TOWARDS SUSTAINABLE MANAGEMENT OF URBAN GREEN SPACES IN ZIMBABWE: AN EXPLANATORY STUDY OF GWERU CITY

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I declare that the above thesis is my work and that all the sources that I have used or quoted have been indicated and acknowledged through complete references.

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I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

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DEDICATION

To my wife Courage and children Tawananyasha, Tovimbanashe, and Tehillah.

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ABSTRACT

Effective sustainable management of urban green spaces can cushion the shocks associated with their depletion and the accomplishment of SDG 11.7, particularly in countries in the Global South that are rapidly urbanising. Gweru was selected as the study's focus point because it parallels the dilemma of urban green space demise in Zimbabwe. The purpose of this research was to provide both practical and theoretical contributions to the sustainable management of green areas to make Gweru a more liveable City. The study's ontological and axiological perspectives are constructivist and value-laden, respectively, while its epistemological viewpoint is interpretivist. This research employed a combined methodological approach to obtain insight into the spatial dynamics, drivers, negative consequences, involvement of stakeholders, and sustainable management of green spaces in Gweru, Zimbabwe. Geospatial technology, direct observation, questionnaires (n=1990), and interviews (face-to-face interview) (n=5) were employed as data-gathering approaches to accomplish this. The Driving Force-Pressure-State-Impact-Response (DPSIR) framework was utilised to give both theoretical and practical answers for the sustainable management of Gweru City's green areas. The findings indicated that urban green areas are being depleted at an alarming rate. The primary causes of such decline spanned from administrative shortcomings to geological impact, while the negative consequences ranged from ecological to environmental damage. The findings also suggested that stakeholders like citizens, churches, and civic organisations, among others, should be engaged in the long-term maintenance of green areas in Gweru City. Finally, this study suggested additional research on the green planning approach, which improves the sustainable management of green areas in Gweru.

Key Words: Urban Green Spaces, Sustainable Management, Gweru City, Geospatial Technology, DPSIR, Environmental Management Agency, Reliability Test, Salient drivers, Demise, Real Estate Developers, Parks and Community Services, Stakeholders, Households.

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LIST OF ABBREVIATIONS

UGS	Urban Green Spaces
EMA	Environmental Management Agency
RED	Real Estate Developers
DPP	Department of Physical Planning
DPCS	Department of Parks and Community Service
DFC	Department of Forestry Commission
UC	Urban Council
NCS	National Conservation Strategy
DEAP	District Environmental Action Plan
LEAP	Local Environmental Action Plan
EIA	Environmental Impact Assessment
ZNPP	Zimbabwe National Population Plan
DP	Decentralisation Policy
AP	Agricultural Policy
FP	Forestry Policy
RS	Remote Sensing
GIS	Geographical Information Systems
GPS	Global Positioning Systems
GCP	Ground Control Points
DPSIR	Driving Force-Pressure-Impact-Response
WHO	World Health Organisation

CHAPTER 1: PROBLEM ARTICULATION

1.1. INTRODUCTION

Global momentum is building for the sustainable management of urban green spaces (UGS). A UGS is described as a wide expanse of vegetation that is partly or covered by vegetation (Conedera, Del Biaggio, Seeland, Moretti, & Home, 2015). Examples of these urban green spaces include "public parks, backyard gardens, sports fields, playgrounds, outdoor recreation places, urban trees, plots of land, forests, and woodlands" (Mensah, 2015: 1; Mensah, Gough & Simon, 2018). The UGS provides various advantages, including social, cultural, economic, and environmental advantages. These advantages are discussed more below.

Socially, UGS visits may promote "physical activity, social contact, stress relief, and relaxation of the body and mind" (World Health Organisation [WHO], 2021; Atiqul-Haq, Islam, Siddhanta, Ahmed, & Chowdhury, 2021: 6). In addition, the use of UGS by children stimulates their physical and cognitive development (Jahan, Shirazi, & Sharkullah, 2019). Culturally, UGS can be used for outdoor worshipping or worshipping of specific trees or sites within urban areas (Ngulani & Shackleton, 2019). Economically, UGS is known for creating jobs, increasing property value, and above all attracting development (Atiqul-Haq et al., 2021). Environmentally, UGS has the potential to mitigate climate change and its related challenges such as flooding, high temperatures, and poor air quality (Duan et al., 2018; Atiqul-Haq et al., 2021). However, despite the importance of UGS, they are currently under threat from anthropogenic activities experienced in the world. The evidence of such threats is articulated below.

On UGS, unrelenting urban imprints can be seen from all around the world. For example, studies of 388 European towns found that as a result of a growing population, urbanisation consumed a considerable portion of green space (Mensah, 2015; Sun et al., 2020). According to estimates, the population increase in major cities in the United States of America resulted in the loss of 1.4 million hectares of green space (Girma et al., 2019; Matsa, Musasa, Mupepi, 2021). As for Africa, the total area of Kumasi (Ghana) was 25 km^2 in 1950, 182 km^2 in 1963, and 252 km^2 in 2011 (Mensah et al., 2018). Mohammed, Hassen, and Badamasi (2019) discovered that Abuja, Nigeria's capital city, lost around 21% of its green spaces from 2001 to 2006. Such an alarming expansion has caused massive destruction in and around African cities. Several scholars have pointed out that the deterioration and destruction of UGS in cities are caused by several factors indicated below.

The primary architect of UGS's demise was discovered to be urbanisation and urban expansion as a consequence of the enormous request for housing induced by the extraordinary growth in population (Johansen, 2021; Liou, Nguyen & Ho, 2021). Studies in African cities like Abidjan (Cote D'lvoire), Lagos (Nigeria), Dakar (Senegal), Accra (Ghana), and Freetown (Liberia) (Sierra Leone) have demonstrated that growing urbanisation was driving the transformation of many designated green space areas for infrastructure investment to accommodate the expanding urban population (Addae & Oppelt, 2019; Asabere et al., 2020; Riad et al., 2020). Aside from urbanisation and urban sprawl, the primary causes of UGS deterioration and destruction are a lack of political will (Roy et al., 2018; Munyati & Drummond, 2020; Cobbinah & Nyame, 2021), leadership support to protect UGS, weak policy frameworks to support it, and lack of a UGS database for monitoring it (Naibei, 2018; Kimote, 2020; Cobbinah & Nyame, 2021). Other primary causes of UGS's demise include, but are not limited to, poor enforcement of development controls in countries such as Ghana, Nigeria, and Kenya (Nyamache, 2021; Justice & Kusimi, 2023), a lack of resources (vehicles and manpower), a political orientation (Wang & Chan, 2019; Randrup et al., 2021), and a lack of stewardship (Winecki et al., 2022; Salvia et al., 2022). Such problems in other nations and localities compelled the researcher to conduct this investigation in Gweru (Zimbabwe).

Previous studies in Zimbabwe, though few, have shown that urban greenery is under severe threat from anthropogenic activities. For example, in Harare, the metropolitan city of the country, urban green spaces (UGS) decreased by 75.5 % between 1984 and 2015 (Mushore et al., 2018).

The authors further predicted that UGS would decrease from 57.42 km^2 to 27.85 km^2 between 2015 and 2045 in the same city. In Gweru City, a study by Matsa et al. (2021) indicated that there was a significant loss of UGS in the city. However, several gaps have emerged in the literature review and these include contextual, methodological, knowledge, and theoretical/conceptual gaps. Contextually, very little has been done in the study area particularly the sustainable management of urban green spaces in Gweru City. A piecemeal attention was carried out by Matsa et al. (2021) as the concept of sustainable management of UGS was left out in their study. Besides, there is also a knowledge gap on the urban green planning model being used by the local authorities to ensure that green areas are established let alone maintained. Methodologically, a study by Matsa et al. (2021) left out the residents and interviewed the key informants yet green areas are exploited by these residents. In addition, the sample size used was small to such an extent that the results could not be generalised. Apart from the methodological, contextual, and knowledge gap, there is also a theoretical and conceptual gap. The study by Matsa et al. (2021) in Gweru City skipped both the theoretical and conceptual framework that should have supported their research. Globally, the use of the systems thinking approach and its conceptual framework (DPSIR) has not been fully explored to the best of the researcher's knowledge and literature review. Thus, these gaps prompted the researcher to examine the urban green spaces demise in Gweru City. This is meant to provide both theoretical and practical solutions for sustainable management of greenery in Zimbabwe and Gweru City in particular.

1.2. MOTIVATION FOR THE STUDY

The dire UGS situation in Gweru City has motivated the researcher to want to understand the driving forces behind the demise of urban green spaces. The aim is to provide both theoretical and practical solutions for the sustainable management of green spaces in the city. The researcher was also motivated by the small size of stands being allocated to the residents. The researcher argues that a 150m^2 stand on its own cannot promote the greening of the city, since the stand is too small. If a family of six, for example, is occupying such a small area, it would want to build a house that is spacious enough to accommodate all members. This will compromise the size of manageable urban green spaces since almost the entire stand will be consumed by the house.

The researcher has also been encouraged by selective public engagement in city planning and development to incorporate green spaces in new projects and to maintain and manage existing green spaces in existing portions of the city. Most of the participants are from the elite group, whose opinions can have an impact on decision-making. The marginalised people have no voice and in most of these cases, they are mere recipients of decisions that would have been made by the elite. The condition described above jeopardises the city of Gweru's sustainable management of urban green areas. The researcher is also interested in how haphazard city expansion outside of the master plan affects the sustainable management of urban green areas. For example, evidence from the city documents shows that the council provided services such as sewer reticulation and water during the establishment of Woodlands High-density, yet the suburb is not on the city's master plan. There is, therefore, a need to establish a green urban planning model as a guide to the city. Another motivating factor is the use of geospatial technology that can monitor the changes that occur over time in a particular phenomenon (green space). Furthermore, the researcher was inspired by the necessity to determine the quantity of green space per population, since information on this topic is limited.

1.3. STATEMENT OF THE PROBLEM

Green places should be available to all people across the world. They should be at least 0.5 hectares in size and located about 300 meters from every residence, according to the WHO (Nieuwenhuijsen, 2021). Green spaces, by their very nature, are linked with a wide range of health advantages, including lower untimely mortality, higher life expectancy, less mental strength issues, lower cardiovascular disease, improved intellectual functioning in children and the elderly, and healthier new-borns (Nieuwenhuijsen, 2021). In addition, green spaces help to mitigate climate change by decreasing the effects of urban heat islands, enhancing ecosystems, and boosting biodiversity in urban areas, especially through the implementation of well-planned green infrastructure. They also do this by generating jobs and raising property values in the immediate neighbourhood (Lee, Jordan & Horsely, 2015; Naibei, 2018). However, despite all the aforementioned recommendations and benefits, green spaces are waning at an upsetting rate, particularly in the city of Gweru in Zimbabwe. The factors that prevent the provision of green spaces according to WHO guidelines are enunciated below.

In Gweru City, there is no database that the council can use to assess and monitor the spatial distribution and destruction of green spaces. The green spaces are being consumed by urbanisation and urban sprawl. In addition, from the researcher's experience, observation, and literature review, there is no documentation of the status and conditions of green spaces in the city (Feltynowski et al., 2018; Hansen et al., 2019). Apart from that, there is political dissonance between the central government and the local authority (Diko, 2019; Abubakari & Amankona, 2022). The evidence on the ground from the researcher's observation is that the green spaces are being destroyed because there is no unit of purpose between the central government and the local authority. This stems from the fact that the central government officials are politically oriented to the ruling party and the local authority officials are aligned to the opposition party. Given such a scenario, because of political polarization and orientation, some of the council's by-laws are circumvented by those that align themselves with the ruling party. Specifically, the land developers and barons are expected to do an Environmental Impact Assessment (EIA) before the establishment of housing units. EIA is a well-established process that is used all over the world to identify significant development impacts and propose mitigatory actions to such impacts (Aryal et al., 2020; Nita, Fineran & Rozylowicz, 2022; Reynolds, 2023). However, because the local authorities report to the central government, most of their by-laws are neglected to the detriment of sustainable managing green spaces.

Furthermore, the urban green model that the city of Gweru follows is not clear. An understanding of the urban planning model, if it exists, is critical since it gives a picture of how the city promotes the sustainable management of UGS. The number of green spaces per capita as recommended by WHO is not documented in the city. There is also little information on the possible drivers of UGS's disappearance in Gweru City. The possible drivers could be the lack of geospatial technology to monitor urban growth or the lack of the capacity to use it. None involvement of the stakeholders in urban planning, development, and management; and poor environmental governance, amongst other factors, could be the other drivers of UGS's demise in the city. A better understanding of these possible drivers/causes behind the destruction of UGS is a need for the future sustainability of the city at large.

If the above-mentioned problems are allowed to persist unabated, the health of Gweru citizens would be compromised. Already, due to climate change, flash floods are experienced every rainy season, particularly in high-density suburbs (Woodlands, Ascot, Mtapa, Nehosho, Mambo, Claymont Park, etc.) that are built-in wetlands. In 2016, 91 per cent of urban residents globally was breathing air that did not satisfy World Health Organization (WHO) norms, according to research conducted to review the development of SDG number 11, target 11.7. Over half of the inhabitants were subjected to air pollutants that exceeded at least 2.5 times higher than the WHO's safety guidelines (Olalekan et al., 2018). Once again, it was anticipated that in 2016, 4.2 million deaths were caused by excessive levels of ambient air pollution (Olalekan et al., 2018). This shows the catastrophic nature of destroying the UGS. In addition, if the disappearance of urban green spaces is allowed to continue in the city of Gweru, there will be a change in wildlife habitat, aesthetics, historical values, and other resource values (Naibei, 2018; Muziri, Banhire & Matamanda, 2019; Marambanyika et al., 2021).

In response to this, the study proposes to encourage the city authorities to use current geospatial technologies in monitoring urban spatial growth as well as involving stakeholders in the planning, development, and management of urban green spaces. However, only involving stakeholders without encouraging them to see the larger reality that affects the entire city population will never lead to sustainable management of urban green spaces in the city of Gweru. City officials should also concentrate on recovering urban land for green space, implementing natural solutions like green roofs and vertical gardens, green schools and churches, green corridors, trees and shrubs, pocket parks, and vegetable gardens, as well as traffic rerouting in addition to green space replacement strategies everywhere (Haaland & Konijnendijk van den Bosch, 2015; Nieuwenhuijsen, 2021). Natural spaces must be easily accessible and close to homes. As a result, the researcher contends that an integrated strategy is required to allow stakeholders to look beyond the observable occurrences and apply their mental models (mental schemata/perceptions) to support the sustainable management of urban green areas in Gweru.

1.4. RESEARCH ORIENTATION

The following section focuses on setting the research aim, objectives, and questions to address the problem of UGS deterioration and destruction in Gweru City.

1.4.1 Research Aim

This research sought to provide both practical and theoretical contributions to reducing UGS loss in Gweru. This may be accomplished via an integrated strategy that allows stakeholders to look beyond the observable events and utilise their mental models to enhance UGS's sustainability. Thus, sustainable management of UGS can only be done by establishing inhabitants' perspectives and attitudes, as well as determining the geographical extent of green space decline. Understanding the key drivers/causes, as well as the negative consequences of UGS's collapse in Gweru, would alter the perspective of all parties. This would help them see the significance of maintaining and increasing green spaces in their jurisdictions.

1.4.2 Research Objectives

1) To assess the spatio-temporal dynamics of green spaces in Gweru City over the past two decades (2000-2019).
2) To analyse the drivers of green space depletion in Gweru City over the past two decades (2000-2019).
3) To establish the pressures of green space depletion in Gweru City over the past two decades (2000-2019).
4) To assess the state/conditions of green space depletion in Gweru City over the past two decades (2000-2019).
5) To examine the impact of green space depletion in Gweru City over the past two decades (2000-2019).
6) To provide both theoretical and practical solutions toward sustainable management of green spaces in Gweru City

The following section discusses the relevance and contribution of the study.

1.4.3 Research Questions

The above-mentioned objectives can be achieved by addressing the following research questions.

1) How did the green spaces in Gweru City spatially change over the past two decades (2000- 2019)? 2)
2) What are the human needs that caused green space depletion in Gweru City over the past two decades (2000-2019)?
3) What are the human activities responsible for the depletion of green spaces in Gweru City over the past two decades (2000-2019)?

4) What is the state/condition of green spaces in Gweru City over the past two decades (2000-2019)?
5) What is the impact of green space depletion in Gweru City over the past two decades (2000-2019)?
6) How best can sustainable management of green spaces be achieved in Gweru City?

1.5 RELEVANCE AND CONTRIBUTION OF THE STUDY

The current study provides significant contributions by attempting to fill several gaps. First, the study extends the limited research on the demise of UGS and its related impacts on Gweru City residents in Zimbabwe. Second, by assessing the spatial changes of UGS in the City since the turn of the millennium (2000-2019), the stakeholders will change their mindset on the way they perceive green spaces. Third, no previous study has empirically addressed the drivers/causes of UGS demise in Zimbabwe in general and Gweru City in particular, to the best of the researcher's knowledge and through searches in peer-reviewed databases. The existing research by Matsa et al. (2021) on UGS's demise lacks depth as it mainly depended on geospatial techniques, observation, and interviews of a few key informants such as town planners, town map production officers, and the printing executive. Apart from using observations, geospatial technology, and a few key informants from the study by Matsa et al. (2021), this study will extend and fill that knowledge gap. This will be done by involving residents' perceptions, and key informants such as the Environmental Management Agency (EMA), Forestry Department (FD), Department of Physical Planning (DPP), and Department of Parks and Gardens (DPCS) in the City Council. These stakeholders are part of the team that is mandated to promote the sustainability of green spaces. By involving such stakeholders, the city authorities come up with sustainable means of conserving and extending the establishment of UGS in the city. Fourth, the research is based on DPSIR, systems thinking framework lens. The DPSIR framework believes cause-and-effect connections exist between various social, economic, and environmental system components

(Misganaw & Teffera, 2021; Ladi, Mahmoudpour & Sharifi, 2022). To the best of the researcher's knowledge, this conceptual framework is not used in several studies on the demise of UGS, not only in Gweru City but in many cities across the globe. Hence, its use in this study will enable other researchers to use it in situations elsewhere in the world, especially in the developing world. The research methodology of the study is explained in the section below.

1.6 RESEARCH METHODOLOGY

The study is anchored on pragmatist principles. As a research philosophy, pragmatism allows for some flexibility in knowledge development (Morgan, 2014), hence its suitability to address the research problem at hand. The stakeholders such as Gweru city households, key informants (Forestry Commission Officials [FCO], Environmental Management Agency Officials (EMAO], Department of Physical Planning Officials [DPPO] and Real Estate Developers [RED]) and Department of Parks and Community Services [DPCS] constitute the unity or unison of analysis of the study. Both deductive and inductive approaches were followed.

The inductive approach involves testing a theoretical assertion using research tactics particularly developed for testing, while the deductive approach involves testing a hypothesis "using precisely designed procedures for the goal of constructing a theory" (Saunders, Lewis & Adrian, 2012; Collis & Hussey, 2013; Ihuah, 2015). The case studies were used as part of a mixed-method approach.

The study used satellite images downloaded from the United States Geology Survey (USGS) website, observation, questionnaires, and semi-structured interviews (face-to-face), to gather information regarding the phenomenon under consideration. The data from satellite images were analysed using ENVI 5. The data from the questionnaire were analysed using SPSS. Face-to-face interviews were analysed thematically using NVivo. For a detailed and comprehensive research methodology see Chapter 3. The next section presents the structure of the thesis

1.7 STRUCTURE OF THE RESEARCH THESIS

The research is structured into five (5) chapters with the following breakdown (Figure 1.1). **Chapter 1:** This chapter focuses on the background and research justification. This is followed by what motivated the researcher to carry out the study. One of the reasons is the rapid demise of urban green spaces. The problem statement and research relevance are articulated in this chapter. The research aims, objectives and questions central to this research project are enunciated in this chapter. The study's contribution to science, methodology, and knowledge is also articulated. For example, providing both theoretical and practical solutions for sustainable management of green spaces in the city of Gweru contributes to the literature that informs subsequent research. Finally, the structure of the thesis is presented in this chapter.

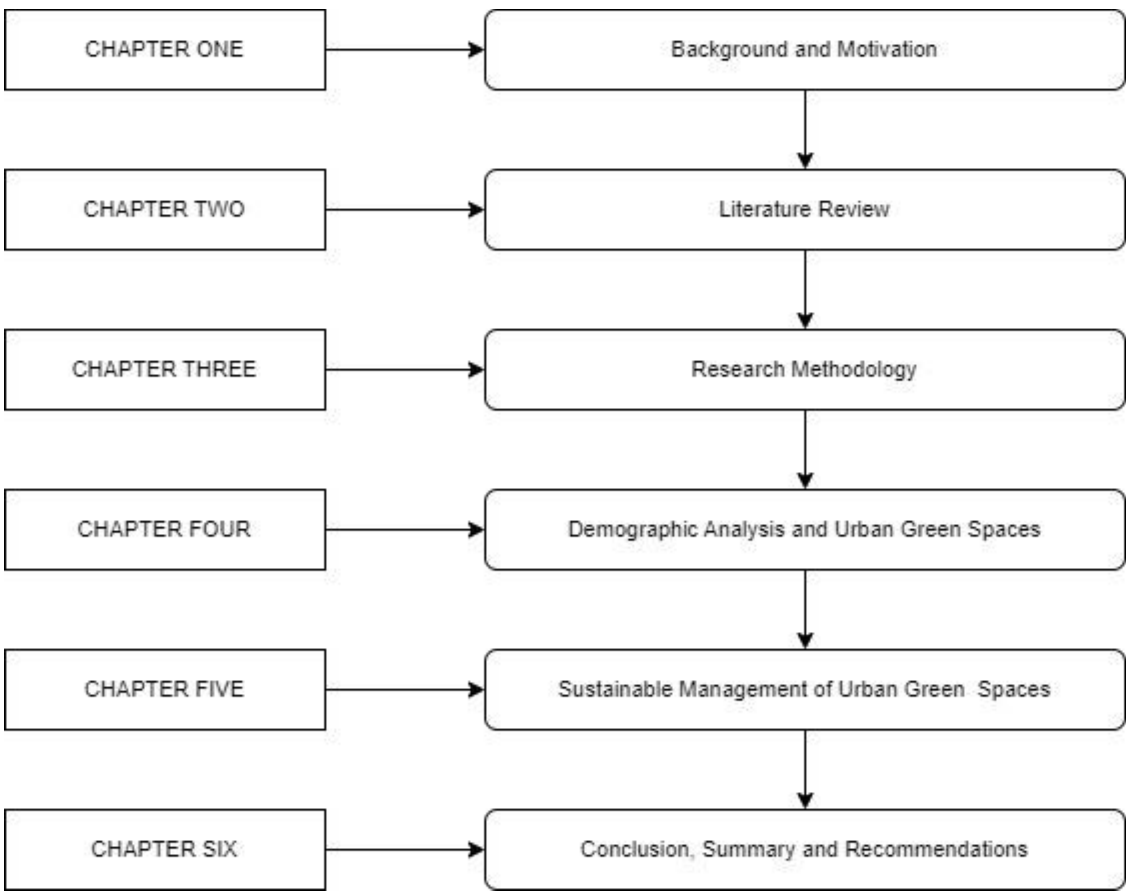

Figure 0.1: The Structure of the Thesis

Chapter 2: This chapter reviews related literature on urban green spaces, green urban planning models, urban environmental governance, sustainable development strategies in Zimbabwe, regulatory and institutional frameworks for natural resources (including green spaces) in Zimbabwe, and challenges to the sustainable management of urban green spaces. The categorization and advantages of green areas are discussed in this chapter. The pros and disadvantages of urban green planning concepts were also examined in depth. In terms of urban environmental governance, the emphasis is on the ideas utilised in the administration of green areas in various nations. The chapter also focuses on the Zimbabwean government's sustainable management methods for protecting natural resources in general and green areas in particular. The legislative and administrative structures that regulate the sustainable management of green areas were studied following sustainable development. The chapter further looked at the possible drivers of urban green space demise in Gweru City. The chapter ends by presenting both the gaps in the literature and the conceptual framework adopted in the study.

Chapter 3: In this chapter, the research methodology is presented. It is in this chapter that the methodological framework for the study is comprehensively outlined, discussed, and justified. The chapter also focuses on the conceptual framework of the study (DPSIR) and hypothesis statement formulation based on the conceptual framework. The study area description, research philosophy, research approach, research design, methods, and research ethics are also discussed in this chapter. Besides the methodological framework, this chapter presents the research ethics, validity, and reliability of the study. The potential methodological limitations are also highlighted in this chapter.

Chapter 4: This chapter presents the demographic analysis of the study. The demographic profile includes the following characteristics: gender and age of the respondents, years spent living in Gweru, and size of housing units and green spaces.

Chapter 5: This chapter presents, interprets, and discusses the results. It is in this chapter that all the research questions and hypotheses are answered. In addition, all the analysed data from different software (ENVI 5, SPSS, and Nvivo) were presented and interpreted in this section.

Chapter 6: This chapter summarises the whole research, which focuses on the sustainable management of urban green areas in Zimbabwe, using Gweru as a case study. It summarises the whole study, highlighting important results and conclusions, the study's contributions and limitations, and opportunities for further research. The chapter summary is shown below.

1.8 SUMMARY

This chapter laid the foundation and served as a general introduction to the thesis. It considered the background and research justification; motivation to carry out the study; problem statement and research relevance; research aim, objectives, and questions; the study's contribution to science, methodology, and knowledge; and the conceptual framework that informs the study. Besides, the chapter also focused on the study area. In the study area, the physical setting, land use, and economy were discussed extensively. The next chapter focuses on an extensive literature review supporting the topic of the research and the angle taken to make suggestions for resolving the stated problem.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

Globally, sustainable urban green space management is a prominent subject. This is because green areas are critical for city health, liveability, and long-term viability (Liu & Jensen, 2018; Bibri, Krogstie & Kärrholm, 2020; van Dinter et al., 2022). The purpose of this chapter is to look at a range of issues connected to the study aim, goals, and questions discussed in chapter one. As a result, the chapter defines urban green spaces, their categorization, and the benefits connected with them. This is followed by an examination of urban planning concepts and environmental governance ideas applied in various cities throughout the globe. Furthermore, the chapter focuses on Zimbabwe's sustainable management frameworks. This is followed by an examination of the country's legal and institutional frameworks for green space management, as well as the problems encountered in achieving sustainable management of green spaces in Zimbabwe. Finally, the chapter finishes with a summary of the important gaps in the literature that prompted the necessity for this research. The following sections concentrate on the notion of urban green areas.

2.2 URBAN GREEN SPACE CONCEPT

Green space is an area of land that is covered with vegetation, such as parks, gardens, and other green areas (Shahtahmassebi et al., 2021). The terms "green space" and other terms used in urban planning, particularly "open space" and "public open space," are frequently used interchangeably (Mensah, 2015: 13). These words are frequently used inexactly or interchangeably. The following definitions, which apply to both developed and developing nations, have been proposed by various writers to clarify these concepts and provide a better understanding of the significance of green spaces in the practice of urban planning. According to Xu, Zhang, and Li (2022), urban green spaces refer to any places that are naturally or artificially covered with vegetation in developed nations. Urban green spaces include all vegetated areas, including those with trees, shrubs, and grasses, according to Gillefalk et al. (2021). Urban green spaces are places that are mostly made up of unsealed, permeable, "soft" surfaces like soil, grass, bushes, woods, parks, gardens, wetlands, and trees that are either privately or publically accessible or managed (Gupta et al., 2020; Hyder & Haque, 2022). According to Jim and Chen (2003), urban green spaces are outdoor areas with some vegetation and are mostly found in semi-natural settings (Ngulani & Shackleton, 2019). Urban green spaces, according to Wu et al. (2021), are any vegetated land or building, water feature, or geological feature that may be found in urban environments. Urban green spaces, as defined by Sen (2020), are either public or private urban areas that are largely covered with vegetation and that are accessible to users directly or indirectly. Urban green spaces refer to the network of all-natural, semi-natural, and artificial ecological systems that can be found at all spatial scales within, around, and between urban areas (Ferreira, Monteiro & Silva, 2021). According to Ignatieva et al. (2020), an urban green space is any area or piece of land that is covered in plants or water.

Despite the modest variations in the various definitions of green spaces, it can be inferred that both industrialised and non-industrialised nations generally understand what urban green spaces are. Urban green spaces broadly cover all urban spaces or lands with some form of vegetation, either natural or artificial, and are available for human use. The criteria for defining green spaces in both contexts focused primarily on the availability of green foliage. This perspective makes it very clear that the phrase "urban green spaces" refers to a far larger range of land cover types with vegetation on them, including forests, woodlands, urban trees, allotments, and many more. It is not just confined to parks and gardens.

Swanwick et al. (2003) developed the following definition of urban green spaces to gain a deeper understanding of their significance. They claim that the built environment and the outside space between buildings make up urban regions. The two basic components of the ambient environment are "green space" and "grey space" (Figure 2.1). According to Swanwick et al. (2003), "green space" refers to useful land that is primarily made up of unsealed, permeable, "soft" surfaces like soil, grass, shrubs, and trees. These surfaces can be either linear (green vegetation along routes), semi-natural (woodland), practical (allotments), or ornamental (parks and gardens) in nature.

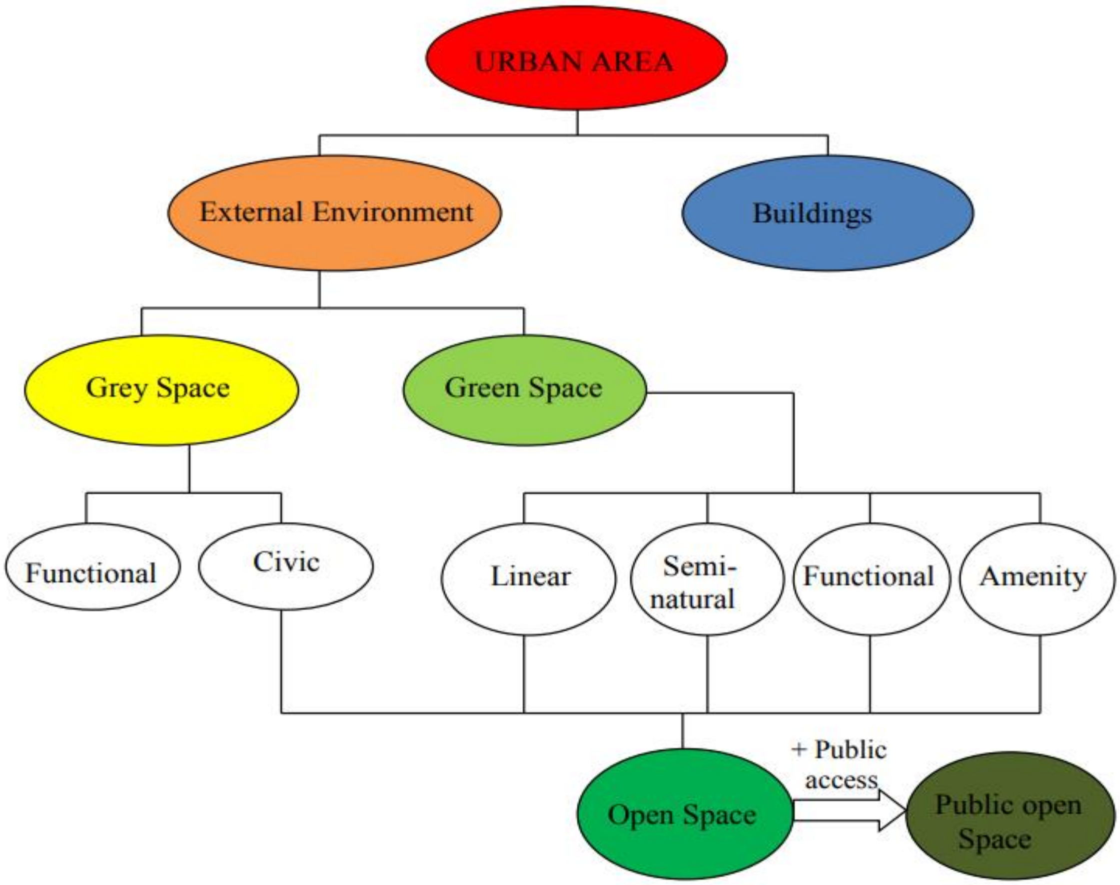

Figure 2.1: Green spaces description in the urban landscape (Source: Swanwick et al., 2003)

The subsequent element of the external environment, referred to as "grey space," is simply land that has "hard" surfaces like concrete, asphalt, or tarmac and is more thoroughly sealed, impermeable, and sealed. The two main categories of grey spaces are civic grey spaces (publicly accessible places designed primarily for public enjoyment, such as town squares, plazas, and esplanades) and functional grey spaces (which serve a specific purpose such as highways, pavements, car parks, and many more). In light of this classification, Swanwick et al. (2003) classified urban open spaces as a combination of green spaces and civic grey spaces (Figure 2.1) and defined it as that portion of urban areas that contributes to its amenity, either visually by positively enhancing the urban landscape or under its functional contribution to a variety of urban functions. Public open spaces are any areas of land that are accessible to the general public.

In essence, it is possible to classify urban green areas as a subset of urban open spaces. Urban open spaces, on the other hand, include all features of green spaces in addition to those hard land surfaces of urban areas (grey spaces) created expressly for human pleasure. Urban green spaces, on the other hand, are confined to only the vegetative component of the urban environment, specifically the soft lands. Combining the several concepts, the term "urban green spaces" is used in the context of this study to refer to any naturally occurring or semi-naturally occurring places in urban regions that are largely covered by vegetation, whether they are publicly owned or privately owned, and are readily accessible for human use.

2.2.1 Urban Green Spaces Typology

Urban green spaces typology is a systematic method of categorising or grouping urban green spaces into distinct categories (Rigolon et al., 2018). Urban green spaces are frequently categorised based on a variety of factors, including size, function, kind of green space, facilities, and ownership (Pearsall & Eller, 2020). In light of this, many categorisation systems have been used to categorise urban green areas (Mensah, 2014b). In the United States, Bonsignore (2003) found 26 distinct types of urban green areas. Urban green areas were divided into six primary categories by Herzele and Wiedemann (2003), and Šiljeg et al. (2018) based on size: residential green, neighbourhood green, quarter green, city green, district green, and urban forest. Baycan-Levent and Nijkamp (2009) divided urban green spaces into sixteen unique varieties under five primary values (ecological, social, economic, planning, and multi-functional values), placing focus on the values or functions of urban green spaces. The nature of green spaces was also used by Azadi et al. (2011) to classify urban green spaces into 8 main categories: general urban green space, brownfield rehabilitation, greenway, neighbourhood gardens, green belt, urban forest, city park, and national urban park.

Indra (2008), who concentrated on developing nations, divided the green spaces in Yogyakarta, Indonesia, into two major categories (linear and non-linear spaces), which covered a variety of green space kinds, including public parks, sports fields, and leisure areas. Seven different types of green spaces were also identified in a study involving certain African cities, including semi-private areas (such as residential areas), public green spaces (such as parks), tree plantations, trees planted for protection of the environment, rangeland and forest adjacent to urban areas, protected areas, and established parks (Fuwape & Onyekwelu, 2011; Mensah, 2014a).

Dunnett et al. (2002) created a thorough classification of urban green spaces based on the conflicting opinions that have been voiced on the categorisation of urban green spaces and using factors including ownership, nature, and uses of green spaces (Table 2.1). According to their taxonomy, urban green spaces may be roughly divided into four different types: amenity, utilitarian, seminatural, and linear green spaces.

Urban green spaces are categorised or categorised according to a variety of typologies, all of which have their unique characteristics and range in size and scope. Therefore, if one typology is used carelessly, it may lead to issues such as restricting the classification to only publicly managed green spaces (such as parks), omitting some essential types of green spaces, and duplicating some green spaces, which will result in an inconsistent and incomplete classification. Dunnett et al.'s (2002) typology of urban green spaces (Table 2.1) is used for this study after taking into account the numerous typologies. This is because of its inclusive character, which encompasses all types of urban green spaces, regardless of their size (small or huge), ownership (public or private), location (developed or developing nations), or the many purposes they serve.

Table 2.1 A typology of urban green spaces

Principal Forms of Urban Green Areas			
All urban green spaces	Amenity green Space	Recreational green Space	Parks and gardens Informal recreational areas Outdoor sports areas Play areas
		Incidental green space	Housing green space Other incidental green space
		Private green space	Domestic gardens
	Functional green space	Productive green space	Remnant farmlands City farms Allotments
		Burial grounds	Cemeteries Churchyards
		Institutional grounds	School grounds (including school farms and growing areas Other institutional grounds
	Semi-natural green space	Wetlands	Open/running water Marsh fens
		Woodlands	Deciduous woodland Coniferous woodland Mixed woodland
		Other habitats	Moor/health Grassland Disturbed ground
	Linear green space		River and canal banks, Transport corridors (road, rail, cycle ways and walking routes) Other linear feature (cliff)

Source: Dunnett et al. (2002) and Mensah (2015)

2.2.2 Green Space Coverage and Standards Across the Globe's Cities.

The World Health Organisation (WHO) and the Food and Agricultural Organisation (FAO) have set a minimum threshold for the amount of green space per city inhabitant of 9m^2 (Siddique et al., 2020; Gelan & Girma, 2021). 20 m^2 of park area per person is the typical green space guideline that many industrialised countries follow (Thapa & Poudel, 2018; Azagew & Worku, 2020).

According to the European Environmental Agency, urban dwellers should be able to reach urban green areas (such as 20 urban parks) within 15 minutes of walking, or 900 metres (Csomós, Farkas & Kovács, 2020; Hsu et al., 2022; Gorzelany et al., 2023).

English Nature (EN), a UK government agency, advises that there should be 2 hectares of accessible green space for every 1,000 people and that no one should live more than 300 metres (about 5 minutes walking distance) from the closest green space (Handley et al., 2003; Wray et al., 2005; Schipperijn et al., 2010). According to Khan (2019), the benchmark for the amount of green space per 1,000 people in the USA is 6.25 to 10.5 acres. The city of Copenhagen (Denmark) has established a green space standard that mandates that at least 90% of people have access to green space within 400 metres (Schipperijn et al., 2010).

There are comparable quantitative norms for green areas in many developing nations. To increase the availability of green spaces in Bangkok, the Bangkok Metropolitan Administration in Thailand sets a standard of $10m^2$ of green space per person (Fraser, 2002; Abdulraheem et al., 2022). Though such quantitative requirements have not been widely incorporated into the urban planning system in Africa, limited provisions have been made in various African nations. For instance, Cote D'Ivoire requires real estate businesses to set aside 5% of the land they are developing for green space (Djibri et al., 2012). According to the Nairobi City (Kenya) regulation, new housing estates should contain 3,588 persons on average per hectare of nearby open space (Makworo & Mireri, 2011). According to Lagos (Nigeria) planning guidelines, 8–10% of the land area in a residential environment must be set aside for green areas (Abegunde, 2011).

Numerous studies have calculated the overall coverage of green space in numerous places across the world based on these quantitative benchmarks. For instance, research conducted by Fuller & Gaston (2009) on 380 European towns revealed that the percentage of land area that is made up of green areas differs greatly amongst European cities. According to research by Fuller and Gaston (2009), green space area coverage in European towns ranges from 1.9% in Reggio di Calabria (Italy) to 46% in Ferrol (Spain). According to the study, there are between 3 and 4 square metres of urban green space per person in Cádiz, Fuenlabrada, and Almeria, Spain, and more than 300 square metres per person in Liège, Belgium; Oulu, Finland; and Valenciennes, France. The average amount of green space per person in Japan is 8.5 m^2, and that in Tokyo is 6.1 m^2, whereas that in London is 26.9 m^2. This information comes from Carmona et al. (2004). In several African cities, the coverage of green areas varied greatly, according to the African Green City Index (Lange & McNamara, 2011). The coverage of green areas in cities like Cape Town (South Africa), Maputo (Mozambique), and Dar es Salaam (Tanzania) was high, with scores of 289.5m^2, 114.9m^2, and 64.1m^2 per capita, respectively. But in places like Alexandria (Egypt), Luanda (Angola), and Cairo (Egypt), the coverage of green areas was below 1m^2 per city person, suggesting a very poor coverage of urban green spaces.

The scientific validity of the quantitative requirements, despite their use as a benchmark to direct the creation of green spaces and subsequently influence future planning choices, is still under dispute (Mensah, 2015). Such quantitative guidelines were attacked by Pauleit et al. (2003) for being too specific, focusing on the desired distance from green spaces and the needed amount of green space per person while ignoring the importance of green space quality. Ignatieva et al. (2020) emphasise the fact that quantitative norms are overly restrictive, focus only on access to green spaces without adapting to changing demands, and downplay the quality of green spaces. These problems make it challenging to evaluate the overall quality of green spaces in a specific city only using quantitative criteria since such evaluations will be limited and not represent the overall condition of the green spaces. Due to the extensive nature of urban green spaces' poor conditions in developing nations, preserving these areas solely through the use of quantitative standards will not be sufficient to address all of the issues affecting the loss of urban green spaces, which take various forms and call for more comprehensive solutions.

Due to this issue, several factors that account for both the quantitative and qualitative characteristics of green spaces have been proposed as suitable criteria to assess the general condition of green spaces in cities. According to Williams and Green (2001), the ideal urban green area ought to be clean, safe, easily accessible, and quiet. According to research by Dunnet et al. (2002: 66), an ideal urban green space should contain a variety of qualities. These qualities included the availability of leisure amenities (such as sports facilities), ease of access, comfort (such as restrooms, chairs, and shelter), and natural aspects (such as wildlife, flora, etc.). Cleanliness, naturalness, beauty, safety, accessibility, and appropriateness of growth are only a few of the qualities that a well-maintained urban green space should have, according to Gobster and Westphal (2004). A good-condition urban green space has been reported to have several essential characteristics, including user happiness, equal access, safety, and community engagement in planning (Harnik, 2004). Cleanliness, maintenance, facilities, care of historical heritage, environmentally sensitive management, community participation, good management plan, conservation, and attractiveness are the criteria for the Green Flag Award, a pristine award given to parks and other green spaces that are in good condition and well managed in the UK (UGS Task Force, 2002:62). Accessibility, friendliness, community involvement, marketing, attractiveness, safety and security, management and maintenance, conversation and heritage, sustainability, and design were among the themes emphasised in Plymouth's Green Space Strategy as ways to evaluate the quality of green spaces (Plymouth City Council, 2009). Accessibility, community involvement, security, and the availability of services are among the key characteristics of an ideal green space, according to some of the literature on green spaces that concentrated on the developing world.

The variety of characteristics or themes discussed regarding evaluating the condition of green spaces demonstrates how difficult and time-consuming it may be to ascertain the general health of these areas (Mensah, 2015). This implies that care must be made while carrying out such assignments in a particular city to pick a group of factors or topics that comprehensively examine green spaces from diverse angles to make the assessment much more thorough. To ensure the evaluation is accurate for further research, the chosen themes must also be clearly defined to eliminate any ambiguities and operationalised to fit the geographical area in which they are employed.

Some concerns that are present in both developed and developing nations have been discovered to have an impact on the loss of urban green space. Urbanisation is a serious problem that is destroying many urban green areas in both established and developing countries of the world, according to the 2012 Global Garden Report. According to several studies conducted in various parts of the world (including Europe, Asia, North and South America, and Africa), growing urbanisation is associated with the loss of significant amounts of urban green space (Gomes & Moretto, 2011; McDonald et al., 2010; Honu et al., 2009; Fuller & Gaston, 2009). To accommodate the expanding population, rapid urbanisation has led to the conversion of substantial portions of green space lands into various land uses. Poor maintenance, budgetary restrictions, and a lack of community involvement in urban greening initiatives are some other significant problems mentioned in the literature that contribute to the degradation of urban green spaces (Cobbinah et al., 2021; Adjetey et al., 2023). The loss of urban green spaces is a greater concern in the majority of developing nations, and this trend is only expected to worsen in the coming decades as these regions are expected to be severely affected by rapid urbanisation and the environmental issues that come with it (United Nations, 2012). This issue highlights the need for protecting urban green spaces in emerging nations so that the advantages associated with these areas can be easily reaped. One of the gaps in the literature that the study hopes to close is this one. To support the necessity to protect these areas in the urban physical landscape, the research now looks more closely at the multiple benefits urban green spaces provide to the general growth of cities.

2.3 BENEFITS OF URBAN GREEN SPACES

Many studies have demonstrated the practical contributions that urban green spaces may provide to City growth (Kruize et al., 2019; Hedblom et al., 2019). These articles address various aspects of urban development, including social, economic, and environmental issues. The purpose of this review is to provide a theoretical framework for the importance of green spaces in sustainable urban design for the current study. This is done to emphasize the importance of urban green spaces in ensuring the long-term viability of cities, as well as to show how the loss of these places might obstruct that long-term viability (Jennings, Browning & Rigolon, 2019). One of the study's research questions is centred on this topic. Because of the wealth of experience and well-documented nature of the benefits of urban green spaces in established nations, this section of the thesis focuses on how these benefits in developed countries can also give lessons to developing countries (Shackleton et al., 2017).

2.3.1 Social and Psychological Benefits

This section presents the social and psychological benefits of UGS. These include recreation and well-being as well as human health (Pinto et al., 2022). Such benefits are discussed in detail in the following paragraphs.

2.4.1.1 Recreation and well-being

The main benefit that urban green spaces provide is recreation. Spending time in green places reportedly enhances one's physical and mental health; once more, cities become more appealing when they provide a choice of recreational options (Derkzen, 2017). Since nearly 80% of people in the United Kingdom reside in cities, green spaces inside cities make up a substantial portion of all outdoor recreational activities, according to Venter et al. (2021). Many urban inhabitants in China, according to research by Gao et al. (2019) and Kuldna, Poltimäe & Tuhkanen (2020), use green spaces for recreational purposes including relaxing, playing with kids, walking dogs, and finding and observing wildlife. Basu and Nagendra (2021) assert that the majority of medium- and low-income individuals in both developed and developing countries gather in urban green areas like parks and gardens. The majority of people in developing countries congregate in urban parks and gardens, where some play games, some walk, and still others just enjoy the surroundings, he continues.

Aside from enjoyment, research has demonstrated that urban green areas are vital in the development of children (Mensah, 2015). Kronenberg et al. (2020) observed that regular participation in urban green spaces helps children to have intimate contact with nature, allowing them to have a better knowledge of nature, develop a sense of environmental responsibility, and appreciate and cherish nature. Children may readily enhance their physical stamina, coordination, language, cognitive thinking, and reasoning skills while playing in parks and other green spaces (Yuniastuti & Hasibuan, 2019). Furthermore, the engagement of youngsters in urban green spaces has been shown to benefit the development of analytic and strategic thinking, as well as cognitive growth (Kruize et al., 2019).

2.4.1.2 Human health

Urban green spaces have a favourable impact on human health and well-being, as well as a significant impact on human thermal comfort in external settings (Li, Saphores & Gillespie, 2015; Lee, Jordan & Horsely, 2015; Coccolo et al., 2018). The term "thermal comfort" refers to a scenario in which the brain feels happy with the temperature (Santurtún et al., 2020; Wang et al., 2022). Solar radiation, the temperature of the outer surface, air temperature, air humidity, and wind speed are all factors that affect thermal comfort, according to Ji, Song, and Shen (2022). The presence of green areas moderates and counterbalances the negative aspects of these variables (Abulibdeh, 2021).

Environmental psychology research reveals that being in touch with nature is beneficial to one's mental health (Van den Berg, 2017; Bratman et al., 2019). According to recent research, the presence of trees and close nature in human populations has a variety of psychological benefits (Marselle et al., 2020). Trees in public housing neighbourhoods, according to research cited by Jing et al. (2021) decrease fear, promote less violent and aggressive behaviour, and strengthen neighbour relationships. Other research has indicated that when hospital patients are exposed to the outdoors, they recover quicker and use fewer painkillers (Donovan, Gatziolis & Douwes, 2019). According to Zech et al. (2019), patients in a hospital with rooms overlooking a park recovered 10% quicker and used 50% less powerful pain medicines.

It has also been shown that utilising urban green areas for physical activities such as walking, running, football, and other sports activities may help in the battle against obesity and the prevention of illnesses such as cardiovascular disease, musculoskeletal problems, stroke, and cancer (Mensah, 2015). Using parks for physical activities helps the elderly remain well, relieves them of numerous chronic diseases associated with old age, and boosts their overall lifespan, according to studies on the elderly in northern England, Tokyo, and other worldwide megacities (Mensah, 2015).

According to Faraji and Karimi (2022), green spaces like botanical gardens, nature trails, and zoos provide chances for individuals and families to learn about the environment and natural processes while also educating locals and tourists about diverse species of flora and fauna. Tappert, Klöti, and Drilling (2018) claim that different kinds of urban green spaces are utilised for research activities in universities and scientific and industrial research organisations. This support helps researchers look into a variety of biophysical, economic, and cultural issues in the urban environment. Fam et al. (2008) cite the Museum of Economic Botany at the Adelaide Botanical Gardens as an illustration of the benefits of green spaces for teaching. The next section focuses on the environmental advantages of UGS.

2.3.2 Environmental Benefits

This section presents the environmental benefits that accrue from the establishment of UGS. Ecological pollution control and biodiversity as well as nature conservation benefits are enunciated in detail below.

2.3.2.1 Ecological benefits

Climate change is expected to increase the frequency and intensity of heat waves, which would increase energy expenditures and increase illness and death (IPCC, 2012; Derkzen, 2017). According to Mensah (2015), the existence of several green areas helps to minimise climate change and its attendant challenges, which are still at the forefront of international talks. The local urban climate has been proven to be positively regulated by green areas (Yao et al., 2020). Paved surfaces that prevent evapotranspiration, wind-restricting thick buildings, and dark building materials that collect solar energy during the day and release it gradually at night, delaying the air-cooling process, are the causes of the Urban Heat Island (UHI) (Li et al., 2015; Derzkzen, 2017). Up to 50 degrees Celsius may be added to City temperatures by the urban heat island effect (Liu et al., 2020). Numerous urban green areas contribute to increasing evapotranspiration and solar radiation reflected off the ground surface, both of which help to lower metropolitan temperatures and, as a consequence, alter the climate in these regions, according to studies conducted in both developed and developing nations (Herath, Halwatura & Jayasinghe, 2018).

Similar findings from studies conducted by Wang, Li, and Sodoudi (2022) showed that urban green spaces help to mitigate urban extreme heat, lessen the impact of urban heat islands, and increase the comfort of urban residents. Urban green spaces regulate air and temperature exchange by acting as coolers, according to Wang et al. (2018) and Das, Das, and Momin (2022), therefore enhancing the urban climate.

2.3.2.1 Pollution control

The prevalence of cardiovascular and respiratory illnesses rises as a result of the air pollution that is emitted by waste treatment, industry, transportation, and household heating systems (Derkzen, 2017; Singh, Singh & Mall, 2020). Air quality in vegetated regions is improved through the filtration of atmospheric pollutants such as nitrogen dioxide (NO2), particulate matter (PM10), and sulphur dioxide (SO2) (Derkzen, 2017). Urban greening may directly decrease air pollution by trapping dust and smoke particles (Xing & Brimblecombe, 2019). 85% of the air pollution in a park may be filtered, according to a study (Tran, Park & Lee, 2020).

Additionally, excessive noise reduces the comfort of homes, workplaces, and neighbourhoods while also raising the risk of serious health problems including hearing loss (Themann & Masterson, 2019). Between 0.2 and 2% of the gross domestic product of the European Union are thought to represent the entire costs associated with noise (Badulescu et al., 2019). Urban ecosystems serve as natural sound insulators and offer noise reduction benefits (Lindgren, Almqvist & Elmqvist, 2018). Derkzen (2017) asserts that vegetation (green spaces) serves as both a direct and an indirect noise barrier. Green belts minimise noise by sound wave absorption, dispersion, and destructive interference, however, if the sound is captured directly under tree tops, local sound levels may rise (Derkzen, 2017). According to Oquendo-Di Cosola, Olivieri, and Ruiz-García (2022), indirect noise reduction benefits are produced by lower wind speeds and the capacity of prior soils to absorb sound. Because of this, having a lot of urban trees (green spaces) aids in stopping the flow of certain pollutants, hence reducing the amount of City air pollution.

2.3.2.2 Biodiversity and nature conservation

Green areas act as a breeding ground for plants as well as a centre for soil and water quality protection (Montgomery, Caruso & Reid, 2020). Furthermore, environmental conservation literature expressly stresses the preservation of biodiversity (plants and animals) via urban green areas (Mensah, 2015). Several urban environmental studies have found that different kinds of urban green areas cover substantial levels of biodiversity (Schebella et al., 2019; Cameron et al., 2020). Apfelbeck et al. (2019) discovered that in a study of 15 parks in urban areas in Flanders (Belgium), the parks include around 30%, 50%, and 60% of wild flora, birds, and amphibians, respectively. The fact that parks often include a variety of habitats (grasslands, woodlands, plantations, water features, gardens, banks, hedges, and so on) is one of the main causes of the high species richness variance (Ancillotto et al., 2019).

Research done in the United Kingdom discovered that golf courses feature a great number of tree species and a broad diversity of birds (Adams, 2018). Green areas are connected to the management of various urban environmental concerns, such as soil erosion (Mensah, 2015). According to studies, the presence of various types of urban green spaces, such as urban trees, forests, golf courses, parks, and gardens, helps stabilise urban soils, lessens the effects of erosion agents (wind and water), and eventually safeguards urban areas from harmful erosion (Artmann et al., 2020; Pearlmutter et al., 2020).

Urban green spaces, from an architectural perspective, enhance both the urban environment as a whole and urban design (Mensah, 2015). Greenery, in all of its many forms and aesthetics, enhances both the richness of urban planning and the beauty of the landscape, claims Ma, Hauer and Xu (2020). Green spaces not only improve the aesthetics of urban design but also contribute to a more consistent and varied urban environment (Ma et al., 2020). Green spaces, according to Kruize et al. (2019) are essential for the development of towns and cities because they strengthen their identities and raise the attractiveness of these areas as locations to live, work, invest in, and travel to.

Considering the multiple environmental advantages of green spaces, it is possible to infer that these contributions contribute to the settlement of different urban environmental issues affecting both developed and developing nations. Consequently, paying particular attention to green areas in a given City (established or developing) can undoubtedly help in the management of various environmental challenges. The part that follows focuses on the economic advantages of UGS's founding.

2.3.3 Economic Benefits of Green Spaces

This section considers the economic benefits offered by UGS. These include, but are not limited to energy savings, employment opportunities, and property value. Therefore, the following presents each economic benefit.

2.3.3.1 Energy savings

In temperate temperature towns, expanding green space and tree planting have become more popular due to the usage of vegetation in lowering the energy costs of cooling buildings (Zhu et al., 2022). Wong et al. (2021) said that plants also offer shade, evapotranspire, and promote air circulation. This has a cooling impact and contributes to a reduction in air temperature. A cooler park may greatly reduce the severity of the heat in the town when there are high breezes. For instance, an air temperature differential between a park and a nearby City that is noticeable up to 4 km distant may be produced by a park that is 1.2 km 1.0 km in size (Aram et al., 2019). According to research conducted in Chicago, a 10% increase in tree cover might result in a 5–10% reduction in the amount of energy used to heat and cool buildings (Naibei, 2018).

2.3.3.2 Employment opportunities

Economically, urban greening projects create both temporary jobs (soil preparation, planting, etc.) and more permanent jobs (maintenance, management, etc.) for a large number of people in both developed and developing countries because they are frequently labour-intensive and require extensive maintenance (Mensah, 2015). According to Mensah (2015), these employment opportunities are crucial for developing countries since they help to reduce the high unemployment rate that many of these nations experience. In Africa, Djibril et al. (2012) found that the department in charge of managing urban green spaces in Abidjan (Cote D'Ivoire) employed hundreds of people in a variety of roles to work on green spaces. Additionally, it is anticipated that in Australia, 80,000 people would be employed in a variety of activities in urban green spaces (Dickinson et al., 2018; Astell-Burt et al., 2022). Over 50,000 individuals in the UK work in public parks and gardens daily, and many more are employed in industries that are connected to green spaces, such as those that provide products for parks (Rice et al., 2020).

2.3.3.3 Property value

Green parts of the urban are visually appealing to both inhabitants and investors (Turo & Gardiner, 2019). For example, one of the elements that drew large foreign investments that aided quick economic expansion was the beautification of Singapore and Kuala Lumpur, Malaysia (Haq, 2011). Green areas and landscaping, according to Trojanek, Gluszak, and Tanas (2018), improve property prices and monetary revenues to land developers by 5% to 15% depending on the kind of project. Furthermore, the results of research in the Dutch municipalities of Emmen, Appledoorn, and Leiden found that residences located near greens had greater asset values than those located away from ordinary parks (Naibei, 2018). These high property prices were discovered to raise government income and, as a result, assist finance various government programmes. In Ontario (Canada), for example, a statistical examination of data from two communities revealed that the property prices of homes near green areas had improved significantly, allowing the government to raise property tax income by around 8% (Crompton, 1999). Similar effects of increased property tax income were seen in Philadelphia (USA). The government received more than $18 million in total taxable income as a consequence of a rise in the property value of properties near green areas (Immergluck & Balan, 2018).

Greenery in urban areas has been shown to influence firm location decisions. In other words, the increased customer traffic and health advantages that come with being close to natural spaces attract businesses. It has been discovered that well-designed and maintained green spaces improve an area's appearance and attract businesses, customers, employees, and a variety of services, creating a positive business environment and increasing investment (Vargas-Hernández, Zdunek-Wielgołaska & Pallaggst, 2019; Abdelhamid & Elfakharany, 2020). A high tourism value has also been connected to green spaces. In accordance with Zhou, Song, and Tan (2021), creating green areas like community forests, urban parks, and zoos and also greening community centres attract tourists whose expenditure on goods and services (like hotels, restaurants, transportation, clothing, and food) creates investment opportunities to assist local industries and enterprises in both more economically developed (MED) and less economically developing (LED) countries. Therefore, the overall economic benefits of green spaces come in many forms and provide a wide range of business opportunities that developed and developing cities throughout the world may take full use of to foster community development.

In summary, urban green spaces are valuable natural capitals that contribute to the growth and sustainability of urban areas in a variety of ways. Their contributions are substantially represented in metropolitan areas' social, economic, and environmental features. Although the majority of these contributions are most visible in the developed world, the conservation of the urban natural environment, such as green spaces is now encouraged by many international bodies and national governments worldwide. These contributions now provide good lessons for the developing world. The contributions of urban green areas in Gweru (Zimbabwe) may assist to solve numerous environmental and health issues plaguing the region. However, it seems that there is a dearth of knowledge about the value of urban green areas, thus stakeholders continue to abuse them at an alarming rate. As a result, there is another gap that this research aims to address. Green planning approaches centred on green areas are examined in depth in the next section. These are examined to establish a compelling theoretical and practical case for the inclusion of green areas in urban planning and sustainable development.

2.4 URBAN PLANNING MODELS

Several urban schemes that have evolved through time provide for the preservation of urban green areas. According to Mensah (2015), the models may be roughly classified into two categories: (1) development around green areas (garden city, green development replicas, and green urbanism) and (2) well-organized terrestrial use or land conservation (dense city, shrewd growth, and new urbanism). These models, although mostly limited to wealthy nations, provide insight into how vital sustainable management of urban green areas is, particularly in emerging countries.

2.4.1 The Garden City Model

Ebenezer Howard (1850-1929) developed the garden city idea to address social and health issues caused by the 18th-century industrial revolution (Chen, 2013; Mensah, 2015). Howard (1902) stated in his theory of the garden city model that addressing the unhealthy situations in cities, towns, and villages in terms of lifestyles must be combined. The combination of cities, towns, and villages would create another (garden city) that would provide fresh hope and vitality (Mensah, 2015; Tizot, 2018). Based on the garden city idea, both cities and rural areas have distinct traits that pull people in. The countryside gives clean air, sunlight, natural beauty, and earth's bounty (Clark, 2003). According to Clark (2003), cities attract individuals because of options such as work, prospects for progress, social enrichment, better pay, and cultural activities.

Ward (1992) established that Letchworth and Welwyn were the original garden city founders in 1903 who inspired many other similar small towns/village schemes throughout the globe. In 1994, the garden approach was used on a larger scale throughout Greater London (Chen, 2013). According to Mensah (2015), the garden city perception has been adopted in various cities in poor nations, including Pinelands (South Africa), Kumasi (Ghana), and Putrajaya (Malaysia) (Malaysia). The garden city concept is often regarded as the foundation of contemporary urban preparation in general. For the successors of urban green space spatial structures, such as the greenbelt, green wedge, green fingers, and other significant concepts, these structural principles of green space layout, in addition to the interaction between green spaces and other areas and uses, serve as a model (Chen, 2013). However, according to Bookchin (1974), the garden model fails to take into account social tensions in productive relationships, economic difficulties, and social interactions with nature. Aalen (1992) regrets that Howard's assertion that a new physical environment may result in a social revolution is improbable. However, the strategy has gained universal acceptability in urban planning and is often mentioned in conversations about the creation of new cities and green space (Mensah, 2015).

2.4.2 The Greenbelt Model

The green belt developed from the garden city paradigm as a protective device to limit urban sprawl (Chen, 2013). To avoid urban sprawl, greenbelts are established on the fringes of cities in the shape of a ring. Aside from that, green belts function as physical barriers that divide cities and protect the area on the outskirts for leisure, agriculture, and forestry (Amati, 2008; Prior & Raemaekers, 2007). According to Hall (2002) and Mensah (2015), cities having greenbelts include Letchworth and Welwyn in England, Ottawa Greenbelt in Canada, Seoul Greenbelt in South Korea, and Sao Paulo Greenbelt in Brazil (Brazil). Opponents of this strategy, however, contend that the notion of a "green belt" is ineffective and insufficient for protecting many green spaces in urban areas due to the world's rapid urbanisation (Prior & Raemaekers, 2007; Zonneveld, 2007).

2.4.3 The Green Heart Model

Unlike the greenbelt concept, the green heart model focuses on building numerous green spaces in the core of a city, with many built-up regions around such areas (Mensah, 2015). According to Xi-Zhang (2009) and Lorzing (2004), the fundamental goal of the green heart model is to limit the fusion of urban regions and solve the issue of congestion in the city centre. With cities like Amsterdam, Rotterdam, Utrecht, Leiden, and Den Haag creating an urban ring around a sizeable land area at the centre inhabited by green regions, the Randstad model of the Netherlands is a famous example of the green heart.

2.4.4 The Greenways Model

The greenway idea was first put out by the President's Commission on American Outdoors in 1987, drawing inspiration from greenbelts, boulevards, parkways, and park systems (Chen, 2013). According to Little (1995), it is a linear open space created along a natural corridor, such as a riverfront, stream valley, ridgeline, or overland along a railroad right-of-way now used for leisure, a canal, a scenic road, or any similar route. It is any landscape or natural route used for walking or bicycling, as well as a connection between populated regions and parks, natural reserves, cultural attractions, or historic places. According to Walmsley (2006), it "threads across towns and countryside like a massive circulation system integrating rural and urban regions in the American environment". The Fish Creek greenways in Calgary are an excellent example (Canada). The Fish Creek greenway is roughly 13 kilometres long and 0.8 kilometres broad, according to (Tayor et al., 1995).

2.4.5 The Green Roof Model

According to Banting et al. (2005), the green rooftop concept has been utilised to improve greening in various places, such as Toronto. The green roof model is concerned with the growth of green vegetation on building rooftops. Its advantages include reducing urban air pollution, providing a home for animals, and enhancing the metropolitan environment (Mensah, 2015). Although incorporating green spaces into urban areas is an innovative idea, the high expense of installing green roofs on buildings limits its implementation to a smaller scale than other green design approaches (Getter & Rowe, 2006).

2.4.6 Green Fingers

The Finger Plan assumed that economic and housing expansion were inescapable and irreversible (Regional Planning Office, 1947). The design was to allow for ongoing population growth while also diverting the rising population to the west and southwest to safeguard the previously established north. It also arose from an early recognition of the necessity for efficient transit that merged trains and vehicles, as well as easy access to green recreational areas. The latter was explicitly stated in a 1936 inter-municipal white paper on green space conservation. The goal was to prevent unplanned, slow urbanisation in which residences, businesses, and little pockets of nature coexisted in a jumbled structure that inhibited the development of an effective public transit system. Fortunately, the designers had a keen eye for blending urban and non-urban natural places and separating the two while keeping them nearby.

In hindsight, the Finger Plan is founded on two basic design assumptions. The first notion is station closeness which stipulates that housing, business, and service activities should be concentrated in centres along radial railway lines and highways that create the joints of the fingers (Sorensen & Torfing, 2019). The second concept is known as 'green wedges,' which proposes that green zones should be utilised to split urban fingers where no development or construction is permitted.

The Finger Plan's design has simplicity as one of its key merits. The two design concepts were combined and condensed in the finger metaphor. The picture of a hand with the palm resting on the compact core city and fingers pointing in various directions, signalling future urban expansion, adorned the cover of the first Finger Plan paper from 1947 and has since been duplicated in an endless number of planning documents.

The Finger metaphor represented the essence of the new plan in terms of radial housing and transportation development divided by natural areas, and it was easy to explain to lawmakers and the general public. It was warmly accepted, enjoyed, and remembered by the audience (Sorensen & Torfing, 2019). The Finger Plan immediately became well-known. A quick look at the S-train system map reminds people of the Finger Plan, which guided Copenhagen's rapid expansion. The finger metaphor was simple and effective. It is now a well-known reference point in global planning disputes (Hall, 2002; Vejre, Primdahl & Brandt, 2007; Sorensen & Torfing, 2019). As a result, the green finger (five-finger plan) advocates for the inclusion of green areas into the physical landscape of cities as a method of establishing and conserving the urban natural environment. Table 2.2 summarises the fundamental challenges of various planning models and the locations in which they have been used.

2.4.7 Remarks: Green Urban Planning Models Discussed Above

In summary, the models discussed above give an overview of the importance of conserving urban green spaces and incorporating them into a city’s physical landscape. However, no model (researcher’s experience) has been adopted in the city of Gweru (Zimbabwe), so it is important that through this study, the stakeholders are made aware of the need to follow one of the discussed models. The adoption of such a model will promote sustainable urban green space management. It is imperative to also consider the issues of environmental governance to get an insight into how urban green spaces are being managed in urban areas. Therefore, the following section addresses the issue of urban environmental governance.

2.5 URBAN GREEN SPACES GOVERNANCE

2.5.1 The Concept of Urban Governance

"Urban governance is the culmination of the many ways that people and organisations, both public and private, organise and run city affairs. It is an ongoing process that enables varied or competing interests to be taken into account and cooperative action to be done. It encompasses both official and informal agreements, as well as residents' social capital (UN-Habitat 2002: 14).

In support of this definition, urban governance is described by DiGaetano and Strom (2003) as the coordination of political decision-making that is accomplished via several intermediations across the structural, cultural, and agency levels of government. To impact and coordinate stakeholders' interdependent demands, interests, and interactions with the environment at various scales, governance incorporates the official and informal institutions, norms, methods, and decision-making processes (Tacconi, 2011).

An urban area is a complex system with multiple actors (Figure 2.2); hence it requires good governance. Each actor has a specific task to ensure that the environment (green spaces) is sustainably managed, for example, the private sector is responsible for pollution prevention during the production of certain materials. They are also responsible for making sure that their service delivery is in line with the statutes that protect the environment. The public sector is responsible for formulating policy and legal frameworks that are binding. The policies and legal frameworks should be adhered to through monitoring and enforcement to protect the environment. The households, on the other hand, play a complementary role by checking their consumption level as well as sustainably managing their solid waste. In addition, they are responsible for the protection of natural resources. Civil societies act as a watchdog and are responsible for raising awareness. They promote environmental governance by carrying out education campaigns meant to educate the nation on the importance of protecting the environment.

However, these participants should carry out their duties by abiding by good governance standards. The environment is overused as a result of bad governance. There is a need for equitable involvement, upholding the law, openness, responsiveness, consensus-building, efficacy, and efficiency, as well as accountability.

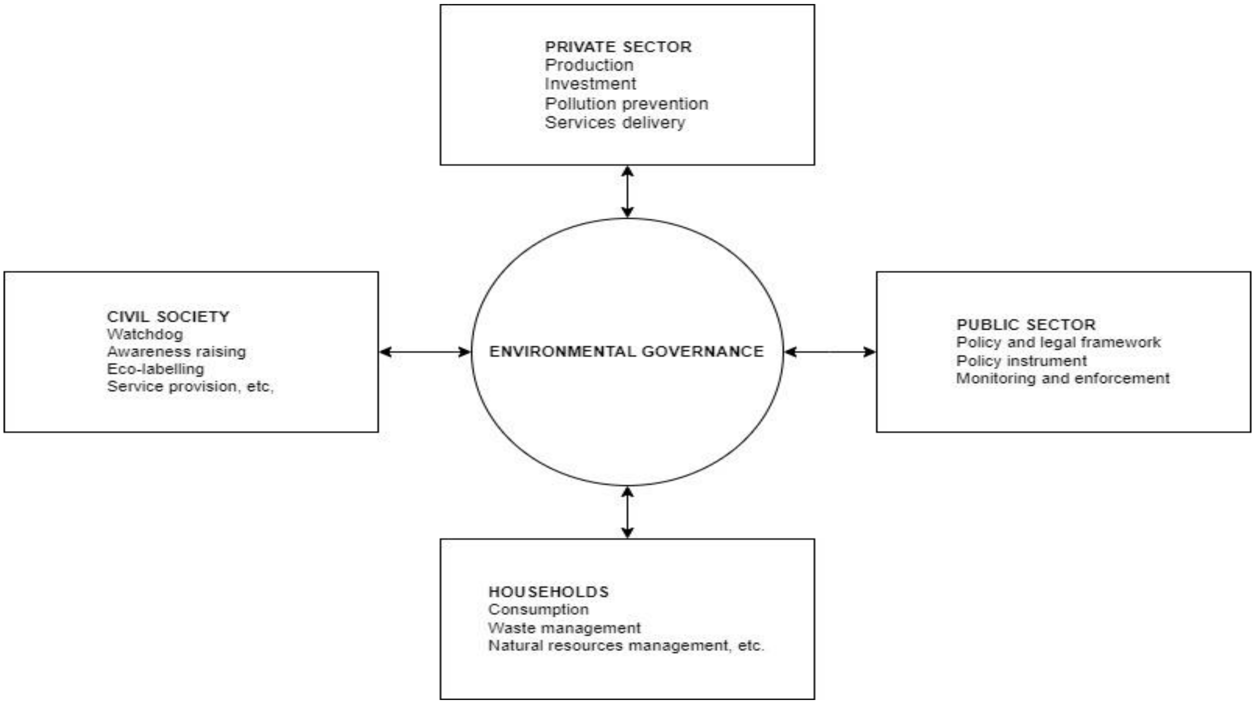

Figure 2.2: Multiple good governance actors (Source: UNITAR, 2017)

The understanding of good environmental governance in this study is important in the sense that sustainable urban green space management can only be achieved when each actor in the urban area adheres to its mandate. Be that as it may, there is a need for these actors to use their mental models to effectively manage their area of jurisdiction. Above all, once their duties are combined with the principles of good governance, urban green spaces can be sustainably managed. The city becomes healthy, liveable, and sustainable because the green spaces will be protected, hence future generations will enjoy the benefits proffered by green spaces such as climate change regulations among other benefits. In Zimbabwe, there is little information on who is responsible for environmental governance, hence the need to carry out this research to fill that gap.

To clearly outline the theory that guides this research, the next section discusses theories of urban governance that have been used in various studies. The focus is on their strength and weakness. The justification of the selected theory that underpins this research will be given.

2.5.2 Theories of Urban Governance

2.5.2.1 Urban regime theory

Vazquez-Brust et al. (2020) are associated with the urban regime theory, which the author defines as “the informal structures through which public entities and private interests collaborate to develop and carry out governing choices”. The regime theory's core focus is coalition building (DiGaetano, 2003), in which ruling elites develop and sustain regimes by providing resources to regime partners, resulting in the creation of support and corporation around attempts to complete relatively achievable goals (Mensah, 2015). The urban regime theory is concerned with the issue of collaboration and coordination among the government, business, and civil society (Stoker, 1995). Urban regime theory is divided into four categories by Mossberger and Stoker (2001): maintenance, development, middle-class advancement, and lower-class opportunity growth. The development regime places a focus on changing land use to promote expansion, whereas the maintenance regime emphasizes consistent service delivery and low taxes. While the lower-class opportunity expansion regime concentrates on investment policy, increased access to employment, and asset ownership, the middle-class progressive regime handles issues like environmental protection, historical preservation, affordable housing, and linkage funds (Mensah, 2015).

However, the urban regime theory has its shortfalls. According to Davies (2002), the regime theory's supporters face significant theoretical and empirical challenges when they interpret it as a theory of structure. The heart of the problem is the limited theorisation of the way economic forces affect local political institutions and the balance of power within them (Lauria, 1997; Davies, 2002). Explaining how economic fluctuations both empower and limit political alternatives is vital in addition to acknowledging the impact of the market economy on local political processes (Davies, 2002). The absence of this explanation weakens the ability of regime theorists to explain city politics. Harding (1997) criticises this theory for its narrow base as it is confined to the USA with little or no bearing outside the USA. It was also criticised for giving much attention to individual agencies but failing to account for the impact of state structures (Goodwin & Painter,1997).

2.5.2.2 Urban governance theory

According to urban governance theory, the primary duty of city governments is to coordinate agencies throughout the local region toward common objectives (Dijk, Edelenbos & Rooijen, 2017). The limitations of governmental power, as well as the significance of communal and cooperative action, are emphasised in urban governance literature (Kjaer, 2009). Cities are shown as being enmeshed in complicated contingencies, with vertical interactions with regions, central governments, and international organisations, as well as horizontal relationships with private enterprise and organised local and social interests (Peters & Pierre, 2000; Kearns & Paddison, 2000). This viewpoint acknowledges the formal power held in electoral offices and institutions but recognises that this alone is insufficient to manage the city. As a result, local governments collaborate with a variety of partners depending on the problem, sector, or area of public service delivery in question (Ansell & Gash, 2018).

Different players control various forms of resources (authority, expertise, financial resources, networks, and so on) that may be used to promote collective action and objectives. The following types of government are explored in urban governance literature: clientelist, corporatist, managerial, pluralist, and populist (Dijk et al., 2017). Table 2.2 summarises the situation. The emphasis on the performers differs in each method. In the clientelist model, specific customers get attention in exchange for political support, but in the corporatist model, they report to private-sector leaders (DiGaetano & Strom, 2003). The emphasis of managerial governance is on formal/contractual connections between government officials and private-sector interests (Florini & Pauli, 2018). The great degree of complexity among competing interests is emphasised in the pluralist method. Governments then act as middlemen or offer a forum for conflicting private interests to negotiate (DiGaetano & Storm, 2003). Politicians under the populist paradigm rely on grassroots mobilisation to create and execute policy objectives. The ruling rationale is democratic inclusion, which expands individual and group involvement (Dijk et al., 2017).

The final two types of urban governments are now receiving the greatest attention. These paradigms acknowledge the revival of local levels (Jessop, 2018). Their strategy is to promote the concept that issues should be handled at the most basic level possible, with the help of the national government (Dijk et al., 2017). Cities are essential to managing the interfaces between local problems and global flows, between demands for local sustainability and well-being and those for international competitiveness, and between ongoing demands for liberalisation, privatisation, deregulation, and other processes and the challenges of social exclusion and global polarisation (Jessop, 2018). This puts a significant focus on collaboration and networks over top-down urban administration (Dijk et al., 2017). The public and commercial sectors, as well as the government and civil society, should work together, according to the pluralist and populist approaches. NGOs, religious institutions, community-action organisations, and private-sector companies are examples of organisations that participate in partnerships. The development regime places a focus on changing land use to promote expansion, whereas the maintenance regime emphasizes consistent service delivery and low taxes (Mensah, 2015). While the lower-class opportunity expansion regime concentrates on investment policy, increased access to employment, and asset ownership, the middle-class progressive regime handles issues like environmental protection, historical preservation, affordable housing, and linkage funds (Mensah, 2015).

Table 2.2: Models of urban governance

Variable	Clientelistic	Corporatist	Managerial	Pluralist	Populist
Governing relations	Particularistic Personalised exchange	Exclusionary Negotiation	Formal Bureaucratic Or contractual	Brokering/ mediating activities	Inclusionary negotiation
Governing Logic	Reciprocity	Consensus Building	Authoritative Decision making	Conflict management	Mobilisation of popular support
Key Decision Makers	Politicians And clients	Politicians and powerful civic leaders	Politicians And civil servants	Politicians and organised interests	Politicians and community movements leaders
Political objectives	Material	Purposive	Material	Purposive	Symbolic

Source: Adopted from DiGaetano and Strom (2003: 366)

2.5.2.2 Collaborative Governance

A collaborative theory is "a governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented, and deliberative and that aims to make or implement public policy or manage public programmes or assets," according to Ansell & Gash (2018: 544). This description emphasises six crucial standards: non-state actors are invited to participate in the forum, which is sponsored by public institutions or agencies. Participants actively participate in decision-making rather than merely being "consulted" by institutions or agencies. The forum is formally organised and meets in a group setting. It aims to reach a consensus on decisions, even if this is not always the case (Mensah, 2015). To develop laws and regulations for the provision of public goods, public and private actors must cooperate in certain ways and use specific methods. This style of governance is known as collaborative governance.

Positive reinforcement is received for the word "collaborative governance." It appears to promise that by working together to make decisions, we might avoid the huge costs of adversarial policymaking, increase democratic involvement, and even bring back a reason to public administration (Mensah, 2015). Numerous studies reviewed here have demonstrated the importance of collaborative strategies: acrimonious opponents have occasionally learned to have fruitful discussions; public managers have improved their relationships with stakeholders, and advanced models of group learning and problem-solving have been created. However, other studies highlight the difficulties that collaborative strategies face in achieving these desired results, namely: strong stakeholders' manipulation of the process; public agencies' lack of genuine commitment to collaboration; and distrust acting as a roadblock to good faith negotiation (Mensah, 2015).

Numerous case studies make notice of the time-consuming nature of collaborative governance (Roussos & Fawcett, 2000; Till & Meyer, 2001; Margerum, 2002; Gunton & Day, 2003; Imperial, 2005; Warner, 2006). Building consensus, in particular, takes time and cannot be hurried (Coglianese & Allen, 2003; Yaffee & Wondolleck, 2003). The procedure may take a large amount of time when corrective trust-building is essential. In circumstances when agencies must make or execute decisions fast, collaborative governance is typically not an effective option. It should be noted, nevertheless, that making an upfront investment in productive cooperation may sometimes save a lot of time and effort during implementation. The research implies that implementation may happen quite quickly if stakeholders reach a workable agreement. Therefore, if policymakers anticipate a challenging implementation process, collaborative governance may be more appealing.

2.5.2.3 Systems thinking approach governance

Systems thinking is an all-encompassing method of analysis that emphasizes how a system's component pieces interact as well as how it functions through time and concerning other systems (Cristiano et al., 2020). In contrast to traditional analysis, which explores systems by dissecting them into their parts, the systems thinking method examines systems as a whole. The study of medical, environmental, political, economic, human resource, and educational systems, among many other fields of study, have all benefited from the use of systems thinking. Therefore, the approach can also be used in urban governance in cities.

When seen as urban ecological systems, cities comprise several subsystems that each function as a system in their own right. People, urban space, air, water, energy, food, trash, safety, health, and transportation are some of these subsystems. Each of these subsystems' activities might be changed slightly without adversely affecting the network of systems' other subsystems, which would then affect the dynamics and effectiveness of the system as a whole. The solution to all of these issues and problems is "systems thinking," which serves as a tool to manage complexity and uncertainty and uncover "what if" effects (Onat et al., 2017). For example, when the residents destroy the green spaces in a city, subsystems such as fresh air, clean water, health, and food among other systems are going to be affected.

The division and specialisation of bureaucratic divisions in urban areas are becoming more and more important to urban governance (Bai et al., 2016). There is little to no coordination, let alone communication, between these departments as they each deal with a certain urban sector, such as water, transportation, power, parks, food, health, etc. The institutional structure's fragmentation reflects the extent of the difficulties in contemporary urban administration as well as the requirement for expertise that is becoming more and more specialised (Silva, 2018). However, such a strategy ultimately results in problem translocation because activities restricted to one sector sometimes fail to produce the expected results because of negative externalities that manifest in other areas of the city or even outside of it. Additionally, blame-shifting and scapegoating between various sectoral units tend to be pervasive in fragmented governance structures (Bai et al., 2016). A lack of careful management of interactions between scales, among sectors, and over time is caused by silo-thinking in urban administration and institutions, which prevents the creation and application of comprehensive solutions. This calls for a systems approach to urban governance.

Systems thinking provides a broader understanding of how a system functions by exploring the linkages and changes within the system. System theory outperforms all other approaches because of its systematic behaviour in integrating systems, ability to foresee composite changes within the system and understanding of the importance of perspective divergence (Kutty et al., 2020). Systems thinking may be used as a method to help cities define their ideas more clearly concerning a range of input-output factors, including population, urban area, air, water, waste, energy, safety, and transportation. Systems thinking identifies needs, information gaps that may exist, correlations, and goals (Onat et al., 2017). As part of the function's work cycle, it also helps in identifying possible system paralysis, missing components, inefficiencies in urban dynamics, and prospective linkages.

2.5.3 Remarks: Different Theories Discussed Above

Systems thinking theory's DPSIR conceptual framework has been selected as an effective theory that undergirds this research. Collaborative governance stood a chance to be used in this research. But it cannot tackle the complex problem of the overexploitation of urban green spaces as it involves multiple subsystems that need the inputs of all stakeholders regardless of socioeconomic background. The researcher argues that with systems thinking's DPSIR conceptual framework, such a weakness can be conquered because every stakeholder is encouraged to see wholes rather than parts. Systems thinking encourages the use of mental models to tackle complex problems such as the overexploitation of urban green spaces. The other theories, that is, urban regime theory and urban governance theory, cannot effectively tackle the complex problem because of their respective weaknesses highlighted above. In the next section, there is a need to consider how urban green spaces are being managed in Zimbabwe.

2.6 SUSTAINABLE MANAGEMENT OF URBAN GREEN SPACES IN ZIMBABWE

Before considering sustainable management strategies in Zimbabwe, it is imperative to first look at the conditions of urban green spaces in Zimbabwe.

2.6.1 Nature and Conditions of Urban Green Spaces in Zimbabwe

The savannah woods, open grasslands, and dambos (seasonally waterlogged low-lying regions) in the central watershed area are what make Zimbabwe's scenery unique (Garwe, Munzara-Chirwa & Kusena, 2009). In the Eastern regions of the nation, subtropical woods may be found (Garwe et al., 2009). The Afromontane, the East African coast, and the Zambian are the three phytogeographic zones that make up the nation. Over 95% of the nation is in Zambia, which has five different kinds of woodlands: acacia, miombo, mopane, teak, and Terminalia Combretaceae (Garwe et al., 2009). Over 60% of Zimbabwe's forestland is made up of the Miombo forests, which are mostly Brachystegia species with Julbernadia globiflora. These forests are home to several commercially significant tree species that are utilised for fruit, medicine, timber, poles, and fuel (Garwe et al., 2009). The Afromontane region's Eastern Highlands, notably in the Chimanimani Mountains, contain the greatest degree of endemism. About 5 930 taxa are thought to make up Zimbabwe's whole floral population (Garwe et al., 2009). Zimbabwe's vegetation distribution is shown in Figure 2.3.

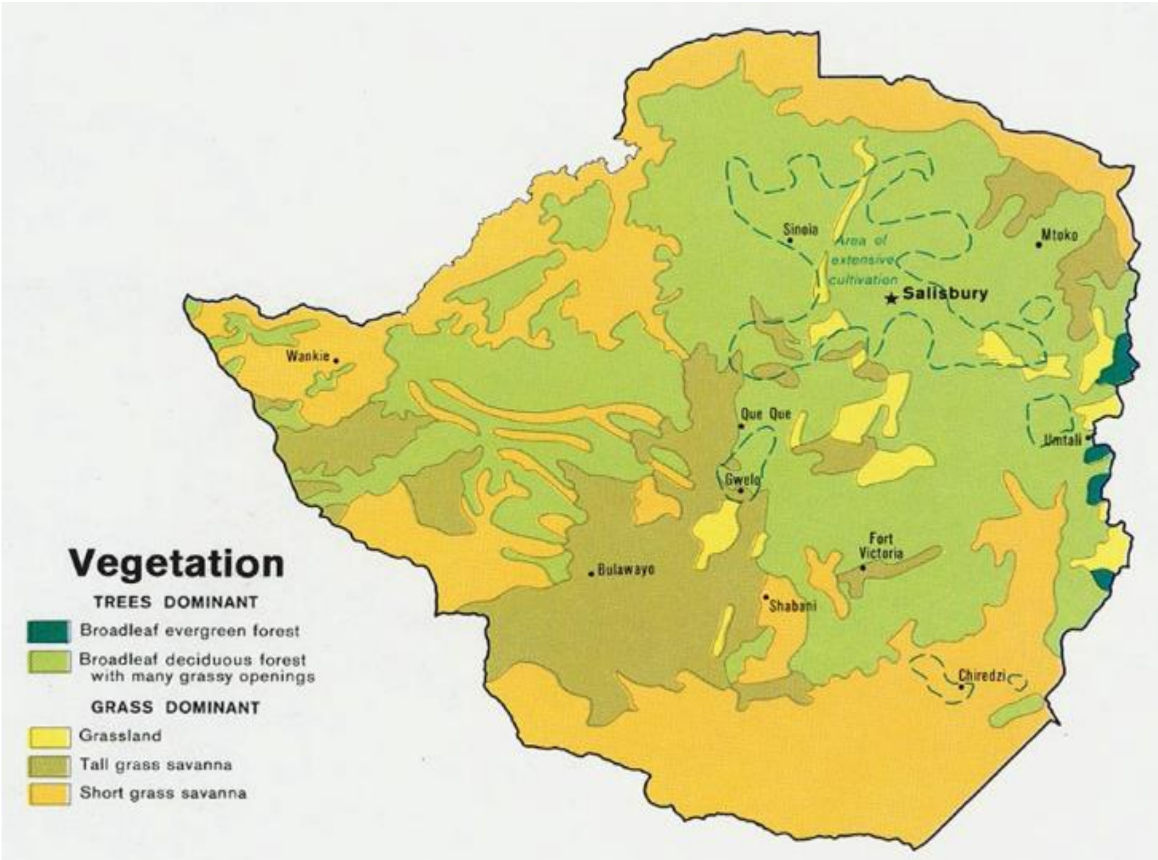

Figure 2.3: Nature and conditions of green spaces in Zimbabwe (Source: Forestry Commission, 2012)

2.6.2 Sustainable Management Strategies in Zimbabwe

To maximise human well-being in the here and now without sacrificing the capacity of future generations to satisfy their requirements, sustainable development entails integrating societal economic, social, and environmental goals (OEDC, 2001). This entails making compromises when required and pursuing mutually beneficial strategies wherever feasible. To address the complex development problems that lie ahead and pursue sustainable development, it is necessary to enhance the coherence and complementarity of policies across a variety of sectors (OEDC, 2001). A strategy, on the other hand, comprises a coordinated set of democratic, participatory, capacity-building, planning, and investment procedures that combine societal economic, social, and environmental goals while attempting to find trade-offs when they cannot be made (IMF/OECD/UN/World Bank, 2000). The primary focus of these two concepts is an environmental goal. As a result, the Zimbabwean government developed several strategies, action plans, and regulations to minimise or mitigate the impact of environmental pressures (green spaces). These include, among others, the Local Environmental Action Plan (LEAP), the District Environmental Action Plan (DEAP), and the National Conservation Strategy (NCS) (Chenje et al., 1998). Along with this, the government developed sector-specific policies, including the Environmental Impact Assessment (EIA), Zimbabwe National Population Policy (ZNPP), Decentralization Policy (DP), Forest Policy, and many more (Chenje et al., 1998).

2.6.3 National Conservation Strategy

The World Conservation Union (WCU), which was founded in the early 1980s after the establishment of the sustainable development idea, is the organisation behind the NCS (Matowanyika & Marongwe, 1998). Its main goal was to persuade countries to create national conservation policies so that planning for development would take into account the need to strike a balance between socioeconomic growth and environmental preservation (Matiza & Crafter, 1994). As a result, the Globe Conservation Unit (WCU), created by the International Union for the Conservation of Nature and Natural Resources (IUCN), served as a template for the creation of national conservation programmes around the world (Chenje et al., 1998).

The NCS was introduced to Zimbabwe in 1987, and it urged the government to communicate with stakeholders while creating environmental programmes (Magadza, 1997; EMA, 2007). With its acceptance, the government underwent a pragmatic change in which development and the environment (green spaces) were seen as two sides of the same coin (Chenje et al., 1998). Numerous participants, including government representatives, business leaders, non-governmental organisations (NGOs), academics, and others, were involved in the early stages of the NCS project. The villagers, who were the main partners in the process of the sustainable management of natural resources, were excluded (Nhema, 2005; EMA, 2007). A thorough inventory of natural resources was required as a result, encompassing both arable and non-arable land, genetic diversity, water, energy, minerals, and population patterns (Chenje et al., 1998). In addition, a thorough land-use planning programme built on a more integrated, holistic approach to resource management was advocated for in the paper created during the stakeholder engagement process. It further prompted the inclusion of community involvement and awareness raising in the planning process (Nhema, 2005; EMA, 2007).

The proposal, however, fell short of articulating a workable, funded plan of action with distinct centres of authority for the numerous tasks it highlighted. The strategy paper was also released as a policy document without any legal support. Therefore, adherence to its terms was not required by law and other institutions were free to disregard them (Matowanyika & Marongwe, 1998). Thus, the NCA was never really taken into account by development planners, which is why Gweru's urban green areas disappeared. Making matters worse, local people become passive beneficiaries as a result of their exclusion from the strategy formulation processes, which harms the sustainable management of urban green areas. Due to the NCS's flaws, the District Environmental Action Plan was developed as a more effective tactic District Environmental Action Plan (DEAP). This is discussed below.

2.6.4 District Environmental Action Plan

The DEAP strategy engages local communities in the formulation of locally specific plans for natural resource sustainability in support of NCS (Shumba, Enos & Baker, 2002). The programme was launched in 1995 and was supported by the United Nations Development Programme (UNDP) and other development agencies. It started in eight districts throughout the country-one district from each of the country’s eight administrative provinces (Chenje et al., 1998). DEAP was founded on the following premises:

- The abundance of indigenous knowledge held by the local population may be used to advance sustainable development that is both culturally and socially suitable (Mhlanga, 2002); and
- That initiatives to establish communities that are community-driven and community-based have a higher probability of success over time, creating the groundwork for sustainable development. (Mhlanga, 2002).

The DEAP employed a participatory approach to build capacity for environmental action planning at the local community and local authority levels (Shumba et al., 2002). It develops the capacity of local communities to assess the state of their ecosystems' well-being. The assessment enables the communities to prioritise action to improve their ecosystems. Traditional planning approaches separated the process of planning from the implementation of such plans and this gap was closed by DEAP (Matowanyika & Marongwe, 1998) as it was proven that the communities were capable of reorganising themselves for more sustainable land-use practices (Murphree & Cumming, 1993). An evaluation carried out in 1997 concluded that the programme was very successful and that the participatory methodology would be implemented in urban environmental planning as well (Chenje et al., 1998). Whilst on paper the DEAP was considered a panacea to the sustainable management of natural resources, its implementation remains weak due to a lack of political will and the partisan operation of urban authorities in the city of Gweru. The resultant picture is the further disappearance and fragmentation of urban green spaces. The DEAP was followed by the Local Environmental Action Plan (LEAP).

2.6.5 Local Environmental Action Plan

LEAP is defined as a participatory planning process for the management of environmental goods and services in an area (EMA, 2007; Daniels, 2017). It is aimed at correcting negative environmental conditions to ensure a clean, safe, and healthy environment. The LEAP programme in Zimbabwe started in 2003 (Daniels, 2017). It was preceded by the District

Environmental Action Planning (DEAP) programme which was common in rural areas. According to the Environmental Management Act (Chapter 20:27) (Daniels, 2017), local authorities are mandated to develop Local Environmental Action Plans (LEAPs) for the areas under their jurisdiction (EMA, 2007; Daniels, 2017). The process, however, is participatory, calling for the corporation of all stakeholders in an area, the community, government departments, NGOs, local leadership, environment committee and subcommittees, councillors, captains of industry, private companies, religious groups, etc (Daniels, 2017). in the development and implementation of the plan. The local authorities take the lead in the entire process (Daniels, 2017).

In the early years, environmental challenges were mainly concentrated in rural areas (Daniels, 2017). However, with urbanisation, there has been a growing increase in urban environmental challenges such as improper waste management, deforestation, especially in the peri-urban areas, sand and clay abstraction, sewer bursts, and discharge of untreated liquid waste (effluent) into the environment among others (EMA, 2007; Daniels, 2017). Since 2003, the Environmental Management Agency has held 81 LEAP training sessions that covered 46 RDCs and 29 Town Councils (Daniels, 2017). Twenty (20) local authorities have developed LEAP documents since the programme started, with some local authorities developing theme-specific plans (EMA, 2007; Daniels, 2017). The most common challenges identified in the LEAP programme are improper solid waste management and veld fires in the urban and rural areas respectively.

However, since LEAP's inception, the concentration is on solid waste management, and the sustainable management of urban green spaces is ignored regardless of their alarming disappearance rate (Naibei, 2018). Thus, in this study, the researcher argues that as long as stakeholders see parts rather than wholes, urban green spaces will continue to disappear further, especially in the face of rapid urbanisation (Senik & Uzun, 2022). Therefore, there is a need to take a pragmatic approach to promote the sustainable management of urban green spaces in Gweru City.

2.6.6 Environmental Impact Assessment

Apart from the action plans developed by the government of Zimbabwe, some policies are related to the sustainable management of natural resources i.e., the Environmental Impact Assessment (EIA). The EIA process is a multidisciplinary and multistep method that ensures environmental concerns are addressed in project choices that may affect the environment (Government of Zimbabwe, 2007). Environmental impact assessment is not a procedure for preventing actions with significant environmental impacts from being implemented. Rather, the intention is that project actions be authorised with the full knowledge of their environmental impacts (EMA, 2007). There are some cases in that EIA takes place in a political context. Economic, social, or political factors will inevitably outweigh environmental factors in many instances (EMA, 2007). This is why the mitigation measures are so central to EIA. Decisions on proposals in which the adverse environmental effects have been mitigated are much easier to make and justify than those in which mitigation has not been achieved. The significance of EIA is embodied in the following:

- EIA is more than technical reports, it is a means to a larger intention – the protection and improvement of the environmental quality of life.
- EIA is a procedure to identify and evaluate the effects of activities (mainly human) on the environment - natural and social. It is not a single specific analytical method or technique but uses many approaches as appropriate to the problem.
- EIA is not a science but uses many sciences in an integrated interdisciplinary manner, evaluating phenomena and relationships as they occur in the real world.
- EIA should not be treated as an appendage, or add-on, to a project, but be regarded as an integral part of project planning. Its costs should be calculated as an adequate part of planning and not regarded as something extra.

- EIA does not give decisions but its findings should be considered in policy and decision-making and should be reflected in final choices. Thus, it should be part of the decision-making process.

Agriculture, drainage and irrigation, forestry, housing developments, road building, industry, mining and quarrying, tourism, waste treatment, and disposal are all projects that need EIA in Zimbabwe (Chenje et al., 1998). The main problem with the EIA strategy is that it is based on the same environmental management legislative rules as the Zimbabwean constitution and the EMA of 2002. These environmental law frameworks are all-inclusive (EMA, 2007). The desire to respect the moral agency of other creatures in the environment, other than human beings, has no impact on EMA policy (Mangena, 2014). This is because Zimbabwe's constitution is silent on the need to protect the rights of non-human species, and this has fostered a mentality that has resulted in huge environmental degradation, which has resulted in climate change and biodiversity loss (Mangena, 2014).

As a result, the EIA policy is oriented toward human interests and values, which is one of the reasons Zimbabweans have usually become a threat to the environment (green spaces). As a result, urban green areas in Gweru are jeopardised since EIA is often trumped by economic, social, and political concerns. Politics is at the forefront in Zimbabwe when it comes to ignoring legislative measures that promote the proper management of green areas. As a result, green areas are deemed land uses, and they continue to vanish in Gweru.

2.6.7 Zimbabwe National Population Policy

Another policy that the Zimbabwean government came up with is the national population policy. The 1996 Zimbabwe National Population Policy (ZNPP) adopted a multidisciplinary approach to the question of population, moving away from just looking at the population in terms of economic growth and fertility regulation (Chenje et al., 1998). One of the areas identified for incorporation in the population policy is population and the environment (Central Statistics Office, 1994). It was hoped that once the linkages between the population and the environment became well understood, future population strategies would incorporate environmental considerations (Chenje et al., 1998). This would go a long way in addressing land degradation directly related to the pressure of people on land, particularly in rural areas (Central Statistics Office, 1985). Although it was a noble idea to consider population and environment in the planning processes, there is a need to revisit the policy and incorporate the urban areas. The deterioration of the urban green spaces in Gweru calls for the inclusion of the effects of the population boom in urban areas rather than giving much attention to the effects of the population in rural areas (McConnachie & Shackleton, 2010).

2.6.8 Decentralisation Policy of 1984

The decentralisation policy of 1984 gave local authorities more control over their natural resources, improving stewardship over resources and in some cases, resulting in better management of natural resources (Moyo, 1998). Nevertheless, the policy resulted in the depletion of natural resources as district councils allowed unsustainable harvesting of land resources, leading to degradation (Moyo, 1998). Besides, decentralisation was not accompanied by capacity building for local-level structures. This has led to the mismanagement of resources and poor planning for resource management and utilisation. Administrative decentralisation has not been accompanied by the decentralisation of functions, responsibilities, and resources of the sectorial ministries (Mudimu et al., n.d). This policy was done in rural areas through the Communal Area Management Programme for Indigenous Resources (CAMPFIRE). The policy is biased towards the rural areas but has nothing for the urban set-up. This makes the researcher argue that the decentralisation policy should cascade to the urban areas so that residents protect their green spaces. A piecemeal decentralisation where the local authorities seek authority from the central government if they want to enforce a by-law that has to do with the sustainable management of urban green space is retrogressive (Chen, 2013).

2.6.9 The Agricultural Policy

In addition to the decentralisation policy, there is also the agricultural policy. In Zimbabwe, the agricultural policy promotes food production without paying much attention to the conservation of land resources (Tsvakwi, 1997). Land use planning is carried out by the Ministry of Lands and Agriculture, resulting in a bias in agriculture to the detriment of other land uses. Chapter 14 of Agenda 21 calls for a paradigm shift in agricultural, environmental, and macroeconomic policies to create conditions for sustainable agriculture and rural development (Vogel, 1992; Otzen & Gumbo, 1995). There is urban agriculture in urban areas and that has been done in green spaces due to poverty. The agriculture policy does not consider sustainable ways of conserving land resources in the urban areas, hence the continuous disappearance of the urban green spaces in Gweru (Kafafy, 2010). Urbanisation is there to stay and as such, there is a need to consider ways of promoting sustainable urban agriculture. This will go a long way in protecting urban green spaces (Bokhari, Saqib, Ali & Zaman, 2018).

2.6.10 The Forestry Policy

The forestry policy is yet another policy that the government of Zimbabwe adopted to promote sustainable development. It is based on several principles contained in the Forest Act of 1980 (Bradley & McNamara, 1993). Its objectives are to:

- Ensure that the country's forest and woodland resources are managed for the benefit of the people of Zimbabwe both present and future generations (Nabei, 2018);
- Ensure that the multiple demands on forest resources at global, national, and local levels are balanced and sustainable;
- Engage in afforestation and reforestation programmes and woodland management for meeting social, economic, and ecological needs; and

- Integrate forestry activities with the macro-economic, social, and ecological objectives of the country

The objectives are quite valuable but, in most cases, tree plantation is done once per year and mostly confined to rural areas. As for the urban areas, a person interested in planting a tree has to seek authority to get permission to do so (World Bank, 1993; Sukume et al., 1997) except if it is a tree planting day. This leaves the residents without an option but to exploit the few available urban green spaces (vegetation). The removal of trees contributes to the removal of urban green spaces in the city (Mensah, 2015); hence residents should be allowed to grow trees without waiting for the first Saturday of December each year.

2.6.11 Remarks: Different Sustainable Development Strategies in Zimbabwe

The different sustainable management strategies discussed above have various weaknesses. Such weaknesses might be the reason behind the disappearance of urban green spaces in Zimbabwean cities. For example, the DEAP strategy was affected by the partisan operation of urban authorities, hence its poor implementation at the expense of urban green spaces in the city of Gweru. The NCS failed to include stakeholders since its inception, hence it was abandoned because it failed to achieve its intended goals. Stakeholders are important actors in ensuring the sustainable management of green spaces. The Forestry policy, on the other hand, requires that individuals seek permission if they want to plant a tree. This is a major drawback when it comes to the promotion of urban greenery. In Zimbabwe, trees are planted once per year, and considering the rate of deforestation, such a provision does not help at all. The decentralisation policy is effective in rural areas but in urban areas, it is not effective. This could explain the state of urban green spaces in the city of Gweru. The EIA is homo-centric; hence it is failing to achieve its objectives. All the weaknesses highlighted could be solved by taking an integrated approach where geospatial technologies and the involvement of stakeholders in green urban planning could promote sustainable management of urban green spaces. The next section focused on the regulatory and institutional frameworks for urban green space management in Zimbabwe's urban centres.

2.7 REGULATORY AND INSTITUTIONAL FRAMEWORKS FOR URBAN GREEN SPACES MANAGEMENT IN ZIMBABWE

In Zimbabwe, several laws control how cities are administered daily. To govern the development of lands, communities, and the preservation of the natural environment, including green spaces, such rules provide a variety of concepts and procedures (Mensah, 2015). Additionally, these laws provide authority to some organisations to help govern and design the communities. (Nyamhute, 2009; Mutembedzi, 2012; Zhou & Madhekeni, 2012; Muchadeyi, 2013; Muzenda & Chirisa, 2014; Chakunda, 2015; Hapanyengwi, 2016; Muderere, 2016). These are:

- The 2013 Constitution of Zimbabwe
- The Regional, Town, and Country Planning Act of 1996
- The Urban Council Act (1993)
- The Environment Act (2004)

2.7.1 Zimbabwe 2013 Constitution

The Zimbabwe 2013 constitution is yet another Act that advocates for environmental rights. In its provisions, every person has the right:

- to an environment that is not harmful to their health or well-being; and
- to have an environment protected for the benefit of present and future generations, through reasonable legislative and other measures that:
  - (i) prevent pollution and ecological degradation;
  - (ii) promote conservation; and

(iii) secure ecologically sustainable development and use of natural resources while promoting economic and social development.

The constitution further states that it is the responsibility of the government to ensure that there are legislations that enable the achievement of the environmental rights highlighted above. True to its provisions, some legislations have been highlighted above but they do not see the light at the end of the day because of corruption and lack of political will.

2.7.2 The Regional, Town, and Country Planning Act of 1996

Master and local plans, which are statutory plans created following the Regional, Town, and Country Planning Act, are used in Zimbabwe's planning systems (RTCP Act). A component of the law that regulates urban planning and development is the Regional, Town, and Country Planning Act (Chigudu & Chirisa, 2020). It serves as Zimbabwe's primary tool for regulating urban planning and development (GoZ, 1996; Chigara et al., 2013). Urban local councils are given particular authority under the Regional, Town, and Planning Act to create town planning programmes (Wekwete, 1989; Magidimisha & Chipungu, 2011). According to the Regional, Town and Country Planning Act, urban plans must include recommendations for the coordinated development, redevelopment, or enhancement of the urban environment (GoZ, 1996). However, it is unclear from this framework which urban landscapes need to be changed. The Regional, Town and Town Planning Act is silent on the management of urban green areas, which accounts for the city of Gweru's fast loss of its natural surroundings.

2.7.3 Urban Councils (UC) Act of 1993

Besides the RTCP Act (1996), there is the Urban Councils (UC) Act of 1993. The creation of Urban Councils and the administration of councils or urban settlements are outlined in UC Act (1993), Chapter 29:15. It covers the issues of estate development, housing provisions, and development, which proceed in tandem with the Ministry activities in the same area (Mutembedzi, 2012). The Act authorises the council to formulate its by-laws (Chenje et al., 1998; Kurebwa & Muvandi, 2014). However, no by-law is specifically for urban green space management in the city of Gweru. The main by-law that is most prominent among others is the one on transport that deals with the parking areas for vehicles because it allows the council workers to be corrupt. Little effort is being made to incorporate a by-law that strictly deals with sustainable management of green spaces, hence their rapid disappearance in the city.

2.7.4 Environmental Management Act of 2004

Another essential rule that influences the design and administration of municipalities in Zimbabwe is the Environmental Management Act (2004). This is a wide legal framework that is responsible for environmental management. Section 4 of the Environmental Management Act, Chapter 20: 27, 2002 improved environmental rights for Zimbabwean residents (Muzenda & Chirisa, 2014). It also fosters environmental care among urban inhabitants. Related to environmental conservation is the Forest Act of 1949 Chapter 19: 05 which argues for safeguarding the urban flora, and the Parks and Wildlife Act of 1975, chapter 20: 14 safeguards the overexploitation of urban fauna (Muzenda & Chirisa, 2014). However, these tools have failed to encourage the protection of urban ecology (urban spaces included) in the city of Gweru.

There is also the Environmental Management Agency (EMA) that sets environmental policies such as the Environmental Impact Assessment (EIA) policy of 1976 and the National Environmental Policy of 2003 (Muzenda & Chirisa, 2014). Statutory Instrument 7 of 2007 under EMA specifies that before any development begins, there must be an EIA done for the preservation of wetlands, public streams, and other specific areas parts III and VI, respectively (Government of Zimbabwe, 2007). Nevertheless, having numerous entities in charge of environmental management produces a scenario where a lack of clear-cut tasks affects their efficacy (Muzenda & Chirisa, 2014). The EMA was founded to enforce the terms of the EMA Act; however, it lacks the appropriate money for its execution (Jerie, 2012).

2.7.5 Remarks: Regulatory and Institutional Frameworks for Urban Green Spaces Management in Zimbabwe

The problem with the Zimbabwean government is that good legislation has been formulated but they are not implemented on the ground. Political interference has seen major shifts and leap-frogging some Acts that are meant to protect the environment. Some private house developers do not even carry out EIA in Gweru because they have political muscles and this has resulted in the urban green spaces vanishing. This even weakens the powers invested in EMA and the urban councils. Arm-twisting of good legislation because of lack of political will is the order of the day, hence more green spaces disappear not only in Gweru city but also in Zimbabwe as a whole. Challenges toward sustainable management of green spaces in Zimbabwe are discussed below.

2.8 DRIVERS OF URBAN GREEN SPACES DEMISE

Several causes of UGS's demise have been outlined by researchers. For example, Wu et al. (2019) discovered that UGS's demise in China is mainly caused by the population increase, conflicting government policies, real estate development, and rising demand for recreational space. Studies carried out elsewhere in the world have indicated that UGS demise is caused by uncontrolled urban development (Cobbinah & Nyame, 2021; Nordh et al., 2022), lack of monitoring mechanisms (Cobbinah & Nyame, 2021), poor and irregular watering of UGS (Ramaiah & Avtar, 2019), informal urban agriculture on the fragile environment such as rivers and wetlands (Mabaso et al., 2021), high levels of poverty (Lindley et al., 2018), hard surface soccer field, basketball and tennis courts, increased vehicular volume and soil compaction (Jim et al, 2018), lack of environmental education (Festus & Said, 2018), insufficient funds, unskilled personnel, lack of equipment and political will (Chishaleshale et al., 2015), the dissonance between the central government and the local authorities, fast track land reform programme and the adoption of the multi-currency system between 2009 and 2013 (Matsa et al., 2021a), lack of collaborative governance (Abubakari & Amankona, 2022), accelerating property prices (Roy,

2019) and the lack of proper climate change adaptation regulations (Misiune & Kazys, 2022). These studies have shown that the demise of UGS across the globe geographically differs in space and time.

Phil Harding cited by Brown (2018) alleges that “destroying a green belt land for immediate economic gain is like burning your children’s inheritance to cook a single meal.” This is particularly true in the Zimbabwean context. In general, Zimbabwe on average lost 312,900 hectares of woodland every year (Hlanganayi, 2013; Kadyamatimba, 2013). This equates to an annual deforestation rate of 1.41%. The annual rate of forest change rose by 16.4% between 2000 and 2005, reaching 1.64%. This loss of biodiversity jeopardises indigenous forests' ability to mitigate climate change via carbon storage, altering carbon and nitrogen cycles as well as livelihood sustainability. Hlanganayi (2013) and Kadyamatimb (2013) discovered such a loss in forestry was attributed to both direct and indirect drivers. Direct drivers of green area depletion, according to the authors, included settlement and agriculture expansion, firewood extraction, tobacco curing, veld fires, brickmaking and overstocking as well as logging, mining, and charcoal production. Indirect drivers included socio-economic factors such as poverty, policy and legal frameworks, land tenure and property rights, climate change, and other ecological factors (Hlanganayi, 2013; Kadyamatimba, 2013). These statistics and the drivers of forest fragmentation focused mainly on rural and peri-urban areas neglecting the urban set-up. However, they are important in this study as they give a glimpse of the drivers of green space depletion as some overlap into urban areas.

In Zimbabwean urban areas, the drivers of UGS's demise include but are not limited to, disorganised planning strategies, ineffective policies and legislative frameworks, weak institutional environments, financial constraints, out-of-date planning standards and regulations, poverty, lack of environmental stewardship, and absence of a political will (Muzenda & Chirisa, 2014; Mandishona & Knight, 2019; Marambanyika et al., 2021). Specifically, in Gweru, Matsa et al. (2021a) discovered that the drivers of UGS depletion included a tug of war between the central government and the local authorities, fast track land reform programme, and the use of a multi-currency system between 2009 2013. However, these studies on the drivers of UGS depletion are limited in scope and they need to be grouped into specific areas. For example, they may be human activities, administrative deficiencies, and geological influences. In addition, methodologically, these studies consulted a few individuals- by interviewing key informants and having focus group discussions with a few individuals. Therefore, this study attempts to address these gaps by examining households' views on the possible drivers of UGS depletion in Gweru City from 2000 to 2019. The study also uses both exploratory and confirmatory analysis to reduce the number of drivers into understandable units. In addition, an extensive literature review from the google scholar database was carried out to develop the questionnaire. This gives a world view of the drivers of the depletion of UGS from different countries since they geographically differ in space and time. Advanced statistical analysis was used in this study and the details are discussed in the methodology section.

2.9 PRESSURES OF URBAN GREEN SPACES DEMISE

Pressures can be defined as human activities that are triggered by the insatiable demands of the human population. Several studies identified a plethora of human activities that are responsible for the demise of urban green spaces across the world's cities. Rapid urbanisation and population growth are one of the pressures that cause green space demise in cities. Urbanisation refers to the process of increasing urban areas' population and the expansion of cities into rural areas. This can lead to the loss of natural habitats, increased surface sealing through construction measures, and the emission of greenhouse gases, which can cause various environmental issues. For example, a study in Southampton, United Kingdom discovered that the increasing student populations and purpose-built accommodation complexes in university cities were responsible for the depletion of green spaces (State, Malcolm & Hudson, 2019). Subsequently, studies elsewhere in the global cities have also discovered that urban green spaces are depleting due to rapid urbanisation and population growth. Such cities include Chandigarh in India (Bedi, & Mahavir, 2020), Dhaka in Bangladesh (Chowdhury et al., 2021), Kumasi in Ghana (Essel, 2017; Abass et al., 2020), Mafikeng in South Africa (Munyati & Drummond, 2020), Harare in Zimbabwe (Matamanda et al., 2019), Gweru in Zimbabwe (Matsa et al., 2021) and other cities (Bärg, 2019; Coding et al., 2020; Ishimatsu, Ito & Mitani, 2021). As more people move into urban areas, there is often a corresponding increase in the demand for land for housing, infrastructure, and other uses. This can lead to the conversion of green spaces into other land uses, resulting in the loss of urban green spaces. Besides rapid urbanisation and population growth, unplanned and unregulated urban expansion is responsible for the demise of urban green spaces.

Unplanned and unregulated urban expansion refers to the growth of urban areas without proper planning and regulation (Jarah et al., 2019; Boulton, Dedekorkut-Howes & Byrne, 2018). For instance, a study in Kumasi, Ghana found unplanned and unregulated urban expansion has led to the depletion of green spaces and the increase in impermeable surfaces, contributing to the worsening flooding situation in the city (Abass et al., 2020). Elsewhere, Colding et al. (2020) and Bedi et al. (2020) in Chandigarh, India discovered ad hoc urban planning with no long-term vision. Ad hoc urban planning refers to a lack of comprehensive planning and coordination in urban development, which can result in piecemeal decisions that prioritise short-term gains over long-term sustainability. This approach can lead to the gradual loss of opportunities for nature experience and the depletion of ecosystem services that humans rely on. Apart from unplanned and unregulated or ad hoc urban planning, poor spatial planning can cause the depletion of urban green spaces in cities.

Spatial planning refers to the process of designing and organising physical space in urban and rural areas. It involves the development of policies and strategies to guide the use of land, the location of infrastructure, and the provision of services to meet the needs of communities. Poor spatial planning refers to the lack of proper planning and regulation in the development of urban areas (Chigudu & Chirisa, 2020). For example, in a study in Kumasi, Ghana, poor spatial planning is one of the factors contributing to uncontrolled urban expansion and the depletion of green spaces (Abass et al., 2020). Besides poor spatial planning, land use transformation leads to the depreciation of urban green spaces.

The transformation of existing green areas and open spaces into other types of land use are indeed contributing to the loss of green resources in urban areas. Factors such as unplanned urbanization, rapid increase in urban population, and lack of conservation activities are leading to the conversion of green spaces into built-up areas or other land uses (Siddique & Uddin, 2022). This transformation of green areas into other types of land use is resulting in the loss of vegetation, trees, and open spaces that are crucial for maintaining a healthy and sustainable urban environment (Gashu & Gebre-Egziabher, 2018). The loss of green resources due to the transformation of existing green areas and open spaces has negative impacts on the ecosystem functions, local climate regulation, and overall quality of life in urban areas. It is important to address this issue through proper planning, conservation efforts, and the incorporation of green space preservation measures into urban development policies. Apart from land use transformation, the lack of conservation activities causes the demise of urban green spaces.

The lack of conservation activities and inadequate treatment of improving the quality of urban green space is indeed further contributing to the pressures on green resources in cities (Ayele, Megento & Habetemariam, 2022). The absence of proper maintenance and monitoring activities in urban green spaces, such as parks, gardens, and playgrounds, puts them at risk of degradation and loss. The improper management and monitoring of green spaces, including activities like the felling of trees, illegal occupation, and lack of maintenance, contribute to the deterioration of urban green resources (Thorn et al., 2021). Inadequate treatment of improving the quality of urban green space, such as poor soil management, lack of proper irrigation, and insufficient care for plants and trees, further adds to the pressures on green resources in cities (Jim et al., 2018). Addressing the lack of conservation activities and improving the quality of urban green space through proper maintenance, monitoring, and management practices is essential for the preservation and sustainability of green resources in cities. Apart from a lack of conservation activities, poor maintenance and management of green areas.

The lack of proper maintenance and management of parks and green areas is indeed contributing to the degradation and loss of green spaces (Rigolon & Németh, 2018). Improper management and monitoring activities, such as the felling of trees, illegal occupation, and lack of maintenance, pose a threat to the existing green areas in cities. The absence of effective maintenance practices in parks and green areas results in their deterioration and puts them at risk of being degraded or lost (Wassie, 2020). Inadequate management and monitoring of green spaces, including the lack of proper maintenance, contribute to the degradation of urban green resources. Addressing the lack of proper maintenance and management of parks and green areas is crucial for the preservation and sustainability of green spaces in cities.

In addition to the lack of proper maintenance and management, demand for recreational areas causes the demise of urban green areas. The increasing demands of the urban population for recreation and good health are indeed creating a spatial mismatch between the supply and demand of urban green space (De Luca et al., 2021). The quantity and quality of green space in urban centres are falling short of meeting the increasing demands of the growing urban population for recreation and good health. The expansion of built-up areas in cities is resulting in a scarcity of urban green space, leading to a spatial mismatch between supply and demand (Shi et al., 2020). The lack of policy and measures for effectively incorporating green space into urban spatial development is exacerbating the spatial mismatch between the supply and demand of urban green space. Improving the planning, design, utility, and function of urban green space is crucial to address the spatial mismatch and meet the increasing demands of the urban population for recreation and good health (Yang et al., 2022).

2.10 STATES/CONDITIONS OF URBAN GREEN SPACES

There is a rapid degradation and loss of green resources in urban areas due to factors such as unplanned urbanization, improper planning, and transformation of green spaces into other land uses (Cobbinah & Nyame, 2021). These factors contribute to the transformation of existing green areas or open spaces into other types of land use, leading to a loss of green resources. The exceptional mode of urban development, the rapid increase in urban population, and the lack of proper planning and implementation also contribute to the degradation and loss of green spaces in urban areas (Peter & Yang, 2019). The lack of conservation activities for protecting the existing greeneries further exacerbates the degradation and loss of green resources in urban areas. The state of urban green spaces is overwhelmed by limitations inherent to unplanned urbanization, the rapid increase in urban population, and the transformation of green and open spaces into other types of land use (Lahoti, Lahoti & Saito, 2019).

The lack of proper maintenance and management of parks and green areas is indeed contributing to the degradation and loss of green spaces. Improper maintenance and management activities, such as the felling of trees, digging, and illegal occupation of open spaces, pose threats to the existing green areas in urban environments (Fröhlich, 2020). The study conducted in Dhaka city revealed that most of the parks are under threat due to a lack of proper maintenance, which includes activities that harm the green spaces and their ecological functions. To prevent further degradation and loss of green spaces, it is crucial to address the issue of improper maintenance and implement effective management strategies for parks and green areas.

The quantity and quality of urban green space are indeed falling short of meeting the increasing demands of the growing urban population for recreation and good health, creating a spatial mismatch between supply and demand (Boulton et al., 2018; Benton-Short, Keeley & Rowland, 2019). Due to the expansion of built-up areas, urban green space is becoming a scarce resource, leading to a spatial mismatch between the supply and demand for urban green space. The lack of policy and measures for effectively incorporating green space into urban spatial development, as well as inadequate treatment of improving the quality of urban green space, contribute to the spatial mismatch between supply and demand (Chen et al., 2019; Li, Peng & Cheng, 2021; Zhang et al., 2022). This spatial mismatch between the supply and demand of urban green space highlights the need for better planning, design, utility, and function of urban green space to meet the increasing demands of the growing urban population.

2.11 IMPACT OF URBAN GREEN SPACES DEMISE

The lack of adequate urban green space can indeed have negative consequences on the ecological environment and living environment in cities, as well as on the overall quality of life for urban residents (Kruize et al., 2019; Giannico et al., 2021). Urban green spaces play a critical role in air purification, regulating the local climate, reducing noise pollution, and beautifying, among other functions. Green resources, such as trees and vegetation, have a significant effect on moderating high temperatures, especially in cities with tropical climates like Dhaka, Bangladesh (Sultana et al., 2021). The scarcity of urban green space can lead to the degradation of the ecosystem functions in the area and have devastating effects on the local climate. In addition to the ecological impact, the lack of adequate urban green space can also have negative effects on the overall quality of life for urban residents, including reduced opportunities for recreation and relaxation, increased stress levels, and decreased physical and mental well-being.

The impact of the spatial mismatch between the supply and demand of urban green space is that the quantity and quality of green space are indeed falling short of meeting the increasing demands of the growing urban population for recreation and good health (Baró et al., 2016; Boulton et al., 2018). The spatial mismatch between the supply and demand of urban green space refers to the imbalance between the availability of green spaces in urban areas and the increasing demand for these spaces by the growing urban population. This spatial mismatch creates a challenge in providing sufficient urban green space for the urban population, leading to a scarcity of green areas for recreational activities and the promotion of good health (Schindler, Le Texier & Caruso, 2022). The lack of adequate urban green space can have negative consequences on the ecological environment and living environment in cities, as well as on the overall quality of life for urban residents. As cities expand and urbanise, the built-up areas increase, resulting in a reduction of available land for green spaces. This reduction in available land for green spaces leads to a scarcity of urban green areas, making it challenging to provide sufficient green spaces to meet the recreational and health needs of the urban population (Sikorska et al., 2020). Green spaces play a crucial role in promoting physical activity, mental well-being, and overall good health. They provide opportunities for outdoor recreation, exercise, and relaxation, which are essential for maintaining a healthy lifestyle.

The scarcity of green areas in urban environments can have negative consequences on the physical and mental health of urban residents (Callaghan et al., 2021). Lack of access to green spaces can contribute to sedentary lifestyles, increased stress levels, and reduced overall quality of life. Additionally, urban green spaces have ecological benefits, such as improving air quality, mitigating the urban heat island effect, and supporting biodiversity. The scarcity of green areas limits these ecological services, further impacting the overall sustainability and resilience of urban environments (Van Oijstaeijen, Van Passel & Cools, 2020). Addressing the spatial mismatch between the supply and demand of urban green space requires strategic urban planning and policy interventions. This may involve repurposing underutilised or vacant land for green spaces, integrating green infrastructure into urban development projects, and promoting the preservation and enhancement of existing green areas. Collaborative efforts between government agencies, urban planners, community organisations, and residents are necessary to ensure the provision of sufficient urban green space to meet the recreational and health needs of the urban population (Sugiyama et al., 2018).

2.12 RESPONSES TO URBAN GREEN SPACES DEMISE

Strategic urban planning is essential to address the spatial mismatch between the supply and demand of urban green space (Chen, Yue & La Rosa, 2020). This involves carefully analysing the existing urban landscape, identifying areas with a shortage of green spaces, and developing plans to allocate and create new green areas in those locations. Carefully analysing the existing urban landscape is the first step in strategic urban planning to address the spatial mismatch between the supply and demand of urban green space. This involves conducting a comprehensive assessment of the current distribution and availability of green spaces in the city. It includes identifying areas that lack sufficient green spaces and areas that have a high demand for recreational and green areas. Identifying areas with a shortage of green spaces is crucial in understanding where the spatial mismatch exists (Li et al., 2021). This can be done through mapping and spatial analysis techniques, considering factors such as population density, proximity to existing green spaces, and community needs and preferences. By identifying these areas, urban planners can prioritize them for the allocation and creation of new green areas. Developing plans to allocate and create new green areas involves designing strategies and interventions to address the identified shortage of green spaces (French et al., 2019). This can include identifying suitable locations for new parks, gardens, or green corridors and considering factors such as accessibility, connectivity, and proximity to residential areas. It also involves considering the size, design, and amenities of the green areas to ensure they meet the needs and preferences of the local community.

In addition to creating new green areas, strategic urban planning also involves allocating existing land for green spaces. This can include repurposing underutilised or vacant land, converting unused infrastructure or brownfields into green spaces, or integrating green infrastructure into urban development projects. By utilizing existing land effectively, urban planners can maximize the provision of green spaces within the constraints of urban areas. The development of these plans should involve collaboration and consultation with various stakeholders, including government agencies, community organisations, residents, and urban planners (Jennings et al., 2019). This ensures that the plans are inclusive, responsive to community needs, and aligned with broader urban development goals. Implementation of the plans requires coordination between different government departments, agencies, and private developers. It may involve securing funding, obtaining necessary permits and approvals, and overseeing the construction and maintenance of the new green areas. Regular monitoring and evaluation are also important to assess the effectiveness of the plans and make necessary adjustments as needed.

Repurposing underutilised land is a key strategy for addressing spatial mismatch (Viola & Diano, 2019). This involves identifying vacant or unused land within urban areas and transforming it into green spaces. This can include converting abandoned lots, brownfields, or unused infrastructure into parks, gardens, or other types of green areas. Repurposing underutilised land is a crucial strategy in addressing the spatial mismatch between the supply and demand of urban green space (Narandžić & Ljubojević, 2022). It involves identifying vacant or unused land within urban areas and transforming it into green spaces to meet the growing need for recreational and environmental amenities.

One approach to repurposing underutilised land is converting abandoned lots into green spaces (Zhang et al., 2023). Abandoned lots are often neglected and can become eyesores in urban areas. By transforming these lots into parks, gardens, or community green spaces, they can contribute to the overall greening of the city and provide residents with accessible and attractive areas for relaxation and recreation (Kim, Newman & Jiang, 2020). Brownfields, which are abandoned or underused industrial or commercial sites with potential environmental contamination, can also be repurposed into green spaces. Through remediation and restoration efforts, these sites can be transformed into parks, urban forests, or natural habitats, providing both environmental benefits and recreational opportunities for the community (Zhang et al., 2023).

Unused infrastructure, such as old railway tracks, highways, or parking lots, can also be repurposed into green spaces. By converting these areas into linear parks, green corridors, or urban trails, cities can optimize the use of existing infrastructure while creating valuable green spaces that enhance the urban environment and promote active transportation (Kim et al., 2020).

Repurposing underutilised land into green spaces not only addresses the spatial mismatch but also brings numerous benefits to urban areas (Newman et al., 2019). These green spaces can improve air quality, mitigate urban heat island effects, enhance biodiversity, and provide opportunities for urban agriculture. They also contribute to the overall aesthetics and liveability of the city, promoting physical and mental well-being among residents (Abassa et al., 2020). Successful implementation of this strategy requires collaboration between various stakeholders, including local government, urban planners, community organisations, and residents. It involves conducting feasibility studies, engaging in public consultations, securing funding, and ensuring proper maintenance and management of the repurposed green spaces. Regular monitoring and evaluation of the repurposed green spaces are essential to assess their effectiveness and make any necessary adjustments (Newman et al., 2019). This ensures that the repurposed areas continue to meet the needs and preferences of the community and contribute to the overall goal of addressing the spatial mismatch between the supply and demand of urban green space.

Integrating green infrastructure into urban development projects is a crucial approach to addressing the spatial mismatch between the supply and demand of urban green space (Ramyar, Ackerman & Johnston, 2021). It involves incorporating green spaces, such as parks, green roofs, and vertical gardens, into the design and construction of new buildings and infrastructure. By integrating green spaces into urban development projects, limited space in urban areas can be maximised effectively (Ramyar et al., 2021). This is particularly important in densely populated cities where available land for traditional parks and green areas may be limited. Integrating green infrastructure allows for the creation of green spaces within the built environment, ensuring that residents have access to nature and its associated benefits.

One way to integrate green infrastructure is through the inclusion of parks and green spaces within new development projects (Pauleit et al., 2019). This can involve setting aside designated areas for parks, playgrounds, or community gardens within residential or commercial developments. These green spaces provide opportunities for recreation, social interaction, and relaxation, enhancing the overall liveability of the urban environment. Another approach is the incorporation of green roofs into building designs. Green roofs involve covering the roof surface with vegetation, which provides numerous benefits such as stormwater management, insulation, and improved air quality (Treglia et al., 2022). Green roofs not only contribute to the greening of the urban landscape but also help to mitigate the heat island effect and reduce energy consumption.

Vertical gardens, also known as living walls, are another form of green infrastructure that can be integrated into urban development projects (Shafique, Kim & Rafiq, 2018). These gardens involve growing plants vertically on the exterior or interior walls of buildings. Vertical gardens not only add aesthetic value to the urban environment but also provide benefits such as improved air quality, noise reduction, and thermal insulation. Integrating green infrastructure into urban development projects requires collaboration between urban planners, architects, developers, and landscape designers (Bush et al., 2021). It involves considering the incorporation of green spaces from the early stages of project planning and design. This ensures that green areas are seamlessly integrated into the urban fabric and that their benefits are maximized. The implementation of green infrastructure also requires proper maintenance and management to ensure the longevity and functionality of the green spaces (Di Marino et al., 2019). This may involve the establishment of maintenance plans, the use of appropriate irrigation systems, and the engagement of community members in the care and stewardship of green infrastructure. By integrating green infrastructure into urban development projects, cities can create a more sustainable and resilient urban environment (Lähde & Di Marino, 2019). These green spaces not only provide recreational and aesthetic benefits but also contribute to improved air and water quality, biodiversity conservation, and climate change mitigation.

Policy interventions are necessary to support and enforce these strategies. This can include implementing regulations that require a certain percentage of land to be allocated for green spaces in new developments, providing incentives for developers to incorporate green infrastructure, and establishing guidelines for the design and maintenance of urban green spaces.

Policy interventions are crucial to support and enforce the strategies of repurposing underutilised land and integrating green infrastructure into urban development projects (Roy, 2022). One policy intervention is the implementation of regulations that require a certain percentage of land to be allocated for green spaces in new developments (Cortinovis & Geneletti, 2018). This ensures that developers prioritise the inclusion of green areas within their projects, helping to address the spatial mismatch and providing residents with access to nature. Providing incentives for developers to incorporate green infrastructure is another important policy intervention (Burszta-Adamiak & Fiałkiewicz, 2019). This can include tax breaks, grants, or other financial incentives that encourage developers to integrate green spaces, such as parks, green roofs, or vertical gardens, into their projects (Dong, Zuo & Luo, 2020). These incentives help to offset the costs associated with implementing green infrastructure and promote its adoption.

Establishing guidelines for the design and maintenance of urban green spaces is essential to ensure their effectiveness and longevity (Langemeyer et al., 2020). These guidelines can provide standards for the selection of plant species, the use of sustainable materials, and the incorporation of features that enhance biodiversity and ecological functionality. They can also outline best practices for maintenance, including irrigation, pest control, and waste management.

Policy interventions should also address the equitable distribution of green spaces within urban areas (Nieuwenhuijsen, 2020). This can involve prioritising the development of green infrastructure in underserved neighbourhoods or areas with limited access to nature. By ensuring that all residents have equal opportunities to benefit from urban green spaces, policy interventions can contribute to social and environmental justice. The implementation of these policy interventions requires collaboration between government agencies, urban planners, developers, and community stakeholders (Sachs et al., 2019). It involves the development of clear and enforceable regulations, the establishment of monitoring and enforcement mechanisms, and ongoing evaluation to assess the effectiveness of the policies. Policy interventions should be supported by public awareness campaigns and education initiatives to promote the importance of urban green spaces and the benefits they provide (Jennings & Bamkole, 2019). By fostering a culture of appreciation and stewardship for green infrastructure, policy interventions can help to create a sustainable and resilient urban environment.

Collaboration between various stakeholders is crucial in implementing these strategies. This includes coordination between government agencies, urban planners, developers, community organisations, and residents to ensure that the planning and implementation of urban green spaces are aligned with the needs and preferences of the local community. Collaboration between various stakeholders is essential in implementing strategies related to urban green spaces (Feltynowski et al., 2018). This collaboration involves coordination and cooperation between government agencies, urban planners, developers, community organisations, and residents. Government agencies play a crucial role in setting policies, regulations, and guidelines related to urban green spaces. They provide the framework and support necessary for the planning and implementation of green infrastructure projects. Collaboration with government agencies ensures that the strategies align with broader urban development goals and priorities (Hansen et al., 2019).

Urban planners are responsible for the design and layout of urban spaces, including the integration of green infrastructure. Collaboration with urban planners ensures that the planning and design of urban green spaces are well-integrated into the overall urban fabric and take into account factors such as accessibility, connectivity, and functionality (Hansen et al., 2019). Developers play a significant role in implementing green infrastructure within their projects. Collaboration with developers is important to ensure that green spaces are incorporated into new developments and that they meet the required standards and guidelines. This collaboration can involve providing incentives, technical support, and guidance to developers to encourage the integration of green infrastructure.

Community organisations and residents are key stakeholders in the planning and implementation of urban green spaces (Sugiyama et al., 2018). Collaboration with these stakeholders ensures that the strategies align with the needs, preferences, and aspirations of the local community. Their input and involvement can help shape the design, programming, and management of green spaces, making them more inclusive, accessible, and relevant to the community. Collaboration between stakeholders can take various forms, including regular meetings, workshops, public consultations, and partnerships (Chyhryn et al., 2020). These collaborative efforts facilitate information sharing, exchange of ideas, and joint decision-making, leading to more effective and sustainable outcomes.

Effective collaboration requires clear communication, mutual understanding, and shared goals. It also requires recognising and respecting the expertise, perspectives, and interests of each stakeholder group. By working together, stakeholders can leverage their respective strengths and resources to overcome challenges, address concerns, and ensure the successful implementation of strategies related to urban green spaces (Chyhryn et al., 2020). The following section presents the research gaps that have emerged in the literature.

2.13 RESEARCH GAP

Several gaps have emerged in the literature review and these include contextual, methodological, knowledge, and theoretical/conceptual gaps. Contextually, very little has been done in the study area particularly the sustainable management of urban green spaces in Gweru City. A piecemeal attention was carried out by Matsa et al. (2021) as the concept of sustainable management of UGS was left out in their study. Besides, there is also a knowledge gap on the urban green planning model being used by the local authorities to ensure that green areas are established let alone maintained. Methodologically, a study by Matsa et al. (2021) left out the residents and interviewed the key informants yet green areas are exploited by these residents. In addition, the sample size used was small to such an extent that the results could not be generalised. Apart from the methodological, contextual, and knowledge gap, there is also a theoretical and conceptual gap. The study by Matsa et al. (2021) in Gweru City skipped both the theoretical and conceptual framework that should have supported their research. Globally, the use of the systems thinking approach and its conceptual framework (DPSIR) has not been fully explored to the best of the researcher's knowledge and literature review. Thus, these gaps prompted the researcher to examine the urban green spaces demise in Gweru City to provide both theoretical and practical solutions for sustainable management of greenery in Zimbabwe and the city in particular.

2.14 CONCEPTUAL FRAMEWORK AND ITS JUSTIFICATION

A conceptual framework for the study was constructed based on the ideas of numerous theories and concepts on sustainable urban development, green spaces, and urban governance that were explored. Hence, this study is heavily inclined toward the DPSIR (Drivers-Pressures-State-Impact-Response). The DPSIR framework is a system thinking approach framework that assumes cause-effect relationships between interacting components of social, economic, and environmental systems. (Mandić, 2020; Ahmed, Anh & Schneider, 2020; Qu et al., 2020; Mosaffaie & Tabatabaei, 2021). The framework was initially developed by the Organisation for

Economic Co-operation and Development (OECD) in 1993, refined by the European Environmental Agency (EEA) in 1999, and has since been used by the United Nations (UN) (Ahmed et al., 2020). The DPSIR is a proper tool to aid good governance, and it has been used for many environmental resources management applications, such as water and mineral resources, land, and soil resources (Gessesew, 2017; Jam et al., 2021), agriculture systems, biodiversity and marine resources (Mukuvari, Mafwila & Chimuka, 2016), fish and fisheries (Gebremedhin et al., 2018; Mozumder et al., 2019), etc. This model formalises a cause-and-effect connection by defining how drivers, such as social, economic, or environmental changes, put pressure on the environment (Ahmed et al., 2020). The State of the environment changes as a result of Pressures. Impacts (social, economic, or environmental) may follow, which may need societal responses serving as feedback to drivers, pressures, states, or impacts (Abalansa et al., 2020; Masó et al., 2020). The DPSIR frameworks allow for multi-species analyses and multi-sector methods by taking into account various indicators from various ecological species, fields, and sectors (Hardy et al., 2021). Therefore, the framework offers a comprehensive picture of numerous ecological events to help scientists, experts, policymakers, and other stakeholders inside or outside the field comprehend and communicate (Rizal, Andriani & Kusumartono, 2019; Quevedo, Uchiyama & Kohsaka, 2021). The main constructs of the DPSIR (Figure 2.4) are explained in the context of urban green space depletion in the study area.

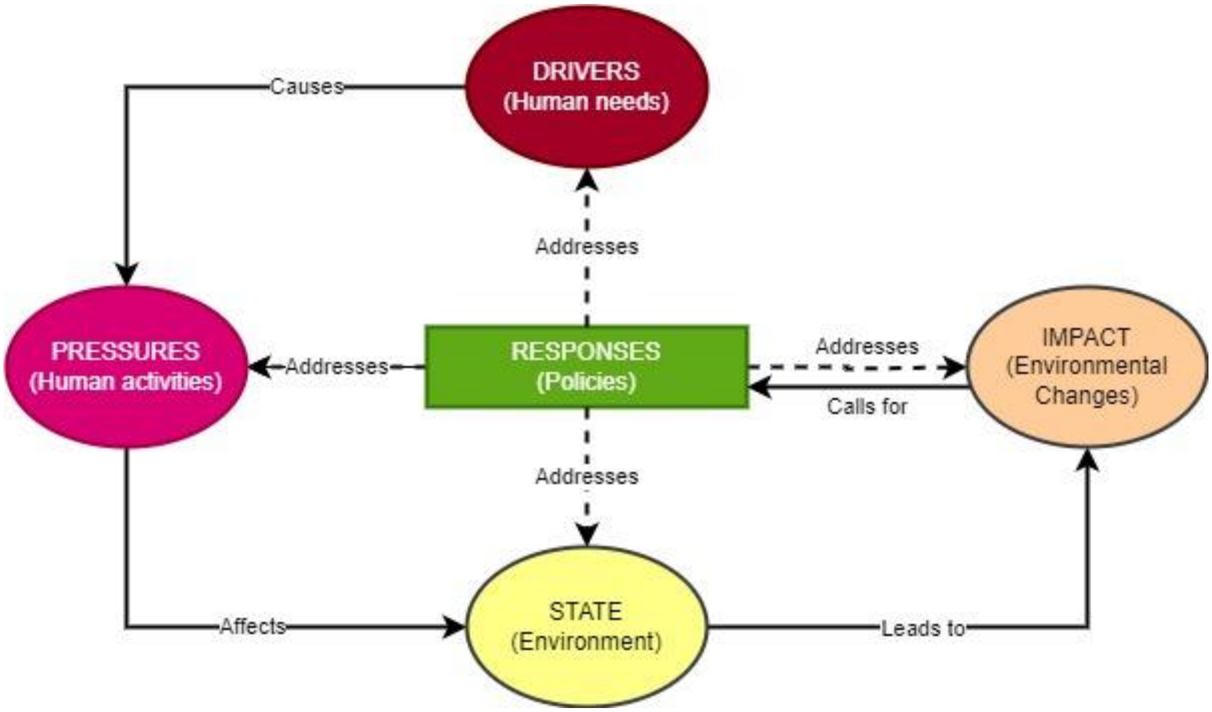

Figure 2.4: DPSIR framework (Author: 2023)

2.14.1 Driving Forces (D) of Urban Green Spaces

Driving forces are human needs that cause a change in urban green spaces in Gweru City. These can be grouped into primary and secondary driving forces. The need for housing, food, and water are examples of fundamental driving causes for an individual that might result in the loss of urban green areas. The desire for mobility, entertainment, and culture are examples of secondary driving forces (García-Onetti et al., 2021; Ternell et al., 2023). A driving factor for an industrial sector may be the requirement to be profitable and to create goods at cheap prices, whereas a driving force for a nation may be the necessity to maintain low unemployment rates (Rouillard et al., 2018; Mandić, 2020; Fet, 2023). Production or consumption processes are organised in a macroeconomic environment according to economic sectors (such as agriculture, energy, industry, transport, and households) (Ladi, Mahmoudpour & Sharifi, 2022; Abdel Kader & Qutb, 2023).

2.14.2 Pressures (P) of Urban Green Spaces Depletion

Pressures are human activities that directly affect urban green spaces and are caused by human needs (drivers). The unsustainable human activities in fragile areas and also aggravated by natural disturbances such as drought or flooding led to the demise of green spaces (Wantzen et al., 2019; Hung Anh & Schneider, 2020; Akbari et al., 2021). Examples of human activities that lead to the demise of green spaces include land conversion, wetland conversion, deforestation, cultivation on river banks, domestic waste, discharge of waste, and water rationing (Obubu et al., 2022).

2.14.3 State (S) of Urban Green Spaces Depletion

"State" refers to the current conditions of urban green spaces in Gweru City. The conditions prevailing are triggered by the pressures. The state of the environment, or the quality of the different environmental compartments (air, water, soil, etc.), as well as the activities that these compartments carry out, is impacted by pressures (Gessesew, 2017; Salehpour Jam, Mosaffaie & Tabatabaei, 2021). Thus, a mix of the physical, chemical, and biological factors make up the "state of the environment" (Gessesew, 2017; Rashed, 2019; Assubayeva, 2022). Examples of the "state" of urban green spaces include degraded environment, loss of biodiversity, poor water quality, poor soil quality, shrinking wetlands, damaged infrastructure, shrinking of recreational areas, poor air quality, etc.

2.14.4 Impact (I) of Urban Green Spaces Depletion

These are the negative impacts experienced in Gweru City as a result of the demise of green spaces. The health of ecosystems and the well-being of humans are influenced by changes in the physical, chemical, or biological status of the environment (Sintayehu, 2018; Hernández-Blanco et al., 2022). To put it another way, state changes may have an "impact" on the environment or the economy that affects how well ecosystems support life, which in turn affects human health and society's economic and social performance (Ayanlade et al., 2020). Examples of the negative impacts of urban green spaces depletion include species extinction, heat waves, siltation of dams, loss of aquatic and terrestrial ecosystems, loss of recreational areas, reduced housing prices, health challenges, increased carbon dioxide, acid rains, and flash floods and poor soil quality and soil erosion among other challenges.

2.14.5 Responses (R) of Urban Green Spaces Depletion

Responses refer to the actions taken by the government and society to address the negative impacts of urban green space depletion and the ecosystem services they provide (Hung Anh & Schneider, 2020; Kaur, Hewage & Sadiq, 2020; Kyere-Boateng & Marek, 2021). Actions that could be taken in Gweru City include the following stakeholders' involvement, environmental education, empowerment of local people, green space inventory, strong institutional policies, green planning models, reforestation/afforestation, waste discharge limitations, effective environmental by-laws, prohibitive fines, use of alternative fuels, local stewardship of green spaces and strong legal frameworks.

However, DPSIR tends to demonstrate that the causes and effects are just linear processes, critics claim (Gessesew, 2017; Kazuva, 2018; Mingxia, Jianzhong & Li, 2020; Kyere-Boateng & Marek, 2021). Furthermore, critics contend that the DPSIR framework fails to promote a sufficient understanding of the driving forces perceived as external factors that lead to social and ecological problems rather than perceiving them as an accumulation of multiple factors, including social, economic, cultural, and political, among others (Mingxia et al., 2020; Kyere-Boateng & Marek, 2021). Additionally, the framework does not display the several degrees of intricate, varied indications that could be connected to or connected to components (Kyere-Boateng & Marek, 2021). The framework emphasises the importance of causes leading to various states and circumstances, but it reduces the problems as linear, one-way processes that make it difficult to comprehend the intricate interactions and interlinkages of causative elements (Gessesew, 2017).

The framework is criticised for not encouraging flawless communication between academics, stakeholders, actors, and policymakers, but it nonetheless demonstrates the vital connections between and among many aspects of the environment and society (Gedefaw et al., 2020; Kyere-Boateng & Marek, 2021). The framework's main goal is to link causes (drivers and pressures) to outcomes (state and impacts), and from there, suggestions for reducing those causes and pressures are made. It is useful to explain the connections between the causes and effects of a certain situation (Gebremedhin et al., 2018; Mingxia et al., 2020; Kyere-Boateng & Marek, 2021).

Nevertheless, in this study DPSIR framework has been adopted because of the nature of the problem at hand (Ugwuoke, 2018). The depletion of the UGS in Gweru City is a complex issue that can be addressed through the use of the systems thinking approach (DPSIR). All interested parties need to be aware of and take action on latent concerns. Local officials often only treat one part of an issue with inadequate awareness or consideration of both immediate and long-term effects on the greater system (Qiao, Liao & Randrup, 2020). Furthermore, stakeholders and decision-makers regularly engage in a variety of uncoordinated management activities. Consequently, the use of DPSIR in this research as a systems approach framework takes several issues into account and broadens the context of decision-making. To organise this wide range of UGS-related concerns, management choices, and data into a systems framework that enables a more complete assessment of decision alternatives and anticipated tradeoffs, decision-makers might adopt a structured method.

In this work, the DPSIR is used to record, visualise, and organise relationships between critical components in a UGS complex system. It may be used to evaluate the consequences of different activities on the provision of ecosystem services by linking anthropogenic and environmental stresses to UGS conditions. The model may also act as a conceptual base for the creation of predictive mathematical models, performance indicators, or other decision-support tools in the event of complex multi-disciplinary circumstances like UGS sustainability. The following section presents the hypothesis statement formulation on urban green spaces in Gweru City based on the DPSIR framework.

2.15 SUMMARY

In summary, the chapter began by defining the urban green spaces concept. This was followed by the benefits associated with green spaces which included social and psychological advantages, as well as environmental and economic advantages. Furthermore, several urban green planning methods were thoroughly explored, emphasizing their significance in supporting the sustainable management of urban green areas and their historical growth. The ideas of urban environmental governance were also explored. The management of urban green areas was also taken into account. Various solutions and legislative and institutional frameworks for sustainable management of urban green areas were addressed. Green spaces sustainable management strategies ranged from the Zimbabwe 2013 Constitution to Forest Policy in Zimbabwe. This was helpful in that the researcher wanted to establish the possible drivers of urban green space depletion in the city. In addition, the researcher considered both the regulatory and institutional frameworks used in Zimbabwe to maintain urban green spaces in the city. With that in mind, the researcher aimed to peel the causes of the demise of urban green spaces in Gweru. To justify the study, the researcher had to further consider the drivers, pressures, state, impact, and responses in line with the research questions. The research gap was then highlighted after carrying out an extensive literature review. All the explored literature assisted the researcher to incline the study to the systems thinking theory framework- Driver-Pressure-State-Impact-Responses (DPSIR) as the conceptual framework. The following chapter explicitly discusses the conceptual and research methodology.

CHAPTER THREE: CONCEPTUAL FRAMEWORK RESEARCH METHODOLOGY

3.1 INTRODUCTION

The problem articulation and orientation, aim and objectives as well as an extensive literature review to situate the study were set out in chapters one and two. Chapter three seeks to establish and justify the appropriate conceptual framework and methodology of the study. Therefore, the chapter is structured as follows: description of the study area, conceptual framework, hypothesis formulation, research philosophy, research approach (deductive and inductive), a research design (case study design), research methods (sampling techniques, data collection methods, and data analysis) and ethical consideration (ethical approval, voluntary participation, informed consent, risk of harm, confidentiality and anonymity, permission, research validation, internal validity, external validity, and reliability). The research summary folds the chapter.

3.2 CONCEPTUAL FRAMEWORK AND HYPOTHESIS FORMULATION

The depletion of urban green spaces can be understood through the DPSIR framework, which stands for Drivers-Pressures-State-Impact-Response. The DPSIR framework provides a comprehensive approach to understanding the drivers, pressures, states, impacts, and responses related to the depletion of urban green spaces. Urbanisation, lax enforcement of development controls, ownership issues, low priority given to green spaces, uncooperative attitudes, poor maintenance culture, and lack of coordination are identified as drivers of urban green space depletion. These drivers exert pressures that lead to changes in the state of green spaces, which in turn have impacts on mental health and the environment. To address these issues, responses such as the development of resilient cities and the implementation of integrated urban water management strategies are necessary. Thus, based on the DPSIR framework discussed in chapter two under section 2.14, the following hypotheses were formed:

H_1: Human needs (drivers) have led to the exploitation of green spaces in Gweru.

H_2: Human activities (pressures) have altered the conditions of green spaces in Gweru.

H_3: Human activities have affected the conditions (state) of green spaces in Gweru.

H_4: The impact of green space depletion affect Gweru's environment.

H_5: The responses to urban green space depletion enhance their sustainable management practices.

The following section presents the study description and its justification.

3.3 THE STUDY AREA DESCRIPTION: GWERU CITY

a) Location and size

Geographically, Gweru City is located approximately 285 km southwest of Harare Metropolitan, at geographical coordinates 19.4511° South, 29.8302° East (Figure 3.1). It is the fourth largest city in Zimbabwe. Gweru City has a diverse population, comprising coloured and black people. This has a bearing on the use of green spaces in the city as these residents have different human needs (drivers and pressures). To date, it has a population hovering around 161 294 and is approximately 164.2 km^2 in area coverage (ZimStat, 2022). Such an increase has an impact on green spaces in the city as people would use the environment to meet their immediate needs. Gweru is located at a height of 304 metres above sea level (Matsa et al., 2021a). It is situated on a watershed that stretches from Rusape to Bulawayo and provides water to the local communities (Matsa & Mupepi, 2022).

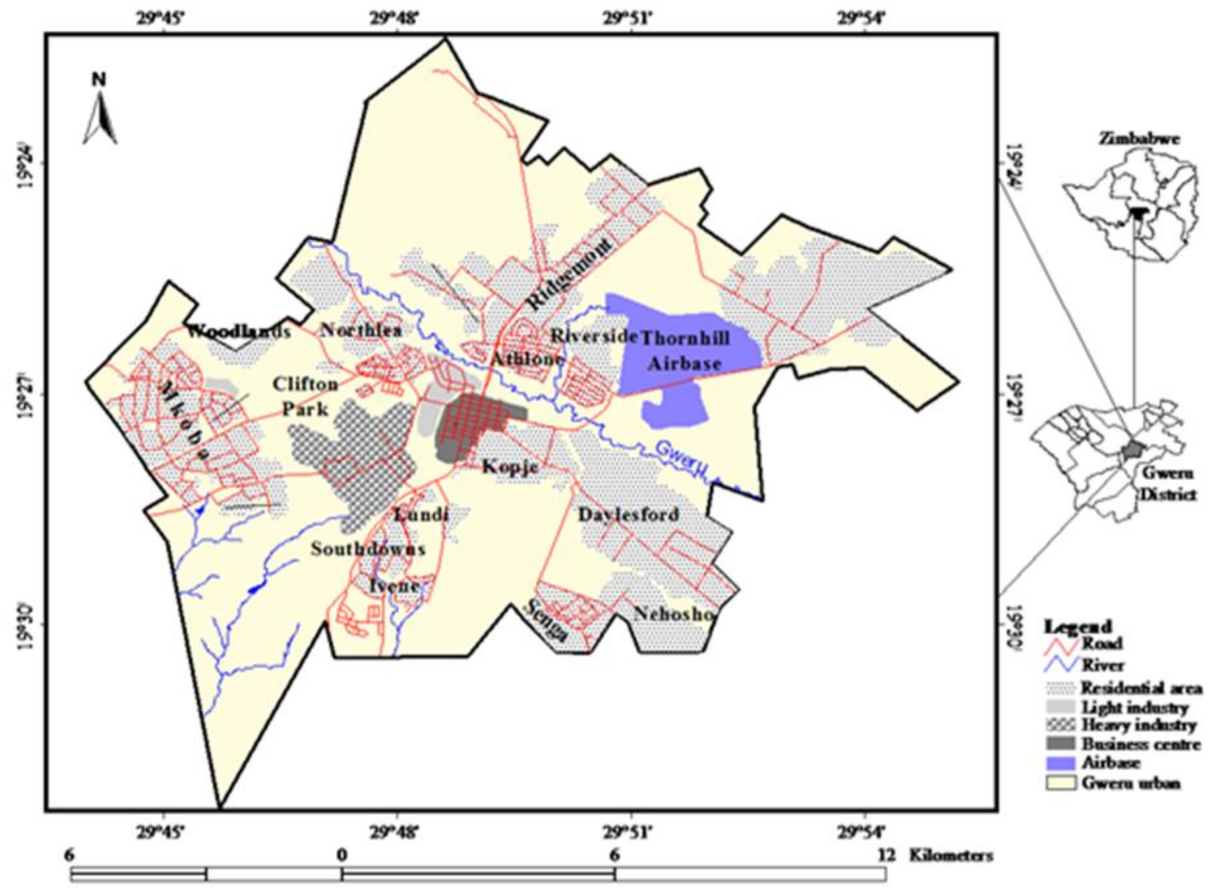

Figure 3.1: Gweru City (Source: Kusena et al., 2016)

Natural environment conditions

Gweru City is located in Zimbabwe's savannah (tropical grassland) vegetation zone, which provides hospitable soil conditions that encourage farming and greenery. The municipal area is traversed by several streams, the majority of which run into the Gweru River, a tributary of the Gwayi River. The area is mostly impacted by northeast prevailing winds, which blow from August to November and average 8.0 to 9.3 knots. Gweru lies in Natural Region IV, with an annual rainfall of 600 mm on average, a low of 400 mm, and a high of 850 mm (Mugandani et al., 2012). Gweru has a warm and wet subtropical climate with chilly dry winters. The city's extensive vegetative cover contributed to the growth of Antelope Park (Figure 3.2).

Figure 3.2: Antelope Park (Source: Fieldwork)

However, Gweru's lush greenery has been significantly reduced by growing urbanisation and urban development. While most of the green spaces in other sections of the city have been encroached upon, patches of lush vegetation near rivers have been removed. Due to unchecked human activity (Figure 3.3) along the water bodies, certain rivers and streams in the city have decreased in number or are on the verge of extinction.

Meta-sediments, felsic meta-volcanic, interbedded sediments, aeolian sands, grits sandstone, siltstone, and felsite rock formations are among the rocks found here. The underlying rock is linked to the majority of the soils in the study region. Regosols and Fersiallitic soils are both abundant in the Gweru area, with the latter dominating. The former consists of deep sands containing 10% silt and clay, with little to no weathered mineral deposits (mainly Kalahari sands).

Figure 3.3: Land being cleared for the construction of houses in Gweru (Source: Fieldwork)

Fersiallitic soils are located mostly south of the city and contain considerable weatherable material storage, with relatively shallow to deep greyish-brown sands or loamy sands over light reddish-brown sandy loams developed on Umkondo and Permian sandstone and quartzite (Mukanga, Chitata & Mudereri, 2016).

Built environment conditions

Gweru City's built environment consists of both residential and industrial areas. The residential areas are divided into high, medium, and low-density suburbs. The industrial areas include ZimAlloys, Bata Shoe Campany, Jin An, and Anji among others. The sizes of these residential areas differ-high-density (150m^2 to 300km^2), medium-density (301km^2 to 500km^2), and (501km^2 to 1000km^2). Examples of Gweru City's built environmental conditions are shown in Figure 3.4.

a) Woodlands High-Density

b) Central Business District

c) Low-Density Suburb (Lundi Park)

d) ZimAlloys Industry

Figure 3.4: Types of land uses in Gweru City (Source: Fieldwork)

As shown in Figure 3.4, the built environmental conditions show some few green spaces which is a cause for concern if the city aims to provide a habitable and smart city by 2030 as enshrined in its mission statement. Below is a description of the research philosophy adopted in this study.

3.4 RESEARCH PHILOSOPHY

A research philosophy refers to the set of beliefs concerning the nature of the reality being investigated (Bryman, 2015). The assumptions created by a research philosophy justify how the research will be undertaken (Flick, 2011). Goddard & Melville (2004) posits that research philosophies can differ on the goals of research and on the best way that might be used to achieve these goals. These are not necessarily at odds with each other, but the choice of research philosophy is defined by the type of knowledge being investigated in the research project (May, 2011). Therefore, understanding the research philosophy being used can help explain the assumptions inherent in the research process and how this fits the methodology being used.

The current study is directed by the pragmatic philosophy. One of the reasons for choosing this philosophy is that it provides the researcher with a comprehensive understanding of the problem of urban green space disappearance in Gweru that would otherwise be difficult to assess by using a single approach (qualitative or quantitative) (Shannon-Baker, 2015). The quantitative phase helps the researcher to reach many more participants than when using qualitative methods. It provides the researcher with a broad and very firm foundation and understanding of the current status of the urban green spaces in Gweru. Secondly, pragmatism brings quantitative and qualitative approaches together to build their strength and weakness (Morgan, 2014; Shannon-Baker, 2015). The strength of qualitative is often the weakness of the quantitative and vice versa (Tran, 2017). Qualitative research, due to the limitations related to the small number of stakeholders that could be interviewed and topics that could be discussed during the interviews, cannot adequately bring the breadth of the issue of urban green space disappearance in the city of Gweru.

Contrarily, qualitative studies often fail to address the depth of reactions and contextual factors leading to the disappearance of urban green spaces in the city. So, by connecting and combining both quantitative and qualitative research approaches, the researcher gets access to the breadth and the depth of the issue of urban green space disappearance and provides the answers to the questions ‘how’ and ‘why’ for most of the key findings in the quantitative phase. According to Venkatesh et al. (2013), this makes better, stronger, and more accurate inferences or meta-inferences. In addition, the qualitative study, designed based on quantitative findings, helps to provide rich explanations of not only the contradictory perspectives of stakeholders but also the other themes that emerge from quantitative findings. The qualitative data does not only confirm the quantitative data findings but also provides insights into those findings. In other words, pragmatism allowed me to use qualitative data to confirm, complete, complement, explain and develop the quantitative findings (Venkatesh et al., 2013). The following section focuses on the research approach used in this study and its justification.

3.5 RESEARCH APPROACH

The approach adopted in a study is important because it influences the research design (Alrajeh et al. 2012). There are three generally used approaches namely: deductive, inductive, and abductive (not indicated in the onion ring model, above, but discussed in the text below as an intermediate position).

Deductive reasoning starts from general principles to particular instances, in which researchers deduce certain hypotheses from others' theories, and then collect appropriate data to prove or reject the theory (Blaikie, 2009). Deductive reasoning is sometimes described as a top-down process that tests general premises through a series of steps to reach specific conclusions (Wheeldon & Ahlberg, 2012). Associated with positivism or post-positivism, quantitative research seeks generalisability through controlled value-free (or value-neutral) processes (Wheeldon & Ahlberg, 2012). However, it ignores humans' interpretation of the social world.

Inductive reasoning is the reverse process starting with particular observations, and then deriving general conclusions or propositions (Chen, 2013). Blaikie (2009) regards inductive reasoning as a process of theory building, where specific facts or observations are used to describe some characteristics and the nature of social regularities, then to create a theory that explains relationships between the phenomenon and allows projecting the future. According to Wheeldon and Ahlberg (2012), inductive reasoning is a process that develops general conclusions based on a series of steps that explore specific premises. Sometimes described as a bottom-up approach to research, qualitative research is associated with constructivism or interpretivism and seeks to understand or make sense of the world based on how individuals experience and perceive it (Wheeldon & Ahlberg, 2012). However, it focuses on the interpretation of the human and does not allow alternative explanations.

The abductive approach uses both deductive and inductive approaches. It constantly moves from the empirical to theoretical dimensions of analysis (Alrajeh et al., 2012). According to Dubois and Gadde (2002), the abductive approach explains, develops, or changes the theoretical framework before, during, or after the research process. It moves back and forth between inductive and open-ended research settings to more hypothetical and deductive attempts to verify the hypothesis (Yin, 2018). Abductive reasoning/approach can be understood as a process that values both deductive and inductive approaches but relies principally on the expertise, experience, and intuition of researchers (Wheeldon & Ahlberg, 2012). In addition, tentative explanations and hypotheses emerge through the research process, and these must be tested theoretically and empirically (Wheeldon & Ahlberg, 2012). Abductive reasoning is associated with mixed-methods research.

Given the nature of the aim, research questions, and research philosophy, this study adopted both the inductive and deductive reasoning strategies implying abductive reasoning. The inductive approach was used to examine the themes of green spaces that emerge from the qualitative research data. This allowed for the development of appropriate research recommendations on how to curb the further disappearance of urban green spaces in Gweru. The elements of the deductive approach were integrated into the research, with the existing theory being used to formulate a conceptual model. Using the deductive approach enhances the generalisability of the research (Saunders et al., 2012). Additionally, the use of structured questions and quantitative data is important for the reliability and validity of the findings. The next section focuses on the research strategy used in this study and its justification.

3.6 RESEARCH DESIGN

Research design is the process of converting research questions into projects and it is an essential component of any research (Al-Ababneh, 2020). Research design is critical in deciding the research processes and elements such as research methods, research strategy, and sampling (Al-Ababneh, 2020). Thus, this study adopted the case study research design. A case study is an empirical investigation that explores a current phenomenon inside its real-life environment, particularly when the boundaries between the phenomenon and setting are not obvious (Peterson & DiPietro, 2021).

The main aim of this research was to make practical and theoretical contributions towards sustainable management of urban green spaces in the city of Gweru and the major question is: why are urban green spaces disappearing in the city of Gweru? As such, the aim and major research question prompted the researcher to use a case study approach. Case studies answer better the 'how', 'why', and 'what' questions of this study which help to achieve the aim and objectives of the research (Alam, 2021). In addition, the case strategy requires multiple sources of evidence including documentation, archival records, interviews, direct observations, participant observation, questionnaires, and physical artefacts (Alpi & Evans, 2019). It helps in the triangulation of multiple data sources. Triangulation refers to the use of different data collection techniques within one study to ensure that the data are telling you what you think they are telling you (Al-Ababneh, 2020; Natow, 2020). The case study strategy provides the opportunity that the study to be undertaken in a manner that incorporates the views of the people (participants) in the field of study (Rashid et al., 2019; Remenyi, 2022). Furthermore, a case study strategy does not allow the researcher to influence or change the attitudes or procedures of the participants or the environment and yet it allows the researcher to explore the behavioural patterns of participants (Cheng & Tsai, 2019; Alam, 2021). A case study, through the explanatory or explanatory strategy, offers in-depth details and a potential understanding of the various impacts of independent variables. As such, the case study design will offer a better opportunity to provide both theoretical and practical solutions for the sustainable management of urban green spaces in the City of Gweru. The research methods used in this study and their justification are explained below.

3.7 RESEARCH METHODS

Research methods are the tactics, procedures, or techniques used in the gathering of data or evidence for analysis to unearth new knowledge or develop a deeper understanding of a topic. The methods used in this study are described below.

3.7.1 Target Population

A population is a grouping of all the units that have the variable attribute being studied and for which generalizations from the research can be made (Trochim, 2004; Al Kindy et al. 2016; Shukla, 2020). It can also be defined as the total number of units (individuals, organisations, events, objects, or items) from which samples are selected for measurement (Cooper & Schindler, 2013; Parahoo, 2016). In addition, Saunders et al. (2012) define a population as the full set of cases from which a sample is taken. In this study, five categories of people constituted the target population. These were the residents of Gweru, city authorities, city councillors, and officials from miscellaneous bodies associated with green space management. Table 3.4 shows a summary of the target population involved in the study, with a justification for each group's inclusion. The following section describes the sampling techniques used in this study.

3.7.2 Sampling Techniques

Sampling is defined by Bhardwaj (2019) as a procedure to select a sample from an individual or a large group of the population for a certain kind of research purpose. Sampling is the process of selecting a subset from a selected sampling frame or the complete population (Taherdoost, 2021). Using sampling, one can conclude a population or make generalizations in light of accepted theory. The following sections describe both the stratified and purposive sampling used in this study.

Table 3.1: The targeted sample for this research study

Sector	Reason for choosing the participants
Household heads	Household heads were included in this study because they are at the fore front of exploiting green spaces in the city. They also dictate how green spaces can be used in their neighbourhoods.
Parks and Community Service	The local administration of Gweru is made up of the city authorities, who are given the legal authority to supervise the city's general growth. Their participation in this research is crucial since green spaces come within their purview because they are a component of the natural environment.
Physical Planning	These are responsible for the spatial planning of the city. Therefore, they plan to leave areas for green spaces.
Forestry Officials	The officials from the forestry department are responsible for vegetating areas with no vegetation and they ensure that residents don’t destroy it. They also provide seedlings to various institutions.
Environmental Management Agency	They are mandated to protect the environment according to the Zimbabwean constitution. They punish an individual caught on the wrong side of the law as they try to protect the environment.
Real Estate Developers	This parcel stands for residents in need of houses and accommodation. As such, they are responsible for creating stands that are big enough to accommodate green spaces.

Stratified sampling, according to Dudovskiy (2022) is a probability sampling method and a form of random sampling in which the population is divided into two or more groups (strata) according to one or more common attributes. These attributes can be sex, age, income, level of education, etc. according to the aims and objectives of the study. It aims to ensure that the sample accurately represents particular strata or subgroups. As a result, applying the stratified sampling approach entails dividing the population into various subgroups (strata) and proportionately choosing participants from each stratum. There are two categories of stratified sampling: proportional and disproportionate. When applying the proportionate stratified random sampling approach, sample sizes in each stratum are calculated proportionally to the total population (Dudovskiy, 2022). For instance, if the total population for a study is 5000 persons, the group can be divided into five strata with 1000 people in each stratum using proportionate stratified random selection. Contrarily, in disproportionate stratified random sampling, the proportion of subjects drawn from each stratum to the total population size is not required. The population can be divided into five strata with the following unequal numbers of the population in each stratum if disproportionate stratified random sampling is used in a study with 5000 participants: 1000, 1500, 1200, 800, and 500. Therefore, when compared to unequal sampling, the implementation of proportionate stratified random sampling yields more accurate primary data.

However, because of the geographical location and disproportionate distribution of the population of residents in Gweru's suburbs, disproportionate stratified random sampling was adopted in this study. Gweru City has a total of nine residential areas namely, high, medium, and low-density suburbs. The population of the study area was then stratified sampled, that is, three suburbs from each stratum (high, middle, and low) were chosen. For high-density suburbs, Mkoba, Mutapa, and Senga were selected. Athlone, Nashville, and Northlea represented the middle-density suburbs while Ridgemont, Kopje, and Southdowns represented the low-density suburbs. Effectively, a total of 2315 residents were sampled using the stratified sampling technique of which 908 were from the high-density, 793 were from middle-density and 614 were from the low-density suburb.

Purposive sampling (also known as judgment, selective, or subjective sampling), according to Dudovskiy (2022) is a sampling technique in which the researcher relies on his or her judgment when choosing members of the population to participate in the study. It is a non-probability sampling method and it occurs when "elements selected for the sample are chosen by the judgment of the researcher. Researchers often believe that they can obtain a representative sample by using a sound judgment, which will result in saving time and money" (Raut $ Das, 2017). The reason for using purposive sampling is that it is one of the most cost-effective and time-effective sampling methods available, particularly when selecting the key informants. As such, in this study, key informants from the Department of Forestry, Environmental Management Agency (EMA), Department of Physical Planning, Department of Parks and Community Services, and Real Estate Developers were purposively sampled for this study. These departments were selected because they have a role to play in the sustainable management of green spaces in Gweru in particular and Zimbabwe in general. The head of the division or the representative from each of the aforementioned departments was interviewed. The following section focuses on the data collection methods.

3.7.3 Data Collection Methods

Both quantitative and qualitative data collection methods were used in this study. This was meant to triangulate the data for effective results. The steps involved in the data collection process are outlined below.

3.7.3.1 Quantitative data collection method

In this study, the data for quantitative analysis was collected using both geospatial technology and questionnaires. The geospatial technology gave the spatial analysis of urban green spaces in the city. The questionnaire for households was meant to explain the situation obtained on the ground. In other words, the questionnaire through households gives the voice that the geospatial technology cannot offer. Data collection through geospatial technology and questionnaires is explained below.

<u>Land use and cover classification scheme and geospatial data sources</u>

To address the first objective of the study which sought to assess urban green space dynamics in Gweru City, the researcher used geospatial technology. Geospatial technology can be defined as the collection of spatial data in the form of satellite images using remote sensing and geographical information systems software as well as the global positioning system. Therefore, the next section describes the sources of satellite images used in this study.

Based on the researchers' prior knowledge of Gweru City and a brief reconnaissance survey with additional information from the Department of Forestry Commission, a classification scheme was created (Table 3.2). Afterwards, an extensive field observation was carried out using a topographic map 1: 50 000, a digital camera, and Garmin GPS 12X.

Table 3.2: Land use/cover classification categorisation

Land cover classes	**Description of each land use/cover class**
Waterbody	This is an area submerged in water and this includes river streams, wetlands, and dams.
Greenspace	Area covered by vegetation (hibiscus, lawn, orchard, bushland, woodlands, etc.)
Bare ground	This is an area of the earth's surface covered by bare soil and rock outcrops
Built-up area	Earth's surface is covered by concrete and buildings (houses, factories, industries, etc.)

Source: Author

Extensive field observation and Ground Positioning System (GPS) control points (GCPs) sample collection was conducted in September to select representative training sites for each LULC category (Table 3.6). The GPS control points and satellite image data were concurrently collected in September to avoid bias. The training samples were then used for image classification and accuracy assessment. As such, a total of 400 GCPs for each were obtained. From the 400 GCPs, 320 (80%) GCPs were used for image classification and the rest 80 (20%) were used for validation. Black and white aerial photos in combination with raw satellite imaging data through visual interpretation were used as reference data to collect sample points for classifying the Landsat images of 2000 and 2005. In addition to gathering training data, transect walks were performed to make site observations, which were then used to improve the training sites and confirm the classification of the photos. In this study, the spatial data of Gweru City was collected from the USGS website (http://glovis.usgs.gov). This website provided geo-referenced, radio-metrically calibrated, and Orth-rectified Landsat TM images for the years 2000, 2005, 2009, 2015, and 2019 for the study area. These images were chosen based on zero cost, capture date (September which is a dry month), spatial resolution (30m x 30m), availability, and (0%) percentage of cloud cover (Table 3.3). Besides, images of the dry season were used to avoid overestimation of the vegetation.

Table 3.3: Landsat Thematic Imagery (TM) used in the study

Satellite	**Path/row**	**Resolution**	**Acquisition Date**	**Source**	**Remarks**
Landsat 4 MSS	170/73	30m x 30 m	24/09/2000	USGS	Dry season data
Landsat 7 TM	170/73	30m x 30 m	20/09/2005	USGS	Dry season data
Landsat 7 TM	169/72	30m x 30m	21/09/2009	USGS	Dry season data
Landsat 8 TIRS	169/72	30m x 30m	26/09/2015	USGS	Dry season data
Landsat 8 TIRS	169/72	30m x 30m	23/09/2019	USGS	Dry season data

The Landsat was used because of its ability to map land use, land cover, soils, and geology (Sisay et al., 2016; Molla et al., 2018). The images were provided in GeoTiff format and resampled to 30 m using the cubic convolution method. This was carried out using the Universal Transverse Mercator (UTM)-World Geodetic System (WGS) 84 projection. The following section describes and explains data collection from the questionnaire.

Questionnaire

The data for the household representatives of Gweru City was collected using a self-administered questionnaire. A questionnaire refers to all methods of data collection in which each person is asked to respond to the same set of questions in a predetermined order (De Vaus, 2002). To design the questionnaire, the researcher carried out a thorough literature review to develop the research instrument (Noori, 2021). The items of the questionnaire were adapted from the relevant literature (e.g., Haq, 2011; Mensah, 2014a, b; Basu & Nagendra, 2021; Matsa et al., 2021; Grigoletto et al., 2021).

Piloting the questionnaire

The questionnaire was put under a pilot study for five days i.e., between the 1st and 5th of December 2018. A total number of twenty (20) questionnaires were distributed and all of them were returned, representing a 100% success rate. The reason for carrying out the pilot study was to get feedback from the respondents as to the user-friendly or unfriendly nature of the questionnaire. One of the weaknesses noted by the respondents was the time needed to complete the questionnaire. Most of them noted that they spent approximately 40 minutes completing the questionnaire and which was too long. This was then adjusted to between 20 and 30 minutes.

The structure of the questionnaire

The purpose of using the questionnaire was to elicit as much information about the demise of green spaces in Gweru City. As such, potential respondents were encouraged to appropriately complete the questionnaire. This allowed the data to be efficiently analysed. With this in mind, the questionnaire was composed of closed-ended questions with fixed alternatives (Dawson et al., 2011). The advantage of such a questionnaire is that it accommodates respondents with lower interview skills, takes less time to complete, is easier for the respondents, and makes group comparison better (Oppenhiem, 2000, Wapwera, 2014). Thus, the questionnaire was divided into five sections, namely:

A. Demographic profile of respondents

B. General information about UGS in Gweru City

C. Drivers of UGS depletion in Gweru City

D. Pressures that cause the depletion of UGS in Gweru City

E. States of UGS in Gweru City

F. Impact of the depletion of UGS in Gweru City

G. Responses to the depletion of UGS in Gweru City

The household representatives in this study were asked to indicate to what extent they agreed or disagreed with the statements on a 5-point Likert Scale (Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree). The choice of the five-Likert scale was based on the nature of the data and the researcher's epistemological view of the research problem (Tourangeau et al., 2000; Oppenheim, 2000). By nature, the five-Likert scale has a mid-point option and the number of options is low, hence it minimizes bias. The following section describes how the questionnaire was administered.

Administration of the questionnaire

The questionnaire was self-administered for three months and each participant was given a maximum of two weeks to complete the exercise. Each questionnaire had an introduction that reflected the aim of the study. The respondents were asked to tick **(√)** the appropriate box in response to several pre-determined choices, based on beliefs, behaviour, and attributes (Saunders et al., 2012; Wapwera, 2018). Privacy, anonymity, and confidentiality were guaranteed; hence participants were advised to avoid writing their names. The questionnaire was administered to the household representatives with adequate experience in the use of green spaces in the study area. Thus, the researcher decided to solicit information from respondents that were above eighteen years and who have resided in Gweru City for more than five years. The following section describes and explains the qualitative data collection methods used in this study.

With the pragmatist's belief in mind, the researcher decided to administer the questionnaire across the three suburbs, namely high-density, medium-density, and low-density. The pragmatists believe that no two people have identical experiences, as such their worldviews cannot be identical. With this in mind and the nature of the problem at hand, the researcher believed that experiences of the demise of green spaces in the city differ with each suburb. These suburbs are in different geographical areas, hence the researcher decided to group the respondents according to them. Besides, their perceptions differ, and understanding their different views would assist town planners to come up with sustainable ways of curbing the demise of green spaces in the city. The sample size for the questionnaire is presented in the next section.

3.7.3.2 Qualitative data collection method

In this study, the qualitative data were collected using semi-structured interviews and direct observation of UGS in the study area. Interview sessions were carried out with key informants drawn from the Department of Forestry, Environmental Management Agency (EMA), Department of Physical Planning, Department of Parks and Community Services, and Real Estate Developers. Direct observation was carried out on UGS in Gweru City. Below is a detailed explanation of how direct observation was done.

Direct observation

Direct observation is a method that is frequently used in both quantitative and qualitative research as part of the triangulation process, with a focus on social and educational research (Cotton, Stokes & Cotton, 2010). The semi-structured direct observation was carried out with the research in mind to monitor the signs of the City's loss of green space. During the process, a digital camera with geotagging features was used to take notes and photos. To capture every observation in as much detail as possible and prevent forgetting the observed characteristics, the narrative recording was also done. To guarantee impartiality, independence, and the integrity and dependability of the data, professionalism, and objectivity were upheld (Kumar, 2017). Infills, parks, marshes, and other delicate green space areas scattered across the city were among the data gathered through direct observation. The predominant land use and built-up area at the expense of green spaces were visible. The next section presents qualitative data collection through semi-structured face-to-face interviews.

Semi-structured interviews

Qualitative research interviews are classified as the most important primary data-gathering technique in qualitative research (Goncalves, M., & Cornelius Smith, 2018; Wainwrigh et al., 2020; Grimalt-Alvaro & Ametller, 2021). Although there are three types of interviews, namely structured, semi-structured, and unstructured, the researcher decided to use semi-structured. Semi-structured interviews are flexible as they allow the researcher to probe for more information. To have an in-depth understanding of the demise of green spaces in Gweru City, the semi-structured interview was the best. Like the questionnaire, the interview questions were derived from an extensive literature review and are in line with the questionnaire. This was meant to understand urban green space dynamics in the city. The following section outlines the structure of the interview guide.

The semi-structured interview guide structure

The semi-structured interviews used in this study were subdivided into five sections. The sections were in-line with the research objectives/questions of this study enunciated in chapter one. Section A elicited information on the drivers of UGS depletion in Gweru City; section B: requested the key informants to give their perception of the pressures that cause the depletion of green spaces in Gweru City; section C: tasked the key informants to outline the state/conditions of UGS in the city; section D: the key informants were asked to give their opinion on the impact of the depletion of UGS in Gweru City and section E: This section focused on coming up with sustainable ways (responses) of maintaining urban green spaces in the city. The following part highlights the interview sample used in this study.

Interview sample

The nature of the study assisted the researcher in choosing interview respondents and these were key informants responsible for the management of green spaces in Gweru City. Key informants included officials from the Department of Physical Planning, Department of Forestry, Department of Parks and Community Services, Environmental Management Agency, and Department of Real Estate. Each department provided one official. The researcher booked these officials by approaching them in their various departments. Thus, five officials were interviewed and were very cooperative. The following section focuses on how the researcher administered the interviews.

Administering the interviews

The researcher booked interviews with the respective key informants over the cell phone. Whenever the respondent was busy, the researcher politely asked for another day. Besides, the researcher did not force the key informants to provide information. Instead, the researcher, told the informants that there were free to withdraw even during the interview whenever they felt uncomfortable with the questions. Before, the interviews, the interview guide was pilot-tested on 3 people. These participants were not part of the key informants. Their feedback was used to correct it. One of the weaknesses identified was its length. Respondents complained that the interview process was taking too long, hence the researcher decided to shorten it. Effectively, after corrections, the interviews lasted between 15 to 20 minutes. The following area describes and explains the data analysis techniques used in this study.

3.7.4 Data Analysis Techniques

In this study the data analysis techniques were divided into two broad categories, that is, quantitative and qualitative. Each category was further divided into subcategories. Below is a detailed explanation of how this was carried out.

3.7.4.1 Quantitative data analysis

The systematic method of gathering and analysing quantifiable and verifiable data is known as quantitative data analysis (Mohaja, 2020; Kumatongo & Muzata, 2021). It includes a statistical method for rating or evaluating numerical data (Creswell & Hirose, 2019). Therefore, the section below describes and explains quantitative data analysis from both the spatial and questionnaire collection methods.

<u>Geospatial data analysis</u>

Image pre-processing eliminates noise, fixes distortions, and improves the data readability of an image. Before classifying the remote sensing data in this work, image pre-processing techniques such as atmospheric and geometric adjustments, acceptable band selection, sub-setting, layer stacking, and image improvements (like histogram equalisation and focus analysis) were used (Demissie et al., 2017; Chamling & Bera, 2020; Mohamed, Anders & Schneider, 2020; Ewunetu et al., 2021). To execute the LULC changes detection, atmospheric correction of the top of atmosphere (TOA) reflectance to surface reflectance is necessary (Mohamedet et al., 2020; Bunyangha et al., 2021 & Chen et al., 2021). Therefore, using the FLASH technique in the ENVI software tools, atmospherically adjusted Landsat Images were used to get surface reflectance data. L5 TM and Landsat 7 ETM + mages were matched to their matching Landsat 8 OLI image utilising automated image-to-image registration algorithms based on a set of ground control points (GCPs) to integrate time series image data sets for change detection at the pixel level.

The Landsat 7 ETM+ image was subjected to a spatial augmentation approach (i.e., focus analysis) to increase the image quality. The data set supplier provided the photos with a georeferenced (Universal Transverse Mercator-UTM, WGS84). Then, utilising ground truth information on existing LULC, the Landsat images from each research year were separately categorised using the supervised classification approach. The LULC types were classified using the ERDAS Imagine 2014 programme using the maximum likelihood classifier (MLC) technique. The spatial and spectral resolution of the employed satellite image, however, may cause classification mistakes in the area estimations (Ozdogan et al., 2013). To analyse the dependability of the information derived from classification, it is crucial to examine the correctness of the categorised images (Olofsson et al., 2013). As such, the data used for data validation was used to assess the accuracy (Table 3.4) of the categorisation findings. The Kappa coefficient was computed using the following formula:

$$\mathrm{Kc} = \frac{\mathrm{Po} - \mathrm{Pe}}{1 - \mathrm{Pe}}$$

Where:

Kc = Kappa coefficient

P_o = the proportion of correctly classified cases

P_e = the proportion of correctly classified cases expected by chance

Table 3.4: Accuracy assessment of LULC classes of the study area

Year	Classification accuracy (%)	Kappa Coefficient statistics
2000	94	0.91
2005	97	0.96
2009	96	0.94
2015	94	0.92
2019	97	0.95

The calculations for accuracy assessments (Table 3.4) fall within the recommended standard of accuracy, that is, 85%-90% (Congalton & Green, 2008). From the results, classification accuracy ranged from 94% to 97%, and the kappa coefficient from 0.91 to 0.96. The following section presents the change detection.

The practice of finding differences in the condition of an object or phenomenon by watching it at different times is known as change detection (Chughtai, Abbasi & Karas, 2021). It can be used for a variety of things, including LULC changes, habitat fragmentation, deforestation rates, coastline change, urban sprawl, and other environmental changes (Noor et al., 2013). The following four aspects of change detection identified by MacLeod & Congalton (1998) are relevant when monitoring natural resources: 1) recognising the changes that have occurred; 2) determining the type of the change; 3) measuring the change's spatial extent, and 4) evaluating the change's spatial pattern. Change detection in this study was based on satellite imagery from 2000, 2005, 2009, 2015, and 2019. These years were chosen due to the availability of satellite pictures and the low cost of using them. Image regression, spectral mixture analysis, hybrid change detection, and post-classification comparison are just a few of the change detection approaches utilised in natural resource monitoring (Lu et al., 2004). Post-classification was chosen for this investigation because it separates date 1 and date 2 photos and compares class values on a pixel-by-pixel basis between the dates (Ernani & Gabriels, 2006). A comparison analysis of independently created categorisation for dates is used in the post-classification technique (Raja et al., 2013). It is the most frequent method for tracking land cover changes since it gives precise information on the starting and final land cover types as well as a complete change direction matrix (Foody, 2002). Thus, the annual average rate of change between two epochs was calculated using a slightly modified formula used by Long et al. (2007), i.e.:

$$\Delta = \frac{\left(\frac{A_2 - A_1}{A_1} \times 100\right)}{T_2 - T_1}$$

Where: Δ = Average annual rate of change (%)

A_2 = amount of land cover in time 1 (T_1)

A_2 = amount of land cover type in time 2 (T_1)

The section below describes and explains how the questionnaire data were analysed in this study.

Questionnaire data analysis

Before questionnaire data analysis, missing value analysis was carried out. As such, observations with more than 15% missing data were excluded from the analysis (Austin et al., 2021). This was followed by determining the sample power and sample size. Both the sample power and sample size estimations are used by researchers to determine how many subjects are needed to answer the research questions or null hypothesis (Jones, Carley & Harrison, 2003). To determine the sampling adequacy, the response rate was reviewed. The response rate is the number of usable responses returned divided by the total number eligible in the sample chosen (Finch, 2020). This study used the minimum threshold response rate of 60% (Brown et al., 2019; Ali et al., 2021). The computations revealed a response rate of 86% which was greater than the prescribed 60%. This validated the sample used in this study. The sample power for this research was then determined through computations. Kyriazos (2018) recommended a minimum sample power threshold of 0.80 and from the analysis, the final sample power was 0.97. By being above 0.80, the adequacy of this study was validated. Cronbach's Alpha was used to evaluate the suitability of the data, that is, the internal and reliability. The minimum threshold of 0.70 was used as prescribed by Carden, Camper & Holtzman (2019). Effectively, none of the study's constructs had an alpha less than 0.70, meaning the data and its constructs were reliable.

In addition, descriptive statistics (mean and standard deviation) were used to evaluate the demographic and distribution data across the study items. Factor analysis was carried out to test the construct validity of the questionnaire. This was done using IBM SPSS Amos v26. Exploratory Factor Analysis (EFA) was applied to the items on the questionnaire. Exploratory factor analysis, by definition, is a statistical technique that is used to reduce data to a smaller set of summary variables and to explore the underlining theoretical structure of the phenomena. The Keiser-Meyer-Olkin (KMO) was first used for testing sampling adequacy and Bartlett's test for sphericity was done to ensure that the EFA was adequate for principal component analysis (PCA) (Dhillon, Zain & Singh, 2014). PCA was extracted using eigenvalue, scree plot, and component matrices.

Confirmatory Factor Analysis (CFA) was carried out using IBM SPSS AMOS v26. CFA was carried out in two stages, the first was an assessment of convergent validity and the second was for discriminant validity assessment. For convergent validity, the minimum threshold used was 0.60 for unstandardized coefficients, and 0.4 for standardised coefficients (Schumacker & Lomax, 2016). Regarding discriminant validity, the maximum threshold used was 0.85 (Heck &Thomas, 2015; Loehlin & Beaujean, 2017). For all these tests, none of these was violated.

Finally, Structural Equation Modelling (SEM) was used to test the DPSIR framework. The framework is comprised of five key constructs, that is, drivers, pressure, state, impact, and response. The dimensions of each construct were derived from the EFA results. Specifically, the covariance-based structural equation model (CB-SEM) was used in this study because the sample was larger than 200 (Hair et al., 2018, Tabachnick, Fidell & Kyriazos, 2018). The quality of the SEM results was ultimately evaluated using the goodness-of-fit measures, that is, first the relative chi-square (CMIN/DF <3.0), second, the baseline comparisons, the Normed Fit Index (NFI>0.90) and the Comparative Fit Index (CFI>0.90). The third was the parsimony-adjusted measures, the Parsimonious Normed Fit Index (PNFI>0.5) and the Parsimonious Comparative Fit Index (PCFI>0.5) (Roy, Acharya & Roy, 2016). The last measure was the Root Mean Square Error of Approximation (RMSEA<0.08) (Sarstedt, Ringle & Hair, 2021; Kline, 2023). None of these goodness-of-fit measures was violated. Besides questionnaire data analysis, the researcher carried out qualitative data analysis which is presented in the next section.

3.7.4. 2 Qualitative data analysis

Qualitative data analysis can be defined as the identification, examination, and interpretation of patterns and themes in textual data and determines how these patterns and themes help answer the research questions at hand. The main aim of this study was to make both theoretical and practical contributions to curb the demise of urban green spaces in Gweru City. Thus, below is a description of how qualitative data analysis was carried out.

In this study, the researcher used semi-structured interviews to gather qualitative data. As such, the data was analysed using content analysis. Content analysis, according to Kyngäs, Kääriäinen, and Elo (2020: 11), is a useful qualitative analysis method due to its content-sensitive nature and ability to analyse many kinds of open data sets. Specifically, structured deductive content analysis was used in this study. Kyngäs and Kaakinen (2020: 23) defined deductive content analysis as an analytical method that aims to test existing categories, concepts, models, theories, or hypotheses. Effectively, the researcher used prior questions used in the questionnaire survey to interview key informants. Thus, prior knowledge was used for deductive content analysis. An extensive literature review was done before the development of the research questions. For content validity, the questions were sent to the experts (Taherdoost, 2022) in various Geography Departments across Zimbabwe's state universities, namely Bindura University of Science Education (BUSE), University of Zimbabwe (UZ), Midlands State University (MSU), Great Zimbabwe State University (GZU) and Lupane State University (LSU). The undesirable items were removed after getting feedback from these experts.

To enhance the credibility of the structured deductive content analysis, the researcher should make sure that the study participants are appropriate in terms of the research question and that data saturation is reached during data collection, i.e., that the sample size was correct (Kyngäs, Kääriäinen & Elo, 2020). In this regard, the researcher engaged the key informants (see Table 3.1). These key informants are in one way or another other responsible for the conservation and establishment of urban green spaces in Gweru City. In addition, the researcher ensured the credibility of the structured content analysis by spending some time with the key informants before the data collection phase begins. This allowed the researcher to identify some of the realities experienced by the key informants in the study area. In turn, the participants get comfortable interacting with the researcher. Resultantly, the researcher got familiar with the participants and had a better understanding of which questions elicits responses that are relevant to the research aim. Besides ensuring the credibility of structured deductive content analysis, the researcher guaranteed dependability.

Lincoln and Guba (1985) defined dependability as an assessment of the quality of the integrated processes of data collection, data analysis, and theory generation (for example, conceptual structures or theoretical models). It refers to the stability of data over time and under varying conditions. Furthermore, dependability concerns consistency across the research starting point, data collection, and analysis (Kyngäs et al., 2020). Thus, to ensure the dependability of the data, the researcher gave a colleague to go over the process involved in generating the data to answer research questions. In this case, the peer reviewer analyses the data and assesses how his results compare to the original findings. However, this includes a certain level of risk because both researchers will analyse the data from their perspectives. Hence, the peer reviewer needs a detailed introduction that will cover the motivation for data analysis, along with the approaches that were used (Kyngäs et al., 2020). Apart from ensuring dependability, the researcher considered the confirmability of the data.

Lincoln and Guba (1985) define confirmability as a measure of how well the study findings are supported by the collected data. Thus, in this study confirmability was done through the evaluation of findings whether they were solely shaped by data collected from key informants or the results reflected some bias, motivation, and other interests (Lincoln & Guba, 1985; Kyngäs et al., 2020). In addition, the researcher used ‘audit trails’, that is, written field notes, memos, or excerpts from a field diary to support the connection between the data and findings. Nonetheless, this practice is intended for the researcher rather than for outsiders. As such, the researcher understood that including ‘audit trails’ can also potentially harm the trustworthiness of their research (Kyngäs et al., 2020).

Besides confirmability, the researcher ensured the authenticity of the data. Lincoln and Guba (1985) opinioned that authenticity describes the extent to which researchers fairly and faithfully show a range of realities. Research that has sufficient authenticity includes various citations that demonstrate the connection between the results and data (Kyngäs et al., 2020). To ensure authenticity, the researcher acknowledged the sources used in the study. The researcher made sure that citations are systematically throughout the text, for example, each identified category included at least one relevant citation. Furthermore, the researcher included citations from different participants, as several previous studies have presented citations that reflect only one participant. In this situation, the reader may wonder whether this was the only participant who expressed something relevant to the research question. In addition, the researcher demonstrated that the citation originates from the original data, for example, by using an ‘identification’ code. For instance, in this study, the code ‘DPP’ demonstrate that the participant is an official from the Department of Physical Planning. However, the researcher ensured that the identification codes are in line with current data protection guidelines and cannot be used to identify the participant (Kyngäs et al., 2020). Apart from ensuring the authenticity of the data, the researcher guaranteed the transferability of the data.

According to Lincoln and Guba (1985), transferability describes the degree to which research findings will apply to other fields and contexts. In this study, the researcher ensured the transferability of the research to other geographical set-ups by describing the sampling techniques, potential inclusion criteria, and participations’ main characteristics. As such, another researcher can assess whether the results drawn from this sample application to other contexts.

According to (Kyngäs et al., 2020), transparent reporting of the research process and results is critical to achieving sufficient transferability. Each researcher must provide enough details about their research so that the audience may determine if the results are generalizable to other situations.

3.8 RESEARCH ETHICS

A research community's determination of what institutes a suitable, fair, and ethical set of principles, regulations, standards, and norms for study-related behaviour is known as research ethics (Davis & Lanchlan, 2017). Participants are safeguarded by ethical review, which also protects the researcher. By obtaining ethical authorisation, the researcher demonstrates conformity with the recognised ethical principles of a valid study endeavour. This would be useful if there are any claims of unethical research or exploitation down the road. Verifying the legitimacy of ethics approvals could act as a prod to encourage morally responsible research. Above all, the researcher should get ethical permission. Thus, before this research study commenced, the researcher sort for ethical approval. This is described in detail below.

3.8.1 Ethical Approval

Following approval of the research concept, the research proposal was evaluated by the University of South Africa’s HREC_CAES_Ethics Committee (Ref no 2018_CAES_025) of which a copy is inserted as an Annexure. Specific ethical requirements are commented on below.

3.8.2 Voluntary Participation

In this study, voluntary participation was fully guaranteed for the chosen participants. There was no coercion of any form. In this regard, the participation of respondents in the questionnaire, semi-structured interviews, and focus group discussions was done voluntarily. The participants were informed that they could withdraw at any point if they felt that the process was infringing on their rights. In addition, the participants were told that there was no reward of any nature for their participation in the data-gathering process.

3.8.3 Informed Consent

The researcher sought permission to quote verbatim from interviewees, and the source of any point of view could be obtained when requested (Kafafy, 2010). All participants were thoroughly 20 told about the processes, such as the questionnaire, the purpose and goals of the research, why it is necessary, what the data would be used for, and any potential hazards. There was no data collection until the interviewer signed clear permission to participate declaration (Kafafy, 2010). Participants in this study agreed to participate by signing a consent form (see appendix viii), and they were always encouraged to ask the interviewer any concerns they had regarding the research and/or their safety or anonymity.

3.8.4 Risk of Harm

Ethical norms encourage researchers to avoid putting participants in situations where they could be harmed as a consequence of their involvement (Resnik, 2018; Novek & Wilkinson, 2019; Drolet et al., 2023). By harm, it is meant both physical and psychological. Participants were told that if they had an urgent task, they may postpone the interview questions or focus group discussions (Resnik, 2018; Novek & Wilkinson, 2019; Drolet et al., 2023). As for the questionnaire, the participants were given seven days to respond and return it. The questionnaire, interviews, and focus group discussion questions had nothing that encroached on any political or religious issues. The participants were asked to withdraw if they thought the research instrument questions had some areas causing them discomfort.

3.8.5 Confidentiality and Anonymity

Confidentiality and anonymity are two criteria that are used to protect the privacy of study participants (Pietilä et al., 2020; Goodwin, Mays & Pope, 2020). The anonymity of participants was adopted in this study to ensure maximum privacy. “Participants were told that their identities would be kept private throughout the study, even from the primary researcher" (Kafafy, 2010: 59). This was also noted explicitly in the introduction comments, and no room was given in the questionnaire for any contact information of the participants to maintain maximum anonymity.

3.8.6 Permission

Lastly, permission to conduct the research in the area of authority was given by the Town Clerk of Gweru City. A copy of this approval letter is also attached as an Annexure.

3.8.7 Research Validation

Research validity is a foundational and widely used concept in science that refers to the degree to which a study accurately measures what it intends to measure (Lukyanenko et al., 2019). It is important to ensure that research is valid to draw accurate conclusions and make informed decisions based on the results. To ensure research validity in a study, it is important to carefully design the study and use appropriate research methods. In this study, research validity was ensured through several ways that include: clearly defined research question and objectives (see Chapter 1), using appropriate research methods and techniques, ensuring that the sample size is appropriate and representative of the population being studied, minimising bias in data collection and analysis, ensuring that the instruments used to collect data are reliable and valid, conducting a pilot study to test the research design and methods, using appropriate statistical analysis techniques to analyse the data and ensuring that the results are accurately reported and interpreted.

3.8.8 Internal Validity

Internal validity is a type of research validity that refers to the degree to which an experiment can demonstrate a causal relationship between two variables (Flannelly, Flannelly & Jankowski, 2018). It is the extent to which the conclusions of an empirical investigation are true within the limits of the research methods and subjects or participants used. To ensure internal validity in a study, it is important to carefully design the study and use appropriate research methods

(Flannelly et al., 2018). Thus, in this study the following ways were carried out to ensure internal validity: clearly defining the causal relationship of the depletion of UGS, controlling for extraneous variables that could affect the relationship, randomly assigning participants to groups to minimize selection bias, using appropriate measures and instruments to collect data, ensuring that the data is collected and analysed consistently across all groups, conducting a pilot study to test the research design and methods, using appropriate statistical analysis techniques to analyse the data and ensuring that the results are accurately reported and interpreted.

3.8.9 External Validity

External validity is a type of research validity that refers to the extent to which the results of a study can be generalized to other populations, settings, and conditions (Flannelly et al.,2018; Pearl & Bareinboim, 2022). It is the degree to which the findings of a study can be applied to real-world situations beyond the specific context of the study (Ramspek, 2021). To ensure external validity in this study, the researcher took the following steps: using a representative sample that is similar to the population of interest, ensuring that the study setting and conditions are similar to real-world situations, using measures and instruments that are appropriate for the population and setting, conducting the study in multiple settings (high, medium and low density-suburbs) to test the generalizability of the findings, using appropriate statistical analysis techniques to test for generalisability and reporting the limitations of the study and the extent to which the findings can be generalized to other populations, settings, and conditions (see 6.6).

3.8.10 Reliability

Reliability is a type of research validity that refers to the consistency and stability of research findings over time and across different conditions (Hajjar, 2018). It is the degree to which a measure or instrument produces consistent results when used repeatedly under the same conditions (Adeniran, 2019). To ensure reliability in this study, the researcher considered the following steps: using a standardised and well-defined research protocol, using reliable and valid measures and instruments, conducting pilot studies to test the reliability of the measures and instruments, using appropriate statistical analysis techniques to test for reliability and reporting the reliability coefficients for the measures and instruments used in the study.

3.9 LIMITATIONS OF THE RESEARCH METHODOLOGY

The spatial resolution (30m x 30m) used to assess the spatiotemporal dynamics of green spaces could not differentiate some spatial features such as bare ground and built-up areas due to their similar spectral signature. Political orientation led to a biased interpretation of the data. Each key informant gave views that are in line with their political ideology and agenda. Thus, the information could have been skewed in favour of one's superiors. The dominance of male respondents might affect the generalisability of this study. A limited number of females were willing to participate in this study hence male dominance and this has a ripple effect on data analysis. Using Factor Analysis posed some challenges when it came to factor loading and naming. For example, in this study, insufficient funds were loaded into geological influence where local topography and climate change belonged. Thus, names may not accurately reflect the variables within the factor. The Covid-19 outbreak and financial constraints severely affected the researcher's progress hence it took time to accomplish the thesis.

3.10 SUMMARY

The chapter presented an overview of the conceptual framework and the research methodology used in this study. The research location was described in detail. This was followed by the research philosophy which was the pragmatist's worldview. The research approach followed and the researcher decided to use abductive reasoning as the approach because it employs both deductive and inductive approaches. Research design was then described and the researcher decided to use a case study as its strategy to answer the research questions. This was then followed by detailed research methods that included the target population, sampling techniques, data collection methods, and data analysis techniques. The research ethics section concluded the chapter and this included ethical approval, voluntary participation, informed consent, risk of harm, confidentiality and anonymity, permission, research validation, internal validity, external validity, reliability, and methodological limitations. In the next chapter, the first objective results are analysed and discussed in detail.

CHAPTER FOUR: DEMOGRAPHIC ANALYSIS AND URBAN GREEN SPACES

4.1 INTRODUCTION

The main thrust of this study was to provide both theoretical and practical contributions to curbing the demise of urban green spaces in Gweru City. To achieve this, the researcher engaged Gweru residents from different settlement types, that is, high, medium, and low-density suburbs in the city. The heterogeneous nature of the residents and the geographical location in Gweru City forced the researcher to at least sample participants from each of the three suburbs. With this in mind, the researcher decided to assess the implication of the demographic profile of residents on the use and establishment of urban green spaces in Gweru City. In this chapter, the analysis is divided into the gender of respondents, age of respondents, years spent living in Gweru, housing unit sizes, and the conditions of green spaces in the city. The chapter concludes by giving a detailed discussion of the research findings. The gender of respondents is tabulated and explained below.

4.2 DEMOGRAPHIC ANALYSIS

Capturing socio-demographic attributes in a study is critical as it provides a broader perspective and explains the trends that other factors might fail to identify (Leedy & Ormrod, 2013; Connelly, 2020). In this regard, the researcher explored all the demographic variables and these included gender, age, number of years one had been staying in Gweru, the size of the stand, and the conditions of green spaces both at the household level. The results were presented by strata as shown in Table 4.1 below.

4.2.1 Gender of Respondents

Table 4.1 shows that in the high-density suburbs, the male responses were the highest and these comprised 65.0%, while female respondents comprised 35.0%. This was a higher margin as compared with the distribution of gender in the medium and lower-density suburbs. For the medium density, males were also the highest, despite being lower than the high-density and they comprised 51.1% against a female prevalence of 48.9%, while for the low-density, the prevalence of males was 59.8% as compared with the prevalence of female respondents (40.2%). In all three strata, male respondents dominated women despite the national trend where there are more women than men (ZIMSTAT, 2018).

Table 4.1: Distribution of respondents by gender and suburb

Residential Area	Gender	Frequency	Percentage	Valid Percentage	Cumalative Percentage
High-density	Male	521	65.0	65.0	65.0
	Female	280	35.0	35.0	100.0
	Total	801	100.0	100.0	
Medium-density	Male	353	51.1	51.1	51.1
	Female	338	48.9	48.9	100.0
	Total	691	100.0	100.0	
Low-density	Male	298	59.8	59.8	59.8
	Female	200	40.2	40.2	100.0
	Total	498	100.0	100.0	

The mobility of males makes them dominant in responding to the questionnaire. Generally, females are reserved and they spent most of their time indoors performing household chores. This means that males are more exposed to urban green spaces than females. For example, besides drinking beer, males use green spaces for recreational purposes. Most of the time, the males would be playing or watching soccer in stadiums such as Mkoba and Ascot. Therefore, males are responsible for the demise of green spaces in Gweru City. However, an official from the Department of Parks and Community Services argued that although males were dominant in responding to questionnaires, they use green spaces more than men. The official women use the green spaces for agricultural purposes daily as they maximize the small portion of land to establish a garden and even a maize field. In addition, the official said more than 50% of women are not employed, hence they invade fragile green spaces such as wetlands to establish a garden leading to the shrinking of such fragile land. The following segment deals with the age of respondents and its implications on the availability and usage of green spaces in Gweru City.

4.2.2 Age of Respondents

The distribution by age was also analysed and Table 4.2 presents the results. Concerning the high-density respondents, the modal age category for the respondents was the 31-40-year-old category and these were 37.8%, with the second highest being those who were between 41 and 50 years of age who were 25.1%. Respondents who were between 51 and 60 years of age were 20.5%, while those more than 60 years were 12.0%. The least were those who were less than 30 years of age and were 4.6%.

Table 4.2 Distribution of respondents by age

Residential Area	**Age**	**Frequency**	**Percentage**	**Valid Percentage**	**Cumulative Percent**
High-density	<30	37	4.6	4.6	4.6
	31-40	303	37.8	37.8	42.4
	41-50	201	25.1	25.1	67.5
	51-60	164	20.5	20.5	88.0
	>60	96	12.0	12.0	100.0
	Total	801	100.0	100.0	
Medium-density	<30	99	14.3	14.3	14.3
	31-40	187	27.1	27.1	41.4
	41-50	156	22.6	22.6	64.0
	51-60	152	22.0	22.0	86.0
	>60	97	14.0	14.0	100.0
	Total	691	100.0	100.0	
Low-density	<30	99	19.9	19.9	19.9
	31-40	121	24.3	24.3	44.2
	41-50	107	21.5	21.5	65.7
	51-60	85	17.1	17.1	82.7
	>60	86	17.3	17.3	100.0
	Total	498	100.0	100.0	

Concerning respondents from the medium-density, the modal age category was those between 31 and 40 years of age and these were 27.1%. Respondents who were between 41 and 50 years were the second highest (22.6%), while those ages 51-60 were 22.0%. The second least category comprised those who were aged less than 30 years and these were 14.3% while the least were respondents who were more than 60 years (14.0%). With regards to respondents from the low-density suburbs, again, those who were aged between 31 and 40 years were the most dominant and these constituted 24.3%, followed by those aged between 41 and 50 years whose proportion was 21.5%. The third highest were those aged less than 30 years (19.9%), followed by those aged more than 60 years (17.3%), and those aged between 51 and 60 17.1%.

These results indicate that the city of Gweru is mainly composed of youth. An official from EMA pointed out that the youth are energetic and, in most cases, they spent most of their time relaxing in green spaces such as parks and stadiums. Gweru has a single park that is visible but at times difficult to access due to its geographical location-the city centre. In addition, the youth use green spaces for discussing educational and political matters. Therefore, the youth have a bearing on the use and establishment of green spaces in Gweru City. This implies that they need to be taken on board when making policies regarding the use, provision, and maintenance of green spaces in their neighbourhoods. Besides the age of the respondents, the researcher also considered the number of years spend in Gweru City. This has also a bearing on urban green space use and provision. Thus, the following section factored in the number of years a resident resided in Gweru.

4.2.3 Years Spent Living in Gweru

The third demographic variable sought to establish the number of years that the respondents had been staying in Gweru. The respective distribution by the number of years residing in Gweru is presented in Table 4.3. From the outcome, considering respondents from the high-density suburbs, the modal category comprised 32.6% who had 31-40 years of stay in Gweru, seconded by 32.5% who stayed in Gweru for 21-30 years. Effectively, a cumulative total of 25% of the respondents in the high-density areas resided in Gweru for up to 20 years and 90% for up to 40 years. Only 10.0% resided in Gweru for more than 40 years. Concerning respondents from medium-density suburbs, the highest category comprised 31.4% of the respondents who had been residing in Gweru for 21-30 years, and this was followed by 25.3% who resided in Gweru for 11-20 years, while those who had been residing for more than 40 years were 17.2% and 14.5% for those who had been residing for 31-40 years.

Table 4.3: Distribution of respondents by years residing in Gweru City

Residential Area	Years	Frequency	Per cent	Valid Per cent	Cumulative Per cent
High-density	<10	80	10.0	10.0	10.0
	11-20	120	15.0	15.0	25.0
	21-30	260	32.5	32.5	57.4
	31-40	261	32.6	32.6	90.0
	>40	80	10.0	10.0	100.0
	Total	801	100.0	100.0	
Medium-density	<10	80	11.6	11.6	11.6
	11-20	175	25.3	25.3	36.9
	21-30	217	31.4	31.4	68.3
	31-40	100	14.5	14.5	82.8
	>40	119	17.2	17.2	100.0
	Total	691	100.0	100.0	
Low-density	<10	40	8.0	8.0	8.0
	11-20	59	11.8	11.8	19.9
	21-30	160	32.1	32.1	52.0
	31-40	140	28.1	28.1	80.1
	>40	99	19.9	19.9	100.0
	Total	498	100.0	100.0	

The least observed were those who had been residing in Gweru for less than 10 years and these were 11.6%. Lastly, regarding respondents from the low-density areas, the modal category was those within the 21–30-year category and these were 32.1%, followed by the respondents in the 31–40-year category whose proportion was 28.1%. Those who had been staying in Gweru for more than 40 years were 19.9%, followed by 11.8% who had been staying for 11-20 years, and lastly, those with less than 10 years of stay in Gweru. Overall, there were more respondents from the medium-density who had stayed in Gweru for up to 30 years (68.3%) as compared with those in the high-density areas (57.4%) and those in the low-density areas (52.0%). This finding might be a result of the creation of more medium-density suburbs over the past two decades in Gweru at a rate that is faster than the expansion of low-density and high-density suburbs.

Generally, the results show that most of the respondents have stayed for at least 21 years in Gweru across all the suburbs. Effectively, these respondents have witnessed the demise of urban green spaces over the past two decades. In other words, in one way or another, these respondents are responsible for the destruction of green spaces in the city. Therefore, the longer one spent in an area the higher the probability that at one point in time, the resident has manipulated the green spaces leading to their demise. Apart from the number of years an individual stayed in Gweru, the researcher decided to ask the respondents about the size of dwelling units. This was because of the sizes of the stand (less than 300km^2) allocated to residents by both the council and the real estate agencies. The analysis is carried out below.

4.2.4 Size of Housing Units and Green Spaces

The respondents were asked to identify the size of their stands, which ranged from less than 300m^2 up to 1000m^2 or more, and the results are presented in Table 4.4. From the findings, regarding the high-density suburbs, none of the respondents had a size stand that was more than 500m^2. The majority (82.5%) had sizes of stands that were less than 300m^2, while the remaining 17.5% had sizes of stands that ranged between 300 and 500m^2. As for the medium-density suburbs, none of the respondents had a size stand that was less than 300m^2. Rather, the modal category which comprised 68.2% had stand sizes ranging from 300 to 500m^2, while the remaining 31.8% were stand sizes that ranged between 500 and 800m^2. Lastly, concerning the low-density suburbs, none of the stand sizes was below 800m^2.

Table 4.4: Distribution of respondents by the size of stand

Residential Area	**Size of stand**	**Frequency**	**Per cent**	**Valid Percent**	**Cumulative Percent**
High-density	<300	661	82.5	82.5	82.5
	300-500	140	17.5	17.5	100.0
	Total	801	100.0	100.0	
Medium-density	300-500	471	68.2	68.2	68.2
	500-800	220	31.8	31.8	100.0
	Total	691	100.0	100.0	
Low-density	801-1000	278	55.8	55.8	55.8
	>1000	220	44.2	44.2	100.0
	Total	498	100.0	100.0	

Source: Author

The majority (55.8%) ranged between 801 and 1000m^2, while 44.2% were more than 1000m^2 in size. From the foregoing, it appeared that the size of the stand increased as we transitioned from the high-density to low-density suburbs.

The size of the stands has a huge bearing on the provision of urban green spaces in Gweru City. Imagine a family of six needing a spacious space to construct a five-roomed house to accommodate their children. A family can have both boys and girls and these require two separate bedrooms. Besides, the parents also need theirs and with a small stand of less than 300m^2, that cannot be achieved. As such, the family would build a five-roomed house on that small-sized stand (Figure 4.1).

This destroys the establishment of green spaces yet the green spaces offer many benefits as enunciated in Chapter 2. The family cannot afford to leave a space for a domestic vegetable garden. However, the researcher observed that there were infill houses with similar sizes to the medium-density suburb (300-500m^2). The implication of small stands that cannot accommodate green spaces is that the city council should educate people to green-roof their houses so that the spatial distribution of the green spaces is enhanced. Once that is achieved, the city becomes smart, attractive, and liveable. The researcher asked an official from Real Estate why the parcel stands that are less than 300 km^2 in size. The respondent pointed out that they follow the colonial system where small houses were meant for singles and not for huge families. Ever since that period, the policy has not changed. This implied that the green spaces could not expand due to the large family of, say, six that need to be accommodated.

Figure 4.1: Small-size packed houses in Woodlands high-density suburb (Source: Fieldwork)

Once that is achieved, the city becomes smart, attractive, and liveable. The following section gives a detailed discussion of the influence of demographic analysis on the demise of green spaces in Gweru City.

4.2.5 Discussion: Demographic Profile and the Demise of Green Spaces

The main reason for analysing the demographic profile of the residents of Gweru City was to assess how it influences the demise of green spaces. The results have indicated that some demographic variables have a strong bearing on the use, provision, and demise of green spaces in the city. The study revealed three outstanding standing variables that trigger the demise of green spaces in Gweru City. These three are the gender of respondents, the age of respondents, and the sizes of stands, particularly in the high-density suburbs of Mkoba, Woodlands, Nehosho, Mambo, Ascot, and Mtapa.

The results have indicated that males dominated the use of green spaces in the city because they are more mobile than females. Females incline themselves to household chores and rarely visit recreational areas unless they are carrying out political and educational discussions. They frequently use green spaces on Sundays when they nourish their souls. After the church survives, they return to their respective places of residents. These findings are in agreement with a study carried out by Li et al. (2020) and Wu et al. (2020) in Chinese cities. In their discovery, they pointed out that men enjoy the use of green spaces more than females. However, an official from EMA said women use green spaces more than men as they spent most of their time gardening. This resonates well with a study that was carried out by Sang et al. (2016) in the city of Gothenburg, Sweden. In their study on the effects of naturalness, gender, and age on how urban green space is perceived, they discovered that women were more active than men. Similarly, the study by Phillips, Klein, and Canters (2021) on the use-related and socio-demographic variations in urban green space preferences in Brussel's Capital Region, revealed an overwhelming response from the women on the use of green spaces than their male counterparts. Brace et al. (2021) and Richardson and Mitchell (2010) shared the same experience that women perceive green spaces more than men. This is in sharp contrast with the Zimbabweans in Gweru City as highlighted in the number of respondents who favoured men more than women.

The age of respondents had also a bearing on the provision, use, and demise of green spaces in the city of Gweru. The results have shown that Gweru City is dominated by the youth in the 30-40 years category. These were discovered to be active in the use of green spaces but inactive in the conservation and establishment of green spaces. Green spaces need proper maintenance, conservation, and replenishment once they are destroyed. Their conservation and establishment can be achieved if the youth are involved in the planning of such green spaces. Leaving such important people who constitute the bulk of the population in urban areas is a major drawback in the sustainable management of green spaces in any city in the world. A study by Farkas, Kovacic, and Cosmos (2021) on the use of green spaces had similar results. In their study in the city of Budapest (Hungary), they discovered that the youth dominated the use of green spaces more than the elderly people. However, this is in sharp contrast with Sang et al. (2016) who discovered that the oldest people use green spaces more than the youth in their study in the City of Gothenburg (Sweden).

Despite the heterogeneous nature of the three types of suburbs in Gweru City, the respondents had similar characteristics in terms of the variables discussed. For example, male respondents dominated across all suburbs. Moreover, despite their age categories the youth dominated in all suburbs. This was unusual especially in low-density suburbs because the majority of the youth migrate straight from rural areas to high-density suburbs where they can readily find accommodation. The researcher expected to witness an aged population dominating the low-density suburb. The possible reason for this anomaly is that most people have either died or migrated outside the country looking for greener pastures. As a result, the youths were left manning the residential area but at the expense of the provision of green spaces as they cannot maintain them. The only area where heterogeneity results were discovered was in the size of the stands and this was expected.

The findings imply that the government through the Ministry of Primary and Secondary Education (MoPSE) and stakeholders should come together and encourage the sustainable management of green spaces regardless of the age of the population. In doing so, the city can achieve, not only, its vision of a smart city by 2030 but it can be liveable and attractive even to tourists. In addition, the youth must not be left aside during policy formulation as they can also voice their concerns and expectations. Some latent by-laws restrict the establishment of green spaces in the city. One of the restrictive by-laws is the allocation of small stands (150m^2). Such stands cannot have space for a domestic garden. Therefore, such by-laws need to be removed.

The potential limitation of this objective of the study is gender bias; respondents were predominantly males. Females in Zimbabwe, according to the Zimbabwean census of 2022, are more than males. As such, they should be at the forefront of preventing the demise of urban green spaces in Gweru in particular and Zimbabwean cities in general. The other potential limitation is the shortage of literature that particularly focuses on the influence of the demographic profile on the demise of green spaces. It is, therefore, important to investigate the influence of the demographic profile on the use, provision, and demise of green spaces. However, the results remained valid as the female respondents concur on the bearing of demography on green space provisions in Gweru City. The following section summarises this chapter.

4.3 SUMMARY

In this chapter, the focus was on the demographic analysis of Gweru residents and their potential influence on the availability and usage of green spaces. Indeed, it has been discovered that demographic variables such as gender, age, years spent in the city, and the size of housing units had a bearing on the availability and usage of green spaces. It has been discovered that despite women's low response rate due to cultural factors, they are the ones that use the green spaces most. In terms of age, it has been revealed that Gweru City is composed of the youth and as such, they also consume green spaces more than other age groups-children and elderly people. It has also been revealed that the greater the number of years, the greater the consumption of green spaces in the city. Besides gender, age, and years spent in the city, the size of housing units was also taken on board. It was discovered that the Real Estate follow the colonial system in allocating small stands and that had a huge bearing on the availability and usage of green spaces in the city. The following chapter focuses on the dynamic, drivers, effects, stakeholders' involvement, and sustainable management of green spaces in Gweru City.

CHAPTER FIVE: DRIVERS, PRESSURES, CONDITIONS, IMPACT, AND SUSTAINABLE MANAGEMENT OF GREEN SPACES

5.1 INTRODUCTION

This chapter follows the methodological framework and the demographic analysis laid out in the preceding chapters to investigate the research questions. This chapter covers six key components. The first component discussed is the urban green spaces dynamics in Gweru City over the past two decades (2000-2019); followed by the drivers of green spaces depletion in Gweru City over the past two decades (2000-2019); while the third component shall be the pressures of green spaces depletion in Gweru City over the past two decades (2000-2019). The fourth component to be covered will be the state/conditions of green space demise in Gweru City over the past two decades (2000-2019), fifth focuses on the impact of green space demise in Gweru City over the past two decades. Lastly, the final component considers the sustainable management of green spaces in Gweru City. These components represent the objectives/research questions that are noted in chapter one. At the end of each section, a discussion of the findings ensues.

5.2 SPATIO-TEMPORAL DYNAMICS OF URBAN GREEN SPACES IN GWERU CITY

5.2.1 Land Use and Land Cover Images

Four major land use and land (LULC) types (waterbody, green spaces, bare ground, and built-up area were classified for the years 2000, 2005, 2009, 2015, and 2019. The results confirmed that the total area of Gweru City was 16451km^2. The aerial coverage and the percentage coverage of each LULC for the five epochs (2000, 2005, 2009, 2015, and 2019) are summarised in Table 5.1. The Landsat image of 2000 showed that the green spaces were the third least aerial coverage of the total area with 17%. The dominant LULC was the built-up area that covered approximately

48% of the total area under study. This was followed by the bare ground which covered 35% of the total area of Gweru City (Table 5.1 and Figure 5.1).

Table 5.1: The distribution of land use and cover in Gweru City

Class	**Class cover (km^2)**									
	2000		**2005**		**2009**		**2015**		**2019**	
	A	**%**	**A**	**%**	**A**	**%**	**A**	**%**	**A**	**%**
WB	18	0	15	0	12	0	7	0	5	0
GS	2813	17	2101	13	1981	12	1020	6	893	5
BG	5718	35	4814	29	4051	25	3022	18	2147	13
BA	7902	48	9521	58	10407	63	12402	75	13406	81
Total	16451	100	16451	100	16451	100	16451	100	16451	100

WB-water body, GS-green spaces, BG-bare ground, BA-built-up area

Similarly, in 2005, the built-up area covered 58% of the total area. This was followed by bare ground and green spaces which occupied 29% and 13% respectively. The last aerial coverage was the waterbody that occupied approximately 0% (Table 5.1 and Figure 5.1). In 2009, again, the built-up area dominated the aerial coverage of Gweru City with 63%. The bare ground and green spaces occupied 25% and 12% respectively, whereas the waterbody covered 0% of the study area (Table 5.1 and Figure 5.2).

As for the year 2015, the greatest consumer of the total area under study was the built-up area which occupied 75%. This was followed by the bare ground and the green spaces that had an aerial coverage of 18% and 6% respectively. The waterbody remained the least with 0% aerial coverage (Table 5.1 and Figure 5.2). The Landsat image of 2019, shows that, once again, the built-up area dominated the aerial coverage of the city with 81%. This was followed by the bare ground and green spaces which covered 13% and 5% respectively. The water body remains suppressed at approximately 0% (Table 5.1 and Figure 5.3).

Generally, the results indicate that over the past two decades (2000-2019) under study, the green spaces' area coverage was shrinking. This confirms the researcher's observation that the green spaces in Gweru City were deteriorating at an alarming rate. It is interesting to note that over the two decades, the built-up area was expanding consuming other LULCs like the green spaces and the bare ground. The following section details the magnitude and annual rate of urban green space dynamics between the years (2000-2005, 2005-2009, 2009-2015, 2015-2019, and 2000-2019) and its dynamics.

5.2.2 Magnitude and Rate of Urban Green Space Dynamics

The magnitude and rates of urban green spaces were fluctuating over the two decades (2000-2019). Specifically, between 2000 and 2005, the urban green spaces decreased by 712 km^2 at an annual rate of -5.1% (Table 5.2).

Table 5.2: The magnitude and annual rate of urban green spaces dynamics

	Magnitude (km^2)					**Rate per annum (%)**				
Class	**00-05**	**05-09**	**09-15**	**15-19**	**00-19**	**00-05**	**05-09**	**09-15**	**15-19**	**00-19**
WB	-3	-3	-5	-2	-13	-3.3	-5.0	-6.9	-7.1	-3.8
GS	-712	-120	-961	-127	-1920	-5.1	-1.4	-8.1	-3.1	-3.6
BG	-904	-763	-1029	-875	-3571	-3.2	-4.0	-4.2	-7.2	-3.3
BA	1619	886	1995	1004	5504	4.1	2.3	3.2	2.0	3.7

WB-water body, GS-green spaces, BG-bare ground, BA-built-up area

Specifically, between 2000 and 2005, the urban green spaces decreased by 712 km^2 at an annual rate of -5.1% (Table 5.2 and Figure 5.1). To gain insight into the possible reasons for the decline in both the coverage and the annual rate of change, the researcher engaged an official from Real Estate. The official claimed that green spaces during this period declined due to the economic recession. According to the official, during the economic recession, most Zimbabweans migrated to foreign countries in search of a decent living. As such, such people remitted forex back home which was exposed to the "burning of money". "Burning money" is a form of currency arbitrage or illegal money changing where people sell hard cash to those desperate enough to pay a premium for it so that they can buy goods and services at cheaper prices.

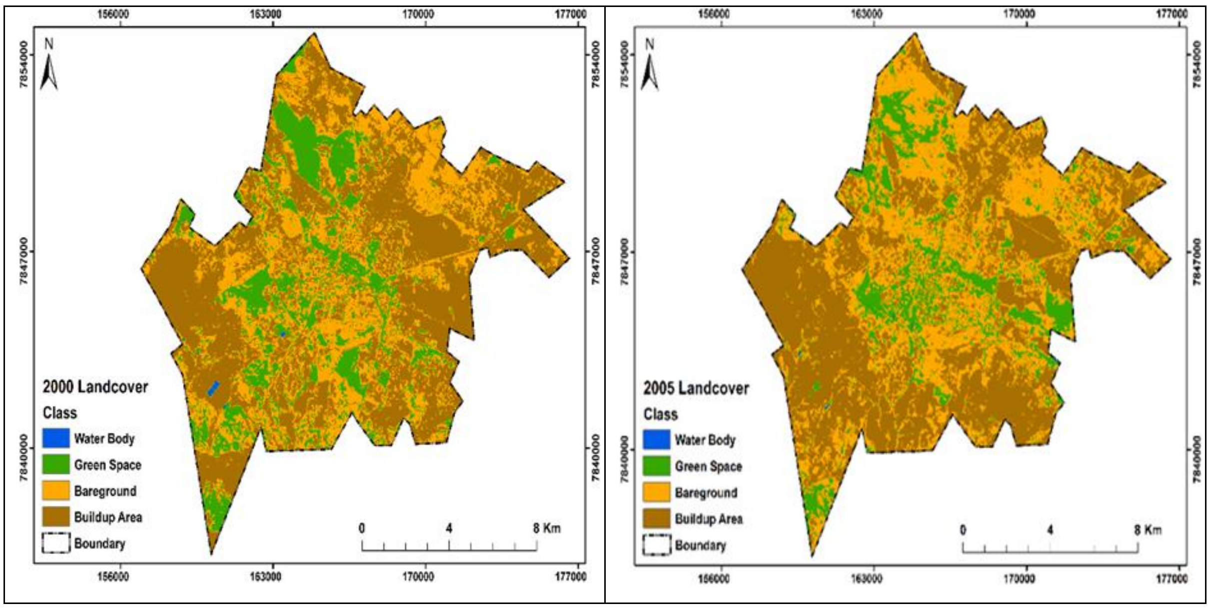

Figure 5.1: Urban green spaces dynamics between 2000 and 2005

According to the official, the housing stands became cheaper and those who had an opportunity to burn the money were able to buy several stands at a cheaper or reasonable price. Due to the high demand for accommodation, many houses were constructed albeit in small sizes (80m^2 to 150m^2), hence the demise of urban green spaces in Gweru City as the vegetation was cleared for house construction.

From 2005 to 2009, urban green spaces in Gweru City further declined by 120 km^2 at an annual rate of -1.4 % (Table 5.2 and Figure 5.2). To understand why urban green spaces further deteriorated during this epoch, the researcher engaged an official from the Department of Physical Planning. The official alluded to the decrease in green spaces due to the Operation Restore Order (ORO) of 2005. According to the official, ORO was a government statutory instrument that was created to clean up cities as slums were mushrooming everywhere in the city. Those slums had some vegetation cover. As such, due to that operation, people were forced to vacate the areas and, in the process, green spaces that had initially been planted were destroyed.

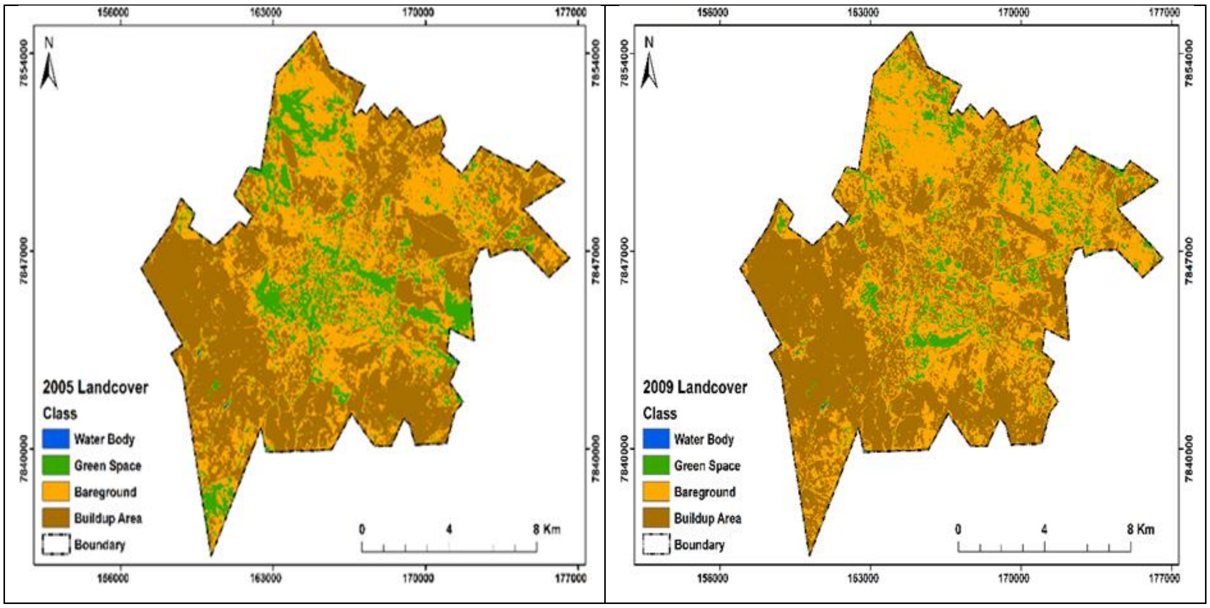

Figure 5.2: Urban green spaces dynamics between 2005 and 2009

In the epoch between 2009 and 2015, the magnitude of urban green spaces sharply decreased by 961 km^2 at an annual rate of -8.1% (Table 5.2). It is during this period (2009 and 2015) that the urban green spaces were decreasing at an alarming rate.

Commenting on the possible drivers of such a situation, an official from Environmental Management Agency alluded to the formation of the Government of National Unity (GNU) between the Zimbabwe Patriotic Front (ZANU-PF) led by the late Gabriel Mugabe and the then Movement of Democratic Change led by the late Morgan Tsvangirai. The formation of GNU ushered in the use of multiple currencies as legal tenders since the Zimbabwe dollar had collapsed beyond redemption. As such, the multicurrency system brought life to Zimbabwe, particularly the United States American dollar. According to the official, there was an upsurge in the demand for accommodation as many people migrated into urban areas. As for the official, the United States dollar enable people from across the divide to increase their buying power, as a result, the land was cleared to accommodate the then-ever-escalating demand for accommodation. However, an official from the Department of Parks and Community Services apportioned the blame to the political dissonance that was existing between the ruling and opposition party.

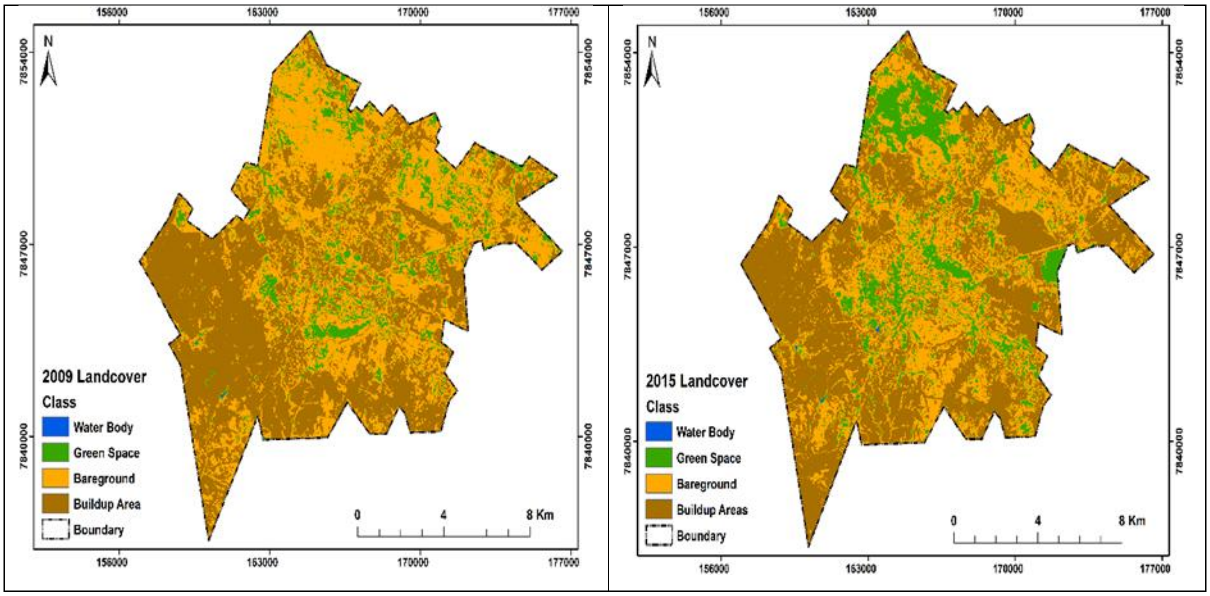

Figure 5.3: Urban green spaces dynamics between 2009 and 2015

According to the official, the dissonance stemmed from the fact that ZANU-PF being the ruling party and an overseer of local authority operations was interfering and parcelling land to people without following legal frameworks that bind the use of land in urban areas. Further, the official said that his party MDC was responsible for running the affairs of the municipality but was denied to do so due to interference from ZANU-PF. He accused the party of parcelling land on fragile lands such as waterbodies and wetlands. All this was carried out at the expense of green space provisions.

Overall, over two decades, the magnitude of green spaces declined by 1920 km^2 at an annual rate of -3.6% (Table 5.2). Generally, the urban green spaces in Gweru City have been deteriorating at an alarming rate. The researcher interviewed an official from the Department of Forestry to gather their views on why green spaces were deteriorating yet it is in their jurisdiction to educate and provide seedlings that can be used by the residents to establish green spaces in Gweru City. The official claimed that several factors cause green spaces to deplete. Lack of resources, immunity, and power cuts were cited as some of the causes of the demise of green spaces.

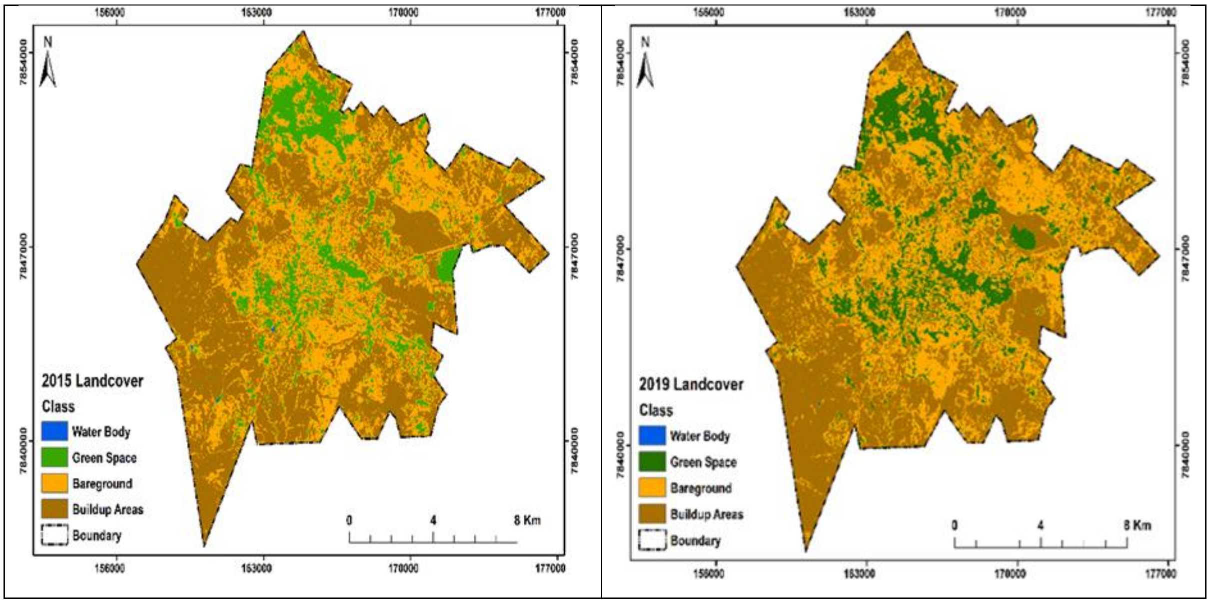

Figure 5.4: Urban green spaces dynamics between 2000 and 2019

In terms of resources, the official said the lack of transport to and from the suburbs limited their effort of educating on the importance of establishing green spaces in their neighbourhood. As for immunity, the official said there are people from the ruling party who are untouchable. People even if they are caught on the wrong side of the law, e.g., destroying the vegetation, are unceremoniously discharged from prison because they have political backing. Further, the official said that during the load-shedding period experienced during the country's economic recession (2005-2008), most residents relied on the immediate environment for energy, hence the destruction of urban green spaces in Gweru City.

To support the statistical computations, visual interpretation, and the data gathered from the key informants, the researcher decided to engage the residents to understand the conditions of urban green spaces in their neighbourhood. Due to the residents' diversity in terms of education level and geographical location, the researcher came up with a closed questionnaire (see Appendix A). The questions were derived from an extensive literature review from renowned high-impact journals such as African Geographical Review, Environmental Research and Public Health, Geojournal, Environmental Research, Cities, and Urban Forestry and Urban Greening among others. Thus, the following section focuses on the condition of urban green spaces in Gweru City.

5.2.3 Discussion: Urban Green Space Dynamics in Gweru City

Assessing the spatiotemporal dynamics of green spaces in Gweru City was the first objective of this study. The purpose of this objective was to determine the extent to which green spaces are disappearing in the city. Understanding the extent of green space disappearance is critical for the sustainable management of green spaces. To achieve this, the researcher used geospatial analysis, interviews, field observation, and questionnaires. The results indicated that the green spaces in Gweru City are declining which is an indication that the city is not in a healthy state. Green space disappearance meant that the area was fast urbanizing as the built-up area consumed a large chunk of the total land of Gweru City. The results also indicated that the city's water bodies (rivers, streams, and dams) are shrinking. These findings paint a gloomy picture as to whether the city will achieve its vision of becoming a smart city by 2030 let alone achieving sustainable development goal number 11 target 11.7. This goal expects cities to provide universal access to safe, inclusive, and accessible, green and public spaces, in particular for women and children, older persons, and persons with disabilities by 2030.

The aforementioned results were also experienced in other cities both in the Global North and Global South cities as urbanization has increased. A common pattern like this has been extensively documented. For instance, urban green spaces in Kumasi (Ghana), Beijing (China), Macau, Hong Kong (China), Kuala Lumper (Malaysia), Hanoi (Vietnam), Karachi (Pakistan), Greater Dhaka (Bangladesh), Mumbai (India) and Shanghai (China) have all declined in recent years (Nero, 2017; Ye et al., 2018; Xu et al., 2018; Wu et al., 2019). However, a five-year interval analysis of green spaces showed a fluctuation pattern. For example, the trend analysis of green spaces has shown that within the shortest period (2000-2009) they were gradually declining and abruptly increased between 2009 and 2019. Thus, trend analysis over a long period (2000-2019) doesn't give a clear picture of the rate and extent of green space deterioration. This calls for a periodical assessment of green spaces at short intervals of time, that is, five-year periods (Latifovic, Pouliot & Olthof, 2010; Mukwenyi et al., 2021).

Commenting on the results, various key participants came up with different narratives of the potential causes of the depletion of green spaces in the city. Operation Restore Oder (ORO) was cited as the major cause of the deterioration in green spaces. The other key participant highlighted that it was an escalating demand in housing that they decided to create $80m^2$ to $150m^2$ sized housing units as prescribed in circular number 20 of 2004 to meet the demand. That decision has a detrimental effect on the establishment of green spaces at the household level. No deterrent fines once a culprit has been caught destroying vegetation were cited as other causes of the depletion in Gweru City. Political orientation and interference (Mensah, 2014a) were also said to be hampering the effort of the local government to improve and conserve the green spaces in Gweru City. In short, there is dissonance among the organisation that is supposed to sustainably manage green spaces as attested by different views enunciated by key participants in the study.

To further understand the dynamics of urban green spaces in the study area, the researcher engaged Gweru residents to understand how they perceive the conditions of green spaces over the two decades (2000-2019). The overall conditions across the three strata were poor and the worst affected areas were wetlands, followed by private residences, along with public parks. Comparing the condition of green spaces across three strata, the worst rating was observed for the high-density suburbs, followed by low-density suburbs, and the better rated, albeit negative, being the medium-density. Venter et al. (2021) and Giombini & Thorn (2022) studied urban green spaces in South African cities and Namibia and discovered that the green spaces were different across suburbs.

The study implies that both the central and local governments should work together and be proactive in conserving and establishing UGS in Gweru City. Political dissonance and orientation should not override the importance of promoting sustainable ways of keeping the city smart through greening. Egocentrism should also be set aside as this affects the establishment of green spaces in the city. Thus, the by-laws need to be followed regardless of the political orientation one is aligned with. The residents need to be conscientious of the importance of establishing and sustainably maintaining green spaces for both the current and future generations. The city "fathers" in consultation with the Ministry of Local Governance should create a database that can be used to monitor land use and cover changes in the city using GIS and RS technology

The major constraint encountered in achieving the first objective was the limited capacity of the spatial resolution (30mx30m) to differentiate some spatial features. For instance, it was difficult to separate the spectral signature of the bare ground from that of built-up areas. Further, Table 3.1 and Figure 3.1 shows that the waterbody was insignificant throughout the study, yet some patches of it are visible on the maps. The other drawback was the information obtained from the key participants. Political orientation led to a biased interpretation of the data. Each key participant gave views that are in line with their political ideology and agenda. Thus, the information could have been skewed in favour of one's superiors. Another limitation was in the area of demographic analysis. The dominance of male respondents might affect the generalisability of this study. Females were not willing to participate in this study hence male dominance and this has a ripple effect on data analysis. A five-Likert-scale structured questionnaire could not give the respondents the latitude to explain their observations and perceptions. Nonetheless, the results are still valid and gave a glimpse of what is obtained on the ground. The research gave a snapshot of how the residents perceive the deterioration of green spaces in the City of Gweru. Further, the questionnaire results from Gweru residents were triangulated with geospatial analysis, interviews with key participants, and direct observation. This alone validated the results of the study.

Conclusively, the study assessed the spatio-temporal dynamics of UGS in Gweru City using an explanatory sequential design. The results revealed the deterioration of UGS in the City. This was also supported by the residents who reported UGS in their respective neighbourhoods was in a poor state. The key participants came up with different narratives as the potential drivers of the dearth of UGS in Gweru City. Chief among them, apart from urbanisation, was the political dissonance and orientation between the central government and the local authorities. The central government acts as an overseer of the events carried out by the local authorities. The central government is comprised of the ruling party (ZANU-PF) and the local authority is manned by the main opposition party (MDC). Therefore, there is a need for the two warring parties to bury their differences and work together to establish UGS for the good of the current and future generations. UGS is good for the city as it would become attractive and liveable.

5.3 DRIVERS OF URBAN GREEN SPACE DYNAMICS IN GWERU CITY

The objective of this study was to examine the key drivers of UGS's demise in Gweru City from households' perspective between 2000 to 2019 since they differ geographically in space and time. A total of 18 drivers had been identified from the literature are were considered in this study and these comprised of lack of environmental practices, inadequate funds, lack of collaborative governance, lack of strong policy support, different cultural practices, lack of green spaces database, political interferences, corruption, population growth, construction, transportation, poor urban planning, industrialisation, accessible markets, different lifestyles, climate change, local topography as well as poor law enforcement practices. The respondents were asked to rate these on a 5-point Likert scale and respective distributions across the three residential area types were analysed. The distribution of the drivers of green space depletion is presented in Table 5.3.

Table 5.3: Summary Statistics - Drivers of green spaces depletion across all suburbs

	High		Medium		Low		Overall	
Variable	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Lack of environmental practices	4.42	.646	4.13	.815	4.23	.775	4.27	.751
Inadequate funds	4.62	.555	4.75	.443	4.72	.469	4.69	.500
Lack of collaborative governance	4.10	.835	4.05	.849	4.08	.861	4.08	.847
Lack of strong policy support	4.01	1.232	3.99	1.510	3.95	1.482	3.99	1.397
Different cultural practices	3.20	1.302	3.70	1.182	3.52	1.255	3.46	1.268
Lack of green spaces database	3.44	1.370	4.03	1.253	3.80	1.332	3.74	1.346
Political interferences	3.60	1.373	3.85	1.196	3.68	1.258	3.70	1.290
Corruption	3.86	1.472	4.00	1.237	3.95	1.353	3.93	1.365
Population growth	4.27	.819	4.32	.701	4.31	.714	4.30	.753
Construction	4.46	.626	4.55	.591	4.52	.632	4.51	.616
Transportation	4.48	.644	4.29	.658	4.37	.650	4.39	.655
Industrialisation	4.62	.554	4.61	.552	4.61	.546	4.61	.551
Poor urban planning	3.70	1.486	3.56	1.423	3.55	1.487	3.61	1.466
Accessible markets	3.62	1.502	3.55	1.602	3.54	1.581	3.58	1.557
Different lifestyles	4.36	.872	4.14	1.373	4.23	1.220	4.25	1.158
Climate change	4.45	.856	4.21	1.387	4.34	1.221	4.34	1.160
Local topography	3.26	1.327	3.96	1.481	3.73	1.465	3.62	1.450
Poor law enforcement practices	4.52	.746	3.03	1.870	3.53	1.737	3.76	1.620

For high-density, all the 18 listed drivers were positively rated as key drivers of green space deletion since all had mean ratings above the mid-point. Industrialisation was rated as the major driver (M = 4.62; SD = 0.554) along with the inadequacy of funds (M = 4.62; SD = 0.555). These had the least standard deviations indicative of the little variability in the responses from the mean. The third highest driver was poor enforcement practices (M = 4.52; SD = 0.746), while the fourth highest was transportation (M = 4.48; SD = 0.644). These were followed by construction (M = 4.46; SD = 0.626), climate change (M = 4.45; SD = 0.856) and the lack of environmental practices (M = 4.42; SD = 0.646). On the other hand, the least rate related to the different cultural practices

(M = 3.20; SD = 1.302), and the second least rating was the local topography (M = 3.26; SD = 1.327).

For medium-density, all the ratings were above the mid-point and this confirms that all the listed drivers played a significant role in the depletion of green spaces in medium-density suburbs. The highest-rated driver was inadequate funds (M = 4.75; SD = 0.443) and this was followed by industrialisation (M = 0.461; SD = 0.552), while the third highest rating was construction (M = 4.55; SD = 0.591). Beyond these, there was a huge gap in the mean ratings, with the fourth highest being population growth (M = 4.32; SD = 0.701), followed by transportation (M = 4.29; SD = 0.658) and climate change (M = 4.21; SD = 1.387). On the other hand, the least rated driver of green space depletion in the medium-density suburbs was poor law enforcement practices (M = 3.03; SD = 1.870), and the second lowest was assessable markets (M = 3.55; SD = 1.602), while the third least rated driver was poor urban planning (M = 3.56; SD = 1.432). These results differed marginally from the results for the ratings of the drivers of green space depletion in the high-density areas, with the common drivers being inadequate funds, industrialisation, and construction.

Again, for low-density, all the drivers had mean ratings that were above the mid-point as in the other suburbs. This confirmed that all of the factors studied had an impact on the depletion of green spaces in the low-density suburbs. The highest rating was the inadequacy of funds (M = 4.72; SD = 0.469), while the second highest rated driver was industrialisation (M = 4.61; SD = 0.546) and the third was construction (M = 4.52; SD = 0.632). These were consistent with the drivers observed for the high-density suburbs as well as the medium-density suburbs. Beyond these three was a huge gap with the fourth highest being climate change (M = 4.34; SD = 1.221), followed by population growth (M = 4.31; SD = 0.714), lack of environmental practices (M = 4.23; SD = 0.775) and lastly, different lifestyles (M = 4.23; SD = 1.221). On the other hand, the least rating was different cultural practices (M = 3.52; SD 1.225), followed by poor law enforcement practices (M = 3.53; SD = 1.737), then accessible markets (M = 3.54; SD = 1.581) and poor urban planning (M = 3.55; SD = 1.487).

The overall ratings of the drivers of green space depletion across all three settlement types are presented in Table 5.3. From the findings, all the drivers were rated above the mid-point. The highest aggregate driver was the issue of the inadequacy of funds (M = 4.69; SD = 0.500) and the second highest driver was industrialisation (M = 4.61; SD = 0.551), while the third was construction (M = 4.51; SD = 0.616). Transportation was ranked as the fourth highest aggregate (M = 4.39; SD = 0.665), followed by climate change (M = 4.34; SD = 1.160) and population growth, as the sixth highest driver (M = 4.30; SD = 0.753). On the other end, the least rated driver of green spaces depletion was the issue of different cultural practices (M = 3.46; SD = 1.268), followed by the accessibility of markets (M = 3.58; SD = 1.557), while the third least driver was poor urban planning (M = 3.61; SD = 1.466) and the fourth least driver was the local topology (M = 3.62; SD = 1.450). These results do show that despite being the least rated, their mean ratings were high enough to show that they were still significant drivers. The following section focuses on the exploratory factor analysis of urban green space depletion in Gweru City.

5.3.1 Exploratory Factor Analysis

The second research objective sought to establish the key drivers of green space depletion and to achieve this, the researcher considered the use of exploratory factor analysis (Taherdoost, Sahibuddin & Jalaliyoon, 2022). In this regard, to validate the use of factor analysis, the Kaiser-Mayor-Olkin test (KMO) for the adequacy of the sample as well as Bartlett's Test of Sphericity was the main assumption that was tested (Garson, 2012). According to Garson (2012) and Madongwe and Jaravaza (2016), the ideal KMO statistic should be greater than 0.50, while Bartlett’s test p-value ought to be significant at $p<0.05$. In the results, KMO = 0.879, and in this regard, the researcher confirmed that the data used for the factor analysis met the sampling adequacy requirement. Regarding Bartlett’s test for sphericity, $\chi^2(153) = 28695.809$; p =

0.000<0.05. This confirmed that Bartlett's test of sphericity assumption was not violated. Effectively, having validated both assumptions, EFA was carried out.

To extract the factors from the 18 items, the researcher used Principal Axis Factoring (PAF) as the extraction method. This selection was largely a result of the fact that the focus was on the identification of factors as opposed to the dimension reduction, which would have required the use of the Principal Component Analysis (PCA) (Fan et al., 2018; Kherif & Latypova, 2020; Gewers et al., 2021). However, to optimize the extraction and minimize the possibility of cross-loadings, the researcher made use of factor rotation (Goretzko, Pham & Bühner, 2021), and of the possible rotation methods, the researcher did not assume a high correlation between the constructs and thus the need to use an orthogonal rotation method, specifically, the Varimax rotation, instead of the oblique methods (Shrestha, 2021; Howard & Henderson, 2023). According to Brown (2015) and Szczepanik et al. (2021), using the Guttman-Kaiser criterion, the eigenvalues ought to be greater than 1.0, and from the results above, there were only three factors extracted whose eigenvalues were greater than 1.0. The resultant total variance explained is presented in Table 5.4.

The highest was Factor 1, whose eigenvalue was 6.964 and the percentage of the rotated sums of square loadings (RSS) variance was 37.474% (unrotated ESS = 38.68%). The second highest eigenvalue was 3.070 for Factor 2 and the corresponding rotated sums of square loadings (RSS) percentage variance was 17.956% (unrotated ESS = 17.055%). The third factor had an eigenvalue of 1.632 whose corresponding rotated sums of square loadings was 9.382% (unrotated ESS =9.069%). Overall, the cumulative percentage variance that was explained by the three factors was 64.811% which is higher than the minimum prescribed 50% (Shrestha, 2021; Szczepanik et al., 2021), this confirmed the validity of the extracted factors.

Table 5.4 Total Variance - Drivers of urban green spaces depletion

	Initial Eigenvalues			**ESS Loadings**			**RSS Loadings**		
Factor	**Total**	**% Of Variance**	**Cumulative %**	**Total**	**% Of Variance**	**Cumulative %**	**Total**	**% Of Variance**	**Cumulative %**
1	6.964	38.688	38.688	6.964	38.688	38.688	6.745	37.474	37.474
2	3.070	17.055	55.743	3.070	17.055	55.743	3.232	17.956	55.430
3	1.632	9.069	64.811	1.632	9.069	64.811	1.689	9.382	64.811
4	.996	5.535	70.347						
5	.908	5.046	75.392						
6	.831	4.617	80.009						
7	.720	4.000	84.009						
8	.633	3.514	87.523						
9	.551	3.060	90.583						
10	.406	2.254	92.837						
11	.344	1.913	94.750						
12	.212	1.179	95.929						
13	.176	.980	96.909						
14	.150	.836	97.745						
15	.120	.666	98.411						
16	.110	.609	99.020						
17	.102	.568	99.588						
18	.074	.412	100.00						

Extraction Method: Principal Axis Factoring.

The extraction was rotated using the Varimax rotation. Lyyra, Leskinen, and Heikinaro-Johansson (2015), Shi, Maydeu-Olivares, and DiStefano (2018), and Kılıç, and Alcı (2022) and all concur that the standard cut-off point for the inclusion criteria of the extracted factors 0.50. The rotated factor matrix is presented in Table 5.5. From the outcome, 8 of the items were loaded under Factor 1, while 7 were loaded under Factor 2 and Factor 3 only comprised three items (Table 5.5).

Table 5.5: Rotated Factor Matrix - Drivers of urban green spaces depletion

	Factor		
Variable	**1**	**2**	**3**
Political interferences	**.920**	.015	.147
Poor urban planning	**.917**	-.037	.081
Corruption	**.879**	.075	-.202
Lack of strong policy support	**.867**	.053	-.151
Lack of green spaces database	**.862**	-.027	.205
Poor law enforcement practices	**.858**	.103	.008
Lack of collaborative governance	**.734**	-.126	.334
Lack of environmental practices	**.549**	-.050	-.085
Construction	.120	**.840**	-.287
Transportation	-.218	**.836**	-.037
Different lifestyles	-.113	**.823**	.243
Accessible markets	.135	**.744**	.012
Industrialisation	.190	**.733**	-.080
Different cultural practices	-.139	**.698**	-.059
Population growth	-.184	**.634**	.298
Climate change	-.256	-.035	**.777**
Local topography	-.139	-.147	**.769**
Inadequate funds	-.073	.007	**.722**

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.

Factor 1 - Administrative Deficiencies (AD): Factor 1 is comprised of the following drivers: political interferences, poor urban planning, corruption, lack of strong policy support, lack of green spaces database, poor law enforcement practices, lack of collaborative governance, and lack of environmental practices. These all relate to policy, legislative, and governance factors that drive the depletion of green spaces mainly as a result of the complacency, ignorance, or incompetency of the authorities to manage the environment and hence: Administrative Deficiencies.

Factor 2 - Human Activities (HA): The second factor is comprised of 7 drivers, that is, construction, transportation, different lifestyles, accessible markets, industrialisation, different cultural practices, and population growth. These are all related to the social and economic activities by humans that led to the depletion of green spaces and hence the name: Human Activities.

Factor 3: Geological Influence (GI): This third factor comprised only three drivers, that is, climate change, local topography, and inadequate funds. While inadequate funds seemed to be misplaced, the remaining two related to geological phenomena and hence the label: Geological Influence. However, the issue of inadequacy of funds likely pertained to the needed wherewithal for conservation activities in which case, this driver would befittingly be classified under this factor.

Reviewing the earlier findings, it is evident then that the primary driver of green space depletion in Gweru was administrative deficiencies, which explained 37.474% of the variance, followed by human activities which explained 17.956% of the variance, and finally, the geological influence which explained 9.382% of the variance. The following section discusses the confirmatory factor analysis of the drivers of urban green space depletion.

5.3.2 Confirmatory Factor Analysis

Having successfully carried out the EFA, according to Roy et al. (2016), Darlington and Hayes (2017), and Shi et al. (2018), it was imperative to test for the construct validity. This was done by using the confirmatory factor analysis (CFA) in two stages, with the first being the assessment of convergent validity and the second being the assessment of discriminant validity. For a construct to meet convergent validity, all the items should have path coefficients that are greater than 0.6, if unstandardized, and 0.4, if standardised (Schumacker and Lomax, 2016). On the other hand, the covariances for discriminant validity should not be less than 0.85 (Heck and Thomas, 2015; Loehlin and Beaujean, 2017). Construct validity was tested using IBM SPSS Amos, which uses the covariance-based approach in place of the variance-based approach because the sample size used (1990) was greater than the minimum allowed (200) for measurement modelling (Brown, 2015; Gana and Broc, 2019). The measurement model is illustrated below (Figure 5.5).

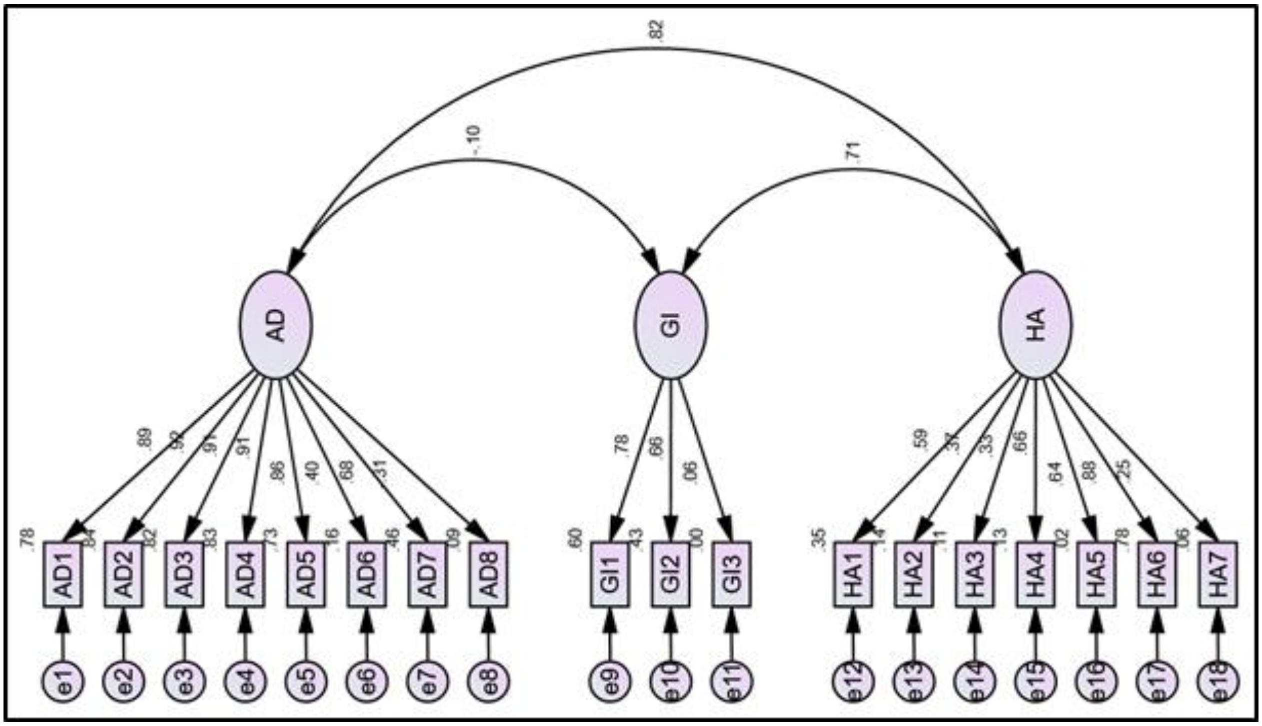

Figure 5.5: CFA - Drivers of urban green spaces depletion

The full outcome of convergent validity testing is presented in Table 5.6. From the outcome, out of the 8 items for the construct Administrative Deficiencies (AD), only one did not meet the standardised convergent validity threshold of 0.40 and this was AD8 (β = 0.308) and was subsequently dropped. For the Geological Influence construct (GI), again one item did not meet the required threshold, that is, GI3 (β = 0.059), and this was dropped. Lastly, as for the Human Activities (HA) construct, three items did not meet the required threshold and were dropped, that is, HA2 (β = 0.372), ha5 (β = 0.141) as well as HA7 (β = 0.253). By excluding these items, the convergent validity was met by the remaining items (Brown, 2015).

Table 5.6: Convergent Validity – Drivers of urban green spaces depletion

			Estimate	Standardised	S.E.	C.R.	P
AD1	<---	AD	1.000	.885			
AD2	<---	AD	1.178	.918	.018	63.970	***
AD3	<---	AD	1.083	.906	.017	61.920	***
AD4	<---	AD	1.113	.909	.018	62.554	***
AD5	<---	AD	1.009	.856	.018	54.576	***
AD6	<---	AD	.667	.400	.030	18.625	***
AD7	<---	AD	.601	.675	.014	36.135	***
AD8	<---	AD	.202	.308	.014	13.983	***
GI1	<---	GI	1.000	.775			
GI2	<---	GI	1.063	.659	.032	33.341	***
GI3	<---	GI	.033	.059	.012	2.772	.006
HA1	<---	HA	1.000	.591			
HA2	<---	HA	.374	.372	.022	16.651	***
HA3	<---	HA	.771	.630	.018	14.933	***
HA4	<---	HA	.714	.659	.019	16.132	***
HA5	<---	HA	.103	.141	.016	6.630	***
HA6	<---	HA	1.832	.882	.057	31.910	***
HA7	<---	HA	.392	.253	.033	11.703	***

HA=Human Activities, GI= Geological Influence, and AD= Administrative Deficiencies

The results of the discriminant validity testing are presented in Table 5.7.

Table 5.7: Discriminant Validity – Drivers of urban green spaces depletion

			Estimate	Standardised	S.E.	C.R.	P
AD	<-->	GI	-.103	-.101	.028	-3.643	***
AD	<-->	HA	.705	.825	.034	20.787	***
GI	<-->	HA	.476	.707	.027	17.911	***

From the outcome, the maximum standardised covariance was 0.825, between administrative deficiencies (AD) and human activities (HA). This showed that there was a relatively high relationship between the two. However, since neither of the covariances exceeded the maximum threshold of 0.85, it is evident that the discriminant validity assumption was not violated (Heck and Thomas, 2015; Loehlin and Beaujean, 2017). With both convergent validity and discriminant validity having been met, the researcher concludes that the overall construct validity was confirmed (Acock, 2013; Loehlin and Beaujean, 2017). The following section focuses on the reliability analysis of urban green space depletion.

5.3.3 Reliability Analysis

Having established the validity of the research constructs, the last validation stage was the need to test for their internal consistency. Hajjar (2018) argue that for the study to be considered reliable, it was imperative to test for the reliability of these constructs. Amirrudin, Nasution, and Supahar (2021) recommend the use of Cronbach's alpha for the determination of reliability. To this effect, this analysis was carried out and the standard acceptable threshold for the alpha that this research considered was 0.70 (Adeniran, 2019). Further, to determine the acceptable items for every construct, the corrected item-total correlation coefficient was considered, and the minimum allowed threshold used was 0.30 (Nelis et al., 2019). For the determination of reliability, Administrative Deficiencies now had 7 items, while Human Activities now had 4 items and Geological Influence had 2. The results from the reliability analysis are presented in Table 5.8 below.

Table 5.8: Reliability Testing - Drivers of urban green spaces depletion

Variables	Cronbach's Alpha	N of Items
Administrative Deficiencies	.795	7
Human Activity	.814	4
Geological Influence	.772	2

From the findings, Cronbach's alpha for administrative Deficiencies was α = 0.795, while for human activities, this was α = 0.814 and lastly, for Geological Influence, this was α = 0.772. It is evident that none of the reliability statistics was less than the required minimum threshold of 0.70 and according to Pallant (2020), this confirms that all the constructs used in this study were reliable. The following section describes the overall analysis of the drivers of urban green space depletion.

5.3.4 Overall Analysis - Drivers of Urban Green Spaces Depletion

Having confirmed three distinct broad drivers of urban green space depletion, that is, administrative deficiencies, human activity, and geological influence, the researcher sought to establish the extent to which each of the three factors is across the three residential types. The summary statistics are presented in Table 5.9. The results show that for the high-density areas, human activity was the main cause of the depletion of green spaces (M = 4.14; SD = 0.471), followed by administrative deficiencies (M = 4.030; SD = 0.727) and then lastly, geological influence (M = 3.856; SD = 0.841).

Table 5.9: Overall analysis - Drivers of urban green spaces depletion

Residential Area	High		Medium		Low	
Variable	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Administrative deficiencies	4.030	.727	3.933	.642	3.944	.696
Human activity	4.144	.471	4.168	.429	4.159	.434
Geological influence	3.856	.841	4.087	1.354	4.032	1.204

Similarly, for the medium-density suburbs, the main driver for urban green spaces depletion was again human activity (M = 4.168; SD = 0.429), followed by geological influence (M = 4.087; SD = 1.354) and the least were administrative deficiencies (M = 3.933; SD = 0.642). Lastly, for the low-density areas, again, human activity was ranked as the highest cause of green spaces depletion (M = 4.159; SD = 0.434), while geological influence was the second highest (M = 4.032; SD = 1.204), and the least were administrative deficiencies (M = 3.944; SD = 0.696).

To shed light on the drivers of urban green space depletion, the researcher interviewed an official from the DDP. An official from the DPP claimed that there are administrative changes they face when it comes to delineating areas meant for housing construction. The official further pointed out that one of the major challenges was the continuous use of Master Plans which were created four decades ago. In addition, the official said they don't have a model to follow in terms of establishing green spaces in the city. The official advocated for the adoption of a spatial planning framework as well as a green planning model to shed off the challenges associated with the depletion of green spaces. The following section presents the discussion on the drivers of urban green spaces depletion in Gweru City

5.3.5 Discussion: Drivers of Urban Green Spaces in Gweru City

The objective of this study was to examine the key drivers of UGS's demise in Gweru city from households' perspective between 2000 to 2019 since they differ geographically in space and time. To achieve this, a questionnaire was developed using information gathered from scholarly articles in renowned journals. A total of 18 items were investigated using exploratory factor analysis (EFA). The KMO and Bartlett's tests were not violated, along with the commonalities. From the varimax rotation, three factors were extracted. The first factor was administrative deficiencies and this comprised of political interferences, poor urban planning, corruption, lack of strong policy support, lack of green spaces database, poor law enforcement practices, lack of collaborative governance, and lack of environmental practices. The second factor was labelled human activities and this comprised construction, transportation, different lifestyles, accessible markets, industrialisation, different cultural practices, and population growth. Lastly, the third driver of urban green space depletion was the role played by geological phenomena, that is, climate change and local topography. Confirmatory Factor Analysis (CFA) was carried out and the three factors were confirmed using both convergent validity and discriminant validity. Concerning the three major drivers, human activity played the greatest role in the depletion of green spaces in high-density suburban areas followed by administrative deficiencies. On the other hand, for the medium-density suburbs, human activity and geological factors played the greatest role, and this was the same for the low-density suburbs.

These results from households' perspectives resonate with studies elsewhere in the world. For example, a study by Byomkesh et al. (2012) in Great Dhaka (Bangladesh), has shown that human factors such as population growth driven by rural-urban migration were behind the demise of urban green spaces demise. They also discovered that administrative factors such as lack of policy, low political motivation, and poor management were chief culprits which led to the demise of green spaces in the city of Greater Dhaka. In South Africa (Eastern Cape), Shackleton and

Njwaxu (2021) discovered that a lack of community engagement triggered the demise of green spaces. In Zimbabwe (Gweru City), Matsa et al. (2020a), discovered both human activities and administrative challenges as the main triggers of the depletion of green spaces in the city. In Ghana (Kumasi City), Mensah (2014b) blamed the demise of green spaces in the city on both human activities and administrative challenges. Similarly, a study by Colding et al. (2020) highlighted that human activities and administrative challenges are responsible for the demise of green spaces. Furthermore, a study in China (Shanghai City) by Wu et al., (2019) revealed a similar pattern to this study as they discovered that human activities and administrative deficiencies were responsible for the fragmentation of green spaces. These studies buttressed the results discovered in this study. However, geological factors discovered in this study received little to no attention in the literature review carried out. Effectively, this is new knowledge that geological factors such as climate change and local topography have an impact on the provision of UGS in the city of Gweru as attested by the residents.

Empirically, the study has contributed knowledge to the limited research on the demise of green areas in Gweru and Zimbabwean cities in general. In doing so, the study has extended the literature review on the key drivers of green space depletion across the globe. In addition, the study has extended the importance of engaging the households in understanding their views on the demise of green spaces so that effective by-laws are formulated and observed by every resident in Gweru City. Practically, these results call for the central government, local authorities, and key government institutions such as the departments of physical planning, forestry and the Environmental Management Agency (EMA) to converge and come up with a binding policy that fosters sustainable management of green spaces in Zimbabwean cities. Besides, during the policy formulation, residents should be involved in the process as they are the custodians of green spaces. Failure to include residents in the demise of green spaces will remain a challenge until such a time the responsible authorities include them. Environmental education should be taught in schools as early as the Early Childhood Development (ECD) stage. There is a need to catch them young so that it becomes ingrained in them that green spaces need to be protected. Tree planting should be mandatory for every citizen. By doing so, planting trees and conserving them becomes a culture that should be upheld by residents regardless of political affiliation.

The use of a large sample size (1990) was the major strength of this study. A large sample size added weight to the robustness and the generalisability of the findings of the study. However, one of the major limitations encountered in this study was naming the factors. Thus, factors may not accurately reflect the variables within the factor. In addition, some variables are difficult to interpret because they load onto a different factor. For example, in this study, insufficient funds were loaded into geological influence where local topography and climate change belonged. In this case, the results from factor analysis can be difficult to match. The other limitation was the inequitable distribution of respondents in terms of gender. This study was more skewed towards male than female respondents. Females were rather reserved, hence most of the information gathered came from males. Generally, women don't give information because of the patriarchal nature of Zimbabwean society. Nevertheless, future studies can address these limitations by expanding the cities to be studied. Furthermore, future researchers may use other methods that represent the equal representativeness of respondents.

In conclusion, this research examined the drivers of urban green space demise in Gweru City from the residents' perspective between 2000 and 2019. It was carried out using a questionnaire that was developed after an extensive literature review that was extracted from the google scholar database. The results showed that human activities, administrative deficiencies, and geological influence are responsible for the demise of urban green spaces in Gweru City. It was envisaged that there was a need for collaborative work from the government, local authorities, residents, departments of physical planning, forestry, and EMA to formulate binding policies that should see everyone observe regardless of status. The residents should be given the mandate to govern their green spaces without interference from both the local authorities and central government.

5.4 PRESSURES OF URBAN GREEN SPACES DEMISE IN GWERU CITY

The third research objective sought to establish the pressures of green space depletion in Gweru City over the past two decades (2000-2019). Based on the literature review, 10 human activities responsible for the depletion of green spaces emerged, namely rapid population growth, rapid urbanisation, unplanned and unregulated urban expansion, poor spatial planning, poor waste management practices, wetland conversion, poverty, law enforcement lax, sand abstraction, and industrialisation. These were rated on a 5-point Likert scale, with 1-strongly disagreed and 5-strongly agreed and in this regard, the mid-point was 3.0. The results for the role played by the pressures in depleting green spaces in Gweru city are summarised in Table 5.10.

Table 5.10: Pressures of urban green spaces depletion in Gweru city

Residential area	**High**		**Medium**		**Low**		**Overall**	
Variable	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Rapid population growth	3.86	1.393	3.44	.962	3.51	1.041	3.63	1.188
Rapid urbanisation	3.41	.796	3.01	1.267	4.41	1.331	4.22	1.322
Unregulated construction	3.84	1.214	3.84	1.241	3.74	1.122	3.81	1.201
Poor spatial planning	3.68	.886	4.27	1.158	3.99	1.038	3.96	1.057
Poor waste management practices	3.18	.384	3.02	.131	3.09	.284	3.10	.301
Wetland conversion	3.55	.791	3.22	.464	3.37	.653	3.39	.673
Poverty	3.94	.925	3.35	.605	3.53	.764	3.63	.828
Law enforcement lax	4.11	1.181	3.50	.642	3.78	.999	3.82	1.012
Industrialisation	4.05	1.508	3.17	.653	3.46	1.164	3.60	1.246
Sand abstraction	3.21	.411	3.42	.549	1.35	.478	1.32	.487

The results show that all the pressures' ratings were greater than the mid-point and only one (sand abstraction) was below the mid-point. This shows that green spaces were affected by human activities (pressures). The highest rating was for law enforcement lax (M = 4.11; SD = 1.181), followed by industrialisation (M = 4.05; SD = 1.508). The rest, however, were rated above 3.0 with the least rating being the poor waste management practices (M = 3.18; SD = 0.384), the second least being sand abstraction (M = 3.21; SD = 0.411).

Like the high-density suburbs, at least all of the pressures were rated positively by the respondents from the medium-density suburbs and with the least being rapid urbanisation (M = 3.01; SD = 1.267). Despite being the least, this was only marginally above the midpoint suggesting that the pressure was simply moderate, but not high. The latter can be ascertained from the very high standard deviation which showed that there was a huge discrepancy in the responses. Apart from this, the rest of the pressures were rated above the midpoint with the highest being poor spatial planning (M = 4.27; SD = 1.158). On the other hand, the second least rated was the poor waste management practices (M = 3.02; SD = 1.131). This was marginally close to the mid-point 3.0 and this showed that virtually all the respondents strongly agreed as also seen from the very large standard deviation. The third least rated was industrialisation (M = 3.17; SD = 0.653), while the fourth least was the wetland conversion (M = 3.22; SD = 0.464).

In the low-density, all the pressures had a positive rating that was above the mid-point. Rather, the highest rating was for rapid urbanisation (M = 3.41; SD = 1.331), and greater than 3.0 meant that the majority of the respondents agreed. The rest of the pressures were rated strongly as well, with the least rating being for the role of poor waste management practices (M = 3.09; SD = 0.284). The second least rating was for sand abstraction (M = 3.35; SD = 0.478), while the third least-rated pressure was the wetland conversion (M = 3.37; SD = 0.653). Overall, the researcher argues that all the pressures had strong ratings suggesting that the pressures (human activities) caused the rapid depletion of urban green spaces in the low-density suburbs.

Overall, all the pressures (human activities) listed were rated above the mid-point as causing the depletion of green spaces in urban Gweru City. The highest rating was observed for rapid urbanisation (M = 4.22; SD = 1.322), followed by poor spatial planning (M = 3.96; SD = 1.057), and the third highest being law enforcement lax (M = 3.82; SD = 1.012). On the other hand, the least rated was poor waste management practices (M = 3.10; SD = 0.301), followed by sand abstraction (M = 3.32; SD = 0.487) and the third least being the wetland conversion (M = 3.39; SD = 0.673). The overall finding, however, all the pressures were causing the depletion of green spaces as evidenced by the high mean ratings which were all less above the midpoint.

5.4.1 Discussion: Pressures of Urban Green Spaces Depletion

The third research objective of this study was to establish the pressures of green space depletion in Gweru City over the past two decades (2000-2019). The study is important in filling the significant gaps in the literature. There have been limited studies in Zimbabwe on the demise of green spaces. Moreso, previous research did not deal with the pressures that lead to the demise of green spaces in Gweru City. Thus, there is a need for more recent data to describe the nature of the pressures that lead to the demise of green spaces in the study area. To achieve this, ten pressures were reviewed and these comprised rapid population growth, rapid urbanisation, unregulated construction, poor spatial planning, poor waste management practices, wetland conversion, poverty, law enforcement lax, industrialisation, and sand abstraction.

The results of this study show that there is a plethora of pressures responsible for the demise of green spaces in Gweru City. Specifically, in the high-density suburbs law enforcement lax emerged as the major pressure responsible for the demise of green spaces in the study area. Poor waste management practices appeared as the least pressure responsible for the demise of green spaces in the city. In the medium-density suburbs, poor spatial planning emerged as the major pressure responsible for the demise of green spaces in Gweru City. Correspondingly, rapid urbanisation became the least cause in the same area. In the low-density suburbs, rapid urbanisation emerged as the greatest threat towards the demise of green areas in the city and the least sand abstraction which was negatively rated. These results show the heterogeneity in respondents among Gweru residents hence it was prudent to carry out the study. Nevertheless, overall, rapid urbanisation emerged as the dominant pressure that causes the demise of green spaces across all the suburbs in Gweru City. Sand abstraction, on the other hand, emerged as the least pressure responsible for the demise of green spaces in the study area.

These findings support the DPSIR framework in that the framework provides a comprehensive approach to understanding the pressures related to the depletion of urban green spaces in Gweru City. The results resonate with the studies carried out in other cities such as Chandigarh in India (Bedi, Mahavir & Tripathi, 2020), Dhaka in Bangladesh (Chowdhury et al., 2021), Kumasi in Ghana (Essel, 2017; Abass et al., 2020), Mafikeng in South Africa (Munyati & Drummond, 2020), Harare in Zimbabwe (Matamanda et al., 2019). These studies revealed that rapid urbanisation is the chief pressure of urban green spaces' demise. Similar results were revealed by Abass et al. (2020) in Kumasi, Ghana. In addition, the results also have practical implications. For example, the key institutions responsible for urban planning in Zimbabwe may come up with sustainable measures that can promote sustainable management of green spaces in cities. Furthermore, the results call for an integrated approach to the sustainable management of urban green spaces.

Although the results filled important gaps in the literature, there are several weaknesses in the study that need to be addressed by future research. For example, the study focused on one chartered city. Thus, the findings cannot be generalized to other cities in the province and other provinces, especially in highly urbanised areas such as Bulawayo and Harare Metropolitans. The data is also limited in that males were the dominant respondents; therefore, it was skewed toward male voices. Nevertheless, future research can address these limitations by expanding the number of cities to be studied. Again, future researchers may use other methods like focus group discussions and the like to address the issue of pressures that causes the demise of green spaces in Zimbabwean cities. The following section presents results on the state or conditions of urban green spaces in Gweru City.

5.5 STATE OF URBAN GREEN SPACES DEMISE IN GWERU CITY

The fourth objective sort to assess the state/conditions of green space demise in Gweru City over the past two decades (2000-2019). The respondents were asked to rate the condition on a 5-point Likert scale with 5 representing very good and 1 representing very poor. As in the preceding scales, the mid-point was 3.0. The summary statistics across the three settlement types are presented in Table 5.11

Table 5.11: Conditions of green spaces in the residential area

Variable	High		Medium		Low		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Wetlands	1.20	.400	1.24	.486	1.17	.373	1.21	.427
Public parks	1.79	.428	1.98	.633	1.91	.577	1.88	.551
Private residences	1.36	.482	1.27	.508	1.27	.445	1.31	.484
Working area	1.61	.583	2.31	1.314	2.10	1.260	1.98	1.108
Learning institutions	1.59	.570	2.27	1.339	2.10	1.255	1.95	1.113
Main roads and streets	1.58	.863	3.15	1.501	2.63	1.554	2.39	1.472
Playing grounds	1.55	.843	3.00	1.504	2.48	1.437	2.28	1.410
Churches	1.93	.750	3.21	1.450	2.79	1.397	2.59	1.328
Cemeteries	1.98	.971	3.53	1.176	3.05	1.301	2.79	1.324
Industrial areas	2.15	.830	3.47	1.055	3.01	1.098	2.82	1.141

For the high-density suburbs, all the ratings of the current conditions of green spaces were below the mid-point. This shows that in all these locations, the conditions were poor. The highest rated condition was seen in industrial areas (M = 2.15; SD = 0.830), and this was way below the mid-point, indicative of the gravity of the conditions. The second highest rating was seen for cemeteries (M = 1.98; SD = 0.971), followed by churches (M = 1.93; SD = 0.750). Parks were rated fourth (M = 1.79; SD = 0.428), while the fifth rated were working areas (M = 1.61; SD = 0.583). On the other hand, the least rated conditions were wetlands (M = 1.20; SD = 0.400). This approximated 1.0, which represented very poor (Figure 5.6), and because the standard deviation was the least, this showed that there was less variability in the distribution of the responses. The second least rated were residences (M = 1.36; SD = 0.482), while the third least rated were playing grounds (M = 1.55; SD = 0.482).

Figure 5.6: Conditions of wetlands in Gweru City (Source: Fieldwork)

Concerning the medium-density suburbs, four of the locations were positively rated above the midpoint. The highest rating of the current green spaces condition was for cemeteries (M = 3.53; SD = 1.176), while the second highest was for industrial areas (M = 3.47; SD = 1.055). Churches were third highest (M = 3.21; SD = 1.450), while main roads and streets were ranked fourth (M = 3.15; SD = 1.501). Playing grounds (M = 3.0; SD = 1.504) were rated on the borderline and were neither good nor bad. Nevertheless, it should be noted that the skewness distributions for these five locations were relatively high, with kurtosis distributions being predominantly platykurtic. This showed that there was a lack of harmony in the responses, suggesting that the condition of green spaces conditions ranged widely.

On the other hand, the least rated condition was observed with wetlands (M = 1.24; SD = 0.486). There was a high consensus among the respondents as evidenced by the standard deviation being the least measured as well as the kurtosis being characteristically positive and high in magnitude (Kurt = 2.653). This was also evidenced by the second least rating, that is for residences (M = 1.27; SD = 0.508), whose standard deviation was the second least and the kurtosis being positive and the highest in magnitude (Kurt = 2.743). Public parks (M = 1.98; SD = 0.633), were the third least, followed by learning institutions (M = 2.27; SD = 1.339) and working areas.

Lastly, for the low-density suburbs, there were only two positively rated green space conditions, and the highest was seen for cemeteries (M = 3.05; SD = 1.301), followed by industrial areas (M = 3.01; SD = 1.098), whose mean was marginally above the mid-point. The rest of the 8 locations had negatively rated conditions of green spaces and the least were wetlands (M = 1.17; SD = 0.373). The second least rated condition was for private residencies (M = 1.27; SD = 0.445), while the third least rated was public parks (M = 1.91; SD = 0.577). These three were also the least-rated green space conditions in the medium-density suburbs, suggesting a degree of coherence. Working areas (M = 2.10; SD = 1.260), as well as learning institutions (M = 2.10; SD = 1.255), were the fourth-ranked least green space conditions, followed by playing grounds (M = 2.48; SD 1.437), main roads and streets (M = 2.63; SD = 1.554) as well as churches (M = 2.79; SD = 1.397). Figure 5.5, shows a sample of the conditions of green space around Gweru City's institutions. As shown in Figure 5.7, the conditions on selected features in Gweru City reflect the dire condition of green spaces.

a) Learning institution

b) Golf course encroached by construction

c) Gweru cemetery

d) Waste Dump on Public Park

Figure 5.7: Green Spaces Conditions in Gweru City (Source: Fieldwork)

On aggregate, there was no location whose condition of green spaces was good, since all the mean ratings were below the midpoint. The least green space condition was seen with wetlands (M = 1.21; SD = 0.427). Overall, there was a high consensus among the respondents regarding the depletion of green spaces at wetlands as evidenced by the very low skewness statistic as well as the high positive kurtosis (Kurt = 2.1135). The second least rated condition was observed for the private residences (M = 1.31; SD = 0.484), and this had the second least standard deviation and the distribution was leptokurtic (Kurt = 0.155). The third least rated condition was for public parks (M = 1.88; SD = 0.551). Learning institutions (M = 1.95; SD = 1.113) and Working areas (M = 1.98; SD = 1.108) were the fourth and fifth least rated respectively. On the other end, the highest rated, albeit being negative, were industrial areas (M = 2.82; SD = 1.141), while cemeteries were the second highest (M = 2.79; SD = 1.324) with the third highest being churches (M = 2.59; SD = 1.328).

Commenting on the poor condition of green spaces in the high-density suburb, the DPCS official claimed that the small-sized stands have a bearing on the establishment of green spaces such as a garden. The official further pointed out that the stands are given without following proper procedures such as Environmental Impact Assessment (EIA). An official from EMA blamed the city authorities for allowing political and church gatherings in stadiums hence the poor condition of green spaces in such areas. This was also observed by the researcher during fieldwork. Both politicians and churches gather in Mkoba Stadium for different functions. More often than not they use tents for shading and they spend days before removing them. This affects the lawn which needs sunlight for continuous growth. Besides using stadiums, the researcher observed that at times when the politicians expect a bumper crowd, they clear huge pieces of land just to hold a rally. This is done at the expense of green spaces. The following section discusses the spatiotemporal distribution of green spaces in the city over the past two decades.

5.5.1 Discussion: State/Conditions of Urban Green Spaces Demise

The objective sought to assess the state/conditions of urban green spaces in Gweru City over the past two decades (2000-2019). Specifically, the objective aimed to explore the conditions of green spaces in various places, namely wetlands, public parks, private residents, working areas, learning institutions, playing grounds, cemeteries, streets, and industrial areas in the city. This objective is important in filling significant gaps in the literature. The has been a limited number of studies in Gweru City, especially on the state/conditions of urban green spaces. The previous study focused on the loss of green spaces in the city and ignored the overall conditions of green spaces on various city platforms. Thus, there was a need for recent information on the conditions of green spaces in the city so that the city authorities can find sustainable ways of conserving green spaces.

The results of the objective show that green spaces on all the platforms included were generally poor. Specifically, wetlands had the poorest green space conditions as attested by respondents across the three suburbs, namely high, medium, and low-density. Although all the platforms had poor conditions, better green space environments are witnessed in industrial areas. Rapid urbanisation is responsible for the demise or shrinkage of wetlands as residents seek accommodation in the city. Theoretically, the findings support the DPSIR framework that is widely used in understanding the various factors that contribute to the depletion of urban green spaces and the subsequent impacts on the environment and society (Spanò et al., 2017; Kaur, Hewage & Sadiq, 2020; Quevedo, Uchiyama & Kohsaka, 2021). The poor conditions of urban green spaces also support previous research carried out in the Global South cities such as Lagos, Cairo, Alexandria, Luanda, Mogadishu, Monrovia, Kumasi, and Accra (Mensah, 2016). In terms of the wetlands that were found to be the worst, the present study is in line with a study that was carried out in Wuhan where wetlands decreased by 10.98% from 1990-2018 (Wang et al., 2022). Finally, the findings on wetlands resonate with a study carried out in India, Chile, and Tunisia (Dhawan, Lara & Mezoughi, 2018). Thus, the findings imply the green space conditions are in a bad state in Gweru City.

The findings also have important practical implications. For instance, the local authority may come up with by-laws that prohibit anthropogenic activities on wetlands. This strategy is to ensure sustainable management of green spaces in general and wetlands in particular. At the household level, the family heads must also respect green spaces in Gweru City. Thus, the families will not dump domestic waste on green spaces and wantonly destroy vegetation. Instead, they should establish more green spaces and at least conserve those available.

Although the objective has filled important gaps in the literature, there are several weaknesses of the study that need to be addressed. For example, the study only focused on one chartered city. Therefore, the findings cannot be generalised to other cities in the province let alone in highly urbanised cities such as Chitungwiza, Mutare, and Masvingo among others. The data is also limited in that the study didn't calculate the number of green spaces on each platform. Instead, the study relied on photographs and residents' responses. Nevertheless, future research can address these limitations by expanding the number of cities to be studied. In addition, the researchers may employ other methods like using a random classifier algorithm to calculate the ariel coverage of green spaces. Furthermore, future researchers can consider the accessibility of green spaces by Gweru City residents.

5.6 IMPACT OF URBAN GREEN SPACE DEMISE IN GWERU CITY

The third research objective sought to establish the after-effects of urban green space depletion. Based on the literature review as well as the pilot test results, 11 key effects were considered for this study and these included: species extinction and migration, high temperatures, flash floods, siltation of dams, loss of aquatic ecosystem, shrinking wetlands, loss of recreational area, reduced house prices, health challenges, increased carbon dioxide as well as acid rains. The effects were measured on a 5-point Likert scale and these will be presented by location. The effects seen in the high-density suburbs are presented in Table 5.12.

Table 5.12: Effects of urban green spaces depletion across all suburbs

Residential area	High		Medium		Low		Overall	
Variables	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Species extinction	1.42	.951	3.35	1.722	2.64	1.736	2.40	1.691
High temperatures	3.30	.931	4.28	.768	3.92	.966	3.79	.985
Flash floods	4.00	.927	4.51	.669	4.36	.775	4.27	.837
Siltation of dams	3.98	.916	4.56	.692	4.41	.793	4.29	.853
Loss of aquatic ecosystem	3.39	1.291	4.39	.891	4.09	1.132	3.91	1.209
Shrinking wetlands	3.47	1.543	4.53	.886	4.15	1.285	4.01	1.364
Loss of recreational area	4.49	.629	4.68	.497	4.62	.536	4.59	.569
Reduced house prices	3.93	1.469	4.44	.762	4.19	1.142	4.17	1.202
Health challenges	3.95	1.472	4.41	.772	4.22	1.161	4.18	1.206
Increased carbon dioxide	3.51	1.440	3.93	1.413	3.76	1.469	3.72	1.449
Acid rains	2.96	.957	3.03	1.591	3.09	1.391	3.02	1.316

The results show that there were only two effects whose mean rating was less than the mid-point, with the least being species extinction and migration (M = 1.42; SD = 0.951). These findings were likely rated low mainly because of the general dearth of fauna in the high-density suburbs as a result of the proliferation of highly dense human settlements. As a result, the species extinction phenomenon was not experienced by the majority of the respondents, hence the low rating. The second least rated was acid rains (M = 2.96; SD = 0.957), and again, this was likely because rain acidity was a technical phenomenon, whose measurement was not easy to determine by the layman and thus, this low rating did not mean that their rains were not acidic. On the other hand, the highest mean rating was the loss of recreational area (M = 4.49; SD = 0.629). This had the least standard deviation suggesting that there was a very high consensus among the respondents. The second highest effect related to flash floods (M = 4.00; SD = 0.927) followed by the siltation of dams (M = 3.98; SD = 0.916), health challenges (M = 3.95; SD = 1.472), then the reduced house prices (M = 3.93; SD = 1.469). There was, however, a huge gap with the other items, with the next having a mean rating of 3.51 (SD = 1.440), which was increased carbon dioxide, while the shrinking wetlands were the next rated (M = 3.47; SD = 1.543), followed by the loss in the aquatic ecosystem (M = 3.39; SD = 1.291).

Unlike the responses from the high-density suburbs, none of the ratings from the medium-density suburbs was less than 3.0 and this shows that the respondents generally agreed with all the listed effects. The least rated effect related to acid rains (M = 3.03; SD = 1.591), and being close to the mid-point, this shows that the respondents were rather indifferent. The second least related to species extinction and migration (M = 3.35; SD = 1.722). On the other hand, the highest effect was the loss of recreation areas (M = 4.68; SD = 0.497). This outcome was consistent with the effects rated in high-density suburbs, and with the standard deviation being the least, this showed that there was a low variability in the responses. The second highest effect was the siltation of dams (M = 4.56; SD = 0.692), while the third was the shrinking of wetlands (M = 4.53; SD = 0.886). Flash floods were ranked fourth (M = 4.51; SD = 0.669), followed by the reduction in the prices of houses (M = 4.44; SD = 0.762), health challenges (M = 4.41; SD = 0.772), loss of aquatic ecosystem (M = 4.39; SD = 0.891), and high temperatures (M = 4.28; SD = 0.768). Unlike the high-density suburbs which only had one effect that was ranked above 4.0, eight of the ratings for the medium-density suburbs were rated very high above 4.0. This discrepancy was likely a result of the visibility of the impact, contrasting levels of ecological awareness, or both.

For the low-density, only one of the effects listed had a mean rating that was less than the mid-point and this was the species extinction and migration (M = 2.64; SD = 1.736). This was consistent with the average rating in high-density suburbs and somewhat deviant to the medium-density ratings. More importantly, the very high standard deviation was indicative of the fact that the majority of the respondents had significant differences in their responses and this lack of harmony was likely a result of the contrasting levels of ecological awareness. Nevertheless, the highest-rated effect was the loss of recreational area (M = 4.62; SD = 0.536). This outcome was consistent with the other suburbs in both being the major effect as well as the degree of coherence among the respondents. The second highest rating was the siltation of dams (M = 4.41; SD = 0.793), while the third was flash floods (M = 4.36; SD = 0.775), then health challenges (M = 4.22; SD = 1.161), followed by the reduction in the house prices (M = 4.19; SD = 1.142). The shrinking of wetlands was the sixth-ranked (M = 4.15; SD = 1.285) and the seventh-ranked was the loss of aquatic ecosystems (M = 4.09; SD = 1.132). Again, it is evident that seven effects were ranked above 4.0, which was consistent with the ratings in the medium-density, but in contrast to the high-density suburbs where only one was rated above 4.0.

The aggregate results show that the major effect of the depletion of the green spaces was the loss of the recreational area (M = 4.59; SD = 0.569). This was consistent across all the suburbs as observed earlier, and the sample applied to the standard deviation being the least as well across the three suburb types. The second highest effect was the siltation of dams (M = 4.29; SD = 0.853), and the third highest effect was flash floods (M = 4.27; SD = 0.837). Health challenges were ranked fourth (M = 4.18; SD = 1.206), while the fifth-ranked was the reduction in the prices of houses (M = 4.17; SD = 1.202), and then followed by the shrinking of wetlands (M = 4.01; SD = 1.364). On the other hand, the least ranked effects of green space depletion were the extinction and migration of species (M = 2.40; SD = 1.691). This was consistent with the results earlier, and this tends to show that the respondents disagreed. The second least rated were the acid rains (M = 3.02; SD = 1.316), and again, this outcome was consistent across all three suburbs, in which the rating for the acid rains was rated among the poorly rated effects. Beyond these, there was a huge gap with the third least rated (M = 3.72 (SD = 1.449) which was the increased carbon dioxide, followed by high temperatures (M = 3.79; SD = 0.985). The following section focuses on the exploratory factor analysis of the negative effects of urban green space depletion.

5.6.1 Exploratory Factor Analysis: Impact of Urban Green Space Demise

Having established the key descriptive statistics regarding the effects of green space depletion, to determine the principal dimensions of effects of the effects of urban green space depletion, exploratory factor analysis (EFA) was used (Chapman & Feit, 2015; Howitt & Cramer, 2017). However, to validate the adequacy of the data for EFA, the KMO for the adequacy of the sample as well as Bartlett's Test of Sphericity was tested. The outcome is presented in Table 5.13.

Table 5.13: Kaiser-Mayor-Olkin test - Impact of urban green spaces depletion

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.726
Bartlett's Test of Sphericity	Approx. Chi-Square	12293.698
	df	55
	Sig.	.000

The KMO statistic was 0.726 and is greater than 0.50, this meant that the sample adequacy assumption was met (Zhang, Jia & Zhou, 2022; Sun, Song & Lu, 2022; Wang, Han & Mei, 2022). For Bartlett's test, $\chi^2(55) = 12293.698$; $p = 0.000<0.05$, and this meant the test of sphericity assumption was not violated. In this regard, the EFA test was validated.

As done in the preceding objective, the Principal Axis Factoring (PAF) extraction method was carried out instead of the Principal Component Analysis (PCA) (Masoudi & Tan, 2019; Ugolini et al., 2020). Again, the Varimax orthogonal rotation was done with Kaiser normalisation instead of the oblique methods (Ricolfi & Testa, 2021). The resultant total variance explained is presented in Table 5.14.

Table 5.14: Total Variance - Impact of urban green spaces depletion

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %
1	3.929	35.722	35.722	3.676	33.422	33.422	2.763	25.122	25.122
2	2.135	19.409	55.132	1.838	16.707	50.129	2.444	22.222	47.345
3	1.492	13.563	68.695	1.247	11.338	61.467	1.300	11.822	59.167
4	1.171	10.646	79.341	.918	8.344	69.811	1.171	10.644	69.811
5	.675	6.138	85.479						
6	.498	4.529	90.008						
7	.328	2.981	92.989						
8	.254	2.307	95.296						
9	.227	2.065	97.361						
10	.150	1.362	98.724						
11	.140	1.276	100.000						

Extraction Method: Principal Axis Factoring.

The results show that Factor 1 had the highest eigenvalue (λ = 3.929) and the rotated variance explained was RSS = 25.122%, while Factor 2 had an eigenvalue of λ = 2.135, whose rotated variance explained was RSS = 22.222%. The third factor had an eigenvalue of λ = 1.492, and the rotated variance explanation was 11.822, and lastly, for the fourth factor, the eigenvalue was λ = 1.171 and the corresponding variance explained was RSS = 10.644%. On aggregate, the cumulative percentage variance that was explained by the four factors was 69.811% and this was greater than the minimum expected 50% thus, the validity of the factors was confirmed as supported by Kılıç and Alcı (2022).

The rotated component matrix is presented in Table 5.15. Using the criteria prescribed by Shi et al. (2018) and, Kılıç and Alcı (2022). the factor loading cut-off point for the inclusion criteria of the extracted factors used was 0.50. From the results, Factor 1 comprised four items, while Factor 2 comprised just two items. On the other hand, Factor 3 comprised three items, and Factor 4, two items.

Table 5.15: Rotated Factor Matrix - Impact of urban green spaces depletion

	Factor			
Variable	**1**	**2**	**3**	**4**
Shrinking wetlands	**.839**	.190	-.128	-.046
Siltation of dams	**.778**	-.132	.123	.177
Loss of aquatic ecosystem	**.693**	.101	.029	.146
Species extinction and migration	**.646**	.375	-.384	.169
Loss of recreational area	-.109	**.864**	.061	-.016
Reduced house prices	.197	**.741**	-.118	-.047
High temperatures	.226	.180	**.798**	.268
Flash floods	.091	.133	**.742**	-.120
Acid rains	-.006	.041	**.664**	.000
Health challenges	.197	.022	-.122	**.751**
Increased carbon dioxide	.208	-.026	.229	**.654**

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

Factor 1 - Ecosystem Degradation: Factor 1 comprised the following effects: shrinking wetlands, siltation of dams, loss of aquatic ecosystem, and species extinction and migration. All these relate to the deterioration of the ecosystem at large, with key constituents of the ecosystem that had been affected being wetlands, dams, aqua life as well as species. Thus, the befitting label was Ecosystem Degradation.

Factor 2 - Aesthetic and Recreational Degradation: Factor 2 comprised two items, that is, the loss of recreational area and the reduced house prices. The reduction in house prices followed as a result of the reduction in the aesthetic appeal of the houses, while the loss of recreational areas translated to the degradation of the recreation facilities. This is the reason why this factor was labelled aesthetic and recreational degradation.

Factor 3 – Climate Change: The third factor comprised three items, that is, high temperatures, flash floods, and acid rains. According to Shukla et al. (2019) and Pearce et al. (2019), high temperatures, high prevalence of flash floods, and increased frequency of acid rains are all key indicators of the climate change phenomenon. In this respect, the third factor was labelled Climate Change.

Factor 4 - Environmental Health Degradation: The fourth factor comprised two items only and these comprised of health challenges as well as the increased carbon dioxide. According to Mutizwa (2015) as well as Wu (2020), the depletion of green space results in an increase in carbon dioxide. The resultant imbalance in the air quality has health implications, and this is why factor 4 was, as a result, labelled Environmental Health Degradation.

Summarising the findings, the primary effect of green space depletion in Gweru was on ecological degradation, which explained 25.122% of the variance, followed by aesthetic and recreational degradation which explained 22.222% of the variance, while the third was climate change (11.8225) and the last major effect was environmental health degradation and this explained 10.644% of the variance. The following section explained the confirmatory factor analysis of the negative effects of urban green space depletion.

5.6.2 Confirmatory Factor Analysis – Impact of Urban Green Spaces Depletion

To further test the validity of the extracted factors, confirmatory factor analysis (CFA) was carried out. The measurement model is presented in Figure 5.8 below.

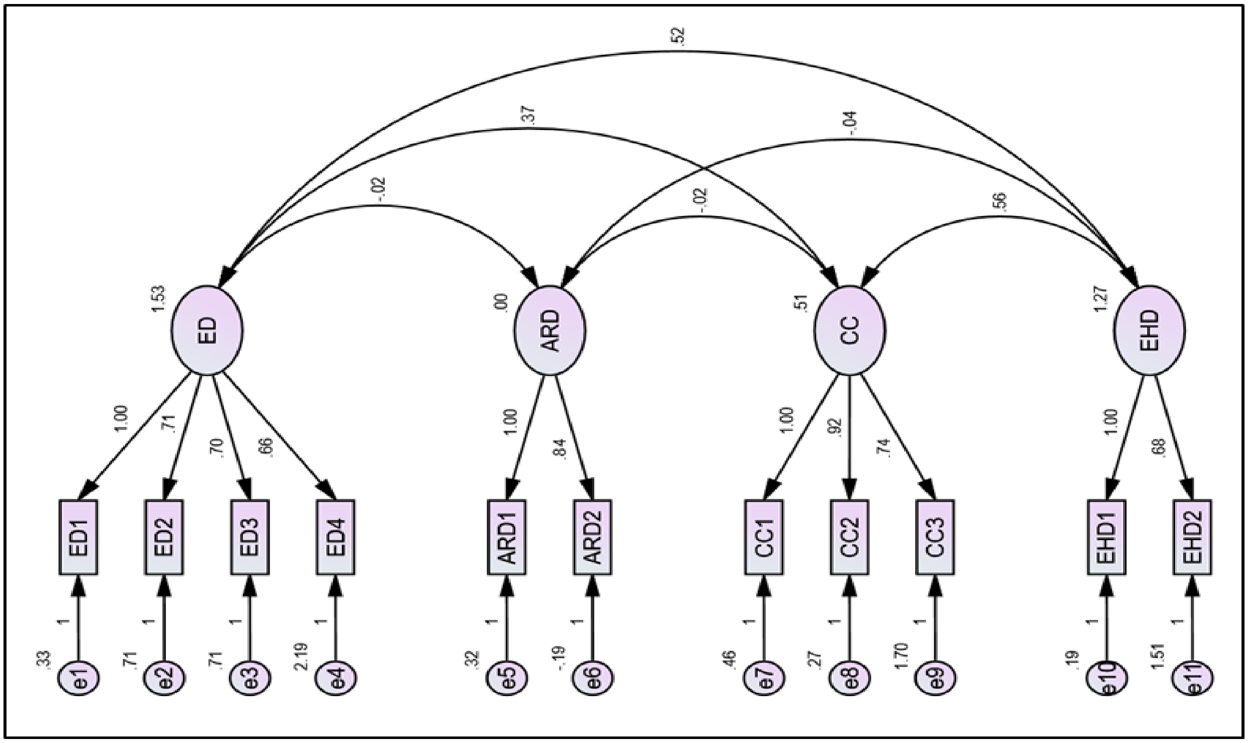

Figure 5.8: CFA - Effects of urban green spaces depletion (Source: Author)

The full outcome of convergent validity testing is presented in Table 5.16.

Table 5.16: Convergent Validity – Impact of urban green spaces depletion

			Estimate	**Standardised**	**S.E.**	**C.R.**	**P**
ED1	<---	ED	1.000	.908			
ED2	<---	ED	.714	.726	.016	7.078	***
ED3	<---	ED	.703	.719	.019	6.507	***
ED4	<---	ED	.663	.485	.030	2.148	***
ARD1	<---	ARD	1.000	.568			
ARD2	<---	ARD	.843	.763	.093	2.456	.014
CC1	<---	CC	1.000	.722			
CC2	<---	CC	.918	.781	.026	8.720	***
CC3	<---	CC	.742	.731	.041	5.839	***
EHD1	<---	EHD	1.000	.934			
EHD2	<---	EHD	.680	.528	.027	2.758	***

All four items under the construct Ecosystem Degradation (ED) had standardised coefficients that were greater than 0.40, with the least being ED4 (β = 0.485). For the construct Aesthetic and Recreational Degradation (ARD), the minimum standardised path coefficient was for ARD1 (β = 0.568). As for Climate Change (CC), the minimum path coefficient was for CC1 (β = 0.722). Lastly, for Environmental Health Degradation (EHD), the least standardised path coefficient was for EHD2 (β = 0.528). From the outcome, all the path coefficients met the minimum requirements for convergent validity, and thus none of the items was dropped. The results of the discriminant validity testing are presented in Table 5.17 below.

Table 5.17: Discriminant Validity – Impact of urban green spaces depletion

			Estimate	**S.E.**	**C.R.**	**P**
ED	<-->	ARD	-.016	.007	-2.419	.016
ED	<-->	CC	.369	.035	24.734	***
ED	<-->	EHD	.518	.038	13.646	***
ARD	<-->	CC	-.017	.007	-2.438	.015
ARD	<-->	EHD	-.037	.015	-2.446	.014
CC	<-->	EHD	.564	.027	20.539	***

The maximum covariance was 0.564 and this was between Climate Change (CC) and Environmental Health Degradation (EHD) followed by a covariance of 0.518 between ecosystem degradation (ED) and environmental health degradation (EHD), while the third highest was 0.369 between ecosystem degradation (ED) and climate change (CC). From the foregoing, none of these covariances exceeded the maximum threshold of 0.85 and, therefore, the discriminant validity assumption was not violated (Heck & Thomas, 2015; Loehlin & Beaujean, 2017). From the foregoing, both convergent validity and discriminant validity assumptions were achieved and, therefore, the researcher confirms the construct validity for the extracted factors (Acock, 2013; Loehlin and Beaujean, 2017). Reliability analysis of the effects of green space depletion is discussed in the next section.

5.6.3 Reliability Analysis - Impact of Urban Green Spaces Depletion

Further to the validation of construct validity was the need to test for the reliability of the research constructs and to achieve this, Cronbach's alpha was computed for each of the four constructs extracted. As prescribed by Loehlin and Beaujean (2014), Taber (2018), Adeniran (2019), and Lubiano et al. (2022), the minimum acceptable Cronbach's alpha was considered to be 0.70. The corresponding results are presented in Table 5.18.

Table 5.18: Reliability Testing - Effects of urban green spaces depletion

Variable	Cronbach's Alpha	N of Items
Ecosystem Degradation	.845	4
Aesthetic and Recreational Degradation	.761	2
Climate Change	.795	3
Environmental Health Degradation	.826	2

The Cronbach's alpha for the ecosystem degradation construct was $\alpha = 0.845$, while for aesthetic and recreational degradation, this was 0.761. For the two climate change items, their alpha was $\alpha = 0.795$, while for the last construct environmental health degradation, the alpha was $\alpha = 0.826$. Overall, none of the constructs had an alpha that was less than 0.70, and this confirms that all four constructs were reliable and internally consistent (Klaufus et al., 2020; Lak et al., 2023). The following part presents the overall analysis of urban green space depletion in Gweru City.

5.6.4 Overall Analysis - Impact of Urban Green Spaces Depletion

From the foregoing analysis, four broad effects of urban green space depletion were confirmed and were ecosystem degradation, aesthetic and recreational degradation, climate change as well as environmental health degradation. The researcher further sought to examine the magnitude of these effects across the three residential types. The summary statistics are presented in Table 5.19.

Table 5.19: Overall Analysis - Impact of urban green spaces depletion

Residential Area	**High**		**Medium**		**Low**	
Variable	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Ecosystem degradation	3.067	.676	4.208	.745	3.821	.886
Aesthetic and recreational degradation	4.207	.755	4.560	.450	4.405	.614
Climate change	3.421	.548	3.937	.579	3.790	.588
Environmental health degradation	3.728	1.351	4.170	.823	3.992	1.120

For the high-density areas, the main effects of urban green spaces depletion were on aesthetic and recreational degradation (M = 4.207; SD = 0.755), and this was followed by environmental health degradation (M = 3.728; SD = 1.355), while the third highest effect was on climate change (M = 3.421; SD = 0.548), and the least being on ecosystem degradation (M = 3.067; SD = 0.676). Concerning the medium-density suburbs, the main effects of urban green spaces depletion, again, was on the aesthetic and recreational degradation (M = 4.560; SD = 0.450), and this was followed by the ecosystem degradation (M = 4.208; SD = 0.745), while the third highest effect was on environmental health degradation (M = 4.170; SD = 0.823) and the last being on climate change (M = 3.937; SD = 0.579). As for the low-density suburbs, the major effect of urban green spaces depletion was also seen in the aesthetic and recreational degradation (M = 4.405; SD = 0.614), and this was followed by the environmental health degradation (M = 3.992; SD = 1.120), while the third highest effect was on the ecosystem degradation (M = 3.821; SD = 0.886), and the least effect was on climate change (M = 3.790; SD = 0.588).

To further understand the effects of urban green spaces' demise, the researcher interviewed an official from the Department of Parks and Community Services. The official said that climate change is the major negative effect that is being felt in Gweru City. Furthermore, the official pointed out that the city has lost its aesthetic and recreational areas. However, the official could not shed light on the extent to which the city is experiencing climate change. Nevertheless, the official gave a series of events in which he believed that there was climate change. The official gave examples of flash floods which were experienced in 2021, the increase in the outbreak of malaria, and shortened rainfall seasons. A discussion on the negative effects of urban green space depletion is carried out below.

5.6.5 Discussion: Impact of Urban Green Space Demise

The third research objective looked into the effects of urban green space depletion. A total of 11 items were analysed using Explanatory Factors Analysis (EFA). The key assumptions were not violated, that is, the KMO test for sampling adequacy and Bartlett's test for sphericity. The Principal Axis Factoring (PAF) was used as the extraction method and the Varimax as the rotation method. From the outcome, four major effects were extracted. The first effect was ecosystem degradation, and this comprised of four items, that is, shrinking wetlands, siltation of dams, loss of aquatic ecosystem, and species extinction and migration. The second effect was aesthetic and recreational degradation, and this comprised of two items, that is, the loss of recreational area and the reduced house prices. The third effect was climate change, and this comprised three items, that is, high temperatures, flash floods, and acid rains. The fourth effect was environmental health degradation, which comprised health challenges and increased carbon dioxide.

Confirmatory Factor Analysis (CFA) was carried out and the extracted effects were validated. On aggregate, comparing the effects of green spaces depletion, ecosystem degradation was the highest followed by aesthetic and recreational degradation and this was consistent across the three strata. While environmental health degradation was the second rated in the high-density suburbs, ecosystem degradation was the second for the medium-density suburbs and low-density suburbs.

Essel (2017) discovered the same results when he studied the destruction of UGS in Kumasi (Ghana). Essel claimed that the destruction of UGS in Kumasi led to high temperatures, an unattractive environment, and atmospheric pollution. Similarly, Iman & Banerjee (2016), in their study on urbanisation and greening of Indian cities, discovered that the shrinking of residential gardens caused environmental degradation and an increase in urban heat islands. This was a result of an incremental in anthropogenic emissions which could have been absorbed by vegetation. The vegetation acts as a carbon sink that reduces the amount of carbon dioxide in the atmosphere. The removal of carbon dioxide in the atmosphere offshoots diseases that are associated with climate change. Some of these diseases that aggravate include heat stroke, heat exhaustion, infectious diseases, and cardiovascular and respiratory problems. Therefore, it is critical to establish and conserve vegetation so that the city becomes healthy and liveable.

Like the previous objective(s) the major limitation of this was factor loading. The naming of the observable variable was problematic in achieving this objective. Nonetheless, the results are valid and reliable. The results were buttressed by the triangulation of the results from key informants, photographs, and residents' perceptions of the effects of UGS depletion. The following section focuses on objective number four which focused on stakeholders' role in the depletion of UGS in Gweru City.

5.7 RESPONSES OF URBAN GREEN SPACES DEPLETION IN GWERU CITY

The fifth research objective was aimed at evaluating the findings to provide both theoretical and practical solutions for the sustainable management of green spaces. In this respect, the first segment of the section reviews the respondents' perceptions regarding the critical success factors for sustainable urban green space management. Ultimately, this section models the causes of green space depletion and the extent to which each of the proposed interventions resolves the status quo towards sustainable urban green space management in Gweru. In the following section, the researcher focused on sustainable green space management success factors.

5.7.1 Sustainable Green Spaces Management Success Factors

The first aspect of this objective focuses on evaluating the key solutions that can be applied to ensure successful sustainable green space management. A total of 13 items were considered based on literature as well as the pilot study and these were: stakeholders' involvement, environmental education, empowerment of local people, green spaces inventory, strong institutional policies, green urban planning models, reforestation/afforestation, waste discharge limitations, indigenous knowledge systems, effective environmental by-laws, prohibitive fines, use of alternative fuels, local stewardship of green spaces. The results are summarised in Table 5.20.

Table 5.20: Solutions to sustainable green spaces management across all suburbs

Residential area	**High**		**Medium**		**Low**		**Overall**	
Variable	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Stakeholders' involvement	3.68	1.474	3.88	1.454	3.82	1.461	3.78	1.466
Environmental education	4.59	.817	4.09	1.369	4.27	1.221	4.34	1.157
Empowerment of local people	4.02	.793	4.47	.650	4.29	.723	4.24	.754
Green spaces inventory	4.43	.749	3.99	1.418	4.17	1.214	4.21	1.152
Strong institutional policies	4.41	.745	3.95	1.400	4.14	1.208	4.19	1.144
Green urban planning models	4.25	.893	3.97	1.432	4.09	1.231	4.11	1.194
Reforestation/Afforestation	4.84	.409	4.46	.865	4.26	1.123	4.16	1.204
Waste discharge limitations	4.61	.818	4.10	1.374	4.28	1.228	4.35	1.162
Indigenous Knowledge Systems	4.18	.888	4.14	1.378	4.16	1.213	4.16	1.159
Effective environmental by-laws	4.45	.868	3.95	1.451	4.22	1.223	4.22	1.206
Prohibitive fines	4.36	.643	4.57	.791	4.54	.598	4.48	.694
Use of alternative fuels	4.48	.612	4.59	.547	4.55	.576	4.54	.583
Local stewardship of green spaces	3.70	1.366	4.56	.834	4.23	1.123	4.13	1.204

From the outcome, all the listed solutions had mean ratings that were greater than the mid-point of 3.0. This meant that the respondents did agree with all the solutions as being viable sustainable green space management solutions. Nevertheless, the highest-rated solution was reforestation/afforestation (M = 4.84; SD = 0.409), and this was followed by waste discharge limitations (M = 4.61; SD = 0.818). Environmental education was rated third (M = 4.51; SD = 0.817), with the fourth rated being the use of alternative fuels (M = 4.48; SD = 0.612). Implementing effective environmental by-laws was ranked the fifth solution (M = 4.45; SD = 0.8680, and the sixth was the establishment of a green spaces inventory (M = 4.43; SD = 0.749). The other solutions that were rated high were implementing strong institutional policies (M = 4.41; SD = 0.745), prohibitive fines (M = 4.36; SD = 0.643), green urban planning models (M = 4.25; SD = 0.893), along with indigenous knowledge systems (M = 4.18; SD = 0.888). On the other hand, the least rated solutions were stakeholder involvement (M = 3.68; SD = 1.474) along with the local stewardship of green spaces (M = 3.70; SD = 1.366). Overall, all the ratings were greater than the mid-point of 3.0 and this shows that all the proposed solutions were positively rated as being viable by the respondents.

For the medium-density, all the listed solutions had mean ratings that were greater than the mid-point 3.0 and this meant that the respondents agreed with all the solutions as being viable sustainable green spaces management solutions. Of these, the highest-rated solution was the use of alternative fuels (M = 4.59; SD = 0.547), and this was followed by prohibitive fines (M = 4.57; SD = 0.791). Local stewardship of green spaces was rated third (M = 4.56; SD = 0.834), and the fourth rated was the empowerment of local people (M = 4.47; SD = 0.650). Reforestation and afforestation were ranked as the fifth solution (M = 4.46; SD = 0.865). The other solutions that were rated high were implementing Indigenous Knowledge Systems (M = 4.14; SD = 1.378), Waste discharge limitations (M = 4.10; SD = 1.374), Environmental education (M = 4.09; SD = 1.365), Green spaces inventory (M = 3.99; SD = 1.418), Green urban planning models (M = 3.97; SD = 1.432), Effective environmental by-laws (M = 3.95; SD = 1.451) and Strong institutional policies (M = 3.95; SD = 1.00). On the other hand, the least rated solution was stakeholder involvement (M = 3.88; SD = 1.454). On aggregate, all the proposed solutions were positively rated as being viable by the respondents.

For the low-density, the results show that all the listed solutions had means greater than the mid-point 3.0 meaning that the respondents from low-density suburbs agreed with all the solutions. Of these, the highest-rated solution was the use of alternative fuels (M = 4.55; SD = 0.576), and this was followed by prohibitive fines (M = 4.54; SD = 0.598). Empowerment of local people was rated third (M = 4.29; SD = 0.723), and the fourth rated was the waste discharge limitations (M = 4.28; SD = 1.228), followed by Environmental education (M = 4.27; SD = 1.221), then Reforestation/Afforestation (M = 4.26; SD = 1.123). The other solutions that were rated high were implementing Local stewardship of green spaces (M = 4.23; SD = 1.123), Effective environmental by-laws (M = 4.22; SD = 1.223), Green spaces inventory (M = 4.17; SD = 1.214), Indigenous Knowledge Systems (M = 16; SD = 1.213), Strong institutional policies (M = 4.14; SD = 1.208), Green urban planning models (M = 4.09; SD = 1.231) and the least rated solution was stakeholders' involvement (M = 3.82; SD = 1.461).

Overall, all the solutions had means above the mid-point 3.0 and this shows that all the respondents agreed with all the solutions. The overall highest-rated solution was the use of alternative fuels (M = 4.54; SD = 0.583) and the second highest was prohibitive fines (M = 4.48; SD = 0.694). The third highest was waste discharge limitations (M = 4.35; SD = 1.162), followed by Environmental education (M = 4.34; SD = 1.157). The fifth rated solution was Empowerment of local people (M = 4.24; SD = 0.754), then Effective environmental by-laws (M = 4.22; SD = 1.206) The other solutions were all rated above 4.0, with the only least rated being stakeholder's involvement (M = 3.78; SD = 1.466). To establish the major factors, exploratory factor analysis was further carried out and the results are detailed below.

5.7.2 Exploratory Factor Analysis - Sustainable Green Spaces Management

This sought to establish the key factors that could be applied to ensure the successful sustainable green space management of green spaces depletion and to achieve this, the researcher used exploratory factor analysis (Howitt and Cramer, 2017). Nevertheless, to validate the use of factor analysis, the Kaiser-Mayor-Olkin test (KMO) for sampling adequacy and Bartlett's Test of Sphericity were the key assumptions that were tested (Sarsted et al., 2021). As noted earlier, the prescribed minimum KMO statistic threshold is 0.50 (Garson, 2012; Zhang et al., 2022; Sun et al., 2022; Wang et al., 2022), while Bartlett's test p-value ought to be significant at $p<0.05$. From the above finding, KMO = 0.786>0.50 and this confirms that the data used for the factor analysis met the minimum sampling adequacy requirement. On the other hand, regarding Bartlett's test for sphericity, from the findings $\chi^2(78) = 18079.999$; $p = 0.00<0.05$. Being significant at $p<0.05$, his finding confirmed that Bartlett's test of sphericity assumption was not violated. To this effect, having validated the two key assumptions, the researcher went on to run EFA.

There was a total of 13 items, and to extract the factors, Principal Axis Factoring (PAF) was used as the extraction method. This was because the study focus was on the identification of factors instead of dimension reduction, which would have required the use of the Principal Component Analysis (PCA) (Masoudi & Tan, 2019; Ugclin et al., 2020). Nevertheless, to ensure optimal extraction and minimize cross-loadings, factor rotation was used (Dugard, Todman & Staines, 2022). However, since the researcher did not assume a high correlation between the constructs, an orthogonal rotation method was used, that is, the Varimax rotation, instead of the oblique rotation method (Ricolfi & Testa, 2021). Based on the Guttman-Kaiser criterion, only eigenvalues greater than 1.0 were considered (Brown, 2015; Masoudi & Tan, 2021). From the results above, four factors were extracted whose eigenvalues were greater than the minimum threshold of 1.0. Their total variance explained is presented in Table 5.21.

Table 5.21: Total variance explained - Sustainable green spaces management

	Initial Eigenvalues			ESS Loadings			RSS Loadings		
Factor	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %
1	4.048	31.140	31.140	4.048	31.140	31.140	3.864	29.720	29.720
2	2.437	18.743	49.884	2.437	18.743	49.884	2.543	19.561	49.281
3	2.356	18.123	68.006	2.356	18.123	68.006	2.429	18.684	67.965
4	1.091	8.391	76.397	1.091	8.391	76.397	1.096	8.432	76.397
5	.942	7.250	83.646						
6	.812	6.244	89.890						
7	.332	2.554	92.444						
8	.217	1.667	94.111						
9	.194	1.490	95.601						
10	.161	1.239	96.841						
11	.150	1.156	97.996						
12	.142	1.089	99.085						
13	.119	.915	100.000						

Extraction Method: Principal Axis Factoring.

Factor 1 had the highest eigenvalue of 4.048 and the percentage of the rotated sums of square loadings (RSS) variance was 29.720% (unrotated ESS = 31.140%). The second highest eigenvalue was 2.437 for Factor 2 and the corresponding rotated sums of square loadings (RSS) percentage variance was 19.561% (unrotated ESS = 18.743%). The third factor extracted had an eigenvalue of 2.356 and the rotated sums of square loadings were 18.684% (unrotated ESS = 18.123%), while the fourth factor extracted had an eigenvalue of 1.091 and the respective rotated sums of square loadings were 8.432% (unrotated ESS = 8.391%). The cumulative percentage variance that was explained by the four factors was 76.397% and since this was greater than 50%, this confirmed that the extracted factors were valid.

Factor rotation was carried out, and as noted earlier, since the researcher did not assume a high correlation of the constructs, the Varimax rotation was used. The inclusion criteria considered for the factor loadings was 0.50 as prescribed by Lyyra, Leskinen, and Heikinaro-Johansson (2015), Shi et al. (2018) and, Kılıç and Alcı, (2022). The resultant rotated factor matrix is presented in Table 5.73. The results show that 4 of the items were loaded under Factor 1, while another 4 items were loaded under Factor 2. However, under Factor 3, there were only 3 items and there were only 2 items under Factor 4. For all the items, none of them had factor loadings that were less than 0.50 across all the five factors, and in this respect, none of the items was dropped (Table 5.22).

Factor 1 – Policies and Regulations (PR): The first factor comprised of the following solutions: waste discharge limitations, effective environmental bylaws, strong institutional policies as well as prohibitive fines. These relate to policies and regulations, and by having the greatest variance explanation, it meant that the principal solution that would lead to sustainable green space management was to ensure that a solid policy and regulatory framework was in place.

Factor 2 – Planning and Education (PE): The second factor comprised of the following four solutions: environmental education, indigenous knowledge systems, green spaces inventory as well as green urban planning models. These solutions related to administrative activities which encompassed both operational planning and environmental education.

Factor 3 – Stakeholder Involvement (SI): The third factor is comprised of three items, that is, the local stewardship of green spaces, stakeholder involvement as well as the empowerment of local people. These three are related to the involvement of third parties, other than the managing authorities. In this regard, this factor, therefore, is related to the need to involve the stakeholders in the management of green spaces.

Factor 4 – Sustainable Practices (SP): The last factor comprised only two items and these were reforestation/afforestation and the use of alternative fuels. These ensured the replenishment of the depleted green spaces through growing more trees, as well as the prevention of further green space depletion by using alternatives. The following section focuses on confirmatory factor analysis of the sustainable management of urban green spaces.

Table 5.22: Rotated factor matrix - Sustainable green spaces management

	Factor			
Variable	**1**	**2**	**3**	**4**
Waste discharge limitations	**0.946**	0.056	0.036	0.076
Effective environmental bylaws	**0.893**	0.120	0.100	0.107
Strong institutional policies	**0.841**	0.255	0.170	0.215
Prohibitive fines	**0.816**	0.276	0.118	0.319
Environmental education	0.146	**0.835**	0.043	0.075
Indigenous Knowledge Systems	-0.170	**0.822**	-0.027	0.124
Green spaces inventory	0.087	**0.797**	0.043	0.086
Green urban planning models	0.119	**0.791**	0.203	0.104
Local stewardship of green spaces	0.137	0.004	**0.816**	0.033
Stakeholders’ involvement	0.137	-0.032	**0.724**	0.024
Empowerment of local people	0.216	0.199	**0.639**	0.381
Reforestation/Afforestation	-0.151	0.006	0.138	**0.803**
Use of alternative fuels	0.102	0.161	0.283	**0.798**

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 4 iterations.

5.7.3 Confirmatory Factor Analysis - Sustainable Green Spaces Management

To validate the foregoing constructs, construct validity testing was done through the use of confirmatory factor analysis (CFA) as prescribed by Roy et al. (2016), Darlington and Hayes (2017), and Shi et al. (2018). The covariance-based approach was used to measure validity using SPSS Amos. Figure 5.9 presents the measurement model.

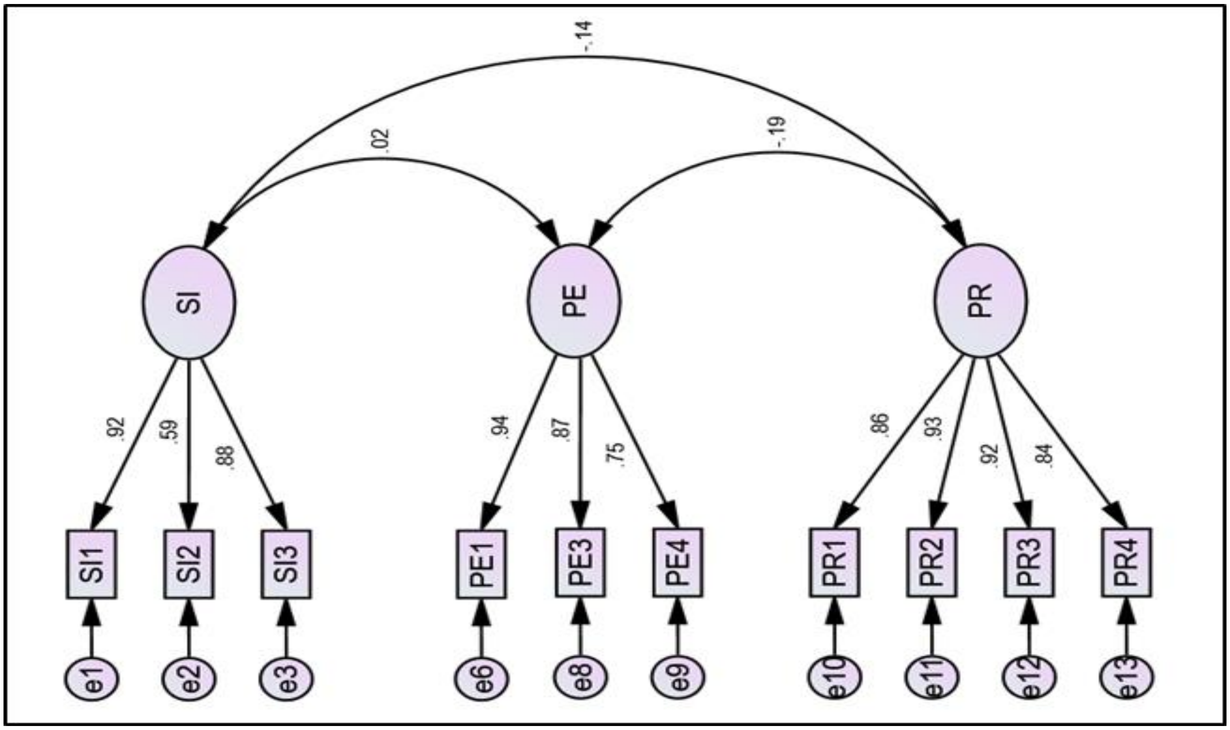

Figure 5.9: Confirmatory factor analysis - Sustainable GSM final model

From the foregoing, all the standardised path coefficients were greater than 0.40 and this meant that convergent validity was not violated. The same applied to the discriminant validity, with the highest magnitude being -0.19, and being less than the prescribed maximum of 0.85. To this effect, with both convergent and discriminant validity having been met, the researcher confirmed that the overall construct validity was confirmed (Acock, 2013; Loehlin & Beaujean, 2017). This meant that the three major sustainable green space management practices were Policies and Regulations (PR), Planning and Education (PE), and Stakeholder Involvement (SI). The next section presents a reliability analysis of sustainable green space management in Gweru City.

5.7.4 Reliability Analysis - Sustainable Green Spaces Management

To test for reliability, Cronbach's alpha was used as discussed herein above. Again, the standard acceptable threshold considered for the alpha was 0.70 (Taber, 2018). For the valid items for every construct, the corrected item-total correlation coefficient was used with the minimum threshold considered being 0.30 (Adeniran, 2019; Lubiano et al., 2022). The results are presented in Table 5.23 below.

Table 5.23: Reliability testing - Sustainable green spaces management

Variable	Cronbach's Alpha	N of Items
Policies and Regulations	.783	4
Planning and Education	.739	3
Stakeholder Involvement	.814	3

The results show that Cronbach's alpha for policies and regulations was $\alpha = 0.783$, and for planning and education, this was $\alpha = 0.739$ while for stakeholder involvement, this was $\alpha = 0.814$. None of these three reliability statistics was less than 0.70 and this confirms that all the constructs are reliable (Pallant, 2020). The discussion of the modelling of green space management using the DPSIR Framework follows.

5.7.5 Modelling Green Spaces Management using the DPSIR Framework

Having reviewed all the key research constructs, the major focus of the fifth research objective was to provide theoretical and practical solutions for the sustainable management of green spaces. This entailed the holistic evaluation of the interactions between the factors that were investigated in this study. As discussed in the preceding chapters, the research conceptual framework was based on the DPSIR framework, which is a causal framework that researchers have widely adopted to help model the interactions between the environment and society. This framework comprises five key constructs, that is, the drivers, pressure, state, impact, and response. The statistical model for this framework is illustrated below (Figure 5.10).

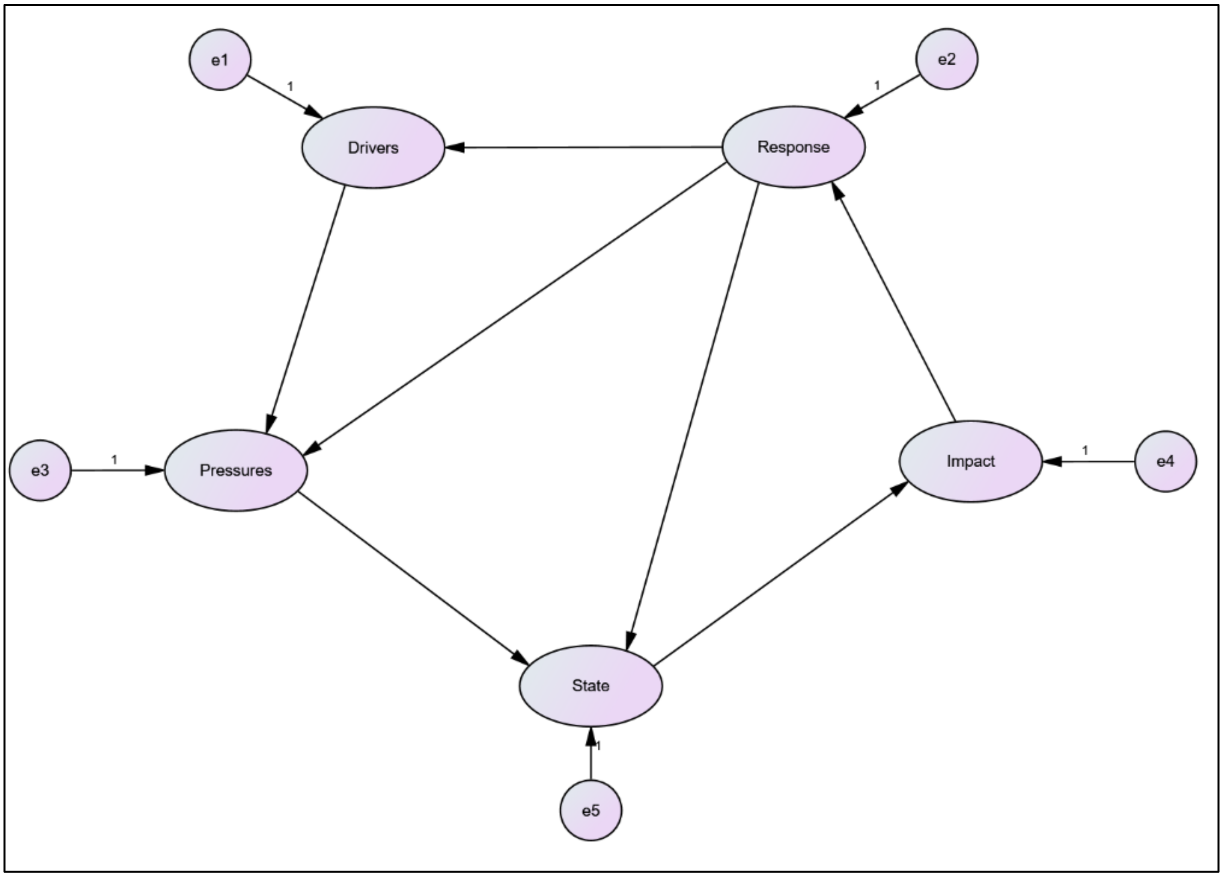

Figure 5.10: General DPSIR statistical model

Drivers: The drivers in the context of this study were the changes in the social, economic, and institutional milieu which triggered pressures on green spaces. From the findings, three broad triggers were extracted from factor analysis and validated with CFA and these were Administrative Deficiencies (AD), Human Activities (HA), and Geological Influence (GI) (Objective 2). The corresponding hypothesis associated with the drivers was:

H_1: Human needs (drivers) have led to the exploitation of green spaces in Gweru City

Pressures: The pressures in the context of this study were activities that were inducing green space depletion and these were measured in this research by six social, economic, and environmental activities, that is, social interaction (PRE1), waste dumping (PRE2), urban agriculture (PRE3), housing construction (PRE4), industrial activity (PRE5) as well as wood harvesting (PRE6) (Objective 3). The corresponding hypothesis associated with the pressures was:

H_2: Human activities (pressures) have altered the conditions of green spaces

State: The state measured the quantity and quality of the green spaces and in this study, this was measured for wetlands (STAT1), public parks (STAT2), private residences (STAT3), working areas (STAT4), learning institutions (STAT5), main roads and streets (STAT6), playing grounds (STAT7), churches (STAT8), cemeteries (STAT9), and industrial areas (STAT10) across all residential types (Objective 4). The hypothesis associated with the state was:

H_3: Human activities (pressures) have affected the conditions of green spaces in Gweru

Impact: The impact was measured by the changes in the environmental functions affecting social, economic, and environmental dimensions, and from both exploratory and confirmatory factor analysis, the key constructs extracted were Ecosystem Degradation (ED), Aesthetic and Recreational Degradation (ARD), Climate Change (CC) as well as Environmental Health Degradation (EHD) (Objective 5). The hypothesis associated with the impact was:

H_4: The impact of green space depletion affects Gweru City's environment

Response: The responses were the interventions that sought to prevent, eradicate, recompense, or mitigate the consequences of the impact. From the findings, three key interventions were extracted and validated using exploratory and confirmatory factor analysis and these were Policies and Regulations (PR), Planning and Education (PE) as well as Stakeholder Involvement (SI) (Objective 6). The hypotheses were:

H_5: The responses to urban green spaces depletion enhance their sustainable management practices

The following part presents the structural equation modelling approach to testing the DPSIR framework.

5.7.6 Structural Equation Modelling Approach

To test the foregoing DPSIR framework in the context of green space management, structural equation modelling (SEM) was considered optimal as prescribed by Fan et al. (2016), Dzhambov et al. (2018), Tian et al. (2020), Yan et al. (2021) as well as Zhao et al. (2021), who all confirm the relative robustness of SEM. More important, was the capability of SEM-based approaches to handle latent variables, which cannot be achieved seamlessly using conventional regression techniques (Loehlin & Beaujean, 2017; Wickham & Grolemund, 2017). There were two SEM approaches that this study could consider, that is, either covariance-based structural equation modelling (CB-SEM) or the variance-based structural equation modelling (VB-SEM), otherwise known as the partial least squares structural equation modelling (PLS-SEM) technique (Gravetter et al., 2020; Sarsted et al., 2021).

To select the optimal test, two major aspects that were factored in were the sample size as well as multivariate normality. Concerning the sample size, a minimum sample size of 200 cases is recommended for CB-SEM modelling, while PLS-SEM is optimized to handle sample sizes less than 200 (Tabachnick & Fidell, 2013; Schumacker & Lomax, 2016; Loehlin & Beaujean, 2017; Kyriazos, 2018; Sarsted et al., 2021). On the other hand, regarding the multivariate normality, the evaluation of the critical ratio and multivariate kurtosis was done. Cohen, West, and Aiken (2014) suggest a minimum multivariate kurtosis of 7.0. Further, according to Satorra and Bentler (2010) as well as Sarsted et al. (2021), the minimum critical ratio threshold for significance is 1.96. The assumption of multivariate normality was not violated. In this regard, given that the sample size for this study was 1990, the researcher considered the CB-SEM as being more robust and to achieve this, IBM SPSS Amos was used. Figure 5.11 presents the DPSIR structural equation model.

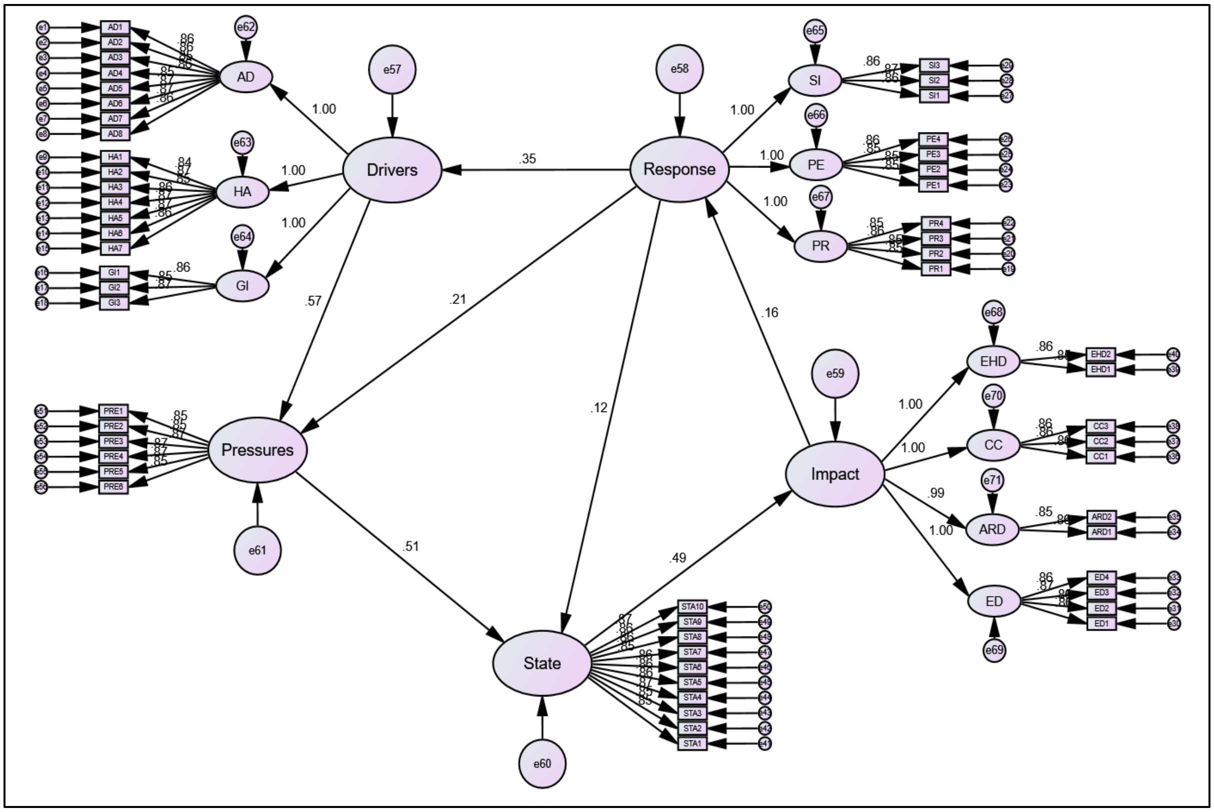

Figure 5.11: SEM - DPSIR framework for green spaces management

The corresponding path coefficients are presented in Table 5.24 below. From the outcome, the strongest link was between Drivers and Pressures (β = 0.572; C.R. = 26.406; p = 0.000<0.05), followed by the link between Pressures and State (β = 0.508; C.R. = 21.470; p = 0.000<0.05). The third highest link was between State and Impact (β = 0.485; C.R. = 21.434; p = 0.000<0.05), while the fourth was between Response and Drivers (β = 0.351; C.R. = 15.456; p = 0.000<0.05). The link between Response and Pressures was the fifth-ranked (β = 0.211; C.R. = 10.723; p = 0.000<0.05), while the sixth was between Impact and Response (β = 0.163; C.R. = 6.065; p = 0.000<0.05), and the beast being the link between Response and State (β = 0.115; C.R. = 4.915; p = 0.000<0.05).

Table 5.24: SEM Path Coefficients

Variables			Estimate	Standardised	S.E.	C.R.	P
Drivers	<---	Response	.341	.351	.022	15.456	.000
Pressures	<---	Drivers	.574	.572	.022	26.406	.000
State	<---	Pressures	.516	.508	.024	21.470	.000
Impact	<---	State	.494	.485	.023	21.434	.000
Response	<---	Impact	.162	.163	.027	6.065	.000
Pressures	<---	Response	.206	.211	.019	10.723	.000
State	<---	Response	.114	.115	.023	4.915	.000

The link between Response and Pressures was the fifth-ranked ($\beta = 0.211$; C.R. = 10.723; $p = 0.000<0.05$), while the sixth was between Impact and Response ($\beta = 0.163$; C.R. = 6.065; $p = 0.000<0.05$), and the beast being the link between Response and State ($\beta = 0.115$; C.R. = 4.915; $p = 0.000<0.05$). From the foregoing, since all the p-values were less than 0.05, the null hypotheses are rejected for all seven hypotheses, and the researcher confirms that all the hypotheses tested were statistically significant. The goodness-of-fit tests are presented in Table 5.25. The relative chi-square was CMIN/DF = 1.287 and was less than the maximum threshold of 3.0 (Sarstedt et al., 2021; Kline, 2023). Further, for the baseline comparisons, the Normed Fit Index was NFI = 0.984, while the Comparative Fit Index was CFI = 0.996 and both were greater than the minimum prescribed 0.90 (Sarstedt et al., 2021; Kline, 2023). As for the parsimony-adjusted measures, the Parsimonious Normed Fit Index was PNFI = 0.938 and the Parsimonious Comparative Fit Index was PCFI = 0.945 and both measures were greater than the prescribed minimum of 0.50 (Roy et al., 2016). Lastly, the Root Mean Square Error of Approximation was RMSEA = 0.012, which was less than the maximum prescribed RMSEA of 0.08 (Sarstedt et al., 2021; Kline, 2023).

Table 5.25: Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	129	1888.762	1467	.000	1.287
Saturated model	1596	.000	0		
Independence model	56	119517.862	1540	.000	77.609

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.984	.983	.996	.996	.996
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.953	.938	.949
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.012	.010	.014	1.000
Independence model	.196	.195	.197	.000

Source: Author

Since all the goodness-of-fit tests were within the expected thresholds, this meant that the SEM model for the sub-constructs had a very good fit and that the DPSIR model was consistent with the empirical data. The following section discusses sustainable green space management in Gweru City.

5.7.7 Discussion: Sustainable Green Spaces Management in Gweru City

The fifth objective sought to establish the theoretical and practical solutions that can lead to the sustainable management of green spaces. For the practical solutions, out of the items that were considered, the major solutions that were cited by the respondents were environmental education, reforestation/afforestation as well as waste discharge limitations. Further analysis was done using EFA with Principal Axis Factoring (PAF) as the extraction method and from the outcome, four factors were extracted. Nevertheless, after CFA, only three were confirmed. The first solution was policies and regulations and this comprised waste discharge limitations, effective environmental bylaws, strong institutional policies, and prohibitive fines. The second solution was planning and education, and this comprised environmental education, indigenous knowledge systems, green spaces inventory, and green urban planning models. The last was stakeholder involvement and which comprised local stewardship of green spaces, stakeholder involvement, and the empowerment of local people.

The results are consistent with studies in Kumasi, Ghana (Mensah, 2014a, b; Mensah et al., 2017; Mensah, 2021), Klang Valley Malaysia (Nath et al., 2018), Mumbai, India (Rahaman et al., 2021) and Thamesmead, London (Salvia et al., 2022) which recommended consistent policies and regulations as a panacea to sustainable management of urban green spaces in cities. Similar findings were discovered in England, Malaysia, and Singapore (Darkhani, Tahir & Ibrahim, 2019) that good and proper planning, programs, and activities in the local government system, can enhance and increase urban green space in the urban landscape.

The last aspect of the fifth objective looked into the theoretical solutions, and to achieve this, the DPSIR framework was applied. Structural equation modelling was carried out and from the outcome, the null hypothesis was rejected for all the hypotheses tested. The research confirmed that green space depletion drivers had a significant impact on the pressures, that green space depletion pressures had a significant impact on the state, that the state of green spaces had a significant impact on the impact, that the impact of green space depletion had a significant impact on the response, that the response had a significant impact on the drivers of green space depletion, that the response had a significant impact on the pressures of green space depletion and lastly, that the response had a significant impact on the state of green space depletion in urban Gweru.

5.8 SUMMARY

The chapter enunciated the research findings and the potential areas of contribution to scientific knowledge. First, the chapter focused on the spatial changes in urban green spaces in Gweru City. The results indicated that the green spaces were depleting in the city. Second, the chapter answered objective number 2 which focused on the potential/salient drivers of green space depletion in the study area. The results confirmed that three factors were responsible, namely administrative deficiencies, human activities, and geological influences. The results were confirmed after factor analysis was carried out and reliability tests computed. Third, the pressures of green space depletion which was the third objective were done. It was confirmed that human activities such as rapid urbanisation were responsible for the demise of green space in the city. Fourth, the study focused on the conditions of urban green spaces' demise. The results indicated that Gweru City’s greenery is in a poor state, especially the wetlands. Fifth, the study focused on the impact of the depletion of green spaces in the city. Factor analysis results claimed that the impact of green spaces can be grouped into ecosystem degradation, aesthetic and recreational degradation, climate change, and environmental health degradation. Sixth, sustainable management of green spaces was considered. The results have shown the importance of working together to conserve green spaces in the city. The following chapter focuses on the summary, conclusions, and recommendations of the study.

CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

The purpose of this study was to provide both theoretical and practical contributions toward the sustainable management of green spaces in Gweru City. As such, this chapter concludes the study in its entirety. The first part of this chapter gives an overall summary of the study. This is followed by an evaluation of the research objectives. The findings and the conclusions follow an evaluation of the research objectives. Further, recommendations of the study are also given. Study limitations are articulated as well. Finally, the study enunciates its contribution to the scientific board of knowledge.

6.2 THESIS SUMMARY

In the context of Zimbabwe, multiple knowledge gaps encompassing urban green spaces informed this study. The gaps included limited research on the demise of green spaces and its related impact on the residents of Gweru City, lack of empirical evidence on the salient drivers and causes of the demise of green spaces in the study area, lack of a database for monitoring urban land use/cover changes that have a bearing on the provision of green spaces, lack of green spaces stewardships in Gweru's residential neighbourhood, the dissonance between the central government and local authorities as well as organisations, that is, Environmental Management Agency, Forestry Department, and Department of Parks and Community Services. These are perceived to be responsible for green space management in the city. In addition, there is a lack of an urban planning model that encompasses and establishes pockets of green spaces in the city, no involvement of residents in the management of green spaces, and the limited use of the DPSIR model in understanding urban dynamics that lead to the demise of the green spaces.

The broad aim of this study was to make a practical and theoretical contribution to curb the loss of urban green spaces in the city of Gweru, Zimbabwe, and to contribute toward sustainable management of green spaces. The specific objectives were to:

1) To assess the spatio-temporal dynamics of green spaces in Gweru City over the past two decades (2000-2019).
2) To analyse the drivers of green space depletion in Gweru City over the past two decades (2000-2019).
3) To establish the pressures of green space depletion in Gweru City over the past two decades (2000-2019).
4) To assess the state/conditions of green space depletion in Gweru City over the past two decades (2000-2019).
5) To examine the impact of green space depletion in Gweru City over the past two decades (2000-2019).
6) To provide both theoretical and practical solutions for sustainable management of green spaces in Gweru City.

Overall, the study covered six chapters with chapter one covering the background and research justification of the study. It also covered the research aim, objectives, questions, and hypothesis which were central to this research project. The study's contribution to science, methodology, and knowledge was also articulated. For example, providing both theoretical and practical solutions for sustainable management of green spaces in the city of Gweru contributes to the literature that informs subsequent research. The DPSIR framework upon which this study rest was briefly explained. The physical setting of the study area was also outlined in this chapter. Chapter Two presented a review of related literature on urban green spaces, green urban planning models, urban environmental governance, sustainable development strategies in Zimbabwe, regulatory and institutional frameworks for natural resources (green spaces included) in Zimbabwe, and challenges toward sustainable management of urban green spaces. Under the green spaces concept, classification and benefits were reviewed in this chapter. Urban green planning models were also discussed in detail-highlighting their strengths and weaknesses. As for urban environmental governance, the focus was on the theories that have been used in the management of green spaces in different countries. The chapter also considered the sustainable management strategies used by the Zimbabwean government to protect natural resources in general and green spaces in particular. In line with sustainable development, studies were the regulatory and institutional frameworks that guide the sustainable management of green spaces. The chapter also outlined the drivers of urban green space depletion and the research gap that emerged from the literature review. Finally, DPSIR conceptual framework upon which the study hinged was also considered in this study.

Chapter Three presented the research methodology. It was in this chapter that the methodological framework for the study was comprehensively outlined, discussed, and justified. The framework consists of research philosophy, research approach, research strategy, research choice, time horizon, and, techniques and procedures. Besides the methodological framework, this chapter presented research ethics, validity, and reliability. Chapter Four presented the demographic analysis of Gweru City's respondents. Chapter Five focused on data presentation, analysis, interpretation, and discussion based on research objectives. Chapter Six summarised the whole study which focuses on the sustainable management of urban green spaces in Zimbabwe, an explanatory study of Gweru City. It provides a summary of the whole study, highlights major findings and conclusions of the study, contributions and limitations of the study, and areas for future research.

The study was both quantitative and qualitative (mixed method approach) in nature. A case study research strategy was used. Gweru City was selected as the case study area owing to its rapid urban expansion and the demise of green spaces. High, medium, and low-density neighbourhoods were specific cases for the study. The reason for choosing these suburbs was their heterogeneity in terms of population, residential stands, and the distribution of green spaces. In line with the principles of the case study research strategy, several sources were used and these include geospatial technology, direct observation, questionnaires, and in-depth interviews. The units of analysis were drawn from Gweru residents, city authorities (officials from DPCS), EMA, DPP, DF, and RED. The major findings of the study along with research objectives are summarised below.

6.3 EVALUATION OF RESEARCH OBJECTIVES

The major research findings of the study are summarised in this section. To effectively articulate this section, the findings are presented along with the research objectives that guided the study.

1) **To assess the spatio-temporal dynamics of green space in Gweru City over the past two decades (2000-to 2019).**

This objective was achieved in Chapter 5. In addressing the objective, the researcher divided it into two parts. The first part used geospatial technology to study the distribution, changes, rate, and trend of green space dynamics in Gweru City. The results indicated that the green spaces are in Gweru City declining which is an indication that the city is not in a healthy state. Green space disappearance meant that the area was fast urbanizing as the built-up area consumed a large chunk of the total land of Gweru City. The results also indicated that the city's water bodies (rivers, streams, and dams) are shrinking. These findings paint a gloomy picture as to whether the city will achieve its vision of becoming a smart city by 2030 let alone achieving sustainable development goal number 11.7. This goal expects cities to provide universal access to safe, inclusive, and accessible, green and public spaces, in particular for women and children, older persons, and persons with disabilities by 2030. The following section addressed the second objective that informed the study.

The second part of the first objective solicited information from both residents (using a questionnaire) and key informants (using in-depth interviews). The reason for the stance was to substantiate the finding from the assessment of the spatio-temporal dynamics of Gweru City's green spaces over two decades (2000-2019). The first aspect was the type of green spaces, and from the findings, it emerged that the garden was mentioned by all the respondents, followed by trees. Aside from the gardens, the distribution of these green spaces was statistically different across the three residential areas with trees being more prevalent in the low-density suburbs than the middle and low-density suburbs. With regards to the main location of green spaces, for the high-density suburbs, the only location which was prevalent was learning institutions, with the others being poorly rated. For the medium-density suburbs, private residencies had the highest rating, and none was negatively rated, while for the low-density suburbs, the main location of green spaces was learning institutions. On aggregate, across all three strata, the main location of green spaces was learning institutions, while the least was wetlands and public parks and this was also validated using multidimensional scaling.

The second part of the first objective also looked into the major activities that were being done in large green spaces. From the outcome, in high-density suburbs, urban agriculture was the major activity, and in the medium-density suburbs, housing construction dominated, and for the low-density suburbs, the dominant activity was also housing construction. On aggregate, housing construction and social interaction were the major activities, and the least was wood harvesting, and again, this was validated using multidimensional scaling. The major aspect of the first research objective looked into the conditions of green spaces. From the outcome, the overall conditions across the three strata were poor, being less than the midpoint, and the worst affected areas were wetlands, followed by private residences, along with public parks. Comparing the condition of green spaces across three strata, the worst rating was observed for the high-density suburbs, followed by low-density suburbs, and the better rated, albeit negative, being the medium-density. The following section focused on the second objective which looks into salient drivers of green space depletion in the city.

2. To analyse the drivers of urban green space depletion in Gweru City over the past two decades (2000-2019).

This objective was achieved in Chapter 5. The objective looked into the drivers of urban green space depletion. A total of 18 items were investigated using exploratory factor analysis (EFA). The KMO and Bartlett's tests were not violated, along with the commonalities. From the varimax rotation, three factors were extracted. The first factor was administrative deficiencies and this comprised of political interferences, poor urban planning, corruption, lack of strong policy support, lack of green spaces database, poor law enforcement practices, lack of collaborative governance, and lack of environmental practices. The second factor was labelled human activities and this comprised construction, transportation, different lifestyles, accessible markets, industrialisation, different cultural practices, and population growth. Lastly, the third driver of urban green space depletion was the role played by geological phenomena, that is, climate change and local topography. Confirmatory Factor Analysis (CFA) was carried out and the three factors were confirmed using both convergent validity and discriminant validity. Concerning the three major drivers, human activity played the greatest role in the depletion of green spaces in urban areas followed by administrative deficiencies. On the other hand, for the medium-density suburbs, human activity and geological factors played the greatest role, and this was the same for the low-density suburbs. On aggregate, human activity played the greatest role when comparing the three strata. The next section focused on the third objective of the study.

3. To establish the pressures of green space depletion in Gweru City over the past two decades (2000-2019).

The third research objective sought to establish the pressures of green space depletion in Gweru City over the past two decades (2000-2019). Based on the literature review, 10 human activities responsible for the depletion of green spaces emerged, namely rapid population growth, rapid urbanisation, unplanned and unregulated urban expansion, poor spatial planning, poor waste management practices, wetland conversion, poverty, law enforcement lax, sand abstraction, and industrialisation.

The results of this objective showed that there is a plethora of pressures responsible for the demise of green spaces in Gweru City. Specifically, in the high-density suburbs law enforcement lax emerged as the major pressure responsible for the demise of green spaces in the study area. Poor waste management practices appeared as the least pressure responsible for the demise of green spaces in the city. In the medium-density suburbs, poor spatial planning emerged as the major pressure responsible for the demise of green spaces in Gweru City. Correspondingly, rapid urbanisation became the least cause in the same area. In the low-density suburbs, rapid urbanisation emerged as the greatest threat towards the demise of green areas in the city and the least sand abstraction which was negatively rated. These results show the heterogeneity in respondents among Gweru residents hence it was prudent to carry out the study. Nevertheless, overall, rapid urbanisation emerged as the dominant pressure that causes the demise of green spaces across all the suburbs in Gweru City. Sand abstraction, on the other hand, emerged as the least pressure responsible for the demise of green spaces in the study area. The following section presents the results of the fourth objective which sought to assess the conditions of green space depletion in Gweru City.

4. To assess the conditions of urban green space depletion in Gweru City over the past two decades (2000-2019).

The objective sought to assess the state/conditions of urban green spaces in Gweru City over the past two decades (2000-2019). Specifically, the objective aimed to explore the conditions of green spaces in various places, namely wetlands, public parks, private residents, working areas, learning institutions, playing grounds, cemeteries, streets, and industrial areas in the city. This objective is important in filling significant gaps in the literature. The has been a limited number of studies in Gweru City, especially on the state/conditions of urban green spaces. The previous study focused on the loss of green spaces in the city and ignored the overall conditions of green spaces on various city platforms. Thus, there was a need for recent information on the conditions of green spaces in the city so that the city authorities can find sustainable ways of conserving green spaces.

The results of the objective show that green spaces on all the platforms included were generally poor. Specifically, wetlands had the poorest green space conditions as attested by respondents across the three suburbs, namely high, medium, and low-density. Although all the platforms had poor conditions, better green space environments are witnessed in industrial areas. Rapid urbanisation is responsible for the demise or shrinkage of wetlands as residents seek accommodation in the city. Theoretically, the findings support the DPSIR framework that is widely used in understanding the various factors that contribute to the depletion of urban green spaces and the subsequent impacts on the environment and society. The poor conditions of urban green spaces also support previous research carried out in the Global South cities such as Lagos, Cairo, Alexandria, Luanda, Mogadishu, Monrovia, Kumasi, and Accra. In terms of the wetlands that were found to be the worst, the present study is in line with a study that was carried out in Wuhan where wetlands decreased by 10.98% from 1990-2018. Finally, the findings on wetlands resonate with a study carried out in India, Chile, and Tunisia. Thus, the findings imply the green space conditions are in a bad state in Gweru City. The following part presented the research findings of the fifth objective of the study.

5. **To examine the impact of urban green space depletion in Gweru City for the past two decades (2000-2019).**

The third research objective was achieved in Chapter 5 and looked into the effects of urban green space depletion. A total of 11 items were analysed using EFA. The key assumptions were not violated, that is, the KMO test for sampling adequacy and Bartlett's test for sphericity. The Principal Axis Factoring (PAF) was used as the extraction method and the Varimax as the rotation method. From the outcome, four major effects were extracted. The first effect was ecosystem degradation and this comprised of four items, that is, shrinking wetlands, siltation of dams, loss of aquatic ecosystem, and species extinction and migration. The second effect was aesthetic and recreational degradation, and this comprised of two items, that is, the loss of recreational area and the reduced house prices. The third effect was climate change and this comprised three items, that is, high temperatures, flash floods, and acid rains. The fourth effect was environmental health degradation and this comprised of health challenges and increased carbon dioxide. CFA was carried out and the extracted effects were validated. On aggregate, comparing the level of degradation was the highest for aesthetic and recreational degradation and this was consistent across the three strata. While environmental health degradation was the second rated in the high-density suburbs, ecosystem degradation was the second for the medium-density suburbs and low-density suburbs. The next section presented the major findings of the sixth objective.

6. To provide both practical and theoretical solutions for sustainable management of green spaces in Gweru City.

The sixth and final objective was addressed in chapter five and sought to establish the theoretical and practical solutions that can lead to the sustainable management of green spaces. For the practical solutions, out of the items that were considered, the major solutions that were cited by the respondents were environmental education, reforestation/afforestation as well as waste discharge limitations. Further analysis was done using EFA with Principal Axis Factoring (PAF) as the extraction method and from the outcome, four factors were extracted. Nevertheless, after CFA, only three were confirmed. The first solution was policies and regulations and this comprised waste discharge limitations, effective environmental bylaws, strong institutional policies, and prohibitive fines. The second solution was planning and education, and this comprised environmental education, indigenous knowledge systems, green spaces inventory, and green urban planning models. The last was stakeholder involvement and which comprised local stewardship of green spaces, stakeholder involvement, and the empowerment of local people.

The last aspect of the fifth objective looked into the theoretical solutions, and to achieve this, the DPSIR framework was applied. Structural equation modelling was carried out and from the outcome, the null hypothesis was rejected for all the hypotheses tested. The research confirmed that green space depletion drivers had a significant impact on the pressures, that green space depletion pressures had a significant impact on the state, that the state of green spaces had a significant impact on the impact, that the impact of green space depletion had a significant impact on the response, that the response had a significant impact on the drivers of green space depletion, that the response had a significant impact on the pressures of green space depletion and lastly, that the response had a significant impact on the state of green space depletion in urban Gweru. The following section focused on the study's main findings and conclusions.

6.4 FINDINGS AND CONCLUSIONS

Based on the general findings and objectives of the study, the following major conclusions can be made.

First, the study showed the importance of considering demographic variables in dealing with social issues such as the depletion of urban green spaces. Failure to assess the influence of the demographic variables on the use and provision of green spaces has a bearing on sustainable management practices. For example, from the results, it was clear that the size of the stand of a house can hinder the provision of green spaces in the neighbourhood. Thus, demographic features as far as yard vegetation, visitation, and the benefits associated when green spaces. Therefore, the city council needs to consider demographic variables in their decision-making. This would go a long way in the sustainable management of green spaces in Gweru City.

Second, the results showed that the green spaces in Gweru City are depreciating as attested by the use of geospatial technology in assessing their spatio-temporal dynamics of them in the study area. To buttress these findings, both the residents and key informants from five organisations responsible for the establishment and sustainable management of green spaces in the city, confirmed that green spaces are under severe threat. Their conditions are deplorable. Most of the areas that are under severe threat are the high-density suburbs. Therefore, the City authorities need to carry out a needs assessment so that green spaces are restored in high-density neighbourhoods.

Third, one of the key salient drivers for the demise of green spaces in Gweru was the dissonance that exists between the central government and the local authority as well as the organisations mandated to conserve the natural resources (DF, EMA, and DPCS). There are conflicts of interest, especially between organisations that are perceived to be the custodian of green spaces in the city. There is a lack of a clear mandate for each organisation as a result there is no clear boundary upon which they operate. They often bump into each other. This severely affects the provision and management of green spaces. In terms of the central government and local authority, the dissonance comes from the political orientation of these institutions. The central government oversees all the activities done by the local authorities. As such the local authorities report to the central government. The central government officials are from the ruling party and the opposite is true for local authorities. These institutions try to outsmart each other for political mileage at the expense of green spaces. Resultantly, by-laws are circumvented by officials from the central government and some of them boast that they are the ruling party. As such, they become untouchable and do as they please. They further accuse each other of corruption and stifling proper management of the city let alone green spaces.

Fourth, the major negative effects of green space depletion were found to be ecosystem degradation, aesthetic and recreational degradation, climate change, and environmental health degradation. These negative effects were discovered to be different across all three residential suburbs. This strengthened the need to administer the residents' questionnaire across all three suburbs because of their heterogeneity in terms of the geology of the places, the size of residential stands, and lifestyles. All these have a bearing on the establishment and sustainable management of green spaces. They view and understand the importance of green spaces differently. Overall, the results showed the major negative effect of green space depletion was ecological degradation. From the factor analysis computed, it was observed that the ecological degradation included the shrinking of wetlands, loss of aquatic ecosystem, species extinction, and migration. These findings were supported by the first part of objective number one. The first part confirmed the shrinking of water bodies such as rivers and dams. This, therefore, explains the water rationing experience in most of the city because wetlands are shrinking.

Fifth, the study revealed that there is a lack of stewardship of green spaces in Gweru City. All the stakeholders were expected to be participating in the management of urban green spaces. However, further analysis of the study revealed that none of them was actively participating in the management of urban green spaces. The results further concluded that officials from EMA should be playing a leading role in the management of green spaces. In addition, residents from the high-density suburb claimed that they did not know the type of green space maintenance carried out in their neighbourhoods. A few of them who had some knowledge picked unplanned maintenance as the type of maintenance done on green spaces. Thus, this means that the responsible authorities (DPCS) neglect green spaces in neighbourhoods, especially the playing grounds.

Sixth, the DPSIR framework was found to be a useful tool for the sustainable management of green spaces in Gweru City. It has shown the cause-effect relationship between variables. It showed its simplicity in representing and reporting the interactions between the environment and residents of Gweru City. Given the complexity of environmental issues and the presence of various stakeholders involved in decision-making processes, The DPSIR provided professionals with a streamlined tool to develop strategic solutions for sustainable UGS management and for promoting residents' well-being. The following section presents the recommendations of the study.

6.5 RECOMMENDATIONS OF THE STUDY

Following a comprehensive discussion throughout this research, several recommendations are made:

1. The Gweru City authorities need to come up with a comprehensive database on the nature and conditions of green spaces. This would assist them in periodically monitoring the land use and cover changes in the city. They can achieve this through the use of geospatial technologies, that is, remote sensing, geographic information systems, and global positioning systems. The geospatial techniques can help the city
2. The Department of Physical Planning needs to adopt the use of spatial planning as opposed to the use of old master plans. Old master plans cannot assist the official to identify areas that need to be greened. In addition, there is a need to adopt a green model that can be used to maintain and expand the green spaces
3. The central government should desist from interfering with local authorities' daily operations. The by-laws need to be observed regardless of political affiliation. Even the current by-laws need to be revamped and include the importance of greening the city.
4. The city authorities need to desist from parcelling land to everyone without following the proper procedures. Building on green spaces such as wetlands needs to be condemned. In addition, the city authorities should refrain from allowing political parties and churches to gather in recreational areas such as playing grounds. Their footprints destroy the green spaces which makes it difficult for personnel in the Department of Housing and Parks to maintain them.

5. Neighbourhood committees should be established in each ward to ensure that there is proactive maintenance of green spaces. Effectively, this addresses the issue of stewardship of green spaces. Stewardship of green spaces in neighbourhoods ensures their sustainable management as the locals would protect their environment.
6. Strong Regulatory and Institutional Frameworks should be crafted and observed to enhance the sustainable management of green spaces in the city.
7. Environmental education should be introduced in schools so that green spaces are appreciated by everyone in the city. Once the subject is introduced at the primary school level, the learners would cascade the information to their parents hence the green spaces would be sustainably managed.
8. More key players should be roped in the management of green spaces, particularly Churches and Civic organisations. Civic Organisations in Zimbabwe seem to focus more on politics and neglect sustainable management of green spaces in cities. Churches hire stadiums and worship on open spaces thereby destroying the green spaces. Thus, their involvement in green space management would help the worshippers appreciate them.
9. The Environmental Management Agency should be responsible for the sustainable management of green spaces in the city since being responsible for natural resources management.

6.6 STUDY LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Like any other empirical study, this study had limitations, and these include:

1. The spatial resolution (30m x 30m) used to assess the spatiotemporal dynamics of green spaces could not differentiate some spatial features such as bare ground and built-up areas due to their similar spectral signature.

2. Political orientation led to a biased interpretation of the data. Each key informant gave views that are in line with their political ideology and agenda. Thus, the information could have been skewed in favour of one's superiors.
3. The dominance of male respondents might affect the generalisability of this study. A limited number of females were willing to participate in this study hence male dominance and this has a ripple effect on data analysis.
4. Using Factor Analysis posed some challenges when it came to factor loading and naming. For example, in this study, insufficient funds were loaded into geological influence where local topography and climate change belonged. Thus, names may not accurately reflect the variables within the factor.
5. The Covid-19 outbreak and financial constraints severely affected the researcher's progress hence it took time to accomplish the thesis.
6. The use of a case study as a research design made the study focus more on the study area. This limited the generalisability of the research's findings to other cities in Zimbabwe and beyond.
7. The use of DPSIR had also some limitations. By nature, the DPSIR is simple as it just focuses on the cause-effect relationship between environmental and socio-economic aspects. As such the complexity associated with the urban systems need the integration of DPSIR with other methods. In this study, DPSIR was not integrated with other methods such as cost-benefit analysis hence the results might be affected because of that weakness posed by the framework.

Considering the limitations and a broad overview of the literature on urban green spaces, some areas need future research. Therefore, the researcher proposes further research on:

1. The use of Random Forests for the assessment of urban green space dynamics in the city. This could buttress or refute the results obtained in this study. The Random Forest

algorithm, according to the literature review, has the potential to differentiate land use/cover with similar reflectance.

2. Use spatial planning on urban green space management as opposed to old master plans. Spatial planning assists town planners to encounter new challenges concerning urban green space issues due to the dynamic nature of the population in Zimbabwean cities.
3. Use of a different theoretical/conceptual framework in promoting sustainable management of green spaces in the city. Behavioural theories can also be adapted to study the behavioural dimension of the destruction of urban green spaces.
4. Effectiveness of Regulatory and Institutional Frameworks in enhancing sustainable green spaces management. Some frameworks are abandoned before they achieve their intended goals.
5. The impact of political dissonance on the demise of green spaces in the city. Political dissonance is affecting the establishment of green spaces in the city. Thus, there need to carry out a study to determine the extent to which the dissonance affects the provision of green spaces in the city.
6. Designing of effective green spaces model that enhances sustainable management of them in the city. Following a particular model has the potential to increase green spaces in Gweru City.
7. The perception of both church and civic organisations needs to be carried out as these can be handy in promoting sustainable management of green spaces in the city.

6.7 CONTRIBUTION OF THE STUDY TO SCIENTIFIC KNOWLEDGE

The current study provides significant contributions by attempting to fill several gaps. These contributions can be divided into 1) empirical, 2) methodological, 3) practical, and 4) theoretical perspectives (Figure 6.1).

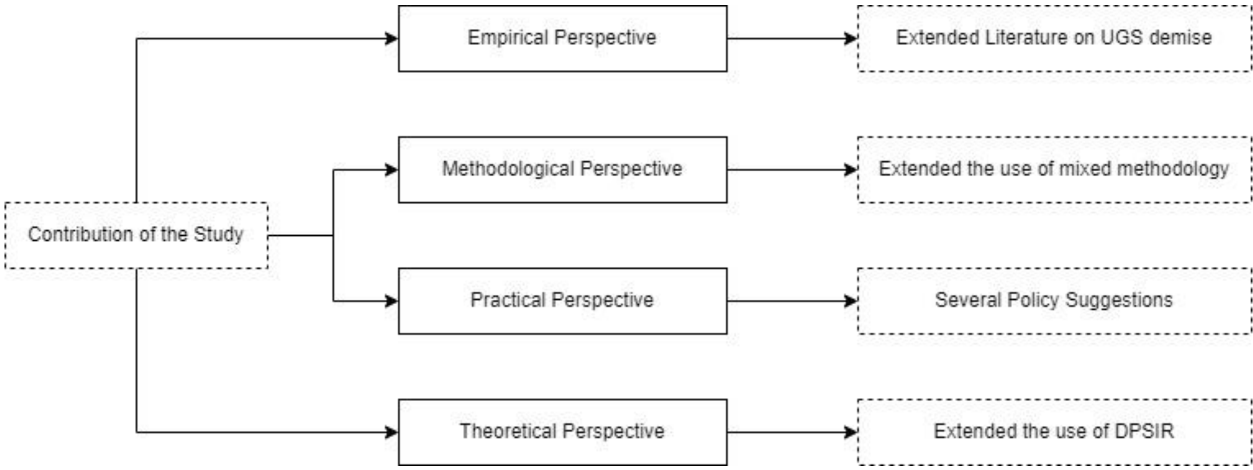

Figure 6.1: Contribution of the study

Empirically, the study has contributed to the limited research on the demise of green spaces in Zimbabwe's urban areas. In doing so, the research has extended the literature review to some of the salient drivers of green space depletion in the city of Gweru and Zimbabwe in general. Additionally, the study has extended the importance of including residents in the sustainable management of green spaces. The inclusion of stakeholders in the management of green spaces has received little attention in Gweru City and this research has brought that to the fore. Besides, the study has also extended the literature to the importance of using geospatial technology in analysing green space changes at the five-year interval. Analysing the changes in green spaces at ten- and more-year intervals give the wrong impression that they are not under threat yet they experience severe incarceration. Therefore, monitoring green spaces over a short space of time enhances their sustainable management.

Methodologically, the study, to the best knowledge of the author and through research from peer-reviewed databases has explored and extended the use of sequential explanatory design to understand the demise of green spaces in Gweru City. It is one of the studies that has integrated the use of geospatial technology, residents, and key informants to gain an insight into the distribution, drivers, negative effects, and the role of stakeholders in the demise of green spaces, particularly in the Zimbabwean's urban area context. The research that was carried out neglected the voice and power of the residents in the sustainable management of green spaces. In addition, the study has extended the use of a questionnaire as one of the best tools for soliciting information. Of particular importance were both the sample power and size that enables the validity, reliability, and generalizability of the study. The use of remote sensing, geographical information, and global position system usage in determining land use/cover changes has also been extended in this study. The importance of both observation and key informants in studying green spaces' demise has also been validated in this study. Key informants were used to explain both the results from the geospatial analysis of green space changes over two decades and the Gweru residents' responses. This adds to the validity and reliability of the results of the challenges under study.

Practically, the results revealed that one of the greatest culprits responsible for the demise of green spaces in the city was the dissonance between the central government and local authorities. They try to outsmart each other as a way of gaining political mileage. Resultantly, green spaces are being destroyed as there is a lack of cohesion among key players. Therefore, this study has contributed to the changing of mindsets when it comes to the sustainable management of green spaces. The research has called upon all stakeholders to work together for the good of the city and future generations. If the dissonance continues unabated, sooner or later the residents would suffer the consequence of green space depletion like excessive heat islands. So, the author calls for the restoration of an executive mayor who should exercise autonomy when it comes to the council's businesses.

In addition, the study has contributed to the paradigm shift of by-laws. They need to be upgraded and aligned with current changes in the demographics of the city. Changing the size of stands from a minimum of $80m^2$ to $300m^2$ in high-density suburbs allows the residents to have an area meant for green space establishment. Currently, high-density residential stand sizes are too small to reserve a lawn, hibiscus, or vegetable garden. Another way of circumventing the challenges of urbanisation is to establish storey buildings. Storey buildings do not consume a lot of land and this creates areas where green spaces can be established in the city.

The study has also contributed to the use and creation of a database for monitoring and management of green spaces. Relying on old master plans creates more problems than solutions in managing green spaces. Sensitive areas such as wetlands should not be destroyed to accommodate the ever-rising urban population. The 'lungs' of the city should be maintained and protected. To effectively achieve this, the city authorities should allow the residents to be the custodians of green spaces in their neighbourhoods, that is, at the ward level. The city authorities need to adopt a Garden City model that promotes the establishment of green spaces not only in Gweru but in Zimbabwean urban areas. In a nutshell, the study has contributed to the change in the mindset of stakeholders, by-laws, storey buildings, and the use of a garden model to ensure sustainable management of green spaces in the city.

Theoretically, the study adapted and extended the use of the systems thinking's DPSIR conceptual framework in the sustainable management of natural resources such as green spaces. The DPSIR framework assumes cause-effect relationships between interacting components of social, economic, and environmental systems and human health in one place (Gupta et al., 2020; Kyere-Boateng & Marek, 2021; Moss, Evans & Atkins, 2021). The DPSIR framework has been used to manage agricultural systems (Lhermie, 2021), water resources (Mosaffaie et al., 2021; Romanelli et al., 2021), land and soil resources (Salehpour et al., 2021), and biodiversity (Dzonga et al., 2020; Zandebasiri et al., 2021; Quevedo et al., 2023). In this study, through DPSIR the use of a structural equation modelling approach was validated and extended. More important, was the capability of SEM-based approaches to handle latent variables, which cannot be achieved seamlessly using conventional regression techniques (Wickham & Grolemund, 2017). Thus, the study extended the use of DPSIR as the conceptual framework lens that can be used in the management of green spaces in cities. It helps in the understanding of the complex system variables in urban areas. It brings to the fore the interaction of these variables and assimilating them assist in devising ways of green spaces sustainable management practices. The following section summarises the research findings of the study.

6.8 CONCLUDING REMARK

Overall, urban green spaces in Gweru are under severe threat from several factors, chief among them is the political dissonance between the central government and the local authorities. If these two entities work together, Gweru City would be attractive and become a city of choice by 2030 according to its vision. In addition, effective sustainable management of urban green spaces has the potential to absorb the shocks associated with their depletion and the achievement of sustainable development goal number 11.7, especially in the Global South countries where there is rapid urbanisation.

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APPENDIX I: QUESTIONNAIRE FOR INDIVIDUAL HOUSEHOLD HEADS

This study is in partial fulfilment of the requirement for the award of the PhD degree in Geography at the University of South Africa. The main objective of this research is to make both **theoretical and practical** contributions to the sustainable management of **urban green spaces** in Gweru City. **Green spaces refer to all the vegetation that ranges from small grasses to well-established woodlands i.e., wetlands, lawns, shrubs, trees, etc.** This questionnaire is designed to elicit information on the management of urban green spaces in Gweru. You are assured of full confidentiality, privacy and anonymity of all the information that you will give. You have the right not to participate. You should, therefore, feel free to give the right information to ensure the success of this work. **Tick☑ all the appropriate boxes.**

SECTION A: RESPONDENT'S DEMOGRAPHIC CHARACTERISTICS

QA1. What is your gender?

☐ Male ☐ Female

QA2. What is your age?

☐ Less than 30 years ☐ 31-40 years ☐ 41-50 years ☐ 51-60 years ☐ More than 60 years

QA3. What is your highest level of education?

☐ Secondary ☐ Certificate ☐ Diploma ☐ Undergraduate ☐ Postgraduate

QA4. How many years have you stayed in Gweru?

☐ Less than 10 years ☐ 10-20 years ☐ 21-30 years ☐ 31-40 years ☐ More than 40 years

QA5. Which residential area do you stay Gweru?

☐ High-density ☐ Medium-density ☐ Low-density

QA6. What is the type of your accommodation?

☐ Owner ☐ Council ☐ Rental ☐ Working place

QA7. What is the approximate size of your stand?

☐ Less than 300m^2 ☐ 300-500m^2 ☐ 501-800m^2 ☐ 801-1000m^2 ☐ More than 1000m^2

SECTION B: GENERAL INFORMATION ABOUT URBAN GREEN SPACES IN GWERU CITY

QB8. There is a green space on the property I reside.

☐ Yes ☐ No

QB9. The following green space is found at my residential property.

☐ Lawn ☐ Garden ☐ Hibiscus ☐ Shrubs ☐ Trees

QB10. The following reasons make it difficult for me to have green spaces on my residential property:

	SD	D	N	A	SD
It is not necessary	☐	☐	☐	☐	☐
The creation of greens is expensive	☐	☐	☐	☐	☐
Limited space	☐	☐	☐	☐	☐
Lack of resources	☐	☐	☐	☐	☐
Poor soils	☐	☐	☐	☐	☐
Water shortages	☐	☐	☐	☐	☐
Government policy	☐	☐	☐	☐	☐

SD= Strongly Disagree, D=Disagree, N=Neutral, A=Agree and SA=Strongly Agree

QB11. The green spaces in my residential area approximately correspond to the following sizes:

	<10 m^2	10-20m^2	21-30m^2	31-40m^2	41+m^2
Lawn	☐	☐	☐	☐	☐
Garden	☐	☐	☐	☐	☐
Hibiscus	☐	☐	☐	☐	☐
Shrubs	☐	☐	☐	☐	☐
Trees	☐	☐	☐	☐	☐

QB12. Green spaces are mainly located in the following areas in my residential area:

	SD	D	N	A	SA
Wetlands	☐	☐	☐	☐	☐
Public parks	☐	☐	☐	☐	☐
Private residences	☐	☐	☐	☐	☐
Working areas	☐	☐	☐	☐	☐
Main roads and streets	☐	☐	☐	☐	☐
Educational institutions	☐	☐	☐	☐	☐
Churches	☐	☐	☐	☐	☐
Cemeteries	☐	☐	☐	☐	☐
Industrial areas	☐	☐	☐	☐	☐
Stadiums	☐	☐	☐	☐	☐

QB13. In your opinion, the following are the benefits associated with green spaces:

	SD	D	N	A	SD
Aesthetic	☐	☐	☐	☐	☐
Environmental	☐	☐	☐	☐	☐
Health	☐	☐	☐	☐	☐
Economic	☐	☐	☐	☐	☐
Recreational	☐	☐	☐	☐	☐
Social	☐	☐	☐	☐	☐
Ecosystem service	☐	☐	☐	☐	☐
Natural ambient and serenity	☐	☐	☐	☐	☐

QB14. The likely challenges brought by the presence of green spaces in your residential area are:

	SD	D	N	A	SD
Physical threat to humane safety	☐	☐	☐	☐	☐
Waste dumping place	☐	☐	☐	☐	☐
Criminals hiding place	☐	☐	☐	☐	☐
Attracting dangerous wildlife	☐	☐	☐	☐	☐
A place for sexual violence	☐	☐	☐	☐	☐

SECTION C: DRIVERS OF URBAN GREEN SPACES DEMISE IN GWERU CITY

Drivers of urban green space depletion refer, in the context of this study, to human needs that are responsible for the deterioration of greenery in Gweru City. The activities may be direct (proximate causes) or indirect (underlying causes). With that knowledge, may you give your thoughts on the following statements.

QC15. The following direct (proximate) human needs cause the demise of green spaces in Gweru City.

	SD	D	N	A	SD
Lack of environmental practices	☐	☐	☐	☐	☐
Inadequate funds	☐	☐	☐	☐	☐
Lack of strong policy support	☐	☐	☐	☐	☐
Inadequate waste disposal	☐	☐	☐	☐	☐
Lack of collaborative governance	☐	☐	☐	☐	☐
Industrialisation	☐	☐	☐	☐	☐
Political interference	☐	☐	☐	☐	☐
Transportation	☐	☐	☐	☐	☐
Corruption	☐	☐	☐	☐	☐

SD= Strongly Disagree, D=Disagree, N=Neutral, A=Agree and SA=Strongly Agree

QC16. The following indirect (underlying) human needs cause the demise of green spaces in Gweru City.

	SD	D	N	A	SD
Lack of green database	☐	☐	☐	☐	☐
Construction	☐	☐	☐	☐	☐
Climate change	☐	☐	☐	☐	☐
Unplanned land use changes	☐	☐	☐	☐	☐
Poor urban planning	☐	☐	☐	☐	☐
Population growth	☐	☐	☐	☐	☐
Accessible markets	☐	☐	☐	☐	☐
Different lifestyles	☐	☐	☐	☐	☐
Poor law enforcement	☐	☐	☐	☐	☐

SECTION D: PRESSURES OF URBAN GREEN SPACES DEMISE IN GWERU CITY

In the context of this study, pressures refers to human activities that causes the demise of urban green spaces in Gweru City. With this in mind, may you give your opinion on the following statement.

QD17. The following are the major activities done in green spaces in my residential area:

	SD	D	N	A	SA
Rapid population growth	☐	☐	☐	☐	☐
Rapid urbanisation	☐	☐	☐	☐	☐
Unregulated construction	☐	☐	☐	☐	☐
Poor spatial planning	☐	☐	☐	☐	☐
Poor waste management practises	☐	☐	☐	☐	☐
Wetland conversion	☐	☐	☐	☐	☐
Poverty	☐	☐	☐	☐	☐
Law enforcement lax	☐	☐	☐	☐	☐
Industrialisation	☐	☐	☐	☐	☐
Sand abstraction	☐	☐	☐	☐	☐

SECTION E: STATE OF URBAN GREEN SPACES DEPLETION IN GWERU CITY

In this study, states refers to the condition of urban green spaces in Gweru City. With this understanding, may you rate the conditions of green spaces in your neighbourhood.

QE18. The state/conditions of the following green spaces in my residential area are:

	VP	P	N	G	VG
Wetlands	☐	☐	☐	☐	☐
Public parks	☐	☐	☐	☐	☐
Private residences	☐	☐	☐	☐	☐
Main roads and streets	☐	☐	☐	☐	☐
Educational institutions	☐	☐	☐	☐	☐
Churches	☐	☐	☐	☐	☐
Cemeteries	☐	☐	☐	☐	☐
Industrial areas	☐	☐	☐	☐	☐
Stadiums	☐	☐	☐	☐	☐
Working places	☐	☐	☐	☐	☐

VP=Very poor, Poor = P, Neutral= N, Good=G, and VG= Very good

QE19. The factors responsible for the current state of green spaces in my residential area can be grouped into:

	SD	D	N	A	SA
Demographic	☐	☐	☐	☐	☐
Institutional	☐	☐	☐	☐	☐
Cultural	☐	☐	☐	☐	☐
Political	☐	☐	☐	☐	☐
Legal	☐	☐	☐	☐	☐
Analytical	☐	☐	☐	☐	☐
Financial	☐	☐	☐	☐	☐
Physical	☐	☐	☐	☐	☐

SD= Strongly Disagree, D=Disagree, N=Neutral, A=Agree and SA=Strongly Agree

SECTION F: IMPACT OF URBAN GREEN SPACES DEMISE IN GWERU CITY

In this study, impact refers to the challenges that are associated with the removal of green spaces in your neighbourhood. Therefore, may you give your perception on the following statements.

QF20. The negative effects of urban green spaces depletion in my residential area are as follows:

	SD	D	N	A	SA
Species extinction and migration	☐	☐	☐	☐	☐
High temperatures	☐	☐	☐	☐	☐
Flash floods	☐	☐	☐	☐	☐
Siltation of dams	☐	☐	☐	☐	☐
Loss of aquatic ecosystem	☐	☐	☐	☐	☐
Shrinking wetlands	☐	☐	☐	☐	☐
Loss of recreational area	☐	☐	☐	☐	☐
Reduced house prices	☐	☐	☐	☐	☐
Health challenges	☐	☐	☐	☐	☐
Increased carbon dioxide	☐	☐	☐	☐	☐
Acid rains	☐	☐	☐	☐	☐

SD= Strongly Disagree, D=Disagree, N=Neutral, A=Agree and SA=Strongly Agree

SECTION G: SUSTAINABLE MANAGEMENT OF URBAN GREEN SPACES IN GWERU CITY

Sustainable management entails the interaction between social and economic activities and the environment in a manner that allows the continuous existence of natural resources for future generations. Therefore, this section is divided into two subsections, namely stakeholders' involvement in the demise of green spaces and society's responses in addressing the perpetual demise of green spaces in the city. Thus, may you give your perceptions on the following statements.

QG 21. Green spaces in my residential area are managed by the following stakeholders:

	SD	D	N	A	SA
City residence	☐	☐	☐	☐	☐
Parks and Garden Department	☐	☐	☐	☐	☐
Environmental Management Agency (EMA)	☐	☐	☐	☐	☐
Forestry Commission	☐	☐	☐	☐	☐
Wildlife and Management Department	☐	☐	☐	☐	☐
Health and Environment Department	☐	☐	☐	☐	☐
Department of Physical Planning	☐	☐	☐	☐	☐
Zimbabwe National Water Authority	☐	☐	☐	☐	☐
Church organisations	☐	☐	☐	☐	☐
Civic organisations	☐	☐	☐	☐	☐

QG22. In my view, the above stakeholders should be involved in the maintenance of green spaces in my residential area:

	SD	D	N	A	SA
City residence	☐	☐	☐	☐	☐
Parks and Garden Department	☐	☐	☐	☐	☐
Environmental Management Agency (EMA)	☐	☐	☐	☐	☐
Forestry Commission	☐	☐	☐	☐	☐
Wildlife and Management Department	☐	☐	☐	☐	☐
Health and Environment Department	☐	☐	☐	☐	☐
Department of Physical Planning	☐	☐	☐	☐	☐
Zimbabwe National Water Authority	☐	☐	☐	☐	☐
Church organisations	☐	☐	☐	☐	☐
Civic organisations	☐	☐	☐	☐	☐

QG23. The following are the types of maintenance strategies for green spaces in my residential area:

	SD	D	N	A	SA
Unplanned	☐	☐	☐	☐	☐
Reactive	☐	☐	☐	☐	☐
Corrective	☐	☐	☐	☐	☐
Preventative	☐	☐	☐	☐	☐

QG24. Comment on green space maintenance in your residential area.

☐ Very poor ☐ Poor ☐ Neutral ☐ Good ☐ Very good

QG25. In my opinion, the following factors cause poor maintenance of green spaces in my residential area.

	SD	D	N	A	SA
Lack of green spaces stewardship	☐	☐	☐	☐	☐
Poor communication among stakeholders	☐	☐	☐	☐	☐
Lack of environmental education	☐	☐	☐	☐	☐
Cultural practices	☐	☐	☐	☐	☐
Poor law enforcement	☐	☐	☐	☐	☐
Lack of effective by-laws	☐	☐	☐	☐	☐
Corruption	☐	☐	☐	☐	☐
Lack of maintenance practices	☐	☐	☐	☐	☐

QG 26. Overall, the following stakeholders are highly involved in the management of green spaces in my residential area:

	SD	D	N	A	SA
City residence	☐	☐	☐	☐	☐
Parks and Garden Department	☐	☐	☐	☐	☐
Environmental Management Agency (EMA)	☐	☐	☐	☐	☐
Forestry Commission	☐	☐	☐	☐	☐
Wildlife and Management Department	☐	☐	☐	☐	☐
Health and Environment Department	☐	☐	☐	☐	☐
Department of Physical Planning	☐	☐	☐	☐	☐
Zimbabwe National Water Authority	☐	☐	☐	☐	☐
Church organisations	☐	☐	☐	☐	☐
Civic organisations	☐	☐	☐	☐	☐

QG 27. The following factors make the stakeholders fail to manage green spaces in my residential area:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Lack of resources	☐	☐	☐	☐	☐
Political interference	☐	☐	☐	☐	☐
Ignorance	☐	☐	☐	☐	☐
Indifference	☐	☐	☐	☐	☐
Weak institutional policy	☐	☐	☐	☐	☐
Lack of environmental education	☐	☐	☐	☐	☐

QG28. How do you rate your understanding of the concept?

☐ Very poor ☐ Poor ☐ Neutral ☐ Good ☐ Very good

QG29. Overall, how do you consider the effectiveness and relevance of this concept in the sustainable management of green spaces?

☐ Ineffective ☐ Slightly effective ☐ Moderately effective ☐ Effective ☐ Very effective

QG30. Do you think it is important to consider the concept in the management of green spaces in the city?

☐ Unimportant ☐ Slightly important ☐ Moderately important ☐ Important ☐ Very important

In the context of this study, responses are actions taken by the society to redress the challenges of urban green spaces demise in your neighbourhood. Thus, may you give you opinion on the following statements regarding responses that the society can take to ensure the sustainability of urban green spaces in the city of Gweru.

QG31. How far do you agree with the following statements regarding responses needed to achieve sustainable management of green spaces?

	SD	D	N	A	SA
Stakeholders’ involvement	☐	☐	☐	☐	☐
Environmental education	☐	☐	☐	☐	☐
Empowerment of local people	☐	☐	☐	☐	☐
Green spaces inventory	☐	☐	☐	☐	☐
Strong institutional policies	☐	☐	☐	☐	☐
Green urban planning models	☐	☐	☐	☐	☐
Reforestation/Afforestation	☐	☐	☐	☐	☐
Waste discharge limitations	☐	☐	☐	☐	☐
Indigenous Knowledge Systems	☐	☐	☐	☐	☐
Effective environmental by-laws	☐	☐	☐	☐	☐
Prohibitive fines	☐	☐	☐	☐	☐
Use of alternative fuels	☐	☐	☐	☐	☐
Local stewardship of green spaces	☐	☐	☐	☐	☐

QG32. Above all, what is your comment on the following statements concerning the sustainable management of green spaces in the City of Gweru?

	SD	D	N	A	SD
Gweru City should be a green City	☐	☐	☐	☐	☐
Everyone has to protect the green spaces	☐	☐	☐	☐	☐
Greening roofs should be done in areas with limited spaces	☐	☐	☐	☐	☐
Regular updates on the status of green spaces are critical	☐	☐	☐	☐	☐
Everyone's views are critical in green spaces conservation	☐	☐	☐	☐	☐
Personal commitment is important for green spaces management	☐	☐	☐	☐	☐
Understanding the causes and effects of depletion is important for green spaces management	☐	☐	☐	☐	☐
Looking beyond a specific event is critical for the management of green spaces	☐	☐	☐	☐	☐

THANK YOU FOR YOUR VALUABLE CONTRIBUTIONS

APPENDIX II: INTERVIEW GUIDE FOR KEY INFORMANTS IN GWERU CITY

Date of interview: Place of interview:

Interviewee's gender: Institution:

Title:

INTRODUCTION

This research contributes to the partial completion of the requirements for the University of South Africa's PhD in Geography. The primary goal of this study is to provide theoretical and applied solutions for the sustainable management of urban green areas in the City of Gweru. This in-depth interviewing tool is intended to extract details on Gweru's management of its urban green areas. You can be assured that all the information you provide will be kept completely private, secret, and anonymous. Therefore, please don't hesitate to provide me with the necessary details so that this project is successful. I appreciate your assistance.

PART A: GENERAL INFORMATION

1. Can you briefly explain to me what you understand by the term urban green spaces?
2. How are the following demographic variables influence the use and provision of urban green spaces in Gweru City? a) gender, b) type of residential area, c) the size of the stand, d) age?
3. Give examples of green spaces common in Gweru City's neighbourhoods.

PART B: DRIVERS, PRESSURES, STATE AND IMPACT OF URBAN GREEN SPACES DEMISE IN GWERU CITY.

4. What are the direct (proximate) human needs that causes the demise of green spaces in Gweru City?
5. What are the indirect (underlying) human needs that causes the demise of green spaces in Gweru City?
6. What human activities (pressures) that causes green spaces demise in Gweru city?

7. What can you say about the conditions of green spaces in the city?

8. What can you say about the provision of green spaces in the city?

9. Which factors do you think are responsible for the condition of green spaces in Gweru City?

10. May you outline the negative effects of urban green spaces depletion in Gweru City

SECTION C: URBAN GREEN SPACES MANAGEMENT IN THE CITY

11. Who is responsible for the management of urban green spaces in the city?

12. In your view, which other stakeholders should be involved in the maintenance of green spaces in the city?

13. What type of types of maintenance strategies for green spaces are you doing in the city?

14. Comment on green space maintenance in Gweru city.

15. Overall, which stakeholders are highly involved in the management of green spaces in the city?

16. What factors make the stakeholders fail to manage green spaces in the city?

SECTION D: TOWARDS SUSTAINABLE MANAGEMENT OF GREEN SPACES IN THE CITY

17. What do you understand by the term sustainable management of green spaces?

18. Overall, how do you consider the effectiveness and relevance of this concept in the sustainable management of green spaces?

19. Do you think it is important to consider the concept in the management of green spaces in the city?

20. What are the challenges that you experience in trying to promote the sustainable management of green spaces?

21. What do you think needs to be done to establish and preserve urban green spaces in the city?

22. What is the relationship between you and other entities that are responsible for the sustainable management of urban green spaces in the city?

THANK YOU FOR YOUR COOPERATION

APPENDIX III: DIRECT OBSERVATION CHECKLIST

Checklist for observations on the state and use of Gweru's urban green areas			
Date	**Time**	**Area**	**Observed activity on the ground**

APPENDIX IV: HREC_CAES_ETHICS APPROVAL

UNISA university of south africa

UNISA GENERAL RESEARCH ETHICS REVIEW COMMITTEE

Date: 19/02/2018

NHREC Registration # : REC-170616-051
ERC Reference # : 2018/CAES/025
Name : Mr P Mukwenyi
Student #: 60849355

Dear Mr Mukwenyi

Decision: Ethics Approval from 16/02/2018 to 31/01/2019

Researcher(s): Mr P Mukwenyi
608489355@mylife.unisa.ac.za

Supervisor (s): Prof A Horn
hornac@unisa.ac.za; 011-471-2168

Working title of research:
Towards sustainable management of urban green space: An explanatory study of Gweru city, Zimbabwe

Qualification: PhD Geography

Thank you for the application for research ethics clearance by the Unisa CAES General Research Ethics Review Committee for the above mentioned research. Ethics approval is granted for a one-year period, **subject to submission of the relevant permission letters**. After one year the researcher is required to submit a progress report, upon which the ethics clearance may be renewed for another year.

Due date for progress report: 31 January 2019

Please note the points below for further action:

1. The application indicates that participants will also include personnel from NGOs. The researcher is reminded that permission must first be obtained from the targeted NGOs before the researcher may approach any of their personnel. These permissions must be submitted to the Committee for record purposes.
2. The Committee recommends that the sampling frame and justification of the sample size be reviewed. The researcher excludes people between the ages of 35 to 65 from

MYE

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participating on the basis that this group will not have the necessary experience in using the green spaces. However, the ages of participants do not necessarily link to their experience of green space – the researcher should consider reviewing the sampling justification.

3. Will there be an overlap between interviewees and focus group participants? This needs to be clarified.

*The **low risk application** was **reviewed** by the CAES General Research Ethics Review Committee on 16 February 2018 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
7. No field work activities may continue after the expiry date. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

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*The reference number **2018/CAES/025** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

Prof EL Kempen
Chair of CAES General Research ERC
E-mail: kempeel@unisa.ac.za
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Prof MJ Linington
Executive Dean : CAES
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APPENDIX V: PERMISSION LETTERS AUTHORITIES

ALL COMMUNICATIONS TO BE ADDRESSED TO THE CHAMBER SECRETARY

CITY of GWERU

CHAMBER SECRETARY'S DEPARTMENT
Municipal Offices
P.O. Box 278 Telephone 263-054-224071-9
Fax 263-054-24309-Gweru, Zimbabwe
E-mail: *gweruchambersec@comone.co.zw*

If calling or phoning this matter.
Please ask for
MR NEMUSESO

Your Ref:
Our Ref: JN/nmd/Personnel

16 October 2017

Produce Mukwenyi
Mkoba Teachers College
Gweru

Dear Sir/Madam

RE: REQUEST TO CARRY OUT A RESEARCH IN GWERU CITY

Your application to carry out a research has been approved on the following conditions: -

1) That you do not publish the name of Council officials.
2) That you also seek police clearance in the case that you want to interview residents.
3) That Gweru City Council shall not be liable of any action arising from your research.
4) That you undertake to deposit of the said research which shall be submitted to the Town Clerk's office.

Note that this letter serves as an introduction to whoever it may concern.

E. GWATIPEDZA
TOWN CLERK
cc. *Chamber Secretary*
Human Resources Manager
File

APPENDIX VI: PROOF THAT THE THESIS HAS BEEN LANGUAGE EDITED

MIDLANDS STATE UNIVERSITY

DEPARTMENT OF ENGLISH

11/4/2022

University of South Africa

Editor's Report for Mukwenyi Produce's PhD Thesis

I edited Mukwenyi Produce's Thesis and here are my comments:

The document was generally fairly written with some few mistakes and relatively few errors which the student has already corrected to my satisfaction. They were as follows:

1. Inappropriate words that needed to be replaced by more suitable ones
2. Tense mistakes, especially the future tense of the proposal that needed to be changed
3. Few too long paragraphs that needed attention
4. Some few sentences and phrases needed rephrasing
5. Some in-text references were to be corrected according to the APA style using the referencing style template (available online)
6. I quizzed him on limited websites on his references but was satisfied that he mainly used hard copies from the university library

Closing Remarks: I was happy with the student's corrections and I feel that he is ready for final submission.

Prof Stella Muchemwa, muchemwas@staff.msu.ac.zw, +263773 505 841

Lecturer in English Education at Midlands State University (MSU), Zimbabwe

APPENDIX VII: TURNITIN SIMILARITY REPORT

PhD Thesis

ORIGINALITY REPORT

22%	18%	6%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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APPENDIX VIII: CONSENT FORM

UNISA university of south africa

CONSENT TO PARTICIPATE IN THIS STUDY

I, __________________ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunities to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the <insert specific data collection method>.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname………………………………………… (please print)

Participant Signature……………………………………………..Date…………………

Researcher's Name & Surname………………………………………(please print)

Researcher's signature…………………………………………..Date…………………