and Social Development- began working on solutions to address the issues of addiction and homelessness (de Bruin, 2018). The founder, Gernia van Niekerk, a community engagement manager, established an initiative that looked at the rehabilitation of the site occupants. This was in response to the house, that accommodates this initiative, having been captured by drug lords and drug addicts residing there. Consequently, the case study site, being a neglected dump site, had also become a hub for very pervasive crimes in the precinct. The founder did not appreciate that these issues lay so close to the university. The inception of these projects began with the aim of bringing solutions to those who participated in these crimes rather than just evacuating them from space.

Figure 2: Aerial images showing the development process of the case study after the completion of the construction of Festival's Edge, from inception to the current date. Top left to bottom right; 2019, 2020, 2021, 2023 (Google Earth, 2023).

So, Ms Van Niekerk, along with COSUP, was able to bring on a health specialist and a social worker clinical associate to begin rehabilitating the homeless of Hatfield. Beyond that, along with community and church leaders in the area, with the help of the Brooklyn Police station, they were able to meet weekly with the displaced homeless community in the area for prayer and soup, this group of passionate workers established and grew the Reliable House Initiative. Through this, they were able to build what would then become the Reliable House. (de Bruin, 2018; Focus group, 2023)

Then, in 2019, once the Reliable House initiative was successfully established, the organisation looked to the neglected dump site South of the Festival's Edge building to expand its community engagement initiatives. So, Ms. Van Niekerk called in Mr. Emmanuel Maringa, to begin finding solutions to turn the negative space into space that not only brings life into the precinct of Hatfield and its residents. (Focus group, 2023) Thus began the Moja Gabedi Gardens. This garden stemmed from the need for not only regeneration of the environment in the area, but also the spiritual interventions needed in the rehabilitation of the homeless men plagued with mental and physical health issues (Focus group, 2023), more often than not resulting in addiction to drugs.

Moja Gabedi is a Northern Sotho name for a funnel used for fetching water, when translated is we eat twice. This came from the design of the funnel, which was a teapot with a triangular shape, cut on both ends to allow for the transfer of water from the dam to the drums used to carry the water from the dam to their houses. This name was therefore suitable for the next phase of the initiative as Reliable House was the accommodation, and this space would then house the therapeutic activities that would help in the rehabilitation and reintegration of its residents into society.

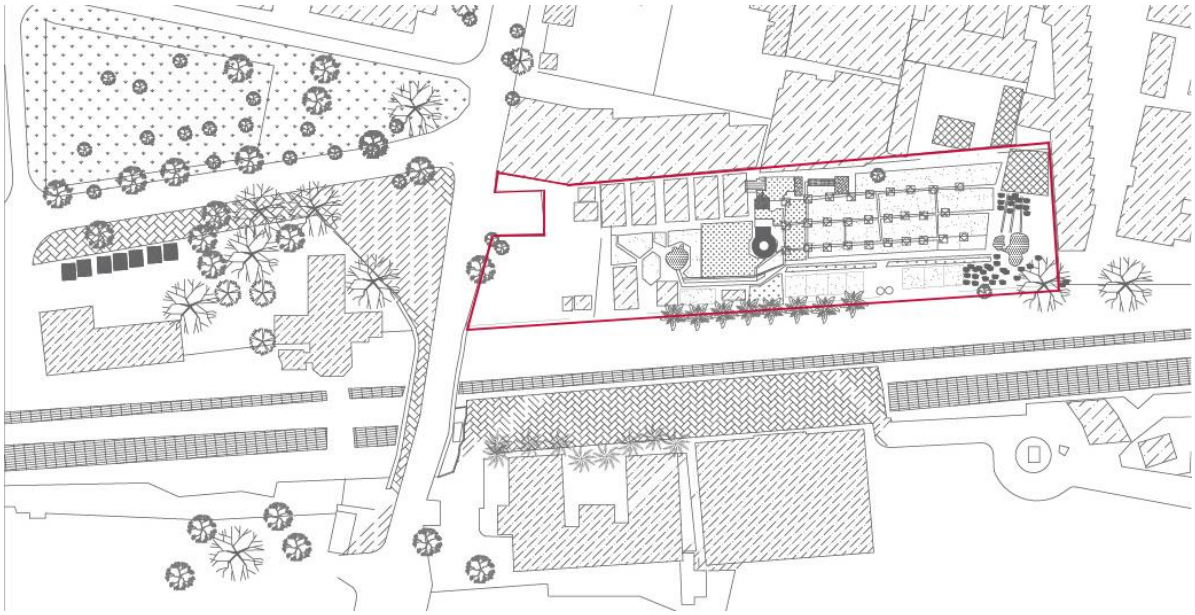
Through the recruitment of Mr Maringa and, later Innocent Chauke, Ms van Niekerk initiated the concept of an urban agriculture garden, programmed with therapeutic activities in partnership with the University of Pretoria community engagement initiative and its students. "It addresses so many needs. And the need for this was huge. It is also an example of what can be done in a community with an open piece of land, which was such a negative space, and has been turned into a positive uplifting area," says Van Niekerk." (de Bruin, 2018).

Once the group of leaders and volunteers within their initiative was established, the process of transforming the site into what it is today began. They began by clearing the site of all the refuse left behind by both the construction company and the criminal activity thereafter. Then after allowing the soil in the space to essentially heal, the first thing that was done was planting

new trees. Then, over time, through partnerships with different departments within the university, they started constructing and building out the layout of the site.

4.2 Site Layout:

These gardens are on a plot of land that has been regenerated from the dump site that was left after the construction of the Festival's Edge apartment building on its Northern boundary *Moja Gabedi* (Map 4) *is a purposefully programmed public space,* though *it* is *focuses its use on the rehabilitation and therapeutic process of Reliable House residents*, it is open to the public during its operational hours. This, the researcher discovered, was a point of concern for the users, as it left the site underutilised (Respondent R, Respondent T, 2023).



Map 4: CAD drawing of the Case study area showing the physical elements and layout of the site. (Author, 2023).

To better understand the effectiveness of this case study, the researcher looked at another public space, Rissik Park, which is situated in the immediate context of the public space. Through this, the comparison of the two helps to further explore the climate adaptation potential of public spaces such as Moja Gabedi.

The layout of the site is conducive to its functionality as a produce garden. All the built structures on the site are situated on the boundaries of the site, except for the steel and timber fire pit gazebo-like structure. This meeting space placed in the centre of the site acts as a type of threshold between the built environment and the natural environment of the space.

Figure 3: Built Structures in Moja Gabedi- Left to right- 1. Vegetation-covered timber archways and timber and steel gazebo; 2. Timber cabin classrooms [North Boundary]; 3. Timber playground/ hutch/ aviary; 4. Timber-shaded secluded seating in the lavender garden (Author, du Plessis, 2023).

It must also be noted how all the structures, Figure 3, from the offices and classrooms to the playground and stage on the east boundary of the site are all made with varying types of timber; planed and treated timber planks, and untreated timber poles, respectively. This element of natural timber is extended to the walkways along the buildings and the bridges where the paths cross the stormwater trenches.

Figure 4: Circular economy design of old timber furniture and material (Author, du Plessis, 2023).

Another form of adaptation present on the site was the evidence of recycled timber used in the furniture on-site, Figure 4; from the benches and tables seen in the buildings to the benches that were scattered around the garden, providing spaces of solitude where the table and chairs in the patios are used to accommodate public gatherings and meeting spaces.

Figure 5: Steel structures on site- Left: Gazebo; Right: Hydroponic greenhouse (Author, du Plessis, 2023).

In the centre of the space is a large gazebo, Figure 5 with steel columns and a roof structure. This is juxtaposed with treated timber seating that surrounds a steel firepit at the centre of the structure. This structure is one of two that are not made entirely of timber. The other is a Hydroponic green house, Figure 5, that is housed in a steel and mesh netting structure. This structure, which sits on the South Boundary of the site for maximum sun exposure, houses several recycled drums, now hydroponic growing tanks- showing the diversity of cultivation practices in the Moja Gabedi gardens. Finally, the rest of the materials used are steel- in the roofs, art and playground areas, plastic, as well as rubber and large paver stones for the walkways.

Figure 6: Textured Rubber and Timber walkway along the North Boundary Cabins.(Author, and Mnguni ,2023).

On the topic of the walkways, the researcher noted that the space is relatively accessible in the western portion of the site. This is due to the aforementioned rubber walkways, Figure 6, that connect the timber cabins. These walkways also have a patterned texture ridging that

provides some form of grip to the surface, particularly when it is slippery from moisture. These rubber walkways are also broken up by mini bridges made of timber slats and gum poles. This feature is both aesthetic and especially functional as it allows users to move easily into the cabin patios without the need for steps. This further emphasises the foresight of the designers in their thinking process to create more accessible spaces.

Figure 7: Different types of Stone Paver paths in the site. Some accessible [left] Some inaccessible [centre and right] (Author, 2023).

However, this line of thinking was not continued throughout the site. Past the larger central lawn is where the cultivation portion of the site begins, and it is here that the researcher noted a change in the pathways. Even though these pathways work to separate the planting plots in the gardens, some of these remain very inaccessible in their design. These pathways are made with larger paver stones, which are excellent in terms of their functionality within the space, as seen in Figure 7.

The texture of these pavers ensures the safety of users in this region of the site. Should there be moisture, rain, or just watering the vegetation in these areas, it is safe to presume the user will not easily slip and fall, lowering the risk of injury in the area. That, unfortunately, is still made possible, by the layout of these stone pavers (Figure 7 centre). The large gaps between each paver do not guarantee safety in any way. Because the pavers are placed on top of the surface and not made flush with the ground, this becomes a tripping hazard. the researcher will discuss possible solutions for this in the discussion section.

The remainder of the site uses the large open spaces used for crop cultivation, separated by stone paver pathways (Figure 8 centre) and natural stone stormwater trenches. These pathways also distinguish predetermined circulation routes though the space leading one

from the entrance to the rear of the site. In addition to this, the use of vine-covered archways (Figure 8 left) not only provides brief respites from the sun and heat but also has the added function of housing the lighting features within the garden.

Figure 8: Vegetation diversity on site, used in production, and functionality respectively (Author, du Plessis, 2023).

Beyond this, the site boasts two ponds (Figure 9 left) that house several ducks on the site. This feature contributes to the biodiversity of the space. This however is not the extent of its fauna life, as there was evidence of peacocks, turkeys, chickens; housed in a segmented coup, rabbits housed in pairs in various hatches (Figure 9 centre and right); some situated on the ground level of the JCP-built playground, which also double as an aviary that housed smaller birds. Lastly three beehives sit within the lavender bushes (Figure 8 right) in the east end of the site, which speak even further to the importance of pollinators in spaces that are focused on urban agriculture.

Figure 9: Some of the fauna present on site- ducks, peacocks, and turkey (Author, 2023).

4.3 Users and Activities

Due to the programmed nature of the Moja Gabedi Gardens, there is a level of underutilisation of the space on a day-to-day basis. The researcher noted that the space has a larger number of users only on programmed days for activities with the Reliable House residents and university students. However, this also means that the space is essentially a dead space outside of those times which in some ways defeats the purpose of a therapeutic garden.

Many of the concerns about this can be seen in the interview response, with many respondents bringing up the fact the space is underutilised and has the potential to do so much more, not only for its current users, but the surrounding community too: “Well, we just talked Mr. Chauke and me and I said the coffee shop could be improved, maybe have a nice couch or two because the students, when they study, they’re under stress and you need to have somewhere or my idea was like I explained, you know, I have a good coffee shop with a better stuff and you serve good coffee. Maybe Rent a book to read, but I am not allowed to take out the book so they can come here, read the book and mark it. And then the next time they come, they can just continue reading with some nice music. And then they suggested maybe a counsellor or two that, while they’re under stress. You know someone to talk to and yeah, that that this is what I think we can improve.” (Respondent R, 00:02:54 – 00:03:44)

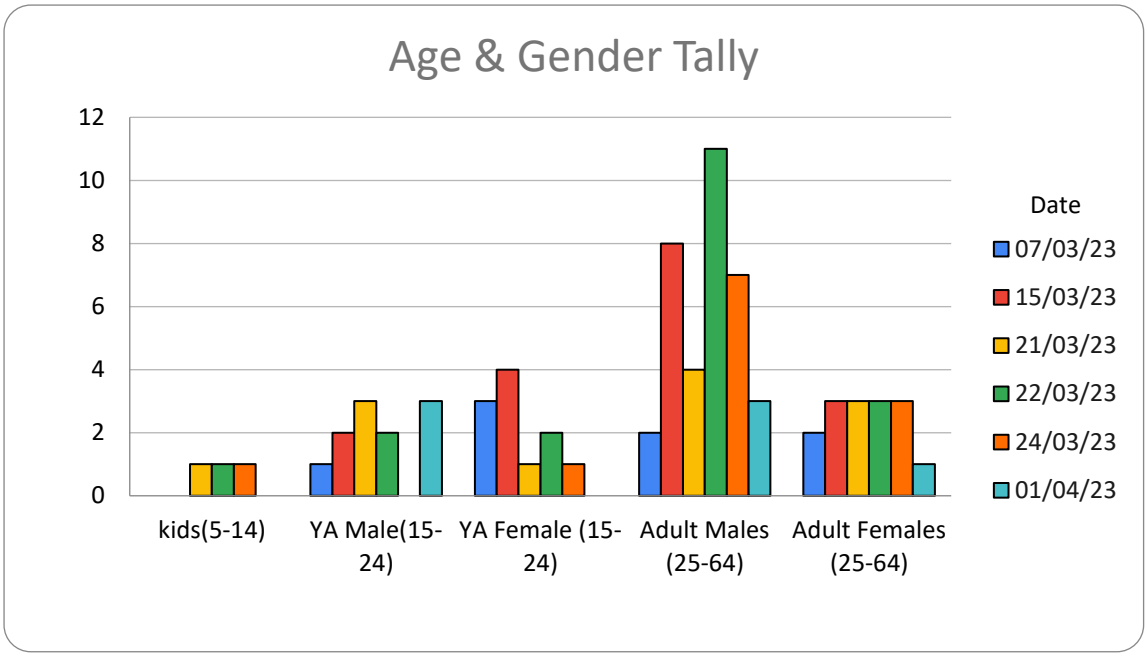


Figure 10: Users observed on-site throughout the study period (Author, 2023).

The last statement by this respondent shows the mental and possible spiritual benefits of this site; a sentiment brought up by most of the interview respondents. As shown in the graph (Figure 10), the majority of the site users, on any given day, are male. These are the Reliable House residents who come to the site for the programmed activities and classes accommodated in the gardens, for their rehabilitation. The female users were all but one from the university, as either students or coordinators for these programs, doing their practical assessments and training while helping to rehabilitate these individuals.

Date	Walking	Sitting	Standing	
07/03/23	3	2	2	
15/03/23	5	0	14	
21/03/23	7	6	5	
22/03/23	3	11	4	
24/03/23	7	3	3	
01/04/23	0	2	2	Tottal
Total	25	24	30	79

Table 1: Activities Mapped for the Males on Site (Author, 2023).

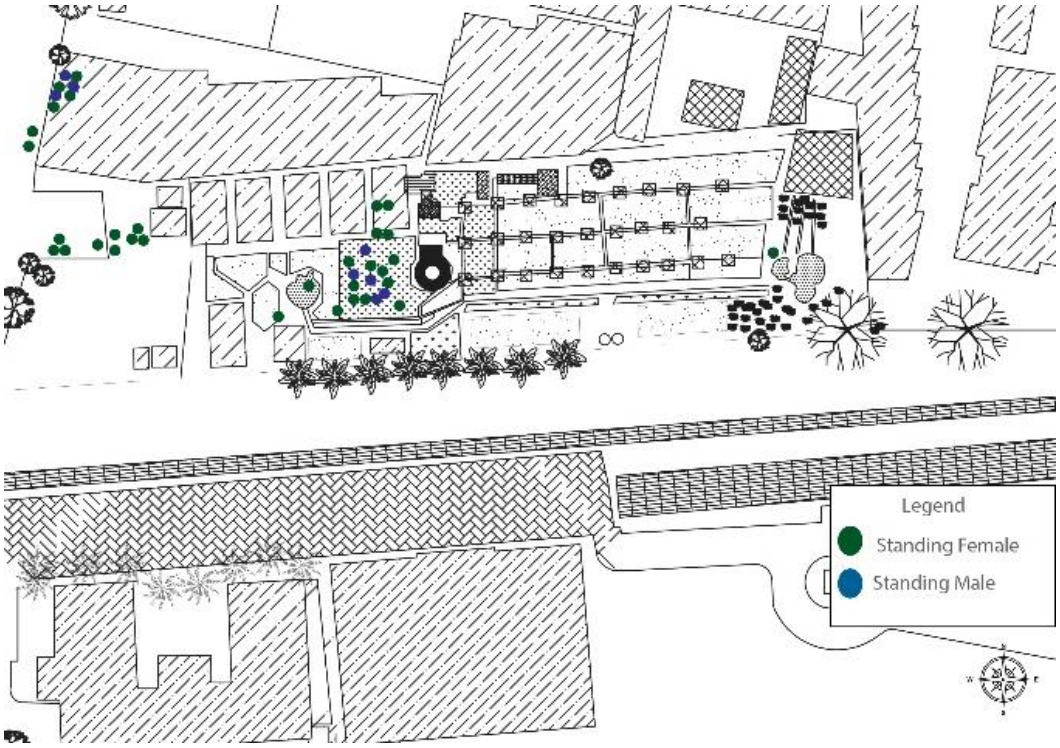
Figure 11: Occupation Therapy session being held on the lawn in the centre of the site (du Plessis, 2023).

That being said, the researcher identified some mixed activities built into the functioning of the spaces, ranging from occupational therapy (Figure 11), art classes therapy sessions and weekend markets with Festivals Edge residents. These activities take place in the western portion of the site for the most part, occupying the cabin portions and lawn space for the Occupational Therapy group, and the Art Cabin for the Art Therapy session. The lawn is multi-functional in this as it also accommodates the aforementioned therapy sessions and market days, with Festival's Edge as well as some events that the interview respondent mentioned (Respondent R, 00:02:54 – 00:03:44).

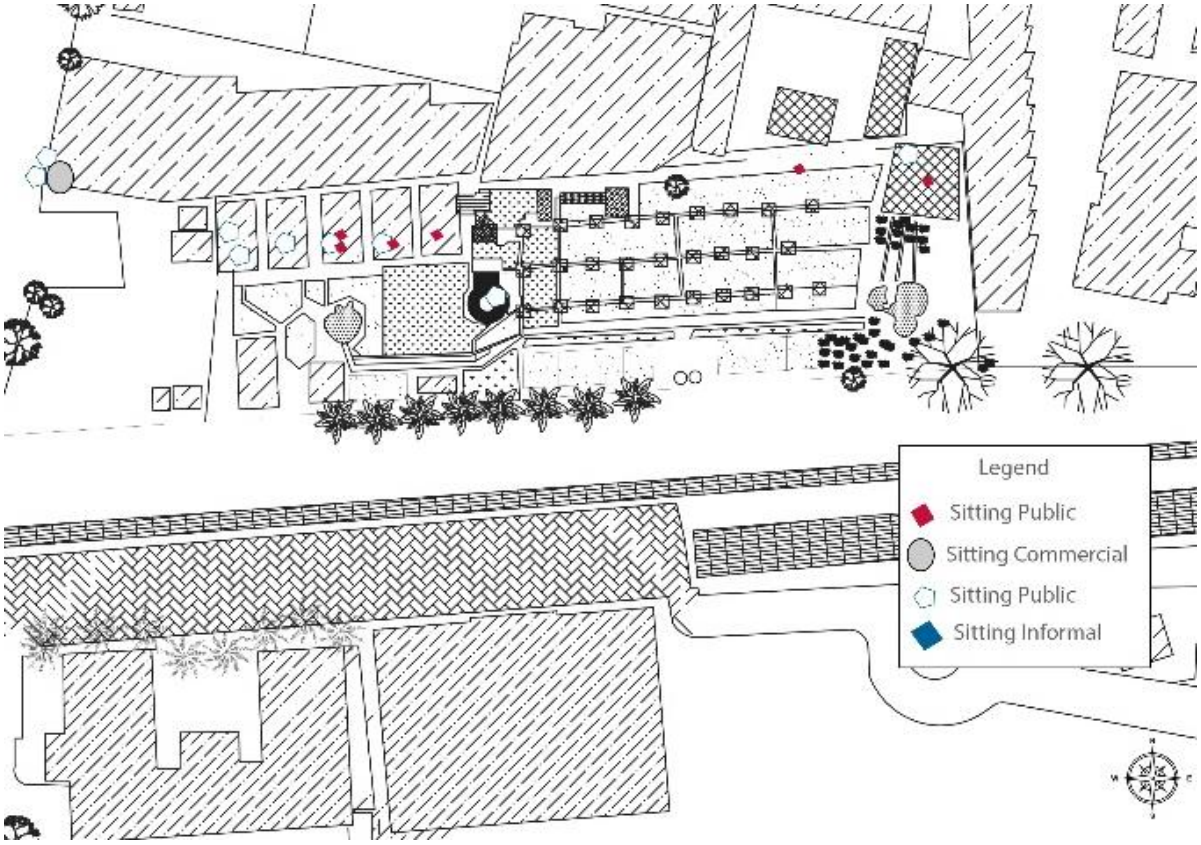
It was through several interviews that the researcher was made aware of the market that takes place on-site, as well as other non-organisational events that occurred during the public holidays during the period of this study. One respondent even took the time to elaborate on what the activities of collaboration with the university entailed.

Respondent T went into detail about how the Art therapy sessions resulted in a book that showed the process and outcomes of the art therapy session and the benefits of spaces like Moja Gabedi in the rehabilitation of the homeless. This same respondent further stated how, should the organization of the space expand beyond just therapy, there is great potential for socio-economic growth within the community, particularly in the age of social media. "It depends on the audience. I was talking to like the other time I was telling this guy who is a musician and videographer told him the potentiality of this place… It's just that we don't know… It's a very nice view even here when [imagine doing a] podcast as well [here]." This

bears credence to the potential all the users see in the site and the different ways it can be used.



Map 5: Stationary Activities (Standing) of male and female users observed on the site (Author, 2023).



Map 6: Stationary activities (Sitting) observed on-site throughout the study (Author, 2023).

Through the observation mapping, it became evident that the activities on the site are essentially limited to certain spaces of the site (Maps 5 and 6). These activities, mapped during the OT sessions and one of the Market days, show that users tended towards the shade areas when seated, but this was not limiting when standing was observed. It is also evident that the lawn on the site is very versatile in terms of activity use. The maps show how both the OT sessions (Map 5 and 6) and the Market (Map 6) occupy this space effectively as it is large and any elements on it are limited to its edges.

The layout of the site is ideal for the movement patterns in conjunction with the activities on the site. Maps 7 and 8 show these movement patterns. These maps show how the movement from the entrance to the back end of the site is simple and efficient. With the added benefit of the shading devices as seen in Figure 8 that are scattered throughout the site.

Map 7: Observed movement of users by age and gender (Author, 2023).

Map 8: Observed movement patterns mapped throughout the study period (Author, 2023).

This made it evident that the design of the space was intentional in maximising spaces for the agricultural aspect of the garden, but still accommodating the alternative activities outside of the therapy sessions (Respondent M). The main event space aforementioned in this report is the lawn as seen in Figure 12. The space is large and open with any equipment present being situated on the lawn boundaries.

Figure 12: Lawn on Site, very central with activity elements on the boundaries, (Author, du Plessis, 2023).

4.4 Climate Change Risk Assessment

The climate risk assessment for this study was conducted to understand the vulnerabilities of the site. Not only that, but this assessment also helps with understanding how the hazards and exposures consequently result in the potential responses that inform the use of the site.

4.4.1 Vulnerabilities

The vulnerabilities identified during the study were mostly related to the users. The larger part of the user group is comprised of a vulnerable segment of society, currently undergoing rehabilitation. These include current and recovering addicts, some homeless individuals, and individuals in transition towards reintegration with society.

From the study pool, 61% of these users are men, of which 46% are adult males between the ages of 25 to 64 years old, (Figure 13) who are Reliable House residents. From some of the interviews conducted- five in total- three respondents had a higher education qualification. This however does not adequately represent the numbers accurately with regards to the reliable house residents as there was a limited number of respondents to interview.

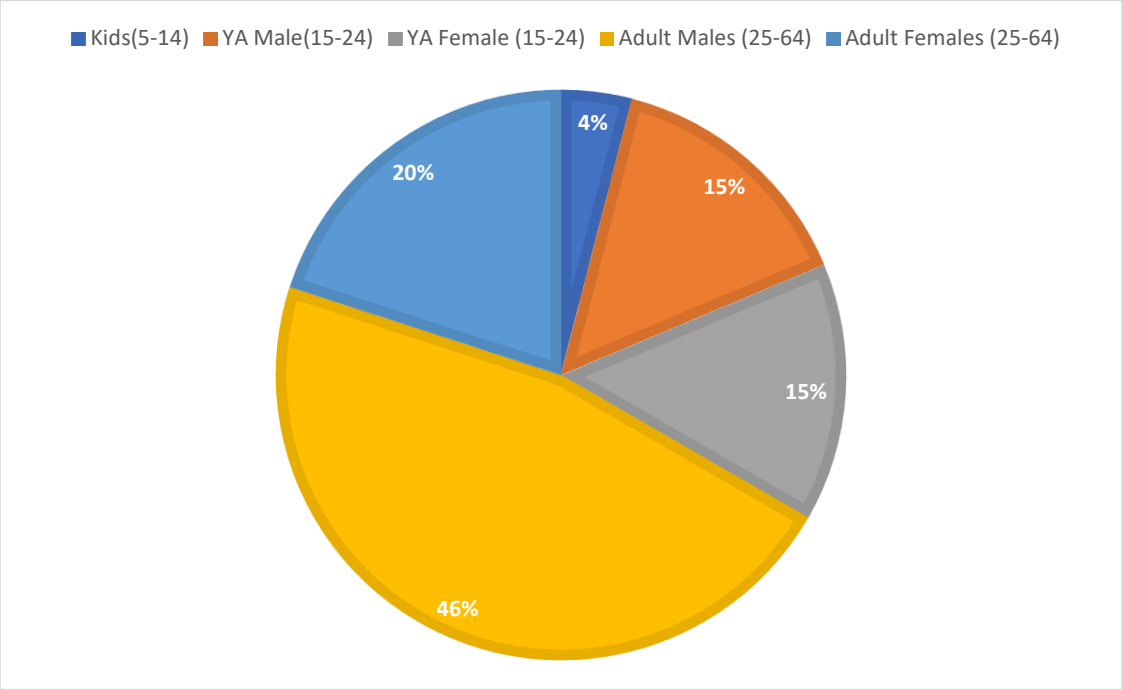


Figure 13: Pie chart showing the percentages developed from the observed people counting. (Author, 2023).

These users are involved in the cultivation and maintenance of the garden in varying degrees- some of the interview respondents being part of the crew- some as full-time employees, others as part-time volunteers.

One of these part-time workers is Respondent R, who is also a Reliable House resident, who said; “OK, so I’ve got a couple of responsibilities. One of them is just cleaning these houses. So, I will come in the morning. Then I’ll start, like now, I had something else to do this morning before. So, I’ll start on that side, and I’ll sweep and then I’ll start here. I’ll mop and clean these black conveyer things that we have, and you know, sweep here and at the back. And then is when there’s like cut grass, that’s one of my duties. Then also taking the dustbins.”

This is an example of how the Initiative is working to rehabilitate these men, not only mentally and physically, but financially too, providing them with the opportunity to grow and learn in disciplining themselves and finding a sense of accomplishment within themselves that they can take further in their lives once they transition from Reliable House.

Another vulnerability identified was that of the ownership and locality of the space. The infrastructure of the space is relatively new, only three to five years old, based on the establishment of the site. This is made even more vulnerable by the fact that the garden is situated on publicly owned vacant land. This leaves the longevity of the space very

precarious as there is potential for the owner, who is the City of Tshwane Municipality, to tear it down to develop it later. Because of this, it places pressure on the garden and its actors to make these beneficial and successful spaces that contribute more to its context than any future development could bring to the area. The motivation for this concept was discussed in the Origin Story of the Gardens (Focus group, 2023) with Speaker 2 mentioning that the site does belong to the municipality. However, if the site and project are successful, this can give weight to other initiatives like Reliable House and Moja Gabedi to propagate more spaces similar to Moja Gabedi. This in turn reproduces open green spaces that are climate change adaptation strategies that reduce the impacts of UHIE within the city.

Figure 14: Vegetables present on site and one of the ponds in the west [left] of the site that can be used for the irrigation of these crops. (Author, 2023).

Another physical vulnerability is that the space is mostly vegetation. Though this element of the site adds to the site's beneficial characteristics of the garden, it is still prone to hazards and exposure [such as water shortages and flood damage, as well as extreme heat damage that can cause the present crops not to produce an adequate yield] that could become a major risk the sustainability of the space. Because of the type of vegetation that is present in the garden, particularly those that provide shade, there is a high chance of them succumbing to high heat events. Fortunately, the presence of a borehole onsite means there is a low risk for dehydration of the plants even if irrigation demand increases with the increase of crop propagation.

4.4.2 Hazards and Exposure to these

The hazards that this garden is likely to experience are either temperature or water-related. The physical hazards identified concerning the case study are drought and heat stress. Drought becomes potentially problematic if there is an increase in temperature, but more likely- with regards to this case study- should the groundwater for the borehole suddenly dry up. However, knowing that the groundwater is likely to last longer, this is a low-exposure concern if the groundwater is properly managed.

With regards to heat stress, this is a low exposure risk as there is plenty of natural shading, and the added artificial shading by way of the structures with covered patios and the shades seating scattered around the site. The possibility of heat stress experienced by site users can become a health risk [heatstroke, sunburn, dehydration etc.] that if not properly managed, can be exponentially exacerbated by the water quality on the site. As mentioned, one of the interview respondents stated a need for a water cleaning pump or system between the two ponds to clean the water that comes into them.

The hazards identified for water are potential flooding (very low risk) and the aforementioned groundwater management. This is still a risk, as there is a documented lack in said groundwater management (Seyler, Witthuser and Sunaitis, 2019), though it is a low risk due to the high-water table present in the city of Tshwane, and in effect the presence of the borehole (Map 9).

Map 9: Site elements observed on the site. (Author, 2023).

The flooding is a low-risk exposure due to the existing stormwater management on the site as well as the site positioning next to the railway. It is also a low-risk exposure due to the ground condition of the gardens as it uses very little hardscape coverage, so there is little

runoff to be concerned about as it will be absorbed into the ground. However, this can be counteracted in the future by rising temperatures, should the ground become very dry and remain uncultivated, there is a chance for stormwater runoff and flooding to become a problem. Again, due to the ground coverage condition, groundwater management becomes less of a risk due to the potential to clean and store the rainwater coming through the stormwater drains and trenches.

Finally, there is the risk of exposure experienced by the natural ecosystems in the site and its surrounding context. These exposures are mainly due to the rise in temperatures and consequently the disappearance of plant and animal species, thus affecting the biodiversity present in the garden. This will be further discussed in the discussion section.

4.5 *Climate Change Adaptation Potential*

Now that we have the information on the climate risk assessment, the following section breaks down how the site responds to these vulnerabilities, hazards, and exposure based on the framework presented by Simpson et al., (2020).

The benefits of Moja Gabedi are that the space, climatically, becomes a cooling space within the city (Brown et al, 2015). Because the space is mostly a green space, situated next to the Gautrain and Metrorail railways, there is less of a thermal impact that the space then needs to combat, as the site condition and design create a cooling space within the area. You can physically feel the temperature difference as soon as you walk through the garden gates, which is made possible by the presence of a large pond in the western section of the site. The Tshwane Greenbook (2021) states that “while extreme heat may not be as detrimental to the economy, compared to other types of severe weather extremes, it is extremely dangerous to humans, especially for dependent population groups such as the elderly and children.” Therefore, this cooling effect is what makes the space inviting. However, due to the boundary conditions that perpetuate limited accessibility, the space’s climate change adaptation as an urban garden does have its limits. That being said, the space still proved to play a major role in climate change adaptation within its context as a cooling space.

Figure 15: Pond at the entrance of the Site, constructed with mostly natural materials, and water-efficient vegetation that adds to the cooling effect on the space. (Author, du, Plessis, 2023).

Starting with the spatial and material aspects of the space; there are not a lot of mechanically manufactured materials (Figure 15); the only non-natural materials present are the steel roofs, gazebo, greenhouse, lawn benches, and monkey bars, as well as the plastic present in the play area used in the space. So, the atmosphere of the gardens prevents any trapped heat from remaining in the air, hence the cooling effect. The immediate context surrounding the garden plays a part in this; the presence of a multistorey building on the northern boundary of the site adds to the cooling effect of the garden, due to the structure's shadow.

However, considering that the study was conducted in the late summer or early autumn season, this can have an adverse result for the garden and the user experience in the winter season as this building will block any sunlight or heat towards the garden (Map 9). In addition to this, the use of minimal hardscape coverings ensures that the ground within the site remains cool, if not cooler than that of the ground off-site. This is beneficial to the context and community around the site as this space now becomes a cooling area for users should there be a heatwave in the area. In addition to this, it was observed that the site provides water for external users, particularly the vendors who cook and sell food in Rissik Park. This was also mentioned by Respondent R in his interview response stating that people come in to get water, and even use the onsite ablutions.

This was evident in how the site treats water. Water management is seen as a priority within the site as it does not put any demands on the municipality as there is a presence of a working borehole on the site. It is through this borehole that all the water for the site is sourced, so there is a long-term, though not unlimited, water source available to maximise the potentiality of the site to actively expand the impact of the site in being beneficial to its current context. The borehole provides a certain level of resilience to the site as it is not dependent on the municipality but it still has a certain vulnerability as it is not an unlimited resource. The site promotes proper water management through the previously mentioned water tanks, ponds and, beyond that, the natural stormwater management system (Map 10).

Map 10: Drawing of the site showing the water storage in blue, present of the site, (Author, 2023).

It should be noted that the stormwater drainage is not completely successful in that, as one of the interview respondents stated- there is potential for water management to be levelled up through a cleaning pump between the ponds and another set of storage tanks. The researcher agrees with this suggestion as the need for groundwater management will be essential in the future as this resource could potentially dry up as global temperatures continue to rise.

4.6 Conclusion

The results of this study have shown not only the important role the design and layout of Moja Gabedi have on the environment around it but also that it has a tangibly positive effect on the users of the space. The use of natural materials in both the buildings and the landscape contributes to the cooling effect of the space. In understanding the intentions of the establishment of the space, we can understand the impact spaces like this could potentially have on their immediate context not only physically but socially as well. The site works well as a therapy garden, as in conjunction with the physical environmental effects the spaces have on the users, the garden subsequently has a positive mental impact on the users. As noted by the conducted interviews, the public spaces are perceived as limited due to their boundary conditions and therefore the space becomes underutilised, although it is an open public space. To better understand how this affects the use and climate change adaptation of the public space, the researcher looked at Rissik Park. The comparison to the site located across the road from Moja Gabedi helps illustrate how boundary conditions are the major contributors to the climate change adaptation potentiality of public spaces in the urban context.

5 Discussion

For this section, the researcher looked at the site of Moja Gabedi and, in some instances in comparison to, Rissik Park, which is across the street from the case study site. Through this, the researcher correlated the relationship between climate change adaptation and public spaces in Tshwane as they relate to their use and the communities they are situated in. Furthermore, the researcher will focus more on the urban agricultural gardens as a public space that can be beneficial to the context environmentally and, to its users mentally, and socio-economically, as is mentioned in the history and origin section.

5.1 Climate Change Risk Assessment Responses

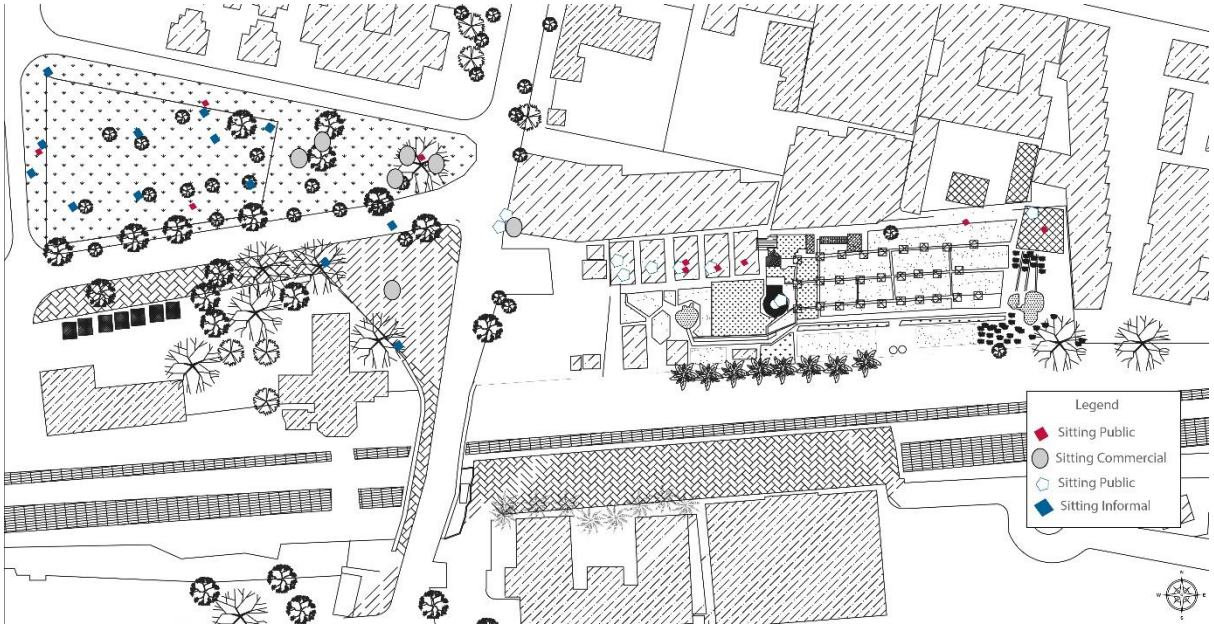
As previously stated, as a programmed space, Mojagabedi has the benefit of being on a site with a borehole, so the site is already exhibiting principles of resilience. This is emphasised by the importance placed on the vegetation throughout the site. As an urban garden, there is potential for the site to not only advocate for the presence of urban agricultural spaces as they tackle the “food insecurity as a critical development challenge” (Battersby, 2013; Poulsen, McNab, Clayton, and Neff, 2015), but they also promote the move of green infrastructure development from just academia, policy documents and professional magazines, as there is poor implementation of climate change adaptation strategies in the urban context (Breed, Cilliers and Fisher, 2015, p 12).

Map 11: Site elements observed in Moja Gabedi and Rissik Park (Author, 2023).

The Tshwane Green Book states that in the 2050 projections, there will be an increased risk over the built-up areas of the city as a result urban heat island effect (City of Tshwane, 2021) this subsequently results in drought being a risk experienced by the site. That being said, the researcher has already stated that this space is a cooling space in the city. As a first-hand experience, it is physically cooler as compared to the external context. This was noted during the observation process, as the researcher noticed that sitting in Rissik Park, though has a lot of trees, the design was not well thought-out.

This can be seen in the placement of its benches do not properly line up with the present trees. This awkward placement affects how users interact spatially with Rissik Park, as shown in Map 11, as users would tend towards the trees for shade, which meant they rarely used the benches and rather sat on the lawn to enjoy the shade. Fortunately, the heavy presence of trees in Rissik Park means there is an increased probability of the area experiencing a cooling effect from the trees, and this will decrease the heat stress through vegetation and natural shading as effectively as in the case study. Brown et al, (2015) explain the greater benefit of this natural shading of public spaces being felt in the greater context surrounding the public spaces as they provide thermally comfortable environments, and the air temperature in the parks typically can extend some distance into downwind neighbourhoods, which means the cooling effect of these space is not limited to their immediate context.

Although there are more trees present in Rissik Park, they have a tangibly less effective result in cooling the area; this was a physical experience the researcher could not map but noted in their observations. Contrary to that, Moja Gabedi has incorporated the use of artificial shading devices throughout the site where there are benches to combat heat and in some cases rain in parts of the site further from the built structures. This, however, is limited in its benefits towards users as the space is still restrictive in access, even though it is a public space. It has been previously mentioned that boundary conditions still make it uninviting to the external user.



Map 12: Observed Seated Activity Mapped to compare seating in Moja Gabedi and Rissik- Sitting Commercial shows the different vendors in the external site (Author, 2023).

The site also benefits its context through how it interacts with external users. For example, adjacent to Rissik Park, are formalised informal food vendors who, several interview respondents have stated use the Moja Gabedi taps for water that they use to cook on-site, as well as to clean their crockery and utensils at the end of the day. The interesting thing that the researcher noted during one of the site visits, is that the times these vendors were active coincided with the times at which the Moja Gabedi Gardens were accessible.

Figure 16: Vendors in Rissik Park- These vendors use the water taps on site to get cooking and cleaning water. (Authors, 2023).

Unlike the informally programmed space, Rissik Park, programmed spaces like the Moja Gabedi case study tend to have set hours of operation, so any interaction with external users is limited to those hours, and subsequently, its amenities are limited to the users as well. As in unprogrammed spaces, there are no restrictions on the use of the public space. This is due to its boundary conditions. There are no defined boundary conditions in Rissik that limit access to the site, unlike Moja Gabedi which has two access points through not one but two lockable gates. This will be further explored in the safety and security sub-section.

5.2 Safety and security:

Concerns about safety coming from visible alcohol and drug use in most public spaces are due to the presence of certain people, especially the homeless within this space. This was the driving force for the establishment of the garden as, while it was a vacant space, it was a crime hub, boasting drug use and sales as well as prostitution; a concern that was raised by Speaker 2 noted in the Origin of Place interview conducted on February 23, 2023. The researcher is certain this concern played a role in the boundary conditions and visibility as criteria for the successful operation of Moja Gabedi.

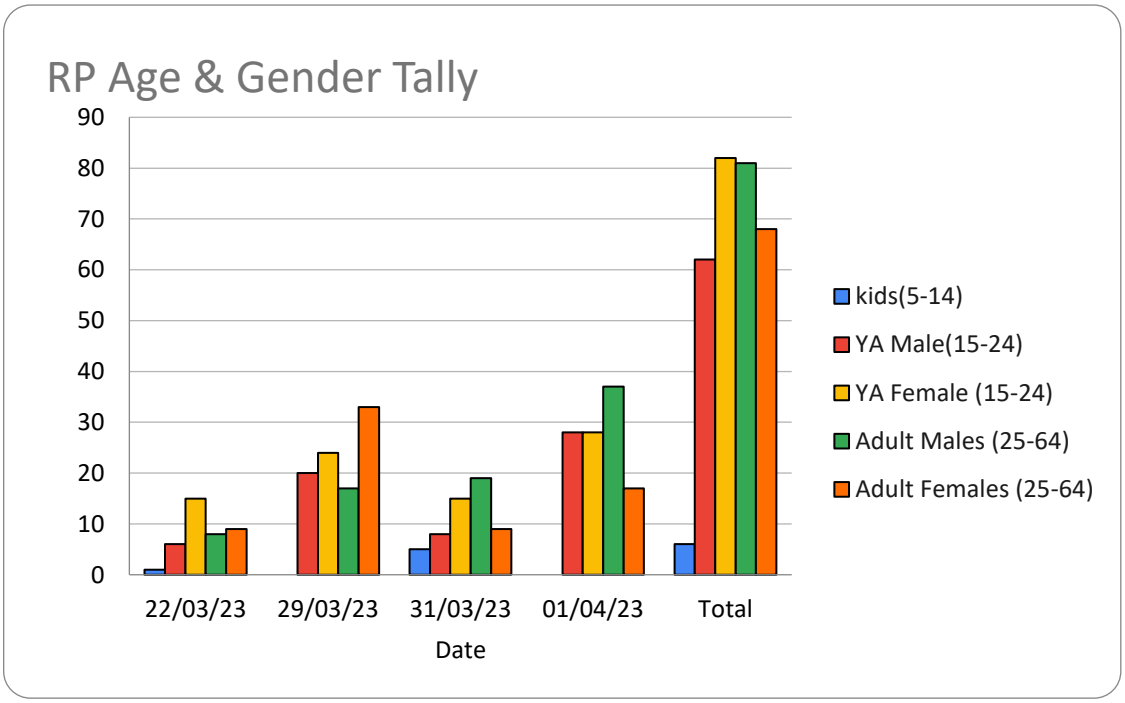


Figure 17: Graph Showing the age and gender tally result from the study in Rissik Park, (Author, 2023).

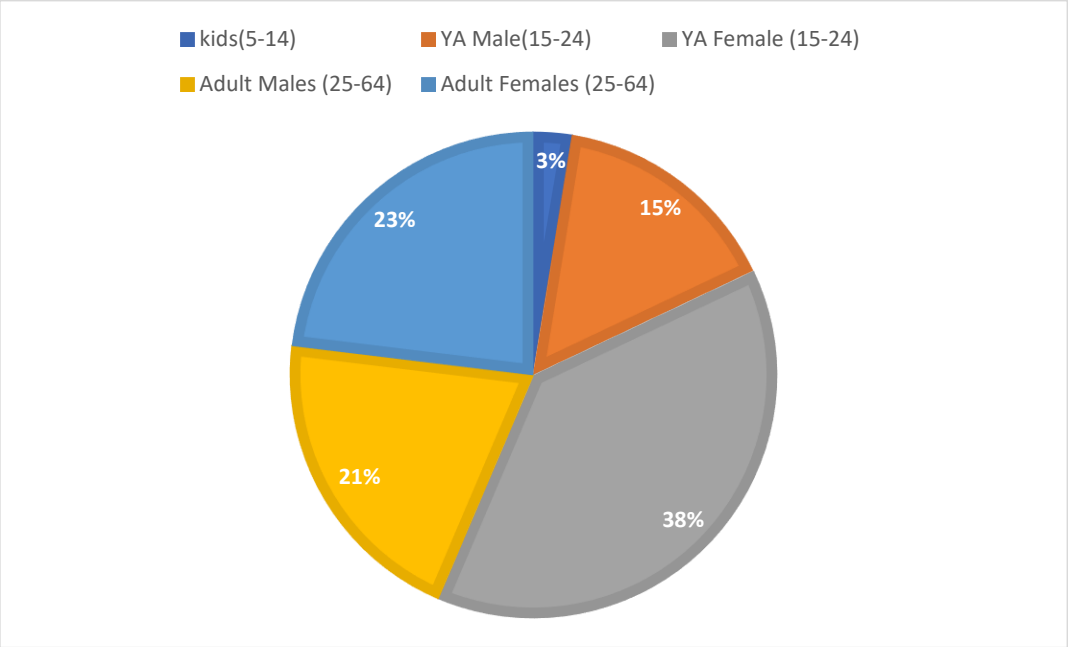


Figure 18: Chart showing the percentages of the people counted throughout the study of Rissik Park (Author, 2023).

As the researcher has noted in the case study, there is a majority male presence on the Moja Gabedi site (Table 2). The same can be said for Rissik Park. This is particularly evident with the fact that though more women are perceptively safer walking past the park, it is mostly men, outside of large groups who linger in the spaces, either leisurely or waiting for transport.

Date	Kids(5-14)	YA Male(15-24	YA Female (15-24	Adult Males (25-64	Adult Females (25-64)	
07/03/23	0	1	3	2	2	
15/03/23	0	2	4	8	3	
21/03/23	1	3	1	4	3	
22/03/23	1	2	2	11	3	
24/03/23	1	0	1	7	3	
01/04/23	0	3	0	3	1	Total
Total	3	11	11	35	15	75

Table 2: Age and gender Tally results in Moja Gabedi, (Author, 2023).

Map 13: Movement Patterns by Gender Mapped in both Moja Gabedi and Rissik Park (Author, 2023).

Map 14: Standing Activity Map for both Males and Females in Moja Gabedi and Rissik Park (Author, 2023).

The interesting thing noted about the stationary activity observation of the men and women in Rissik Park, was that women were more likely to be walking past, as is shown in the tables below, and where they were observed in stationary activities, they were more often than not with a male they knew, and most likely waiting for transport (see Appendix A – Rissik Park Mapping, Table 3). Therefore, it stands to reason that there is a certain perception of safety and security that is evident in these public spaces.

Date	Walking	Sitting	Standing	Lying Down	Waiting for Transport	Rolling	
22/03/23	15	10	16	0	0	0	
29/03/23	31	18	9	0	4	1	
31/03/23	36	21	16	0	1	1	
01/04/23	32	23	9	2	3	1	Total
Total	114	72	50	2	8	3	249

Table 3: People Counting Results for Males in Rissik Park (Author, 2023).

Date	Walking	Sitting	Standing	Lying Down	Waiting for Transpo	Rolling	
22/03/23	22	9	1	0	0	0	
29/03/23	31	2	3	0	2	0	
31/03/23	15	7	3	0	0	0	
01/04/23	47	2	1	0	4	1	Total
Total	115	20	8	0	6	1	150

Table 4: People Counting Results for Females in Rissik Park, (Author, 2023).

The fenced-off and gated boundary of Moja Gabedi (Figure 19) along with its programmed male-focused activities, give the perception of safety. Whereas Rissik Park is an open public space with no security boundaries, there is a perception that it is safe enough to walk through, but particularly for women, it is not safe to stay in the long term.

Figure 19: Moja Gabedi Site Boundary Conditions. (Author, 2023).

This however was not the sentiment of the two interview respondents in Rissik Park, both women and vendors on the site, one stating: “It is positive. Because where you are, where

you feel safe and protected, yes. It's where you can. We can be open, yes, but if there is no safety, Well, you are harassed. That's where you can feel that no, it's negative. But so far, the university is looking after this. I can say also, oh, I can say the government is helping. Yeah. So, we are safe… Yeah. The security guards are all over. So, it's positive." This statement was in response to a question asking whether they have a positive or negative perception of the space. This same respondent went on to explain that the CID (City Improvement District), is who is assisting all the vendors on site in establishing their businesses, setting up the security cameras on site and the security personnel in the area, which does mitigate that perception of a lack of safety in Rissik Park.

Therefore, the perception of safety and security in any public space is not dependent entirely on the boundary conditions, but also on the evident security measures implemented in the space. As a Climate Change Adaptation Strategy, this is not physical but is a psychological benefit as it ultimately impacts whether as space will be occupied by long-term users or where it will become a transition space to other "safer" spaces.

5.3 Mental health benefits:

The establishment of the garden and the initiative to rehabilitate male drug users in Hatfield stems from the history of the site. As was brought up numerous times in one-on-one interviews, the space has had a positive impact on one's mental health. "Research within this paradigm has tended to focus on UA as a means to ensure food security and to address urban poverty through enhancing livelihoods" (Battersby and Marshak, 2013). These authors convey that there is a connection to poverty and its effects on the mental health of public space, therefore public space that deals specifically with UA as a programme can greatly benefit communities in improving not only the quality of their environments but also the well-being of its users. Beyond that, the site is used as a therapeutic garden that is also used for occupational therapy and art therapy, As noted by Ziervogel et al (2013) climate change also affects the mental health of users. This project addresses it by focusing its programmes on the rehabilitation of RH residents, particularly using therapeutic activities. As previously mentioned, the art and OT sessions are geared towards healing the site users from drug addictions. Van den Broek (2021) states that "Climate change may present acute and chronic stressors that may cause severe mental health problems. So, there are both direct and indirect effects of climate change on mental health: mental distress, anxiety, mood disorders, stress, post-traumatic stress disorder (PTSD), substance abuse, domestic violence and depression after acute events." This means that the site has to have the additional impact of healing the mental and sometimes spiritual wounds that tend to lead to

drug use. One respondent even noted how in the short period of being part of the Reliable House initiative, they have seen tangible change in themselves and others, in the way they think and interact with each other once they begin treatment.

There is also evidence of this being a therapeutic garden presented by the type of plants present on site. The researcher was able to note the presence of a lot of lavender bushes in the eastern section of the site, that have an aromatic therapy that adds to the calming effect of the space. These are just some of the design elements that go into what can be considered a therapeutic garden, in this case study there is the added benefit of it being a working garden, so the active planting and cultivating of crops in the garden means the continuous physical and mental health improvement of the users. Krzeptowska-Moszkowicz et al. (2022) note in their study how this was positively perceived by the users of the space, bringing about positive associations to the space, as one of the respondents stated they would spend hours on end, meditating in the gardens, because of the relaxing atmosphere it naturally creates. “More recently, UA has been seen as a way of fostering ‘community capital’, which includes building social and human capital (Smith and Bailkey 2006, p. 145). This further proves, the impact of public spaces programmed as UA gardens have on the social cohesion of urban residents, which we know is always beneficial to the mental health of urban users as it fosters relationships between users.

The role of churches and sermons In the rehabilitation of spaces and individuals has also proved its importance as it has been noted from interview respondents how the sermons and prayer sessions held within the site made coming to a space like this more beneficial and enjoyable. Several respondents mentioned connection to God through the tranquillity of nature in the space was beneficial to them both mentally and spiritually. “Numerous studies found that humans desire contact with nature and display a preference for a green setting instead of a typically urbanized one when choosing a place to regenerate after mental exhaustion.” (Krzeptowska-Moszkowicz, 2022, p. 2).

Therefore, public spaces such as the case study can have mental health and spiritual benefits to the users, with the right conditions and spatial quality. Therefore, the health and well-being of Moja Gabedi users are successfully considered and improved just by being in the space outside of its programmed activities.

5.4 Socio-economic opportunities:

There is potential for this space to do so much more economically, as has been expressed by several respondents, recognition to expand the utilisation of the space to do more in the socio-economic sector through day and night events, formalising spaces like the coffee shop and extending the time of existing events like the Saturday morning market in collaboration with the Festival's Edge residents. The space can also grow in this sector through the use of social media, as a respondent noted, the potential to use the space for podcasts on mental health in the youth, video shoots for music or motivational sessions and even for worship sessions, bringing it back to the connections to the church and spirituality. The space has a large open space that allows for large gatherings, which fosters market opportunity. But there is also the potential to open up the space to be more commercial in the cultivation of the crops on site. The site itself is large enough that, outside of the programmed therapeutic sessions, more people can be hired to tend to and propagate the gardens more effectively. This means there is potential for financial well-being as well as skills development in the agricultural sector, subsequently improving the probability of more spaces like this being established (Viljoen and Bohn, 2009). Therefore, this space is not only beneficial to the urban environment in purely physical means but also in social and financial means.

5.5 Conclusion

With the comparison to Rissik Park, the researcher understood that Moja Gabedi has its benefits and drawbacks as a public space. As previously stated, the major disadvantages of Moja Gabedi stem from its boundary conditions. This creates a perception of restrictive access to the benefits that come from being in the space. Whereas unrestricted access to Rissik Park, which in turn means high visibility on the site, therefore there is a perception of safety. There is a lot more activity and use in Rissik Park, but observations showed that the space was not perceivably safe, despite the security measures put in place.

Concerning the climate change adaptation potential of the case study, Moja Gabedi shows the potential to be a climate change adaptation strategy. This is mainly due to the presence of water management on the site, which allows for the propagation of vegetation; that encourages the spaces to become a cooling space. In addition to that, it also combats the risks and vulnerabilities of heat exposure and drought. This has been an added benefit to the community in the immediate context of the site, particularly the vendors in Rissik Park. Therefore, public spaces like Moja Gabedi, if treated properly, can be a benefit to not only its users but also positively impact the surrounding urban context they exist.

6 Conclusion

6.1 Research results summarised.

Integral sustainability design is about the holistic approach to spatial design. Regenerative design is geared towards humanity being in service of nature, a ‘Seva’ approach to living in urban environments (du Plessis, 2022). The researcher postulates that these two streams of thought cannot work in isolation and must be combined. We should design spaces that are consciously designed to improve the lives of their users in every possible way while being of service to the natural environment. This comes down to the designers, policymakers and place makers of the urban contexts working together to bring solutions to climate change issues, that also build a more cohesive society.

The study of Moja Gabedi has brought to light the potential of public spaces within the city and the impact of climate change adaptation. Additionally, it has also proven the potential for spaces like Moja Gabedi to affect its users positively. However, this means we must look at better ways of treating the boundary conditions of public spaces as it affects the accessibility of public spaces as it affects the useability of these spaces.

With regards to the current, and future, climate change adaptation potential of the Moja Gabedi and how it affects the climate change risk of Moja Gabedi itself and its immediate context, this study has found that the space has a positive impact towards its immediate context. As Brown (2015) states, spaces like Moja Gabedi have a cooling effect that mitigates the UHIE in urban settings. This is further substantiated by the discovery that Moja Gabedi has a net positive effect on the social and economic well-being of the users in and around the site. It has the potential to be a productive food garden, should the step be taken to increase propagation capacity beyond its programmed therapeutic uses.

The establishment and development of the Moja Gabedi affect its current climate change adaptation potential in its immediate neighbourhood by catering to the vulnerable population in the area first. This space was established solely for the rehabilitation of the male homeless population of Hatfield. However, it has had the added effect of contributing to the environmental well-being of its immediate context in its cooling effect and the water contributions it has made to the users in its context.

Lastly, the spatial and material characteristics and climate change adaptation potential affect the use of Moja Gabedi in both a positive and negative way. The positives are that the space has a rehabilitating effect on its users; many users state that they have been able to recover

from their addictions more comfortably, by just being in the space. The programs in place are a great tribute to this and have proven the benefits therapeutic gardens have on their users. The negative is that Moja Gabedi being a pseudo-public space, Moja Gabedi, is rather inaccessible to the greater public. This in turn affects its usability, making it a dead space at certain times of the day, which contradicts the initial intention of the establishment of the space when it was converted from a negative space to a productive garden.

Despite all this, the spaces have contributed positively towards the climate change adaptation discourse, in that it has shown us how spaces such as Moja Gabedi can and should mitigate issues such as water shortages, extreme heat events and food insecurity within the urban context of Tshwane.

Ultimately, the researcher has learned through this study that public spaces can no longer just be for recreation and relaxation as Landman (2015) stated. The researcher now recognises that public spaces, in these current climate conditions, can and should be reimagined in how they can mitigate the effects of climate change, as well as seeing them as spaces that can rehabilitate the most vulnerable populations of our cities.

With all this, there is still work to be done in the research field, to close the information gaps that still exist regarding how public spaces, especially urban agricultural gardens, contribute to the mitigation and amelioration of climate change effects. This becomes more evident in the mental health and spiritual well-being of urban residents, which this study has shown; that public urban gardens can greatly contribute to addressing.

6.2 *Recommendations*

Urban Gardens should be slowly introduced into urban planning policies and land legislation. This can be even more beneficial in the regeneration of lost or degenerate spaces that dilapidated the city. Through these efforts, life will be restored to varying vacant and occupied spaces in our cities and initiatives that tackle food insecurity and the economic crisis that has perpetuated the homelessness issue in the City of Tshwane can be explored. Beyond this, we need to look into how policymakers and land developers are introduced into the conversation with climate change researchers.

This report intends to show the potential of urban gardens to be climate change adaptation strategies within the urban context. Through the research, it became evident that how we treat the boundary conditions of public spaces largely affects the use of these spaces. In

addition to this, programming parts of the space encourages not only the use but also the maintenance of said spaces.

Therefore, as an academic report, this research adds value to the current discourse on how designers and place-makers can rethink the use of negative spaces and transform them into places that promote sustainability mindsets as well as social cohesion and integration. Furthermore, there is now a better understanding of how public spaces play a role in climate change adaptation, however, there is still more work yet to be done on the mental health impacts of climate change, particularly when looking at vulnerable communities.

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8 Appendix A

8.1 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.

Kai-Yin

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

8.2 List of Interviewees

Respondent R: 23 March 2023, Male

Respondent C: 23 March 2023, Male

Respondent M: 23 March 2023, Male

Respondent T: 31 March 2023, Female

Respondent C: 31 March 2023, Female

Respondent B: 01 April 2023, Male

Respondent T: 01 April 2023, Male

8.3 Method Tools

Semi-Structured Interview Questions

1. How often do you come to this place?
2. What do you typically do while you are at this place?
3. Are there groups you meet with here? What do you do while you are together?
4. What do you think works about this place, what about it works well?
5. What limits have you experienced about this place?
6. If you could, what would you do to improve it?
7. At what time do you usually or prefer to come to this place?
8. Do you feel safe when you are at this place?
9. How do you travel when you are coming to this place?
10. Do you live in Hatfield?
11. If not, how far do you have to travel to come here?
12. How long have you been a resident of Reliable House?
13. What changes have you noticed over time since you've been using this space?
14. What surprising or alternative activities take place in this place?
15. What Is there in this space that we don't typically see on a day-to-day basis?
16. Do they improve the quality of this space?

THANK YOU FOR PARTICIPATING IN OUR SURVEY ABOUT PUBLIC LIFE IN THIS AREA. YOUR RESPONSES WILL BE KEPT STRICTLY CONFIDENTIAL.

1 How often do you visit this place?

- ☐ Daily
- ☐ Weekly
- ☐ Monthly
- ☐ Rarely (once per year or less)
- ☐ First time here

2 How did you get here today? (Select option traveled for longest distance)

- ☐ Walk
- ☐ Bike
- ☐ Bus
- ☐ Light rail/Streetcar
- ☐ Private car
- ☐ Taxi/Rideshare
- ☐ Private bus/Shuttle
- ☐ Other. Please describe

_____

3 What best describes your relationship to this area? (check all that apply)

- ☐ Neighbor/Resident
- ☐ Employee (of nearby institution/business)
- ☐ Student (of nearby school)
- ☐ Tourist
- ☐ Attendee (cultural event or institution)
- ☐ Other. Please describe

_____

4 What brings you to this space today?

- ☐ Just passing through
- ☐ Shopping/Market
- ☐ Spending time with my family
- ☐ Meeting up with friends
- ☐ Spending time by myself
- ☐ Sightseeing
- ☐ Recreation/Sports/Exercise
- ☐ Walking my pet
- ☐ Cultural event/Performance
- ☐ Political event/Protest

5 If you answered 'just passing through' are you headed anywhere in particular?

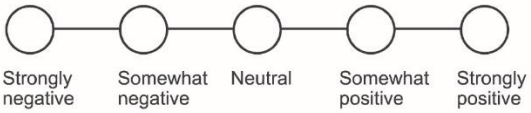
- ☐ Home
- ☐ Work
- ☐ School
- ☐ Cultural institution
- ☐ Restaurant/Bar
- ☐ Store
- ☐ Another public space
- ☐ Other. Please describe

_____

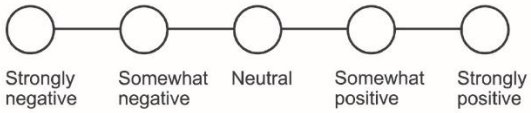
6 How much time do you plan on spending here today?

- ☐ Less than 10 min.
- ☐ 10 min.
- ☐ 20 min.
- ☐ 30 min.
- ☐ 1 hour or more

7 How do you feel about this neighborhood?



8 How do you feel about this particular public space?



9 What three words would you use to describe this public space?

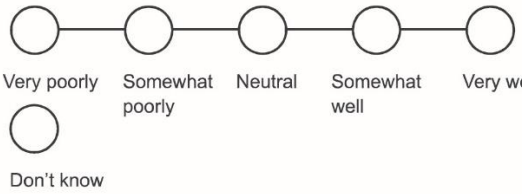
_____

10 What two things would you like to do in the public spaces of this area that you can't do now?

_____ & _____

3

12 How would you rate your feeling of personal safety in this space right now?



13 What would make you feel more safe in this place?

_____

14 Please take a few moments to look at the people here. Do you recognize anyone you weren't already planning to meet?

- ☐
- ☐ No, I don't recognize anyone here right now
- ☐ Yes, I recognize a familiar face, but I don't 'know' them
  Yes, I recognize someone I know but didn't plan to meet

15 What is your age? _____

16 What is the highest level of education you have completed?

- ☐ Less than 9th grade
- ☐ Some high school
- ☐ Completed high School (through grade 12)
- ☐ Some college, no degree
- ☐ Bachelors or Associate's Degree
- ☐ Graduate or Professional Degree

_____

17 Do you identify as

- ☐ Female
- ☐ Male
- ☐ Gender nonconforming
- ☐ I prefer not to say
- ☐ Other. Please specify

_____

18. Do you identify as? (mark one or more boxes + specify if you wish)

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Hispanic or Latino
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White
- ☐ Other. Please specify

_____

19 If foreign-born, what is your country of origin?

_____

20 What is the combined annual income of all working adults in your household?

- ☐ $0 - 9,999
- ☐ $10 - 14,999
- ☐ $15 - 24,999
- ☐ $25 - 34,999
- ☐ $35 - 49,999
- ☐ $50 - 74,999
- ☐ $75 - 99,999
- ☐ $100 - 149,999
- ☐ $150 - 199,999
- ☐ $200K or more

21 What is the street intersection closest to your place of employment or school? (If applicable)

_____ & _____

22 What is your home zip code/country of residence?

_____

THANK YOU!

4


DIT
MAPPING- MOJA GABEDI ONSITE
TNG Mojaphoko

Urban Quality Criteria

Name: Date:

Location: Time:

Is there seating? (Yes/ No) _____(Circle applicable)
[Steel, Timber, Stone, Plastic]

Are there Dustbins?(Yes/ No) _____

Are there Lights?(Yes/ No) _____

Are there Ablution blocks?(Yes/ No) _____

Is it Clean/Maintained?(Yes/ No) _____

Do you feel comfortable?(Yes/ No) _____

Presense of others:(Yes/No)_____

Neglect/ Quality?(Yes/ No) _____

Are there any Gates?(Yes/No)_____

Boundary Condiions:_____

Road/ Paths Surface:(Yes/No)_____(Circle applicable)
[Stone, Pavers, Rubber, Timber, Sand, Gravel]

Surface Coverage: (Yes/No)_____ (Circle applicable)
[Stone, Pavers, Rubber, Timber, Sand,Gravel, Grass]

Accesible?(Yes/ No) _____

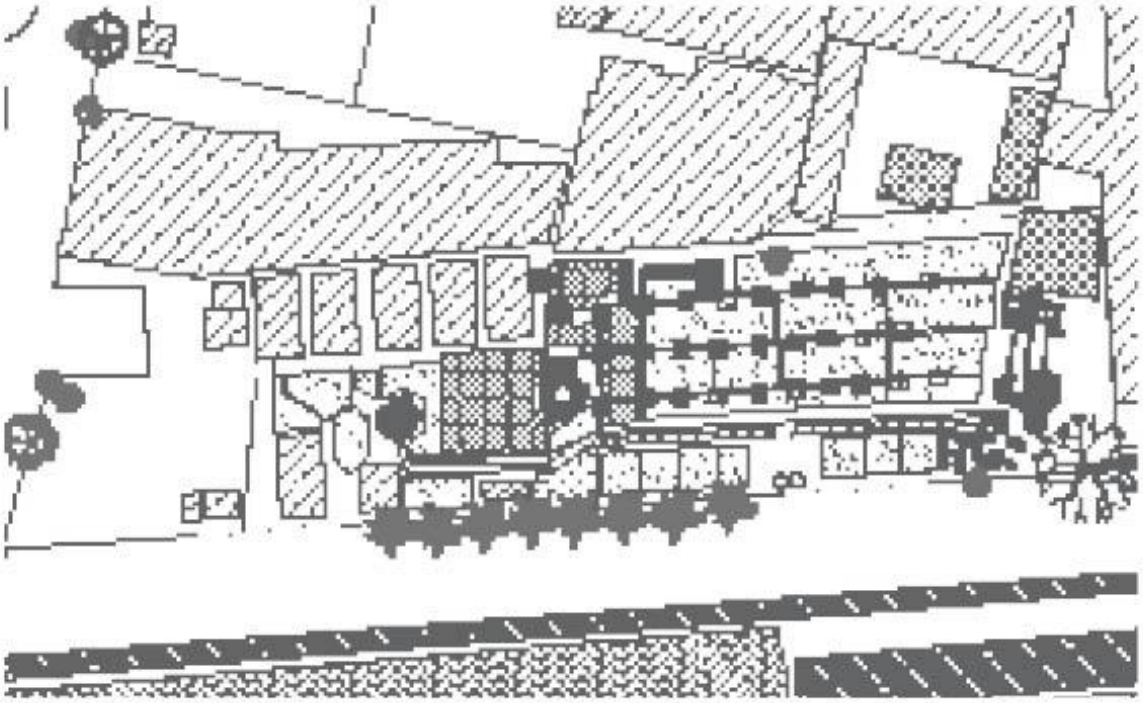
Stormwater Management: (Yes/No)_____

Water Storage: (Yes/No)_____

Vegetation:(Yes/No)_____ (Circle applicable)
[Trees, Shrubs, Flowers, Fruits, Vegetables]

Site Observational Mapping

Name: **Date:**
Location: **Time:**

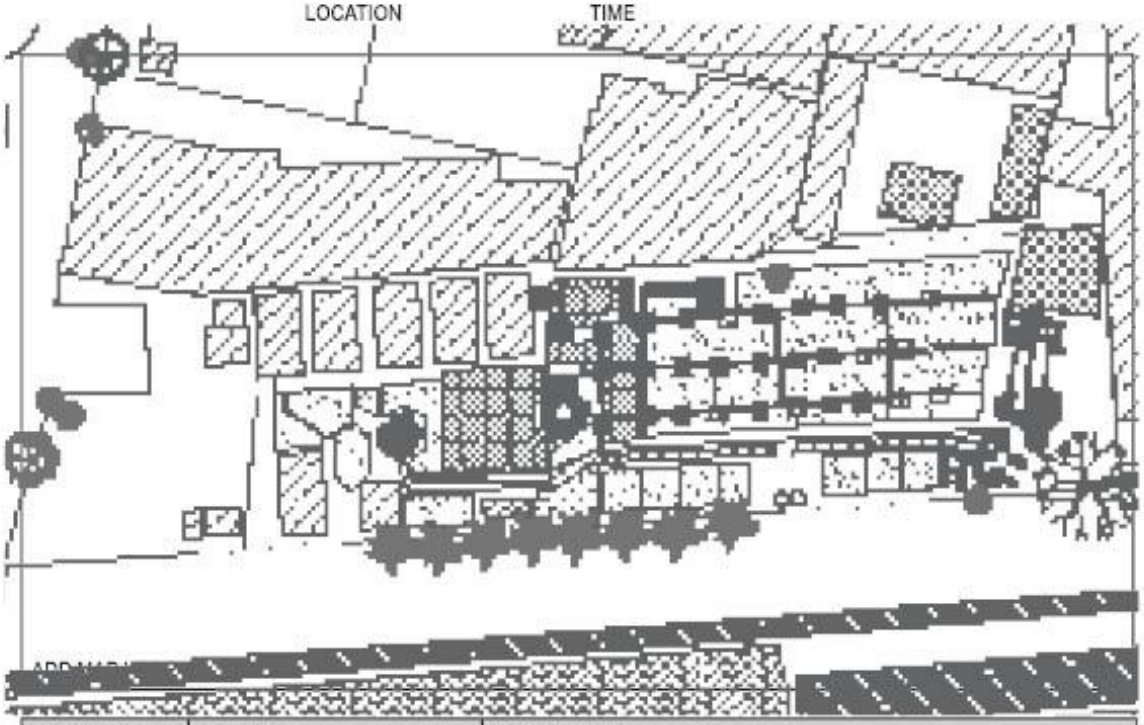


Building Structures	Meeting Space	Gazebo	Coup/aviary	Office
	Toilets			
Seating	Covered	Uncovered	Occupied	Unoccupied
Bench			(o)	(u)
Chair				
Amenities	Dustbins	Lighting	Firepit	Playground
Public Art	Sculpture	Painting	Metal Art	
Access points	External	Internal		
Food Products	Vegetables	Fruits	Hydroponic	Other
Trees	Edible	Nonedible		
Shrubs	Edible	Non-edible		
Fauna	Rabbits	Chickens	Duck	Turkeys
	Peacocks	Bees	Other	
Water	Borehole	Storage Tank	Pond	Stormwater

Stationary Activity Mapping

MAP NAME DATE WEATHER

LOCATION TIME



POSTURE	TALLY choose one per person	ACTIVITIES choose as many as apply				
		WAITING TRANSPORT	CONSUMING FOOD/BEV.	COMMERCIAL ACTIVITY	CULTURAL ACTIVITY	RECREATION PLAY/EXERCISE
STANDING ●						
SITTING PUBLIC □						
SITTING PRIVATE △						
SITTING COMMERCIAL ○						
SITTING INFORMAL ⊠						
LYING DOWN ▬						
MULTIPLE/ MOVEMENT X						

People Moving Count

10 MINUTES

NAME DATE WEATHER

LOCATION TIME

INSTRUCTIONS: Count people moving across the indicated line for 10 minutes. Adjust the location of your line as necessary to maintain a clear sightline from end to end.

CATEGORY		COUNT—TALLY EVERYONE	TOTAL
PEDESTRIANS	WALKING		TOTAL
	RUNNING/ JOGGING		TOTAL
	SUPPORTED (e.g., wheelchair)		TOTAL
	CARRIED (e.g., stroller)		TOTAL
	ROLLING (e.g., skateboard)		TOTAL
PEOPLE ON BICYCLES			TOTAL

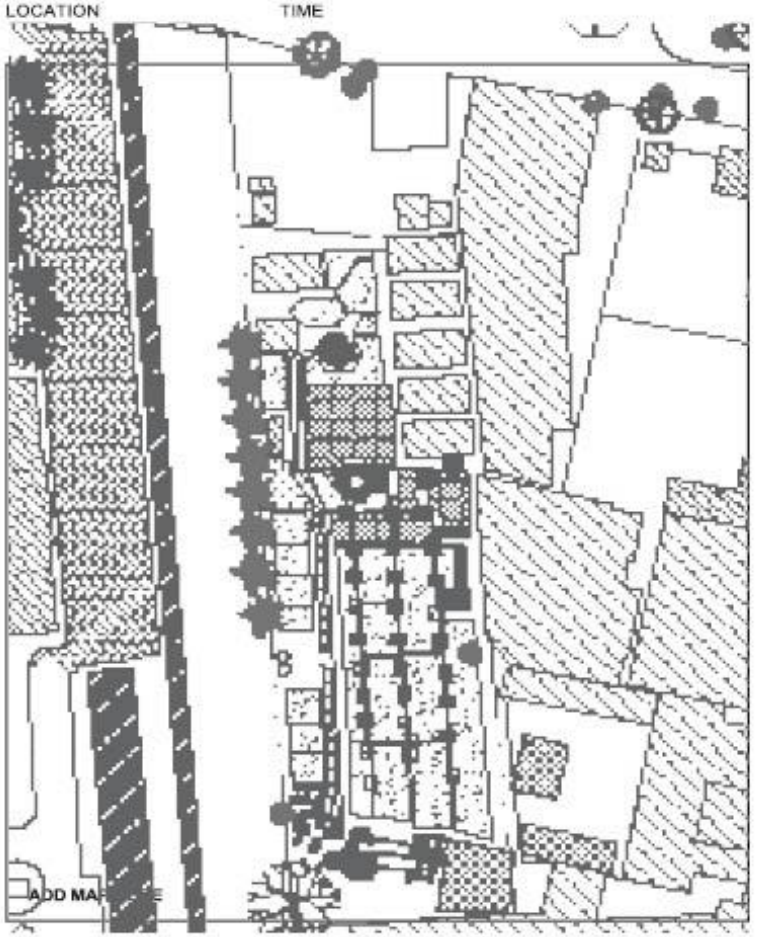
Age + Gender Tally

PEDESTRIANS—10–30 MIN OR 100 PEOPLE (CIRCLE ONE)

AGE			
0-4 toddlers	TOTAL:		
	MALE	FEMALE	OTHER/NOT SURE
5-14 kids	TOTAL:	TOTAL:	TOTAL:
15-24 young adults	TOTAL:	TOTAL:	TOTAL:
25-64 adults	TOTAL:	TOTAL:	TOTAL:
65+ seniors	TOTAL:	TOTAL:	TOTAL:

NAME DATE WEATHER

LOCATION TIME

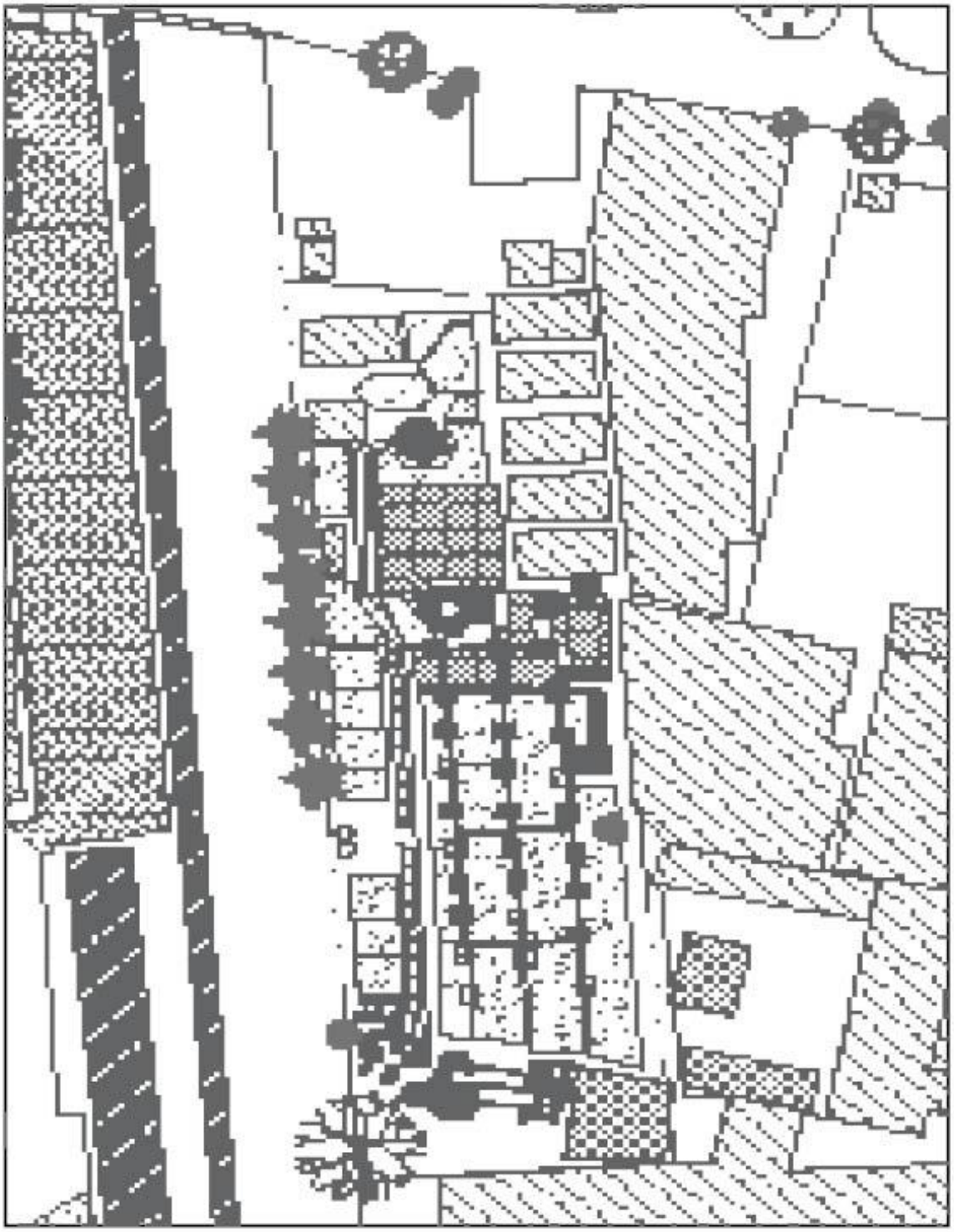


Instructions: Place map over the above box. If you are counting people moving, draw a dotted line across the zone of observation. Count pedestrians moving across the indicated line, noting age and gender for 100 people or 10-30 minutes, whichever comes first. Do not count individuals who do not cross the line, even if they move alongside it.

Additional Observational Mapping/ Notes

Name: **Date:**

Location: **Time:**




DIT
MAPPING- MOJA GABEDI OFFSITE
TNG Mojaphoko

Urban Quality Criteria

Name: **Date:**

Location: **Time:**

Is there seating? (Yes/ No) _____(Circle applicable)
[Steel, Timber, Stone, Plastic]

Are there Dustbins?(Yes/ No) _____

Are there Lights?(Yes/ No) _____

Are there Ablution blocks?(Yes/ No) _____

Is it Clean/Maintained?(Yes/ No) _____

Do you feel comfortable?(Yes/ No) _____

Presense of others:(Yes/No)_____

Neglect/ Quality?(Yes/ No) _____

Are there any Gates?(Yes/No)_____

Boundary Conditions:_____

Road/ Paths Surface:(Yes/No)_____(Circle applicable)

[Stone, Pavers, Rubber, Timber, Sand, Grass]

Surface Coverage: (Yes/No)_____ (Circle applicable)
[Stone, Pavers, Rubber, Timber, Sand, Grass]

Accesible?(Yes/ No) _____

Stormwater Management: (Yes/No)_____

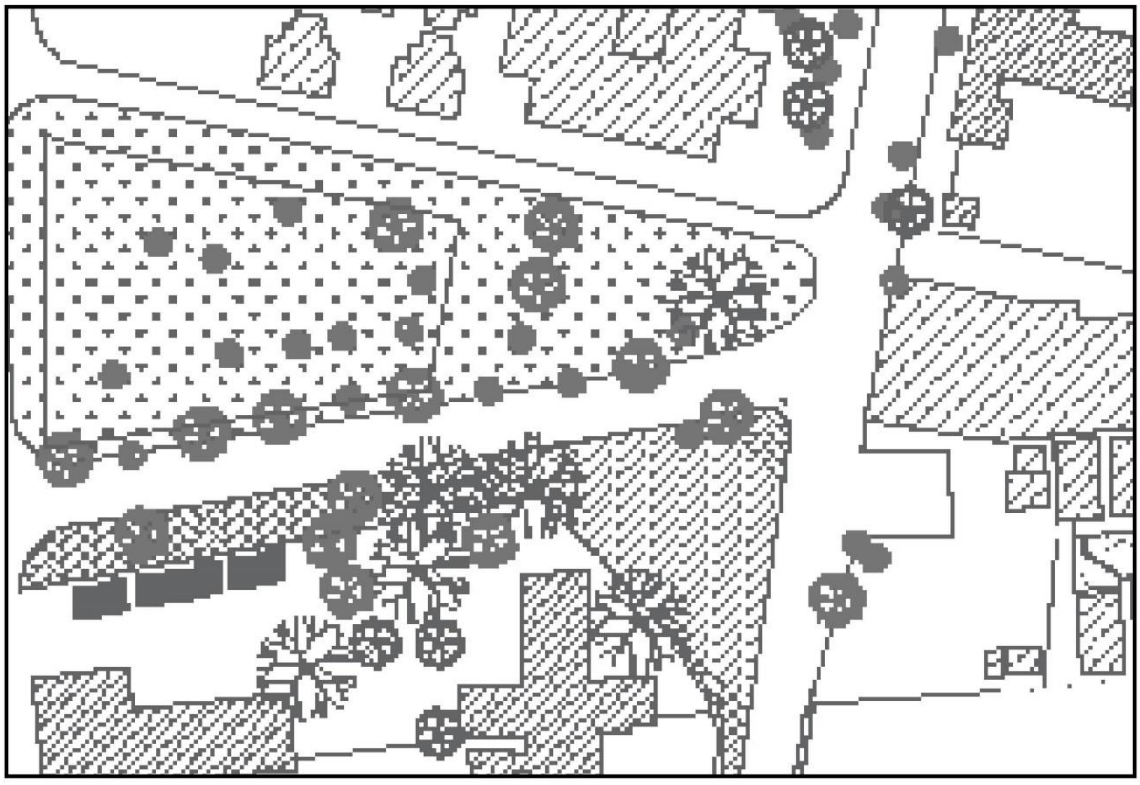
Water Storage: (Yes/No)_____

Vegetation:(Yes/No)_____ (Circle applicable)
[Trees, Shrubs, Flowers, Fruits, Vegetables]

Site Observational Mapping

Name: **Date:**

Location: **Time:**

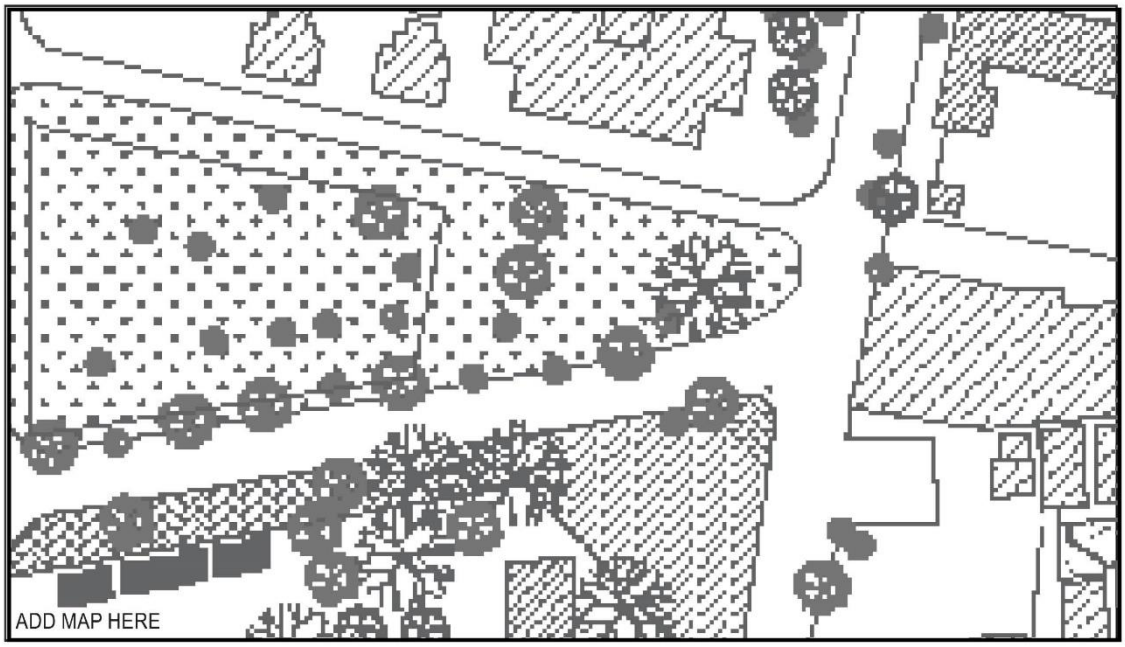


Seating	Covered	Uncovered	Occupied	Unoccupied
Bench	▬	▭	(o)	(u)
Chair	■	□	(o)	(u)
Amenities	Dustbins	Lighting	Firepit	
Public Art	Sculpture	Painting	Metal Art	
Food Products	Vegetables	Fruits	Cooked	Uncooked

Stationary Activity Mapping

MAP NAME DATE WEATHER

LOCATION TIME

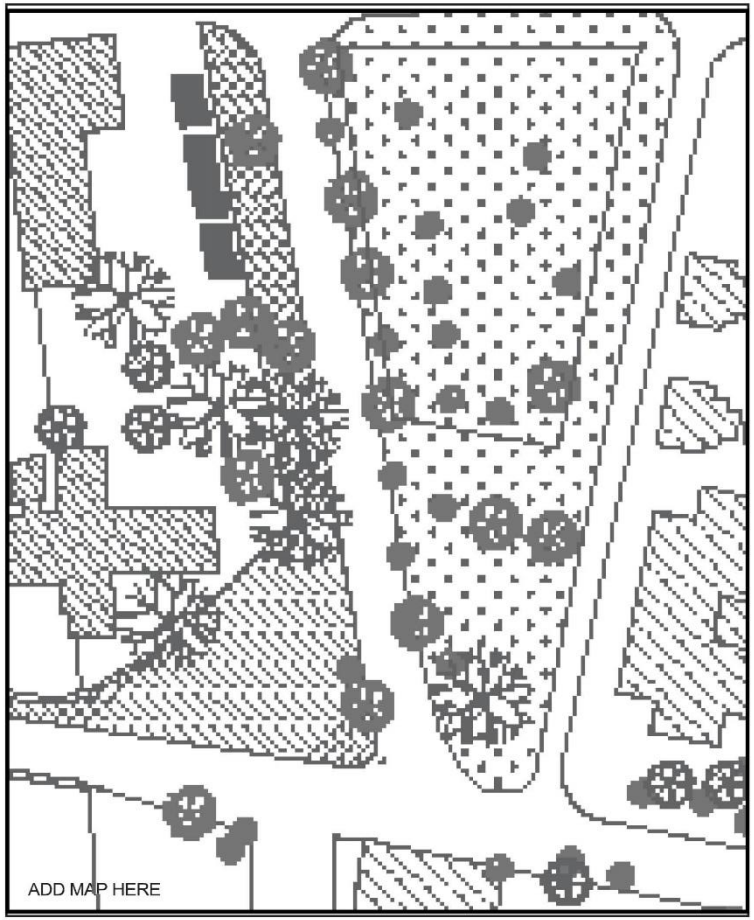


POSTURE	TALLY choose one per person	ACTIVITIES choose as many as apply				
		WAITING TRANSPORT	CONSUMING FOOD/BEV.	COMMERCIAL ACTIVITY	CULTURAL ACTIVITY	RECREATION PLAY/EXERCISE
STANDING ●						
SITTING PUBLIC □						
SITTING PRIVATE △						
SITTING COMMERCIAL ○						
SITTING INFORMAL ⊠						
LYING DOWN ▬						
MULTIPLE/ MOVEMENT ×						

People Moving Count

NAME DATE WEATHER

LOCATION TIME



INSTRUCTIONS: Count people moving across the indicated line for 10 minutes. Adjust the location of your line as necessary to maintain a clear sightline from end to end.

10 MINUTES

CATEGORY		COUNT—TALLY EVERYONE	
PEDESTRIANS	WALKING		TOTAL
	RUNNING/ JOGGING		TOTAL
	SUPPORTED (e.g., wheelchair)		TOTAL
	CARRIED (e.g., stroller)		TOTAL
	ROLLING (e.g., skateboard)		TOTAL
PEOPLE ON BICYCLES			TOTAL

FOR SURVEYORS

DIRECTIONS

1 Draw a mental box that extends 6-8 feet beyond your body. Approach every third person who walks through that box, regardless of their presumed demographic. Do not approach anyone who appears to be under the age of 18. If you are in an exceptionally crowded space, approach every fifth person.

2 Start at Location A (see map) and follow the schedule below.

3 Identify yourself as a public life researcher and state who you are working or volunteering for. Then ask if the person has three minutes to answer an anonymous survey about the social life of this space. Tell them what the data will be used for.

4 Note age & gender of people who decline your survey (see table on this page).

5 Surveys should be filled out directly by the respondent—not asked verbally by the surveyor. It's okay to approach your next person while another is still filling out their survey.

6 Have the person place the form in a manila folder to ensure anonymity.

7 Aim for 40 surveys through the course of your shift. You are encouraged to obtain more surveys if time allows.

SURVEY DEMOGRAPHICS

Tally people who decline to participate in the survey in this table

15-24 Male	
15-24 Female	
15-24 Other/Unsure	
25-44 Male	
25-44 Female	
25-44 Other/Unsure	
45-64 Male	
45-64 Female	
31-64 Other/Unsure	
65+ Male	
65+ Female	
65+ Other/Unsure	

Call with questions

_____ _____

SCHEDULE

Hour 1

Location A	15 Minutes
Location B	15 Minutes
Location C	15 Minutes
Break	15 Minutes

Hour 2

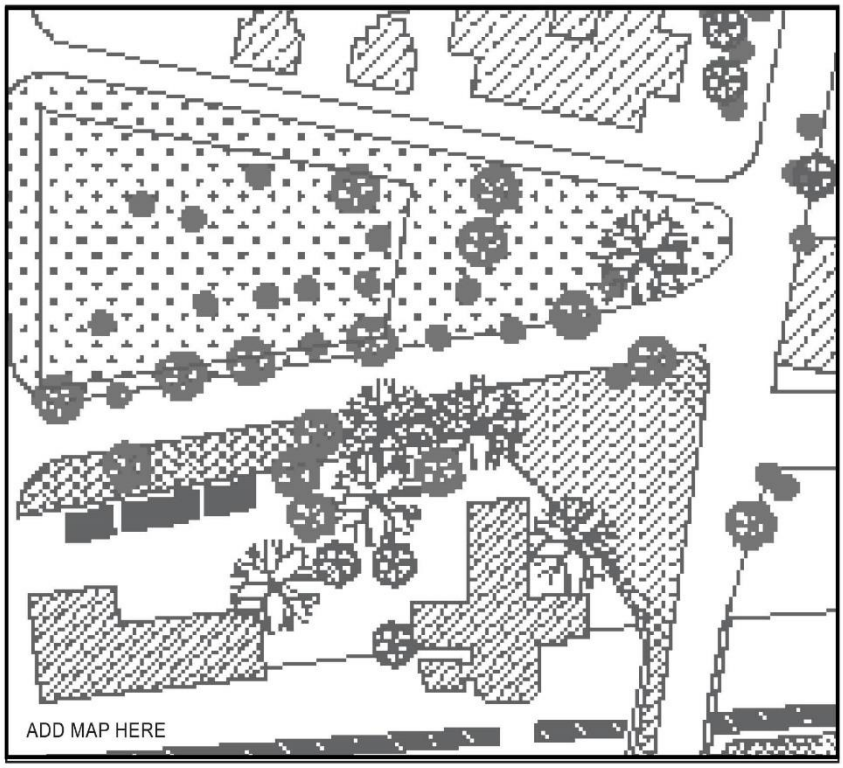
Location C	15 Minutes
Location B	15 Minutes
Location A	15 Minutes
Break	15 Minutes

Hour 3

Location A	15 Minutes
Location B	15 Minutes
Location C	15 Minutes
Break	15 Minutes

Hour 4

Location C	15 Minutes
Location B	15 Minutes
Location A	15 Minutes
Break	15 Minutes



Age + Gender Tally

PEDESTRIANS—10–30 MIN OR 100 PEOPLE (CIRCLE ONE)

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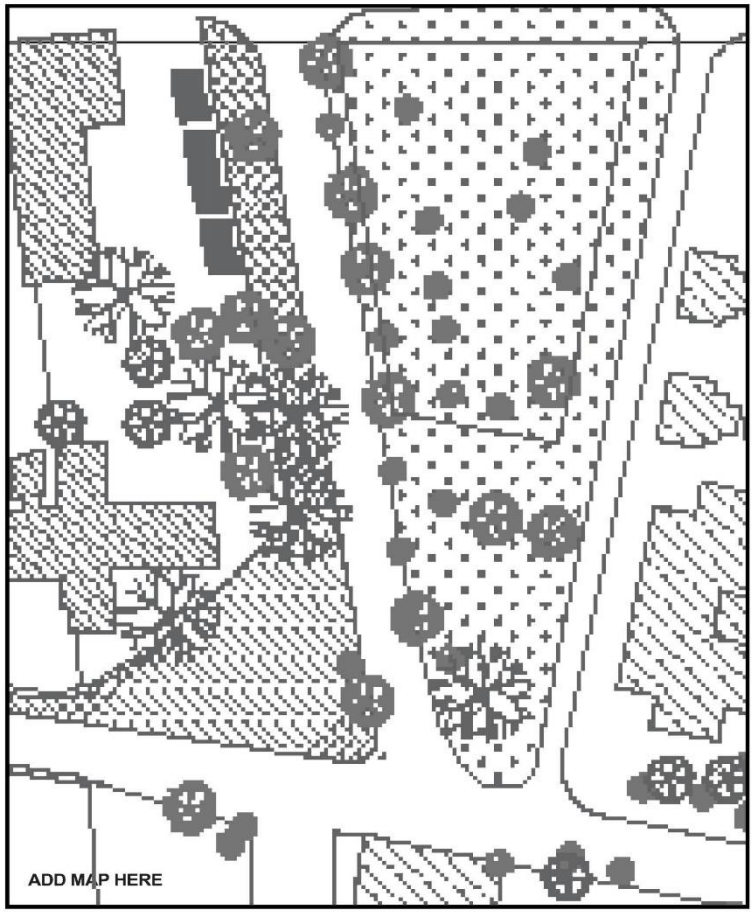
15-24 young adults	TOTAL:	TOTAL:	TOTAL:
25-64 adults	TOTAL:	TOTAL:	TOTAL:
65+ seniors	TOTAL:	TOTAL:	TOTAL:

NAME DATE WEATHER

LOCATION TIME



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Additional Observational Mapping/ Notes

Name: **Date:**

Location: **Time:**