SOCIAL DISRUPTION AND PLACE ATTACHMENT: AN ANALYSIS OF THE SOCIAL CONSEQUENCES OF RESOURCE EXTRACTION IN NON-METROPOLITAN AREAS IN SOUTH AFRICA

Kenneth Tinawo Chatindiara

Student no: 2017008844

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Promoter: Prof. JGL Marais

Co-promoters: Dr Antonie Pool, Prof Zacharia Matebesi, Prof Xaquin Perez-Sindin

Declaration

I, Kenneth Tinawo Chatindiara, declare that the thesis that I herewith submit for the Doctoral Degree with specialization in Development Studies, at the University of the Free State, is my independent work, and that I have not previously submitted it for a qualification at another institution of higher education.

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Student's Signature Date

Centre of Development Support

Bloemfontein

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Dedication

To my late parents, Victor and Nett, and my two sons Kudzai and Karlton.

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Abstract

This study examines the social consequences of resource extraction in non-metropolitan regions of South Africa through the lenses of Social Disruption Theory and Place Attachment Theory. While mining contributes to local economic activity, it generates complex social outcomes, including rising crime, weakened cohesion, and dependence on mining-based livelihoods. The study adopts a quantitative design within a positivist paradigm, drawing on secondary data from the National Income Dynamics Study (NIDS), South African Police Service (SAPS) crime records, and National Treasury mining employment data. Wave 5 (2017) NIDS data is used in the analysis. SAPS crime records and National Treasury mining employment data are panel data for the period 2014 to 2023. Forty-four non-metropolitan districts were classified into five mining regions, and descriptive statistics, logistic regression, Structural Equation Modelling, and lagged panel regression were used to assess patterns of social disruption and place attachment.

The findings show that mining exerts stabilising and disruptive effects, depending on the regional context. Some very high mining regions experience elevated disruption, while others display comparatively low disruption, indicating a non-linear relationship between extraction intensity and social outcomes. The study also demonstrates that homeownership alone is not a strong predictor of place attachment, suggesting limitations in policy interventions such as the Revitalization of Distressed Mining Towns Programme, which emphasises property ownership. Instead, attachment is more strongly shaped by length of residence, preference to remain, and lived identity. Even long-term residents in very high mining regions were more likely to consider relocation, suggesting that prolonged disruption may outweigh historical bonds. Additionally, the crime–mining relationship was found to be non-linear: medium-intensity mining regions exhibited elevated violent crime, while very high mining regions showed lower violent but higher property crime levels.

Overall, the study contributes to theory by challenging the assumption of linearity in Social Disruption Theory, demonstrating that the relationship between mining intensity and social disruption is non-linear and context-specific. It also advances Place Attachment Theory by showing that homeownership alone is not a sufficient indicator of attachment in mining regions; rather, attachment is more strongly shaped by length of residence, preference to stay, and lived

identity. Finally, the study does not support the presumed linear relationship between mining employment (as a driver of attachment) and crime (as an expression of disruption), revealing a more complex and differentiated pattern of social response within resource-dependent communities.

Keywords:

Crime; Mining regions; Place attachment; Resource extraction; Social disruption;

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LIST OF ACROYNOMS

COGTA	Cooperative Governance and Traditional Affairs
DDM	District Development Models
GDP	Gross Domestic Product
GVA	Gross Value Added
IUDF	Integrated Urban Development Framework
NIDS	National Income Dynamics Study
PPP	People Place Psychological
SAPS	South African Police Service
SLPs	Social Labour Plans
StatsSA	Statistics South Africa

CHAPTER ONE: INTRODUCTION TO THE STUDY

1.1 Background to the Study

South Africa's mining history dates back to 1852, when the first copper mine was discovered in Springbokfontein. Approximately 15 years later, diamonds were found, followed by the gold exploration during the Witwatersrand Gold Rush of 1886, which marked a major turning point in the country's mining industry. In 1924, the discovery of platinum in Mashishing further expanded South Africa's mineral base (Casey, 2019). By 1946, approximately 158 000 individuals were employed in the mining sector. This number peaked at around 760 000 in 2004, before declining to about 434 000 by 2025 (StatsSA, 2025). In 1980, mining was the second largest contributor to the economy after manufacturing. At this point mining contributed about 21% to the total Gross Value Added (GVA) in the country. However, in the second quarter of 2025, the sector's contribution had decreased to 4,8% of total value added at basic prices. Mining and quarrying currently rank as the seventh-largest contributor to South Africa's GDP (StatsSA, 2025). Production trends, particularly in gold, have continued to decline due to persistent challenges such as high operational costs, complex geological conditions, and falling production levels (Yager, 2018). While employment in the sector has shown marginal increases, the overall decline in economic contribution and mineral output reflects the broader structural difficulties currently facing the industry.

1.2 Social Disruption Literature

S*ocial disruption* phenomenon is popular amongst social impact practitioners who use it to describe the effects of large-scale projects, particularly in non-urban areas affected by resource or energy development (Murdock & Leistritz, 1979). England and Albrecht (1984) define social disruption as a period of crisis marked by the breakdown of established social patterns and attitudes. This concept aligns closely with *social disorganisation theory*, which proposes that the physical deterioration of neighbourhoods leads to weakened social structures and cohesion (Shaw & McKay, 1942). Later developments in social disruption theory linked community

disorganisation to factors such as low socioeconomic status, ethnicity, residential, and family disruption. These factors were found to be highly correlated to increased crime and delinquency (Sampson & Groves, 1989; Bursik & Grasmick, 1993). Further refinements expanded the theory's scope. Greider et al. (1991) argued that rapid community change, often resulting from population influx, can generate a range of social problems indicative of broader community disorganisation. More recently, Camillus et al. (2020) defined social disruption as a transformation in societal thinking, behaviour, and function that significantly alters institutional, organisational, and individual processes across sectors such as government, business, and civil society.

Potential sources of social disruption include economic crises (Suryahadi & Sumarto, 2003; Cai & Chan, 2009; Tyu & Fan, 2023), natural disasters (Dastrup, 2020), public health crises, technological advancements (Sacchi et al., 2019; Dermont & Weisstanner, 2020; Zara & Monteiro, 2021), educational and political instability (Potter & Thurnau, 2021), and large-scale social movements (Kumaraswamy, 2011; Fishman & Everson, 2016; King & Carberry, 2020).

Evidence of social disruption is particularly prominent in the oil, gas, and energy sectors. Studies have linked development in these industries to fluctuations in per capita income, crime rates, educational attainment, and social health indicators (Haggerty et al., 2014; Beleche & Cintina, 2018; Perez-Sindin, 2021). In the Niger Delta, inequitable revenue distribution and environmental externalities have exacerbated ethnic conflict, criminal activity, and recurring clashes between the government authorities and local communities (Okeagu et al., 2006). Moreover, the lack of equitable social inclusion in oil-producing regions has led to inadequate access to healthcare and education, social fragmentation, and ongoing community conflict (Nkem et al., 2022). Within the mining context, social disruption is often analysed through the *boomtown* research framework. Jones and Mayzer (2021:1) describe boomtowns as "rapid growth communities, often associated with natural resource development (e.g., gold, coal, oil, and gas) and generally rural." Their work outlines five key phases of boomtown research.

Phase 1 emphasises the economic benefits of mining, suggesting that rapid growth could stimulate local development (Smith et al., 1971).

Phase 2 examines the negative consequences, associating mining booms with social problems (Gilmore, 1976; Krannich & Luloff, 1991; Slack & Jensen, 2004).

Phase 3 seeks to balance both perspectives by presenting a more nuanced view of mining's social impacts (Gamu et al., 2015).

Phase 4 focuses on methodological refinement, addressing biases and limitations in earlier research (Donnermeyer & DeKeseredy, 2014).

Phase 5 explores contemporary sociodemographic impacts, introducing critical perspectives on health, gender, and social justice in boomtown settings (Marais et al., 2022).

A **proposed sixth phase** extends this work to the Global South, focusing on how mining decline contributes to social disruption (Marais et al., 2022).

The August 2012 Marikana Massacre, which took place next to the Lonmin Platinum Mine in the Bojanala District Municipality, is a prominent example of societal unrest in South Africa. During a strike over pay, 34 striking mineworkers were killed by South African Police Service (SAPS). The miners, who earned approximately R4,000 per month, demanded an increase to R12,500. Among the root causes were poor living conditions and low wages. Amnesty International (2016:4) described the Marikana settlement as "squalid and inadequate," characterised by overcrowding, poor service delivery, and lack of formal housing. Although conditions have evolved since, the area continues to face challenges related to inadequate housing and infrastructure for mineworkers, a legacy of historical mining practices and insufficient social investment (Amnesty International, 2016).

In response to the Marikana tragedy, government policies and programmes aimed at transforming mining communities were introduced. Two major initiatives emerged. The first was the Revitalisation of Distressed Mining Communities Programme. This programme was initiated by the Presidency in 2014. An Inter-Ministerial Committee led by the National Department of Human Settlements was established to implement the programme (The Presidency, Republic of South Africa, 2014). The programme aimed to transform mining towns into sustainable human

settlements by aligning mining companies' Social and Labour Plans (SLPs) with municipal Integrated Development Plans (IDPs) and Local Economic Development (LED) strategies. This collaborative approach sought to enhance infrastructure, upgrade informal settlements, expand basic services, and promote socioeconomic development for current and former mineworkers. The second initiative was the Integrated Urban Development Framework (IUDF) (COGTA, 2015), which focuses on spatial integration, equitable service delivery, and inclusive urban growth. It operates through nine policy levers, including spatial planning, transport, housing, infrastructure, land governance, economic development, community empowerment, urban governance, and sustainable financing.

In both initiatives, homeownership is positioned as central to the transformation agenda. It is assumed that homeownership fosters emotional attachment to place, social stability, and community cohesion. Encouraging homeownership is therefore viewed as a mechanism for strengthening local identity, discouraging out-migration, and promoting the long-term sustainability of post-mining towns (The Presidency, Republic of South Africa, 2014; COGTA, 2015).

1.3 Place Attachment Literature

The origins of place attachment theory can be traced to Fried (1963), who examined the emotional ties between displaced people and their homes. The theory was later refined by scholars who distinguished between *space* and *place* (Relph, 1976; Gieryn, 2000). Marques and Alexio (2021) subsequently established the connection between space, place, place attachment, and social disruptions. Place attachment establishes the emotional and psychological ties between people and their environments. Its study is significant for understanding the mechanisms through which individuals interact with their surroundings, providing valuable insights for planning and community development (Ramkissoon, 2015; Zahnow & Tsai, 2021; Ji et al., 2023).

Scholars have approached place attachment theory from various conceptual perspectives, including psychological, social and cultural, environmental psychological, interdisciplinary, temporal, and technological or virtual-space perspectives. It is a complex and multidimensional

concept that integrates interrelated emotional, cognitive, and behavioural dimensions (Low & Altman, 1992; Hummon, 1992; Mihaylov & Perkins, 2014; Nientied et al., 2019). Place attachment may develop at an individual level and can also happen at community levels, This attachment has been examined across multiple disciplines and contexts (Low & Altman, 1992; Nientied et al., 2019). Applications of place attachment theory span several contexts, including mobility and relocation (Fullilove, 2014; Manzo, 2014), environmental degradation (Carrus et al., 2014; Devine-Wright, 2014), social tensions within communities (Fried, 2000; Wohl & Cohen, 2024), urban design (Casakin et al., 2015; Moulay et al., 2018; Razem, 2020), and health and well-being (Lomas et al., 2021; Lebrusan &Gomez, 2022).

Theoretical approaches to place attachment include the tripartite model (Person-Place-Process or P-P-P model) (Scannell & Gifford, 2009); the environment-behaviour theory (Seamon, 2014); the Humanistic and Phenomenological Approach (Merleau-Ponty, 1962; Seamon, 2014); individual or interpersonal attachment theory (Giuliani et al., 2003; Manzo, 2005; Gustafson, 2014; Scannell & Gifford, 2014); Cognitive Appraisal Theory (Lewicka, 2011; Gustafson, 2014); and Social Identity Theory (Mihaylov & Perkins, 2014).

Determinants of place attachment can broadly be categorised as personal, environmental, and behavioural (Ji et al., 2023). Personal determinants include; sociodemographic variables such as gender, age, income, occupation, socioeconomic status, homeownership, and length of residence (Brown et al., 2003; Marais et al., 2021). Environmental determinants encompass the availability of infrastructure, public facilities, and opportunities for social interaction (Lestari & Sumabrata, 2018; Marais et al., 2021). Behavioural determinants include residence duration, mobility, and the amount of time devoted to exploring and engaging with one's surroundings (Seamon, 2014; Ji et al., 2023).

Research on the application of place attachment theory remains limited in the Global South. However, existing research demonstrates that displacement often leads to trauma and the severing of emotional ties with one's place of origin (Fullilove, 2014). Other studies reveal a linear relationship between place attachment and pro-environmental behaviour (Feldman, 1996; Carrus et al., 2005; Manzo, 2006; Scannell & Gifford, 2009; Mishra et al., 2010). Strong social links and

a feeling of belonging have been shown to improve resilience, group activity, and community cohesion in the South African environment. (Chigeza et al., 2013). Conversely, mining activities can disrupt people-place relationships, as residents often perceive mining as a threat to social values and environmental integrity (Marais et al., 2018).

1.4 Problem Statement

The economic impacts of natural resource extraction are well documented, with studies consistently showing that the early phases of mining development are often associated with rapid economic growth (Eggert, 2001; Cust & Poelhekke, 2015; Ericsson & Lof, 2019; Worlanyo & Jiangfeng, 2021; Yeboah & Nyarkoh, 2023). However, this growth is frequently accompanied by social disruption, manifested in increased crime, health challenges, weakened social cohesion, and other social ills (White, 2013; Cust & Poelhekke, 2015). At the same time, mining development tends to produce local economic dependency, whereby communities become structurally and emotionally tied to the fortunes of the mine (Cronje & Chenga, 2009; Marais, et al., 2022). This dependency may foster strong forms of place attachment, shaping residents' willingness to remain in or leave mining-affected areas even in the face of social disruption.

In South Africa, these dynamics have become particularly consequential. The national transformation agenda seeks to convert mining towns into open, sustainable settlements through interventions such as human settlement development, informal settlement upgrading, and the promotion of homeownership. These policy initiatives rest on key assumptions: that intensified mining activity inevitably heightens social disruption; that employment and homeownership strengthen place attachment in ways that promote stability; and that these processes ultimately support the long-term sustainability of mining towns. However, these assumptions have not been systematically tested at a national scale.

The absence of robust empirical evidence on how social disruption and place attachment vary across different levels of mining activity, and how they interact, presents a significant policy and planning risk. If social disruption does not increase linearly with mining intensity, or if place attachment formed through mining employment reinforces dependency rather than resilience,

current policy approaches may inadvertently entrench social vulnerability, perpetuate crime, and undermine post-mining sustainability. Without a clear understanding of these relationships, spatial planning and development interventions risk being poorly targeted, inefficient, or counterproductive.

This study addresses this gap by quantitatively examining variations in social disruption and place attachment across mining regions in non-metropolitan South Africa, and by analysing the relationship between crime and mining-related employment as indicators of these processes. By doing so, the study generates empirical evidence that both informs theoretical debates on boomtown dynamics, social disruption, and place attachment, and provides critical insights for evidence-based policy, spatial planning, and the sustainable transformation of mining towns. To the best of my knowledge, this represents the first national-level study in South Africa to investigate these interrelated dynamics.

1.5 Research Objectives

The primary objective of this study is to investigate the distribution of social disruption resulting from mining extraction and the levels of place attachment in non-metropolitan regions in South Africa.

The secondary objective(s) are:

- To investigate the extent of social disruption across areas with different mining activity levels in non-metropolitan regions in South Africa.
- To examine variations in place attachment across areas with different mining activity levels in non-metropolitan regions in South Africa.
- To assess the relationship between crime and mining-related employment across areas with different mining activity levels in non-metropolitan regions in South Africa.
- To refine social disruption and place attachment theoretical frameworks by analysing the intemediary role of mining.

1.6 Rationale for and Significance of the Study

First, this study contributes to the existing body of knowledge on social disruption theory and boomtown research by providing empirical evidence that disruption occurs not only during the early stages of mining cycles (boom periods), as previously assumed, but also during periods of mining decline (bust periods). This contribution is important because bust periods are often characterised by job losses, population decline, reduced municipal revenue, and the withdrawal of corporate and state support, conditions that may intensify social disruption rather than mitigate it. Without empirical evidence on disruption during these phases, theoretical models and policy interventions risk underestimating the long-term and cumulative social costs of mining, particularly in post-mining and declining regions.

Second, the research contributes to the literature on place attachment by offering empirical evidence on its determinants, including housing policy and homeownership. This is important because place attachment shapes residents' decisions to remain in, invest in, or exit mining-affected communities, thereby influencing settlement stability and long-term sustainability. By addressing the research gap identified by Gustafson (2014) concerning the relationship between mobility and attachment, the study provides empirical support for cognitive appraisal theory in a mining context. This insight is particularly relevant for policy frameworks that promote homeownership as a mechanism for community stability, as it highlights how attachment may be formed or reinforced under conditions of economic dependency.

Third, the study examines the relationship between the longitudinal effects of mining employment and crime. This focus is significant because it empirically links social disruption, as reflected through crime, with place attachment-related factors such as employment, under the assumption that place attachment remains relatively stable among residents. Understanding this relationship is important for identifying whether mining-related employment mitigates or exacerbates social disruption over time. Without such evidence, interventions aimed at job creation may overlook unintended social consequences, limiting their effectiveness in promoting social cohesion and community safety.

Fourth, the quantitative methods employed in this research extend those used in previous studies on social disruption and place attachment. This methodological contribution is important because it allows for systematic comparison across regions with varying levels of mining activity, thereby moving beyond single-case or purely qualitative analyses. By confirming and challenging prior findings, the study strengthens the robustness of existing theories and provides a more nuanced understanding of boomtown dynamics, social disruption, and place attachment within complex and heterogeneous mining contexts.

Finally, to the best of my knowledge, this is the first study of its kind in South Africa and Africa, offering valuable localised insights into these interrelated phenomena. This is important because much of the existing literature is derived from Global North contexts, which differ significantly in institutional capacity, governance structures, and socio-economic conditions. Generating context-specific evidence is therefore essential for developing policies and planning interventions that are responsive to the realities of mining regions in South Africa and the broader African context.

Together, these contributions justify the need for the present study and underscore its theoretical, methodological, and policy relevance.

1.7 Key Concepts

Some reference has already been made to the two main concepts underpinning this study: social disruption and place attachment. The working definitions of these concepts are provided below.

1.7.1 Social disruption

Social disruption refers to a period of broad crisis and loss of conventional patterns and attitudes and can occur at individual, organisational, and community levels (England & Albrecht, 1984).

1.7.2 Place attachment

Place attachment was first conceptualised by Kasarda and Janowitz (1974) (Zahnow & Tsai, 2021). Shumaker and Taylor (1983) subsequently applied the theory, emphasising the importance of both social and physical settings. Place attachment, commonly referred to as the P-P-P model,

comprises actors (People), a range of settings (Places), and psychological processes (Processes), as demonstrated by Low and Altman (1992).

1.8 Conclusion

This study employed quantitative methods to investigate the social consequences of resource extraction in non-metropolitan regions of South Africa. To address the research problem comprehensively, the thesis is structured as follows:

Chapter 2: Literature Review – This chapter is divided into two broad sections. The first section reviews various theories related to social disruption theory and place attachment theory. The second section discusses the empirical evidence related to social disruption and place attachment. The last part presents the theoretical framework adopted in this study.

Chapter 3: Methodology – This chapter highlights the methods employed in this study. The chapter includes sections on the research design, data and data sources, and for each study objective; empirical model specification, pre-estimation tests, estimation techniques and procedures post-estimation and diagnostic tests, ethical considerations, and other relevant aspects.

Chapter 4: Mining, Development, and Disruption in Non-Metropolitan Regions in South Africa – This chapter examines how social disruption is associated with mining, focusing on health, cohesion, crime, migration, income, and employment. It utilises data from the 2017 NIDS to analyse variations across mining regions.

Chapter 5: Mining, Place Attachment, and Development in Non-Metropolitan Regions in South Africa – This chapter explores place attachment in South African mining regions, emphasising its complex nature and the role of policy interventions in promoting community resilience amid environmental and socioeconomic change. It also discusses the implications for homeownership-based policies in South Africa.

Chapter 6: Crime and Mining Employment – A Longitudinal Analysis of the Effect of Lagged Mining Employment on Crime in South Africa – This chapter investigates the

relationship between crime and employment in mining regions from 2014 to 2023, revealing heterogeneous crime patterns. It highlights the need for spatially targeted and socially responsive interventions to manage socioeconomic changes and crime risks.

Chapter 7: Synthesis, Discussion, and Recommendations – This chapter synthesises the study's main findings and discusses their relevance to theory, empirical research, and policy.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter systematically reviews the literature on social disruption and place attachment. The chapter is in two broad sections; the first section focuses on the theories related to social disruption and place attachment and the second section focuses on empirical evidence related to social disruption and place attachment.

2.2 Theories related to social disruption

Social disruption refers to significant changes or disturbances in a society's normal functioning, structure, or patterns. It occurs when established social order, norms, institutions, or systems experience upheaval or breakdown, leading to instability within a community. Social disruption can manifest in various forms and intensities, ranging from localised events to widespread societal transformations. Contributing factors include economic crises, political unrest, technological advancements, natural disasters, conflicts, cultural shifts, and other unforeseen circumstances. Societies experiencing disruption face uncertainty, conflict, and challenges in adapting to new realities. However, social disruption can also present opportunities for positive change, innovation, and the emergence of new social structures and solutions.

This section examines the development of social disruption theory and its links to early sociological theories. The first section discusses the concentric zone theory proposed by Park and Burgess (1925). Although their work focused on social classes and delinquency in rapidly growing urban areas, it laid the foundation for broader applications to society. The second section explores social order theory, as proposed by Durkheim (1897), and social systems theory, developed from the works of Parsons (1951) and Luhmann (1984). These theories provide a framework for understanding the applicability of social disorganisation theory (Shaw & McKay, 1942; Kasarda & Janowitz, 1974; Kornhauser, 1978). The social disorganisation theory, based on the social disruption hypothesis (Murdock & Leistritz, 1979), underpins the examination of two contrasting concepts: social disruption and social cohesion.

2.2.1 Concentric Zone Theory (Urban Theory)

The evolution of social disruption theory is closely linked to the concentric zone theory developed by Park and Burgess (1925). According to the Concentric Zone Theory, cities are natural environments subject to the same factors that regulate Darwinian development. Darwin's theory of evolution comprises five elements: evolution, common descent, gradualism, population speciation, and natural selection. Of these, natural selection was most relevant to the concentric zone theory. The concentric zone theory, also referred to as urban theory, asserts that metropolitan areas are separated into natural zones where individuals have comparable social traits due to shared ecological stresses (Park & Burgess, 1925).

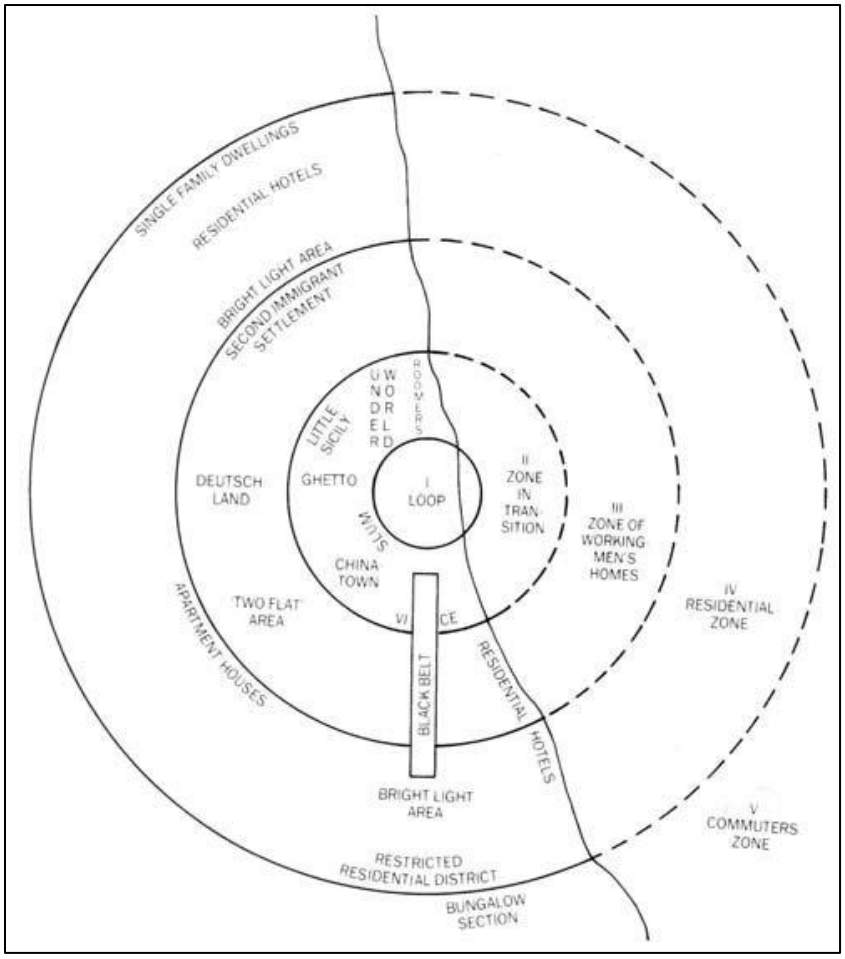


Figure 2.1: The Concentric model (Park and Burgess 1925:55).

This urban theory was first developed to analyze socioeconomic classes, but Park and Burgess (1925) applied it to explain social issues like unemployment and crime in Chicago. They maintained that the demographic shifts that come along with urban growth are responsible for social issues including divorce, delinquency, and social instability. Higher male to female ratios, a higher number of young and middle-aged inhabitants, a higher proportion of foreign-born people, and greater vocational variability were some examples of these demographic shifts (Park & Burgess, 1925). These social and demographic shifts affected social organisation and contributed to what they described as social disorganisation. Rapid urban expansion, they observed, was associated with increased rates of disease, crime, disorder, vice, mental illness, and suicide, which they regarded as indicators of social disorganisation.

A further characteristic of rapid urban growth identified by Park and Burgess (1925:39) was high mobility, which they defined as "the change of movement in response to a new stimulus or situation". They distinguished between mobility and movement: mobility occurs in response to a social stimulus, while movement is a purely physical change without such a stimulus. Their research found that areas characterised by high mobility exhibited higher incidences of juvenile delinquency, gang activity, crime, poverty, desertion, divorce, and child abandonment. Thus, mobility was directly linked to social disorganisation in rapidly growing urban areas.

Park and Burgess's (1925) urban concentric model was widely recognised as the first systematic attempt to explain the physical characteristics and built environment of a city (Quinn, 1940). It also provided a valuable framework for interpreting various urban phenomena such as crime and delinquency (Shaw et al., 1929), family organisation and disorganisation (Mowrer, 1927), gang formation (Thrasher, 1925), mental disorders (Faris & Dunham, 1939), religious institutions, suicides (Cavan, 1928), and vice.

However, the model has been criticised for its oversimplification (Rodrigue, 2020). According to Quinn (1940), criticism of the Park and Burgess (1925) zonal hypothesis falls into two main categories.

The first criticism is that an ideal pattern of concentric zones does not exist universally. The model was developed for American cities such as Chicago, Long Beach, and Rochester, and only partially applied to cities outside North America, such as Montreal. Contrary to the model's assumption that prosperity increases outward from the city centre, the opposite occurs in many contexts. In several European and Asian cities, historical elites established their residences at the centre, with the city expanding outward from this core. In Paris, for instance, wealthy citizens live in central areas near landmarks such as the Eiffel Tower, while lower-income residents occupy peripheral suburbs (Renault, 2019).

Similarly, in mountainous South American cities like Medellin (Colombia) and Rio de Janeiro (Brazil), poorer communities, often referred to as *favelas*, are located in high-elevation outer areas. Even in Chicago, the city for which the model was developed, the urban pattern aligns more closely with semi-circular than concentric zones. Other cities, such as Montreal and New Haven, display irregular or grid-based patterns that deviate significantly from concentricity (Quinn, 1940). Furthermore, processes like gentrification, in which lower-income areas are redeveloped and repopulated by wealthier residents, further complicate the model's assumptions about urban form and class distribution.

The second critique is that although the concentric model offers a theoretical ideal, it is not feasible due to the disparity between the model and actual cities. A key limitation lies in the inconsistent definition of distance, which may be measured spatially or temporally. For example, walking one mile on flat terrain may take less time than traversing a steep hill. Such variations, ignored in Burgess's hypothesis, distort the delineation of urban zones. In grid-patterned cities, equal travel times may correspond to rectangular rather than circular zones (Quinn, 1940).

Furthermore, the model makes the assumption that there is still land accessible for urban growth in other directions. Ethnic, socioeconomic, and occupational status disparities were spatially distinct when Park and Burgess (1925) first proposed their idea, but land use differences were less pronounced. However, geographical or natural barriers like mountains, coasts, or deserts frequently impose restrictions for modern cities. For instance, the nearby mountain ranges have

restricted Tokyo's ability to expand westward (Mberego & Li, 2017). In these situations, city expansion deviates from the concentric zone paradigm.

Despite these criticisms, the urban concentric model remains foundational for ecological and social disorganisation studies. It established a conceptual link between spatial urban structure and social dynamics, laying essential groundwork for later theories of social disruption.

2.2.2 Social Order Theory

For social disorganisation to occur, there must be some form of social structure or order. According to Durkheim (1897), society is a system where forces work together to keep everything in balance. A focal point that strikes a balance between these forces, which he defined as integration, cohesion, solidarity, or regulation, is necessary for society to operate as a stable system. Furthermore, Durkheim (1897) maintained that social institutions have a beneficial impact on how society functions. As a functionalist, he emphasized the role that morals and the law play in preserving social harmony. For instance, religion gives societies moral coherence by representing a single set of values and customs.

In his work *Le Suicide*, Durkheim (1897) proposed a theory of social order and deviance, emphasising the social rather than the individual level. He argued that individual psychology alone cannot fully explain the collective behaviour of social organisations. Social organisations possess structural characteristics such as rules, values, and social relationships that shape and constrain individual behaviour. The emergent nature of social existence, where the whole is greater than the sum of its parts, forms the foundation of social order.

Durkheim (1897) distinguished between the act of suicide and suicide rates, emphasising the latter as a societal fact. Suicide rates reflect structural imbalances in social forces, whereas individual suicides relate to personal circumstances. Figure 2.2 illustrates the key forces affecting social order.

Evidence that supports or is against the social disruption hypothesis

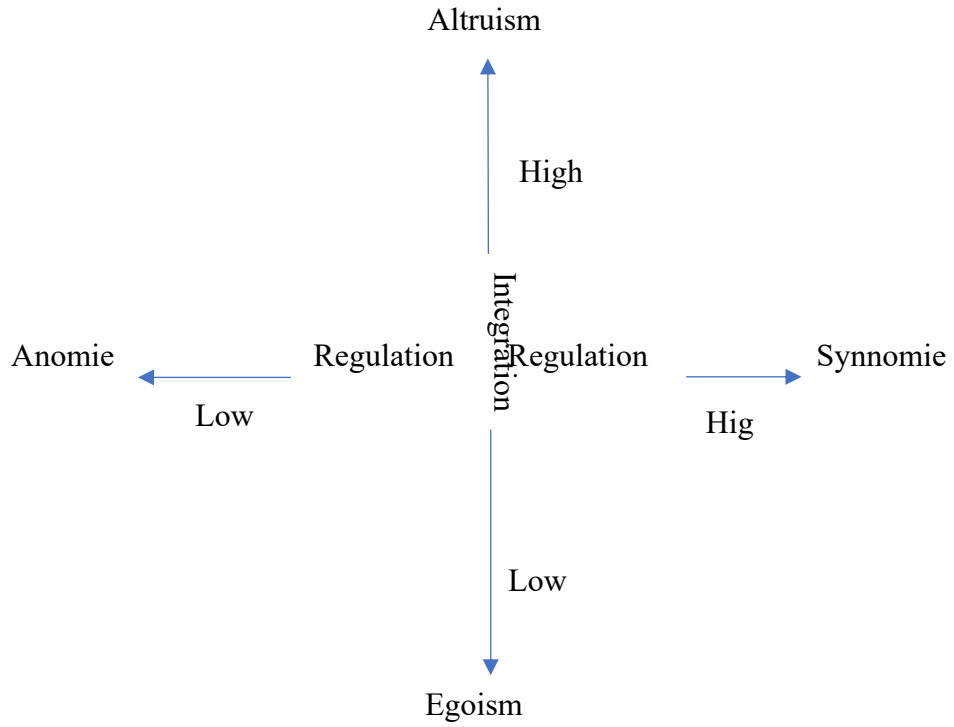


Figure 2.2: Forces affecting the two concepts of social order (Thompson, 2003).

The first concept, social integration, describes the extent to which people and social groups are connected to society through shared values and beliefs. High social integration strengthens adherence to societal norms and laws (altruism), while low integration can foster extreme individualism (egoism) and weaken societal support structures.

The second concept, social regulation, refers to the degree to which society constrains individuals' desires and goals through normative and emotional criteria. Laws and regulations provide benchmarks for acceptable behaviour, and violations may trigger societal sanctions. When regulation is low, anomie emerges; when regulation is high, solidarity prevails. Durkheim (1897) illustrated these dynamics through his analysis of suicide rates, linking total fatalism to the absence of regulation.

Durkheim's (1897) theory has been influential but has faced criticism on three main points regarding the functionalist approach: the assumption of equilibrium, viewing society as a functional institution, and conceptual definitions. Pope (1975) described Durkheim's perspective as functionalist, noting that it oversimplifies the complexity of social order. For example, Durkheim's focus on suicide rates prioritises societal over individual explanations, potentially neglecting alternative causes.

Critics also challenge the assumption that society operates as a system in equilibrium (Pope, 1975). Treating society as composed of interdependent parts overlooks the emergent properties and variability of these parts within the whole. The assumption of centripetal societal forces and centrifugal individual forces is questioned, particularly regarding how these forces are generated.

Thompson (2003) highlighted limitations in Durkheim's scientific approach, noting the exclusion of subjective elements in defining suicide and suicide rates, and the lack of consideration of individual values and motivations. His reliance on statistical measures introduced potential bias and did not test the reliability of his estimates.

These limitations prompted Parsons (1951) to refine Durkheim's ideas, leading to the development of social systems theory, which sought to address the weaknesses of the functionalist framework while preserving the insight that societal order emerges from structured interactions.

2.2.3 Social System Theory

Parsons (1951:15) defines the social system as "a mode of organisation of action elements relative to the persistence or ordered processes of change of the interactive patterns of a plurality of individual actors". This definition complements Durkheim's (1897) view that society comprises interrelated parts. A social system consists of the processes of interaction between actors, essentially reflecting the structure of relations involved in the interactive process (Parsons, 1951).

According to Parsons (1951), the interactive process of actors makes action the building block of the social system. An action consists of the structures and processes by which human beings form meaningful intentions and, to varying degrees, implement them in concrete situations. Social

action is expressed as a role or function, which falls under the social system if performed in a specific social context.

A social system is formed when members of a society share the same culture (Parsons, 1951). It also requires coordinated operation by community members to avoid conflict. Certain institutions, as functional entities described by Durkheim (1897), systematise these social behaviours in advanced societies. Furthermore, a social system comprises diverse individual actors interacting in circumstances with at least a physical or environmental component. Actors are motivated by a tendency to optimise gratification and maintain relationships with their environments.

Parsons (1951) proposed five pattern variables. The first is "affectivity versus affective neutrality," reflecting the expected level of emotion in interactions. The second is "ascription versus achievement," where ascription denotes status obtained by birth or social origin, and achievement reflects merit and capability. The third is "particularism versus universalism," which concerns the scope of consideration in social action, whether directed towards specific groups or society at large. The fourth is "diffusion versus specificity," regarding the range of obligations appropriate in relationships. The fifth is "collective orientation versus self-orientation," determined by social norms, which balance pursuit of individual interests against group expectations. These pattern variables form the basis of the AGIL model for social systems (Figure 2.3).

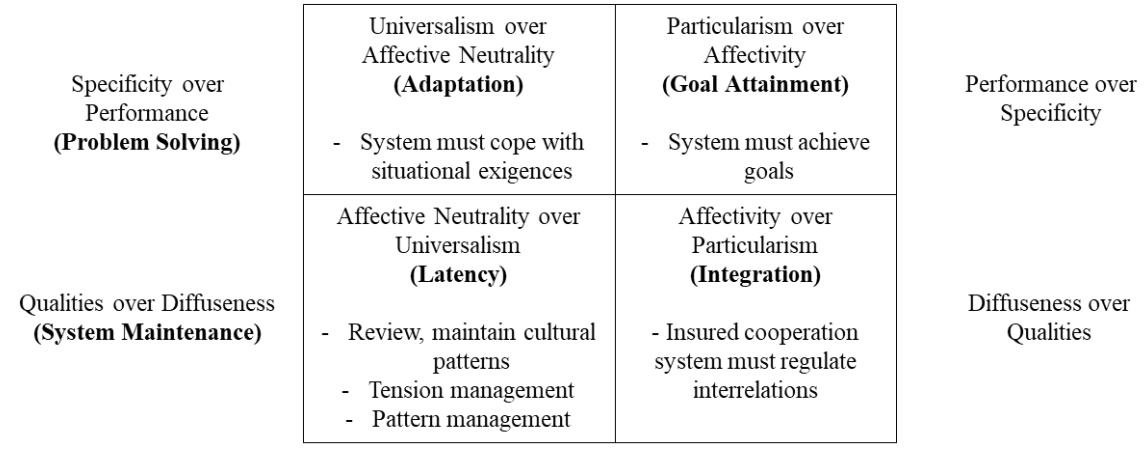


Figure 2.3: The Social System – The AGIL Model of Social Organisation (Parsons, 1951)

Figure 2.3 illustrates Parsons' (1951) pattern variables and the four primary functional issues of the AGIL model. Pattern maintenance involves upholding fundamental principles that guide social order and resolving conflicts. Integration distributes rewards, privileges, and obligations, fostering harmony among participants. Goal attainment mobilises actors and resources to achieve objectives. Adaptability reflects the system's capacity to cope with changing environments.

While Parsons' (1951) development of pattern variables improved the characterisation of social expectations and interactions, certain limitations remain. Actors may not freely choose among social norms, and resolving one pattern variable may leave other issues unresolved. Moreover, specific solutions may represent subsets of multiple types, and the pairs do not exhaust all possibilities for social interaction orientation.

Luhmann (1984) refined social systems theory by emphasising that modern social systems cannot exist without language and certain cultural minimums. These cultural minimums include empirical information needed to address situational demands, patterns of expressive symbolism, and integrated value orientations. Excessive disruption to these cultural elements risks social and cultural breakdown. Luhmann (1984) conceptualises social systems as consisting of communication and introduces structural coupling, highlighting that social communication depends on individuals. This perspective is relevant to social disruption, as disturbances at the community level can destabilise ordered systems. Criticism of Luhmann's (1984) theory has two main strands. First, it is criticised for being heavily functionalist and Parsonian, focusing on communication as the system's primary unit while neglecting individuals (King & Thornhill, 2003). Second, its abstract nature limits practical applications, as it provides little insight into real-world organisations, associations, and governments (Kay, 2002).

2.2.4 Social Disorganisation Theory

Social disorganisation theory has primarily been used to understand crime rates within communities (Kasarda & Janowitz, 1974; Kornhauser, 1978), with many scholars suggesting that social disorganisation plays an important role in the spatial distribution of neighbourhood crime (Sampson and Groves, 1989; Sherman et al., 2002; Bellair, 2017).

Shaw and McKay (1942) were the first to use the concept of social disorganization. Their research used the concentric zone model proposed by Park and Burgess (1925), validating the idea that physical deterioration of residential neighbourhoods is closely related to social disorganization, particularly in core commercial districts. They noticed a gradual decrease in delinquency from the innermost metropolitan zones to the outside. Furthermore, they discovered that delinquency was strongly linked to population growth, poor housing, poverty, the existence of minority and foreign-born populations, tuberculosis, mental problems, and adult criminality. Shaw and McKay (1942) argue that the lack of community effort to remedy these circumstances is the root cause of social disorganisation.

Sampson and Groves (1989) refined the social disorganization theory by developing and empirically testing a community-level framework. They hypothesized that poor socioeconomic position, ethnic diversity, residential mobility, and family disruption all contribute to social disorganization, which in turn increases crime and delinquency. Their research applied the idea to communities in the United Kingdom, confirming its relevance outside the original American context of Shaw and McKay (1942).

Bursik and Grasmick (1993) expanded on Shaw and McKay's (1942) perspective, developing it into a "systemic control" model that links the effectiveness of local crime control to broader institutional structures, including political and economic systems beyond the neighbourhood. They applied this model to key issues in community and crime studies, including community-level correlates of offending and victimisation, fear of crime, gang activity, and crime prevention strategies.

Social disorganisation is the breakdown of social control, social order, or formal and informal rules that govern behaviour in a society, community, or organization. Its key characteristics are a lack of cooperation, common ideals, unity, discipline, and predictability, which lead to disagreements about group goals. As Durkheim (1897) proposed, this fracture damages the social whole. Social disorganisation is frequently characterized by a lack of institutional integration, in which competing aims impede efficient social control and individuals are unable to fulfil expected responsibilities due to uncertainty.

Elliot and Merill (1950) define social disorganisation as the process through which relationships between group members are disrupted or disintegrated. When the balance of social forces shifts, institutions fail, and previously accepted systems of social control no longer operate effectively, social disorder emerges. Social disorder occurs when the forces depicted in Figure 2.3 above become unbalanced.

Porter et al. (2015) criticise social disorganisation theory for being overly theoretical, excessively negative, highly structural, and focused on specific privileged organisational perspectives. The theory is also criticised for neglecting cultural patterns within communities, emphasising larger structural conditions affecting neighbourhoods. Multi-level analyses incorporating sub-cultural factors may enhance the explanatory power of social disorganisation theory. Despite these critiques, the theory remains consistent over time and valuable for explaining crime and delinquency patterns (Porter et al., 2015).

2.2.5 Social Disruption Theory

Several authors wrote about the Social Disruption Theory in the 1970s. For instance, (Gold, 1974) observed that his study area, Colstrip and Forsyth, lacked sense of community due to the large proportion of newcomers in the area. What Gold (1974) observed and documented eventually would be referred to as "social disruption", which became a leading hypothesis and theme of boomtown research throughout the 1970s.According to (Ward, et al., 2020), (Gilmore & Duff, 1975) reinforced many of Gold's (1974) conclusions through their study of Rock Springs, Wyoming. Their findings highlighted the phenomenon commonly referred to as the "Gillette Syndrome", characterized by domestic instability and social anomie, which contributed to the erosion of community cohesion in Gillette, Colstrip, and other energy-driven boomtowns. Murdock and Leistritz (1979) further developed the social disruption hypothesis after observing the expansion of energy projects, predominantly in rural areas and small towns during the 1970s. This growth in economic activity gave rise to boomtowns characterised by rapid population growth and changes in social structure. The social disruption hypothesis posits that community effects are directly associated with energy development.

Building on this, England and Albrecht (1984) define social disruption as a period of widespread crises and the abandonment of traditional patterns and attitudes. Individuals, organisations, and communities can all experience disruption. Individually, crises can have an impact on mental health, change one's worldview, and disrupt social networks. Organizational disruptions occur when newcomers challenge established firms and groups. At the community level, disruption has an impact on cultural norms and public services.

Greider et al. (1991) emphasised that rapid community changes, such as population increases, lead to social problems indicative of overall community disorganisation. They argue that social disruption is more likely when a community's local identity, solidarity, and trust are weakened.

Brown and Perkins (1992), in the context of place attachment, defined social disruption at the household level. They suggest that after secure place attachments are established, their loss produces a stressful disruption phase, followed by a post-disruption phase where new attachments are formed. Disruptions can result from housebreaking, voluntary relocations, or disasters.

Camillus et al. (2020) describe social disruption as altering societal thought, behaviour, and function, significantly affecting individuals, firms, NGOs, and government organisations. Although impactful, disruptions are difficult to predict and rarely stem from a single cause, often arising from multiple external factors.

Jacquet and Stedman (2013) propose that social disruptions to community and place-based identities can be quantified using risk analysis methodologies. They emphasize four dimensions: environmental quality (clean air and potable water), social cohesiveness (strong interpersonal relationships), safety (absence of risks), and mental restoration (spaces for psychological respite). These factors offer a paradigm for measuring social disruption in the context of place attachment.

Szreter (1999) asserts that rapid economic growth is often accompanied by social, administrative, and political disruption, which can result in deprivation, disease, and mortality. This perspective suggests the need to examine social disruption indices beyond crime and social cohesion.

2.2.6 Summary

The section discusses key theories: the concentric zone theory, the social order theory, the social systems theory, the social disorganisation theory, and the social disruption theory. These theories converge around the central themes of social order, disruption, and cohesion. The concentric zone theory (Park & Burgess, 1925) provides insight into the characteristics of rapidly growing urban centres, including social problems, demographic changes, and rapid urbanisation, which can give rise to social issues such as crime and unemployment, key indicators of social disruption. The social order theory (Durkheim, 1897) emphasises the importance of institutions and norms in maintaining social equilibrium. Durkheim (1897) argues that a breakdown in these structures results in social disruption, whereas a well-integrated society exhibits social cohesion. The social disorganisation theory (Shaw & McKay, 1942) examines how social structures can become disorganised due to economic and social changes. This theory posits that disorganisation is associated with increases in crime and other social problems, which can be viewed as consequences of social disruption. The social disruption theory, based on the hypothesis developed by Murdock and Leistritz (1979), synthesises these perspectives, identifying multiple sources of social disruption, including economic crises, political unrest, and cultural shifts. The theory also highlights that while disruption may have negative consequences, it can simultaneously create opportunities for positive change.

Overall, these theories both converge and diverge. On one hand, they align in demonstrating the connections between social cohesion, social order, and social disruption, highlighting the importance of social structures in maintaining stability and the consequences of their breakdown. On the other hand, divergences exist. The social order theory (Durkheim, 1897) emphasises structural stability, while the social disruption theory (Murdock & Leistritz, 1979) incorporates individual agency and collective action, particularly in social movements. The concentric zone theory (Park & Burgess, 1925) focuses on urban spatial patterns, whereas the social disorganisation theory (Shaw & McKay, 1942) explores social relationships and networks as contributing factors to disorganisation.

Social order theory is rooted in functionalism, viewing society as a system of interrelated parts that maintain stability, with disruptions treated as pathological and correctable. In contrast, social disruption theory is informed by critical perspectives, including Marxist thought, which view disruption as a potential catalyst for social change. Disruption may therefore lead to chaos, innovation, social change, and the establishment of new norms and values. These divergences highlight the complexity of social dynamics and the multiple analytical lenses through which scholars examine social disruption and cohesion. Each theory contributes unique insights, enriching the understanding of how societies function and respond to change.

Furthermore, the section examines social disruption in depth, highlighting its multifaceted nature and the contributing factors, such as economic crises, technological advancements, and social changes. It also addresses the long-term consequences of mining booms and busts, illustrating how these cycles can create dependencies that affect social structures over time. Ultimately, the chapter underscores the importance of understanding social disruption to develop strategies for fostering resilience and cohesion within communities. These insights provide a foundation for further exploration into the dynamics of social environments and contemporary societal challenges.

The next section discusses the conceptualization and theories related to place attachment. The link between social disruption and place attachment is complex and multifaceted. Social disruption can challenge existing place attachments, leading to feelings of loss and alienation. However, it can also create opportunities for new attachments and collective action, ultimately influencing the emotional and social dynamics within communities. Understanding this relationship is crucial for addressing the impacts of social disruption and fostering resilience in affected communities.

2.3 Conceptualization and theories related to place attachment

The previous section discussed theories related to social disruption and highlighted that disruption can lead to chaos, innovation, social change, and the emergence of new norms and values, thereby illustrating the complexity of social dynamics. The section concluded that social disruption can challenge existing place attachments, leading to feelings of loss and alienation, but can also create

opportunities for new attachments and collective action. Building on these insights, this section discusses place attachment theoretical foundations.

Place attachment theory originated in the 1960s through early work by researchers such as Fried (1963), who examined the emotional ties individuals maintain with their homes following displacement. This early research emerged primarily from urban planning and focused on the sentimental bonds people form with their neighbourhoods. The theory became more defined in the 1970s with the work of Relph (1976), who argued that space is not an empty void, an isometric plane, or merely a container for physical objects. Instead, he maintained that space must be understood in terms of how it is experienced by people.

Relph (1976) distinguished between instinctual, physical, and immediate forms of spatial experience termed pragmatic, perceptual, and existential spaces, as well as more abstract, ideal, and intangible forms of experience, referred to as planning, cognitive, and abstract spaces. He argued that space and place are dialectically constructed within human environmental experience, because awareness of space is inextricably linked to the places individuals live and the meanings obtained from their spatial contexts.

Similarly, Gieryn (2000) posits that space constitutes part of the natural world and possesses abstract characteristics devoid of cultural interpretation. It becomes a “place” when humans interact within it and attribute meaning and value to it or to its particular features.

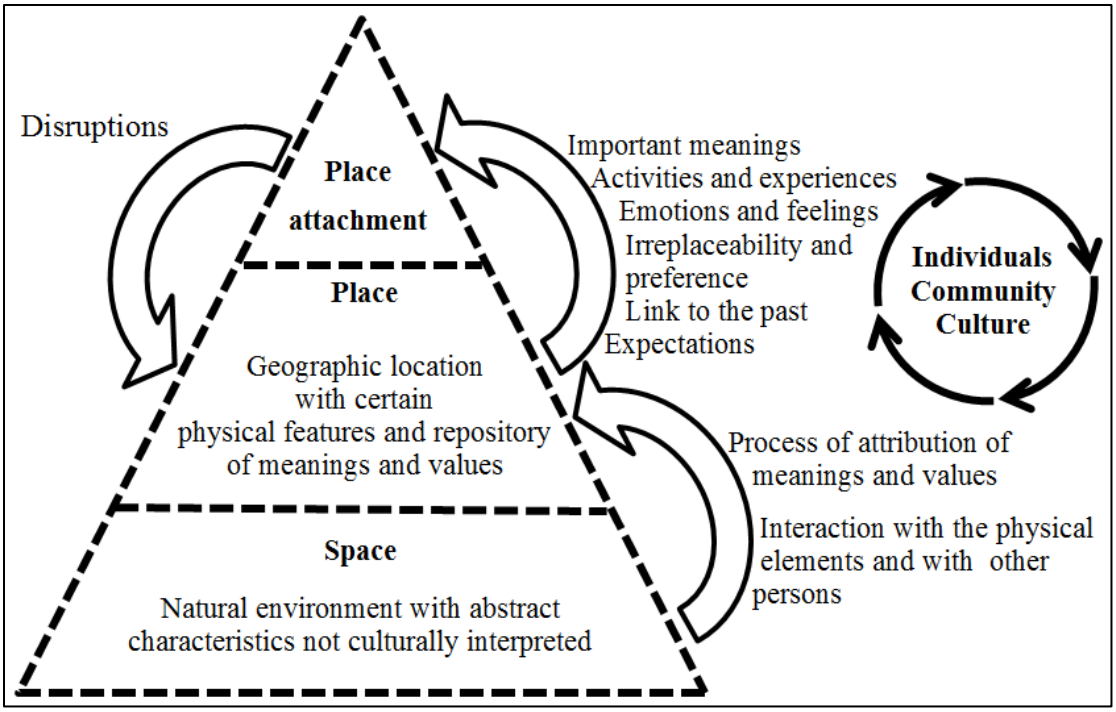


Figure 2.4: Link between space, place, and place attachment (Marques & Alexio, 2021)

Figure 2.4 shows Marques and Alexio's (2021) proposed analytical model that includes the factors that influencing the transformation of spaces into places and those that determine the place attachment process. The first layer, forming the base of the pyramid, shows space as a natural environment with specific physical characteristics. Placing meaning and value in that physical environment turns space into place, represented by the second layer of the pyramid.

The second layer in the model depicts "place", where there is human interaction within space. At this stage, people attach meanings and values to space. Physical features with meaning and values characterise this space, as do people's emotions and feelings about the place. People begin to view this place as irreplaceable, and there is often a reference to past experiences (see Bachelard, 1964).

The third, top layer depicts the stage where place attachment occurs. When people attach meanings, feelings, emotions, and links to past experiences, there is a complete attachment to a place. However, when disruptions occur, people return to the stage where they must create new places and attachments (see Brown and Perkins, 1992).

This chapter discusses place attachment theory and its development (the top layer of the figure above). First, the chapter investigates the multidimensional nature of place attachment, emphasising its various dimensions. Second, it discusses the theoretical approaches to place attachment, including the environment-behaviour (E-B) theory, the humanistic and phenomenological approach, attachment theory, cognitive appraisal theory, and social identity theory. Third, the chapter discusses the main applications of place attachment theory. Lastly, the empirical evidence of applying place attachment theory is discussed, highlighting studies that demonstrate its implications in various contexts.

2.3.1 Background to Place Attachment

According to Zahnow and Tsai (2021), the concept of place attachment was first conceptualised by Kasarda and Janowitz (1974). The theory was later applied by Shumaker and Taylor (1983), who emphasised the importance of both social and physical location. Place attachment, commonly referred to as the P-P-P model, consists of three core components: actors (People), a range of settings (Places), and psychological processes (Processes), as demonstrated by Low and Altman (1992). To unpack the concept of place attachment, it is essential to consider its role in both theoretical and practical contexts. This section examines these dimensions and then explores the multidimensional nature of place attachment, distinguishing between place-level and individual-level attachment.

2.3.2 Role of place attachment

Place attachment consists of two main components: the *place* component and the *attachment* component. A place can be defined as a space occupied by humans (Relph, 1976). In other words, a place is an environment to which people develop emotional and cultural attachments (Low and Altman, 1992). Places vary in scale, from large (for example, the earth) to medium (for example, cities and communities) to small (for example, homes and rooms). The attachment component is linked to emotion and feeling, which relate to cognitive aspects such as knowledge and belief (Low and Altman, 1992).

Place attachment is the connection that people form with their physical environments (Zahnow and Tsai, 2021). Place attachment research is important not only for understanding the mechanisms that underpin the connection between people and their environments, but it also has practical applications in recreating positive emotional attachments between individuals and specific places (Ramkissoon, 2015). It has significant ramifications for urban planning and design, tourist destination management, and other sectors. Place attachment research must therefore consider both theoretical and practical implications (Ji et al., 2023).

Understanding the relationships between individuals and groups in their contexts is theoretically relevant, since it clarifies the link between people and place (Inalhan et al., 2021). Place attachment research also has practical value in examining the connection between people, place, and behaviour. However, this relationship is difficult to analyse empirically. The quality-of-life characteristics of a place influence place attachment, which in turn relates to self-efficacy, subjective happiness, and civic engagement. Policymakers can use these insights to better understand the variables affecting residents' well-being. A pertinent question is whether strong place attachment encourages people to behave in more socially and environmentally responsible ways (Nientied et al., 2019).

Place attachment serves several purposes. Low and Altman (1992) identify three primary roles. The first role is that place attachment provides people a sense of security in their surroundings, which is important when considering disruption and crime. For instance, children's place attachments are vital for developing their identity, security, and sense of belonging (Jack, 2010).

The second role of place attachment is that it connects individuals with friends, family, and kin, thereby reinforcing social cohesion. Bonds with friends and family influence moving intentions: the stronger these bonds, the less likely individuals are to relocate, and the stronger their attachment to place (Gonzalez et al., 2018).

The third role connects people to religion, nation, or culture. The Circle of Place Spirituality (CoPS) offers one view of the relationship connecting place attachment and religion. According to Counted (2018), CoPS investigates the connection of individuals' shifting desires regarding

place exploration and attachment to God using a relational psychoanalytic method. The attachment objects are considered as engaging within two motivational drives, attachment needs and exploration curiosity, which constitute the basis of the individual context. These multiple impulses strengthen the attachment object's impression as a secure base for exploration or a safe shelter for affiliation. However, Brulin and Granqvist (2018) point out that, while the CoPS model contributes to the attachment-religion framework, there are significant differences between people's relationships with physical places and their relationships with interpersonal partners.

In summary, place attachment is multifaceted, serving to provide security, foster social connections, and link individuals to religion, nation, or culture. Its influences extend from issues of crime and social cohesion to spiritual and cultural affiliation.

2.3.3 The conceptual approaches to place attachment

Several unique conceptual approaches exist to understanding place attachment (Low & Altman, 1992). The table below summarises the different perspectives that help understand the concept of place attachment.

Table 2.1: Conceptual approaches to place attachment theory

Conceptual Approach	Description
1. Psychological perspective	• Emotional Bond • Cognitive Mapping
2. Social and cultural perspective	• Collective Memory • Cultural Identity
3. Environmental psychology	• Behavioural Aspects • Restorative Environments
4. Geographical perspective	• Topophilia • Sense of Place
5. Interdisciplinary approaches	• Sociological Dimensions:

	• Eco-psychological Aspects
6. Temporal dimension	• Historical and Future Perspectives
7. Technological and virtual space	• Digital Place Attachment

Source: Author's summary

The psychological perspective on place attachment posits that having a secure interpersonal attachment style is associated with stronger place attachment and attachment to a greater number of places. This suggests that interpersonal attachment styles may directly influence person-place relationships. In this context, fulfilling fundamental psychological needs is crucial for forming and maintaining positive attachment bonds between individuals and places. Three key hypotheses emerge from this approach: 1) place attachment literature identifies basic needs that are influenced by place features, leading to comparable emotional and behavioural outcomes; 2) the ability of a place to meet an individual's needs depends on the individual's attachment to that place; and 3) the attachment formed through perceived needs satisfaction influences behaviours related to that place (Viviers, 2019; Ariccio et al., 2021).

From a sociological standpoint, the rise of place attachment underscores the ongoing discussion about the alleged dissolution of local communities (Giuliani, 2003). In theory, such dissolution is regarded as an unavoidable result of modern urban living, with the concept of local community, which includes a sense of belonging or attachment, being critical. Trentelman (2009) investigates community dissolution and its effects on social connectivity and attachment, contending that community attachment deteriorates as the social relevance of local communities falls. Although systemic elements like population size and density can have an impact on community connection, the dynamics of social relationships are still important. Longer stays in a community predict stronger attachment, emphasizing the importance of human ties in maintaining communal bonds.

Low and Altman (1992:10) further note that "…place attachment may contribute to the formation, maintenance, and preservation of the identity of a person, group, or culture. Furthermore, it may also play a role in fostering individual, group, and cultural self-esteem, self-worth, and self-pride.

Place attachment may buffer against identity crises during transitional periods. Place attachment is also beneficial to the community, as it encourages participation in local affairs."

Environmental psychology is based on the claim that place attachment is an emotional tie between people and places (Purwanto & Harani, 2019). Individual behaviour and personal experiences have a tremendous influence on this relationship. Place attachment is based on the mutually beneficial relationship between actions and experience (Manzo & Devine-Wright, 2018).

The geographical viewpoint on place attachment includes the notions of topophilia and sense of place. Hummon (1992) offers an analytical take on community attachment through the lens of sense of place. Hummon (1992) follows Steele's (1981) theory that sense of place reflects "people's subjective perceptions of their environments and their more or less conscious feelings about those environments" (Hummon, 1992:262). According to this theoretical perspective, sense of place entails a broad comprehension of community sentiment that is attuned to community satisfaction, connection, and identity.

Furthermore, sense of place suggests that community sentiment is related to people's perceptions on location and how they regularly analyze the nature and attributes of the neighbourhood in which they live. Mihaylov and Perkins (2014) state that the community size can range from street blocks and neighbourhoods to cities up to the national level.

However, communal place attachment is distinct from other types of place attachment for a variety of reasons. For starters, it is based on the neighbourhood in which a person lives. Second, it centres on the neighbourhood, town, or city. Finally, it includes sophisticated social cognitions, feelings, and behaviours in reaction to environmental changes or hazards.

Conceptual methods related to place attachment can be divided into four categories: a) attachment to specific locales that are significant locations, b) predictors versus outcomes of place attachment, c) methodologies for investigating place aspects, and d) conceptual approaches to the research (Dlamini & Tesfamichael, 2021).

a) Attachment to Specific Places and Meaningful Locations

In terms of attachment to significant locations, Lewicka (2011) examines the concept of place and investigates whether it has developed since Tuan's (1974, 1975) work on topophilia and Relph's (1976) work on placelessness. These earlier studies were conducted at a period when computing, mobility, and internationalization were less prevalent than they are today, prompting current study to look into potential changes in these ideas throughout time. 008), and those who are subjected to compulsory relocation for employment, including temporary movements (Van Veelen and Haggert, 2016).

These findings back up Tuan's (1974, 1975, 1977) and Relph's (1976) claim that a sense of place is a 'natural condition of human existence' (Lewicka, 2011:209) that endures despite societal change. This argument is consistent with findings indicating the strength and kind of place attachment varies depending on the features of both locations themselves and the social, demographic, physical, and economic qualities of the individuals who live there (Scannell and Gifford, 2010).

b) Predictors vs Consequences of the Place Attachment Approach

Predictors of place attachment include elements that have been separately researched as drivers of attachment, including sociodemographic factors, length of stay, and homeownership. However, the implications of attachment are determined by the level of connection that an individual experiences. Positive attachment is linked to a larger sense of coherence, higher contentment with the general state of life, stronger social links and neighbourhood ties, and a deeper interest in ancestral roots. According to Fleury-Bahi et al. (2008), Gustafson (2009), and Lewicka (2010), the length of residence is the most significant indicator of place attachment.

Lewicka (2010) cites Jorgensen and Stedman (2006), who investigated coastline homeowners in northern Wisconsin, United States. They discovered that the total number of days lived in the area, rather than the length of property ownership, predicted a good sense of place, encompassing place attachment and identity. Kelly and Hosking (2008) discovered a similar pattern in the high-amenity

areas of Augusta Margaret River, Australia, where overall time spent in a second property, as opposed to ownership duration, was the best determinant of attachment.

c) Methodological Approach to Place Attachment

Dlamini et al. (2020) discuss the various methodologies used to assess place attachment. Quantitative approaches usually use proxies such as length of residency or neighbourhood ties, whereas qualitative approaches capture the meanings linked to places using verbal and pictorial techniques. Measurement scales vary, and include both one-dimensional and multidimensional instruments.

d) Theoretical Approaches to Place Attachment

Research on place attachment has predominantly emphasised the 'Person' component of the Person-Place-Process model, often giving less attention to 'Place' and the processes through which attachment develops. This imbalance underscores the complexity of measuring place attachment and indicates opportunities for advancement in both theoretical and methodological frameworks. Further discussion is provided in section 2.3.5.

e) Multidimensional nature of place attachment

Place attachment is a complicated and multidimensional term that incorporates several but connected features (Low & Altman, 1992; Hummon, 1992; Mihaylov & Perkins, 2014; Nientied et al., 2019). It can occur at different locations and individual levels and has been examined from a variety of angles, including personal, collective, external, and multidisciplinary approaches (Low & Altman, 1992; Nientied et al., 2019). The following debate exemplifies the complicated and multidimensional structure of place attachment.

a) Place-level Attachment

Place-level attachment relates to the emotional connections that people form with specific places, such as their homes, neighbourhoods, and communal spaces. These attachments can cause feelings of insecurity, contentment, worry, and uncertainty (Ahrentzen, 1992; Hummon, 1992; Pellow,

1992; Mihaylov and Perkins, 2014). Personal experiences and recollections play an important impact. A sense of continuity and acquaintance with a place helps people build emotional bonds related to it (Raymond et al., 2010; Lomas et al., 2021).

Background culture and social institutions shape how people see and relate to places. Shared values and social interactions within a group can improve attachment (Marques et al., 2020; Allen et al., 2021). The physical characteristics of a location, such as its design, recreational opportunities, and general environment, influence attachment. Positive features can increase attachment, whilst negative aspects can lead to unhappiness (Jayakody et al., 2024).

Place attachment develops through a variety of factors, including genealogical links, economic connections, and cultural practices, emphasizing its complex nature (Louws, 1992). There is a link between several types of attachment, which include attachment to houses, communities, and public spaces, implying that experiences in a particular region might impact feelings in another. Place attachment can be broken by environmental or social changes that impact people's emotional attachments to locations.

b) Individual-level Attachment

Individual-level attachment refers to the emotional connections people form with specific places. This dimension emphasises feelings such as love, nostalgia, and security associated with particular locations (Chawla, 1992; Inalhan et al., 2021). Personal experiences and memories are crucial in shaping these attachments. Positive or negative experiences influence how individuals perceive a place, contributing to a sense of continuity or disruption (Scannell & Gifford, 2014).

Cultural background and shared values also affect individual place attachment, as meanings and significance attributed to places can vary across cultural contexts (Chawla, 1992). Physical characteristics of a location, including aesthetics, functionality, and environmental quality, play a key role in forming attachments. Individuals may develop attachments based on the sensory experiences associated with a place.

Individual attachments are often complex and multifaceted, encompassing dimensions such as affection, idealisation, and ambivalence. This complexity reflects the diverse ways individuals relate to places over time. Furthermore, individual place attachment is closely intertwined with personal identity. The places individuals feel attached to contribute to their sense of self and belonging, influencing social identity and community connections.

Individual attachments are also subject to change or disruption. Relocation, urban development, or significant personal life events can affect how individuals relate to their places, highlighting the dynamic nature of place attachment.

2.3.4 Applications of Place Attachment Theory

Place attachment theory has been utilized in a variety of circumstances. The main themes in the application of place attachment research are mobility and relocating, environmental destruction, tensions between different groups of people in neighbourhoods, and hurdles in urban design and planning initiatives, including social housing policy (Manzo, 2014; Manzo & Devine-Wright, 2018).

a) Mobility and relocation

Understanding residents' attachment to their homes and communities is crucial for disaster preparedness, response, and recovery. Place attachment theory assists emergency managers and policymakers in developing strategies to support affected communities, facilitate recovery processes, and strengthen social networks. Fullilove (2014) explores the impact of multiple evictions, sometimes referred to as repeated displacement by force, on place attachment. She puts out the "Frayed Knot hypothesis," which posits that frequent disturbance undermines the meaning of place and the mutually beneficial connections that connect people to it. However, links are preserved through community practices of commitment to a place that once existed and may again exist. According to Fullilove (2014), localities and people who are serially displaced see major changes in community capacities and practices. Displaced people have memories of the place as it previously was and are anxious to restore and rebuild it. However, empirical evidence for the claim remains inconclusive.

Empirical research show that place attachments include a wide spectrum of feelings and experiences. Manzo (2014) outlines three issues concerning the political aspects of place attachments within residential settings. First, the sense of stigma, as well as collaboration and networking among neighbours, imply that place attachments are the result of a dynamic interaction of multiple emotions and place memories. Second, ambiguous attitudes may have existed prior to displacement, originating in how people perceive their surroundings. Finally, socio-political dynamics shape place meanings and attachments, including the interaction of policy and rhetoric with inhabitants' active meaning-making practices when they face relocation.

b) Environmental destruction

Place attachment influences individuals' attitudes and behaviours towards natural environments. Conservationists can leverage place attachment theory to engage communities in environmental stewardship, including protecting natural habitats, preserving scenic landscapes, and promoting sustainable resource management practices. Carrus et al. (2014) examine research on the impact of attachment to place on the quality of the environment. Their discussion focuses on studies that show positive or negative correlations involving place attachment and environmentally conscious behavior, as well as possible moderating factors of this relationship. These moderating factors can impact whether place-attached people or groups support or oppose environmental preservation. Their review presents scientific support for a positive association between attachment and environmental consciousness. Individuals who are emotionally attached to a specific location are more inclined to protect it, get involved with civic activities that promote the local environment, appreciate and preserve natural resources, and display resilience to environmental hazards.

Closely related to Carrus et al. (2014) is the review conducted by Devine-Wright (2014), which examined the application of place attachment to climate change. Climate change is causing substantial environmental shifts, including rising temperatures, sea levels, and coastal flooding. These impacts significantly affect people's lives and their emotional attachment to places. Although Devine-Wright (2014) calls for further research, the review highlights the challenges in fully understanding the contribution of place attachment theory to explaining human responses to climate change.

c) Tensions across social groups in local communities

This tendency is commonly referred to as the "dark side of place attachment," emphasizing its ambivalent features (Wohl & Cohen, 2024). When people from different ethnic or cultural backgrounds migrate to regions with a high level of connection, it can cause conflict. Long-time inhabitants may see newcomers as a danger to their traditional way of existence (Fried, 2000). As stated in Chapter 2, these processes are linked to social upheaval. Wohl and Cohen (2024) emphasize the importance of addressing social conflicts in varied neighbourhoods, as well as taking into account the possibly detrimental effects of attachment.

d) Challenges in urban design and planning projects

Understanding place attachment allows urban designers and planners to develop sustainable environments that promote identity and well-being (Razem, 2020). Planners can promote social interaction, community cohesiveness, and sustainable behaviours by taking into account individuals' emotional attachments to their communities, parks, and public places. The basic goal of urban design is to create liveable environments that meet inhabitants' needs via responsive public spaces. Underutilized public spaces are frequently the result of focusing solely on the physical and social characteristics of places while ignoring the psychological dimensions and values related with place attachment and behavior (Moulay et al., 2018; Casakin et al., 2015).

e) Health and well-being

Place attachments can improve people's psychological and physical well-being by giving security, encouragement from others, and a sense of belonging (Lomas et al., 2021). Place attachment concerns can be incorporated into treatments designed to improve psychological wellness, inclusion in society, and community resilience. Place attachment is a significant indicator of social well-being and cognitive performance in older persons. As a result, it should be included in strategies addressing neighbourhood planning, older well-being, and aging in place (Lebrusan et al., 2022).

2.3.5 Theoretical Approaches to Place Attachment

Multiple theoretical frameworks have been presented to help comprehend place attachment. These approaches draw on a variety of disciplines, including sociological theory, psychology, geography, and psychology of environment. The most commonly cited frameworks are Scannell and Gifford's (2009) people-process-place tripartite framework, environmental-behaviour theory, social identity theory, psychoanalytic theory, interpersonal attachment theory, cognitive appraisal theory, the humanistic and phenomenological approach, and the environmental psychology approach. Selected hypotheses are examined in depth below.

a) The tripartite model P-P-P model

Scannell and Gifford (2009) merged the concept of place attachment into a framework with three dimensions consisting of person, process, and place. This synthesis agrees with Low and Altman (1992), who proposed that place attachment is a multifaceted concept. The human component of place attachment refers to meanings chosen by a person or group. The process dimension comprises attachment's psychological mechanisms, such as affective, cognitive, and behavioural components. The place dimension stresses the aspects of the place itself, such as its geographical scale, uniqueness, and the significance related to social or physical characteristics.

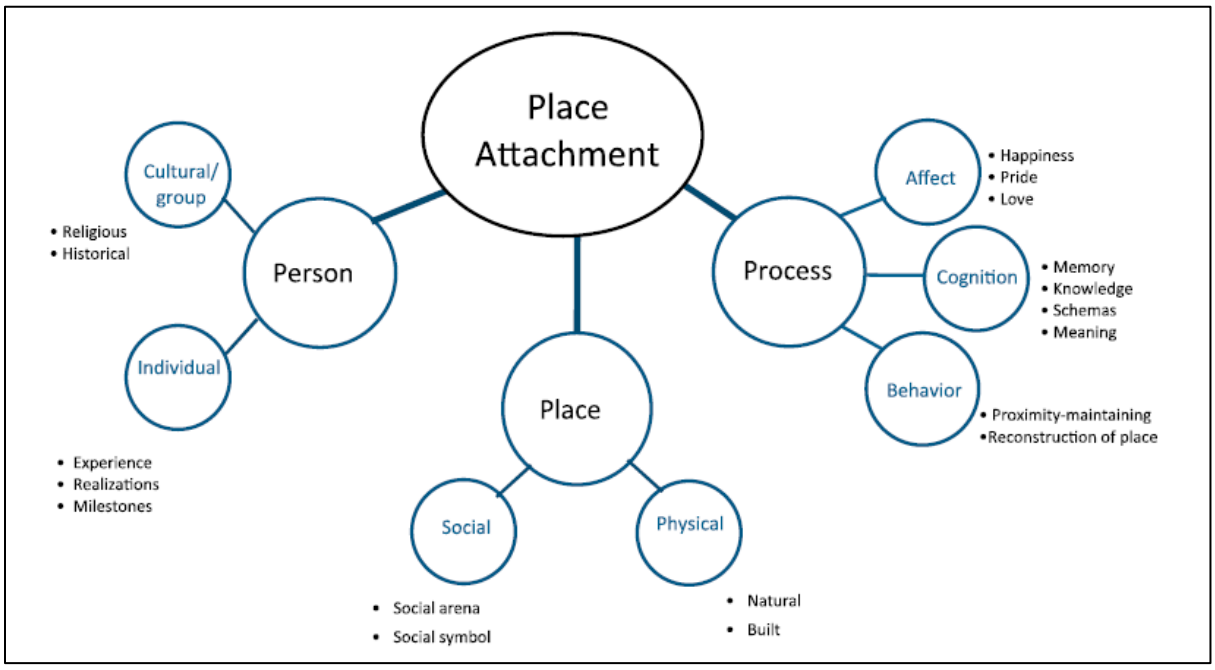


Figure 2.5: Scannell and Gifford's framework of place attachment (Scannell & Gifford, 2009)

Scannell and Gifford's (2009) three-dimensional framework of place attachment is presented in Figure 2.5. According to this theory, place attachment is a multidimensional notion comprising human (person or actor), psychological processes, and place components. Three dimensions are discussed further below.

Dimension 1: The Human Element (People or Persons)

The first dimension focuses on the attached person. Place attachment occurs on two interconnected levels: individual and group. On a personal level, emotional connection can be described by topophilia, memories, closeness, or milestones. Topophilia is an affection of or emotional attachment to space or the physical surroundings (Bachelard, 1964). Memories remain stationary and fixed in space, whereas milestones represent periods of intimacy or solitude. The areas in which an individual has experienced isolation, delight, desire, or compromise are imprinted on that individual (Bachelard, 1964).

At the group level, attachment relates to the symbolic meanings of a shared site among members (Low, 1992). Culture connects individuals with their surroundings through daily historical events, values, and symbols. Individual place attachment develops as cultural place values and significance interact with positive individual experiences within a site to sustain and possibly deepen cultural place attachment.

Religion elevates the importance of some regions to a sacred level. Many religions rely on venerated sites like Mecca and Jerusalem, along with smaller-scale centres of worship, temples, shrines, graveyards, and hallowed natural places. Religious followers recognize their symbolic value. Such sacred sites bring believers closer to their divinities while instilling care and respect for their environment, indicating cultural connection. Although religions normally identify which places are significant to them, personal religious experiences can also provide sanctity to specific locations. Consequently, the cultural and personal aspects of place attachment are unique yet linked.

Dimension 2: Psychological Processes Element

The second component of place attachment pertains to its three psychological aspects: affect, cognition, and behaviour.

i) Place attachment as an effect

Person-place bonding is an emotional tie to a certain locale. The preceding section described topophilia as an emotional connection between individuals and locations (Tuan, 1994). Relph (1976) defines place attachment as a true and emotional connection to a location that fulfils a basic human need.

The literature on displacement gives additional evidence that attachment to a place is emotional, since it arises when people are compelled to abandon their homes due to natural disasters, conflict, immigration, or relocation. For example, Fried (1963) investigated a community revitalization initiative in Boston's West End. Residents lost familiar infrastructure and social connections as part of neighbourhood "improvements," essentially breaking up a close-knit community. Residents were in grief and sorrow after the interruption. Fried (1963) found that grief is not restricted to the death of someone you care about, but may additionally stem from the loss of a significant location. Similarly, Fullilove (1996) observed that displacement causes grief and longing, suggesting that attachment is predominantly affect-based.

Place interactions can provoke a variety of feelings, such as love and satisfaction, fear, fury, and ambiguity (Manzo, 2005). For example, a childhood house may be remembered as important, but this does not automatically imply a positive connection. Traumatic experiences may produce unpleasant or hostile feelings. Although significant negative links can develop with notable places, connections are frequently viewed positively. Being inclined to stay close to an area indicates an attempt to experience the positive sensations that the place of residence may elicit (Giuliani, 2003).

ii) Place attachment as cognition

Cognitive characteristics are involved in person-place relationships. Individuals value environments because they evoke memories, beliefs, meanings, and knowledge. Place attachment as cognition entails generating and relating with place meanings that enable closeness with a location. People create meaning for places and associate them with themselves through memories, frequently clinging to areas related to significant periods or experiences. Hunter (1974) alludes to these as "symbolic communities" since the attachment is based on historical representations entrenched in the surroundings.

Individuals organise information about society in an organized and effective way. They organize this information into cognitive structures, which include knowledge and concepts about specific objects or themselves as individuals. According to Feldman (1996), people develop ties to specific categories of locations, such as rural dwellings, suburban single-family homes, or downtown neighbourhoods. A schema includes information about the characteristics that are shared by different kinds of places with which one may feel linked. A favourite location can be regarded of as a kind of place schema, containing facts and concepts about the location that eventually capture its unique character and how one feels connected to it. Individuals may also associate with a location as a symbol of their identity. Place interconnections can be cognitive as well as on an individual basis, incorporated into one's self-concept.

iii) Place attachment as behaviour

The third component of the cognitive process of place attachment is the behavioral or action part. Place attachment, like relational attachment, is linked to proximity-keeping behaviors (Scannell & Gifford, 2009). It is a pleasurable, affective connection between a person and a location, characterized by efforts to stay close to that spot. Studies relating place attachment to length of stay and efforts to return lend support to the notion that attachment is a proximity-maintaining behaviour.

Religious pilgrimage is further behavioural display of attachment, demonstrating efforts to stay close to an important location (Low, 1992; Mazumdar and Mazumdar, 2004). Securely attached

people, on the other hand, may not always stay close; one can be deeply dedicated to a location while frequently leaving it. Dysfunctional attachment can emerge when an individual refuses to evacuate their home despite the conditions (Fried, 2000). Excursions away from a location, when combined with proximity-maintaining behaviors, can improve comprehension and enjoyment of one's surroundings (Case, 1996).

Place reconstruction following disasters is another notable behavioural expression of attachment. Destruction can allow planners to address pre-disaster issues such as urban decline and suburbanisation (Kates et al., 1977). Residents' attachment often depends on reproducing the city to which they were connected. When relocation is necessary, some attempt to maintain attachment by selecting areas similar to the previous location (Michelson, 1976; Gans, 1962).

Thus, the behavioral dimension of place attachment is founded on a desire to remain connected to a location. It manifests itself through proximity maintenance, trips, site restoration, and relocation to comparable environments.

Dimension 3: The Place Element

The third component is the place element, encompassing the characteristics of the place, such as what the connection is aimed toward and the nature of the place. Place attachment can be investigated at several geographic scales, including intimate settings (such as a single room in a dwelling), medium-sized settings (such as an area of town or city), and broad settings (such as the global community) (Low & Altman, 1992). It is typically divided into two categories: social and physical location connection.

Hidalgo and Hernandez (2001) investigated social and physical place attachment across three spatial levels: the home, the neighbourhood, and the city. Their research identified three important points. First, the degree of attachment, whether social and physical, varies by spatial location. Second, attachment was higher at the household and city level compared in the neighbourhood level. Finally, social attachment showed to be stronger than physical place attachment.

Place attachment research has generally concentrated on social place attachment, emphasizing the significance of connection to the social aspects of one's surroundings (Young & Willmott, 1962; Fried, 1963). Interpersonal relationships, bonding, familiarity, and participation in community activities are examples of social factors.

Because location attachment is fundamentally social, it is inexorably linked to a sense of belonging (Hummon 1992). Community is characterized by a complex network of close relationships, kinship links, and formal and informal associations formed through family life and ongoing socialization. Communities are classified into two distinct categories: communities of interest, whereby members share a common lifestyle and hobbies, and communities of location, where members are connected by geography. Online, professional, and religious communities are seldom geographically bounded. Communities of place, in contrast, are more applicable to this paradigm because they represent social links that are rooted in actual locations such as neighbourhoods, coffee shops, or other places that promote social interaction.

Attachment is also linked to the physical features of the region. Place reliance emphasizes the significance of physical characteristics in providing services or amenities to support individual aspirations. People may recognize significant sites in a wide range of physical settings, including homes, streets, and public structures, as well as natural landscapes such as lakes, parks, pathways, forests, and mountains (Manzo, 2005).

Stedman (2002) proposes a notion in which attachment develops not to physical objects but to the ideas they convey. A developed area, for instance, may represent "a neighbourhood", while an underdeveloped area might represent "untouched nature". The symbolic meanings associated with physical characteristics impact physically based place attachments.

In summary, the P-P-P model describes three aspects of place attachment: the person, the cognitive process, and the site. Person-place bonding is multidimensional, with several threads linking people to important places. Some connections are deeper or more obvious than others; some appear unbreakable; and some are evident to others. This three-dimensional framework integrates the most often used definitions for place attachment in the available literature.

b) The environment-behaviour (E-B) theory

The place is not a distinct physical environment from individuals, but rather an integrated and frequently unnoticed reality of an individual experiencing the place. This phenomenon is often multifaceted, complicated, and dynamic. It encompasses the mechanisms through which a place, its surroundings, and its significance, including place attachment, change or remain relatively stable (Seamon, 2014). Seamon (2014) also claims that individuals and their living surroundings are intrinsically intertwined. Place offers geographical and environmental cohesiveness to life, meaning that it is theoretically and practically important. Place attachment is part of a larger lived interplay in which the human and environmental components mutually support and reinforce one another.

c) Humanistic and phenomenological approach

This approach is built around two fundamental phenomenological concepts: the body-subject concept, borrowed from Merleau-Ponty (1962), and the idea of place ballet. The term "body-subject" refers to pre-conscious corporeal consciousness exhibited through ordinary gestures and behaviours, which are often coordinated with the geographical and physical setting in which they occur. Place ballet refers to the interactions of individual bodily patterns that are rooted in a specific place and can serve as a major site for interpersonal and community exchange, meaning, and connection. In conclusion, place attachment develops via regular environmental actions, habits, gestures, and behaviours that are maintained and strengthened through continued involvement with the location (Seamon, 2014).

Seamon (2014) emphasises that place attachment is not static. He argues that it evolves over time and can be analysed phenomenologically through six interconnected processes. Figure 2.6 below illustrates these six interlinked processes.

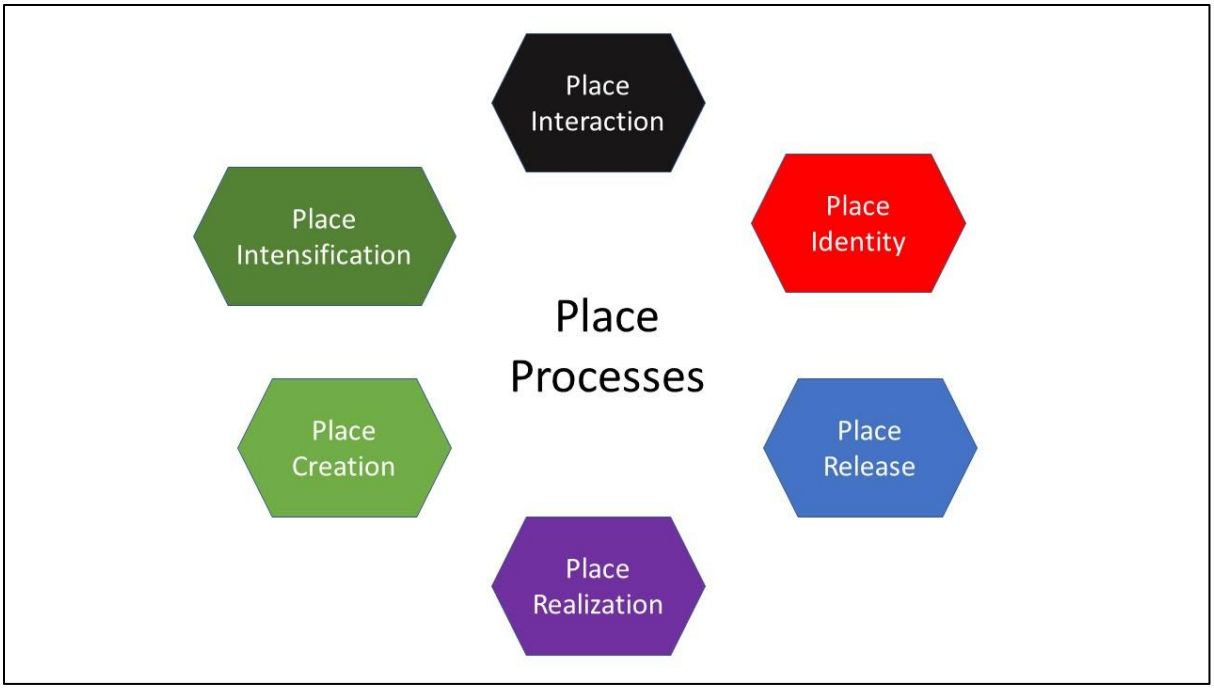


Figure 2.6: Place processes (Seamon, 2014)

Seamon (2014) defines place interaction as the day-to-day actions that take place in a specific area, such as everyday activities, conduct, situations, and events. Individual behaviours and interpersonal exchanges are spatially linked through bodily shared presence and social interactions grounded in place, such as place ballet, which is one sort of place interaction. Place interaction, as a process, can undermine place by disrupting co-presence and causing pain, fragmentation, or decline. According to Enfield and San Rogue (2017), this is a procedure whereby a place reference is made spontaneously and on a frequent basis in multiparty communication.

Place-identity refers to the process by which people who reside in a certain location make that location an important aspect of their life by influencing the physical characteristics of their environment (Proshansky et al., 1983; Dixon & Durrheim, 2000). Breakwell's model can be used to investigate place-identity processes, which emphasizes the following four concepts: continuity, self-worth, self-confidence, and uniqueness (Twigger-Ross & Uzzell, 1996). The continuity process occurs when individuals accept and recognize a location as important to their private and community identities. When people or groups grow disconnected from their surroundings, place-identity processes may weaken a community by lowering self-esteem. Residents may feel mistrust

or threatened and decide to relocate to a more secured or acceptable place. Place-identity is not constant; it depends on individual, interpersonal, and social processes. It also evolves over the lifecycle as physical and social environments change (Bernardo & Palma-Oliveira, 2012). Accumulated meanings of place, transmitted across generations, negotiated, partially destroyed, or altered, form a continuum of people-place links referred to as place-identity (Nanda & Meel, 2023).

Place release entails the serendipity of unanticipated meetings and events in the environment, prompting deeper engagement with oneself. When the pleasures of a place become unsettled or uncomfortable, place release processes diminish its value, as observed by Jacobs (1961) in studies of declining city neighbourhoods in the United States. The location no longer provides unexpected pleasures, and residents lose the vitality and enjoyment once associated with it (Oldenburg, 1999).

Place realization is the physical existence of a place (Relph, 2009). The environmental component of a location, together with human behaviours and meanings, provides a particular atmosphere and character that is as genuine as the individuals who experienced and appreciate it. Place realization can degrade a location's atmosphere as a result of poor strategy, intensive layout, neglect, or catastrophic occurrences such as war or disaster.

Place creation is an approach in which humans engage with their surroundings to create meaningful locations. Stakeholders use their passion and empathy for a location to develop and implement innovative policy, planning, and design strategies that improve place engagement, sense of self release, and realization (Alexander et al., 2012). Place creation may harm a site when rules, plans, or actions misunderstand or overlook the location's true demands, resulting in unjustified interventions that weaken its key attributes.

Place intensification describes the ability of well-executed policies, design, and construction to revitalize and reinforce a location. Here, physical and spatial alterations influence experiences and routines, actively shaping human conduct. Place intensification focuses on how construction can improve place quality and character. Place intensification, on the other hand, can degrade a location when poorly constructed policies, rules, or actions erode the environment's vitality.

In summary, the six processes, place interaction, place-identity, place release, place realisation, place creation, and place intensification, are typically present in well-used and valued locations. Place interaction involves daily activities, while place-identity integrates a location into people's lives. Place realisation encompasses the physical presence and meanings of a place, whereas place intensification strengthens it through considered policies and design. Place creation involves human interaction with the environment, while place intensification enhances and sustains the place through thoughtful design, planning, and fabrication.

d) Individual or interpersonal attachment theory

This notion originated in developmental psychology. Attachment theory concentrates on the ties developed between individuals and their primary caregivers throughout infancy. Scannell and Gifford (2014) examine the fundamentals of personal and place attachment, claiming that, whereas attachment theory focuses on person-to-person bonding, most people form ties with locations. They find that both attachment types have similarities and differences (Gustafson, 2014). Interpersonal and geographical attachment can provide people a sense of security and comfort. While interpersonal attachment has already been extensively investigated and its negative valence well established, place attachment theory requires additional research into negative valenced person-place ties (Giuliani et al., 2003; Manzo, 2005).

e) Cognitive appraisal theory

Cognitive appraisal theory emphasises the role of cognitive evaluations and appraisals in shaping emotional responses to places. Place attachment may develop when individuals perceive a place as congruent with their goals, values, and self-concept, or when it provides satisfying experiences and social interactions. Longevity in a location is one factor influencing attachment (Rubinstein & Parmelee, 1992). A key question is how mobility affects place attachment in an increasingly globalised world, where people move for leisure, work, or better opportunities (Gustafson, 2014).

Two main perspectives exist regarding mobility and place attachment. The first view considers place attachment beneficial and mobility detrimental. Place attachment, through community ties and emotional bonds, contributes positively to well-being, whereas mobility is seen as a factor in

social and emotional disintegration. The second view regards strong attachment as limiting, as rootedness in one location may restrict development and personal growth. From this perspective, mobility is positive, enabling individuals to develop a cosmopolitan outlook. Mobility and place attachment are therefore positioned as opposing forces.

According to research, people who have a strong attachment to their place are less likely to relocate (Lewicka, 2011; Giuliani et al., 2003; Savage et al., 2005), demonstrating a negative relationship between residential mobility and attachment. Gustafson (2014) finds four main types of the mobility-place attachment connection: 1) Mobility has to do with a degree of attachment to a place; 2) Mobility is related to multiple attachments; 3) Different forms of mobility raise concerns regarding territorial scale and place attachment; and 4) emerging technologies for communication and information generate new kinds of person-place relations.

Lewicka (2014) highlights the complex relationship between mobility and place attachment. Whereas earlier studies conceptualised them as opposites (Gustafson, 2014), Lewicka argues that mobility and attachment can complement each other. Length of stay is a key determinant of attachment, with stronger attachment linked to longer residence. Her analysis of quantitative surveys shows that place attachment is nearly universal. However, forced relocation can severely disrupt attachment, with significant psychological and health consequences.

Lewicka (2014) further asserts that high life satisfaction, social capital, and adjustment do not require permanent residence in one's birthplace. This aligns with the view that mobility can be beneficial. Nevertheless, as her findings are based on correlational data, further research using rigorous survey designs is necessary to test causal links between memory, mobility, and place attachment.

f) Social identity theory

Social identity theory posits that, individuals derive a sense of identity and self-concept from their membership in social groups. Place attachment can be interpreted through this lens, whereby individuals develop attachments to places associated with their social identity or group memberships. Such places may include neighbourhoods, cities, or cultural landmarks.

Mihaylov and Perkins (2014) refer to Brown and Perkins' (1992) concept of place attachment, as well as Scannell and Gifford's (2009) three aspects of place attachment. They broaden place attachment theory by emphasizing communal or group characteristics, particularly collective behaviours intended at safeguarding, sustaining, and defending one's community. Community place attachment is distinct from other types of attachment in terms of location, intensity, focus, and behavioural response (Mihaylov & Perkins, 2014:62). Individuals who feel connected to their neighbourhood, town, or city generate a feeling of community distinctiveness, stability, agency, and growth. The uniqueness of community-place attachment stems from its role in an intricate procedure which combines individual and community-level place and societal thoughts, emotions, and behaviours in response to environmental disruptions or challenges, ultimately leading to collective action, adaptation, and acceptance.

2.3.6 Summary

Theoretical models, including the Person-Place-Processes (P-P-P) model and the environment-behaviour (E-B) theory, organise understanding by delineating the roles of individuals, perceptions, and environmental features in forming attachments. Additional frameworks, such as cognitive appraisal theory and the body-subject perspective, explore how cognitive evaluations, bodily routines, and daily interactions contribute to attachment processes.

Social elements, such as familiarity, community networks, and shared social identity, are critical in fostering attachment, particularly in communities of place as opposed to communities of interest. Physical dependence on specific locations and the emotional significance attributed to environmental features further strengthen these bonds.

Despite these insights, research limitations persist, including methodological narrowness, lack of diversity in study populations, and insufficient integration of physical place attributes. Addressing these gaps is essential for advancing theoretical robustness and informing practical applications in urban planning, disaster management, environmental conservation, and community development.

Overall, Place Attachment Theory provides crucial insights into how emotional bonds with places shape social cohesion, resilience, and sustainable development. Chapter 5 will present empirical

evidence of place attachment, focusing on its variations across mining regions in non-metropolitan South Africa. This evidence aims to address theoretical, empirical, and methodological gaps in the study of place attachment.

2.3.7 Determinants of Place Attachment

The research points to several determinants of place attachment. These determinants can be grouped into three groups. Table 2.2 shows the factors or predictors of place attachment.

Table 2.2: Determinants of place attachment

<table>
<tr><th colspan="3">Determinants of place attachment</th></tr>
<tr><th>Personal</th><th>Environmental</th><th>Behavioural</th></tr>
<tr><td>• <u>Sociodemographic variables</u>: Gender, age, income level, education level, occupation, social and economic status
• Homeownership
• Time spent in a place (Length of stay)</td><td>• Physical environment;</td><td rowspan="3">• Residence time;
• Mobility and its scope;
• Time spent looking for a place to live; and
• Outdoor places to explore.</td></tr>
<tr><td rowspan="2">• <u>Interpersonal relationships</u>: the strength of community ties, neighbourhood relationships.</td><td>• The natural environment,
• Environmental quality and infrastructure.</td></tr>
<tr><td>• social
• environmental factors,
• social security,
• administrative management and
• traditional culture</td></tr>
</table>

Source: Ji et al. (2023)

The three groups of place attachment determinants are personal, environmental, and behavioural (Ji et al., 2023). It is possible to subdivide these personal determinants into sociodemographic variables and interpersonal relationships. The environmental determinants include physical, natural, and social environments. Behavioural determinants focus on residence time, mobility, and outdoor spaces.

a) Personal determinants

Sociodemographic factors influencing place attachment include gender, age, income, occupation, social and economic status, homeownership, and length of residence. Homeowners tend to demonstrate pride of place, which fosters positive attachment (Brown et al., 2003; Marais et al., 2021). Long-term residents also report higher levels of safety and security (Marais et al., 2021). Family ties, social relationships, and economic opportunities further shape residents' attachment to their neighbourhoods. Additional influential factors include proximity to workplaces, access to income-generating opportunities, and availability of financial support such as loans. Social factors encompass social closeness, including strong bonds with neighbours, mutual care, daily interactions, intimacy among residents, and participation in communal activities (Lestari & Sumabrata, 2018).

Interpersonal interactions, which range from family networks to local connections, are also important. According to research, place attachment is higher among those who perceive less crimes in their neighbourhood, record fewer crimes on their property, are less afraid of crime, and have a greater sense of community cohesion as well as control (Brown et al., 2003).

b) Environmental determinants

Both physical and social environments play a critical role in shaping place attachment. Indicators of environmental factors include the availability of public facilities, infrastructure, and opportunities for social interaction, all of which influence attachment (Marais et al., 2021). Residents' emotional bonds with their environment depend not only on the physical setting but also on social interactions and relationships within the neighbourhood. Physical characteristics contribute to the distinctiveness of a place and influence residents' perceptions of their

surroundings (Lestari & Sumabrata, 2018). Pleasant, well-maintained neighbourhoods generally foster higher levels of place attachment (Marais et al., 2021).

c) Behavioural determinants

Key behavioural factors include length of residence, mobility, and the time invested in seeking a place to reside or exploring outdoor areas. Individuals who spend more time searching for a new home tend to form stronger connections to their neighbourhood (Ji et al., 2023). Seamon (2014) introduced the concept of place-ballets, proposing that attachment emerges from the interaction of "body-ballets" and "time-space routines," which are structured everyday actions contributing to the experience of place.

2.3.8 Criticisms of Place Attachment Theory

Place attachment theory faces several criticisms. It lacks a robust theoretical foundation, resulting in fragmented and largely exploratory studies. Research disproportionately emphasises individual differences while often neglecting the "Place" and "Process" components and broader contextual factors. The physical attributes of places are insufficiently examined, and the underlying mechanisms and processes remain underexplored. The literature frequently reproduces established findings without offering significant new insights, leading to stagnation in theoretical development.

Further criticisms include limited diversity in study populations, restricted methodological approaches, and high variability in conceptualisations across disciplines, which impedes consensus on definitions and measurement. The theory also predominantly focuses on home and neighbourhood settings, with little consideration of work environments. Operationalisation remains inconsistent, with few studies employing qualitative methods. Additionally, research often emphasises the positive aspects of attachment while neglecting potential negative consequences, such as social disruption or displacement (Yost, 2011; Lewicka, 2011; Inalhan et al., 2021; Lomas et al., 2021). These critiques highlight the need for a more nuanced, inclusive, and methodologically rigorous approach to understanding place attachment.

2.4 Evidence of Social Disruption

This section provides empirical evidence of social disruption. Empirical evidence suggests that resource extraction activities are associated with heightened risk-taking behaviours and adverse public health outcomes. Beleche and Cintina (2018), in their study of unconventional gas development in Pennsylvania counties affected by hydraulic fracturing, found significantly higher rates of sexually transmitted infections and prostitution-related arrests. Specifically, gonorrhoea and chlamydia infection rates increased by 7.8% and 2.6%, respectively, while prostitution-related arrests rose by 19.7%. These findings indicate that rapid industrial development and population influx associated with extractive activities may contribute to social behaviours that increase public health risks and strain local health and law enforcement systems.

Research further highlights the long-term social consequences of sustained economic specialisation in extractive industries. Haggerty et al. (2014) examined oil and natural gas specialisation across six interior western U.S. states between 1980 and 2011 and found that prolonged dependence on extractive industries was associated with adverse outcomes in per capita income, crime rates, and educational attainment. While early participation in the 1980s energy boom initially improved per capita income, these gains diminished over time, particularly in counties that remained specialised for extended periods. This evidence suggests that short-term economic benefits from extractive booms may give way to longer-term social and economic vulnerabilities.

Evidence from post-operational contexts indicates that social disruption linked to energy development can persist beyond the active life of extractive projects. Perez-Sindin (2021), in a study of the As Pontes fossil-fuel power station in Spain, identified enduring social tensions both within and between social classes following the operational phase. The study reported mixed evidence of increased crime and heightened social disorder, including rising suicide rates among young people during the closure period. These findings underscore the long-term and often latent social consequences of energy development, particularly during transition and decline phases.

Despite these findings, the social disruption hypothesis has been criticised on multiple fronts. First, it is said to oversimplify complex social phenomena by attributing diverse social issues entirely to disruptions in social order (Jacquet & Stedman, 2013). Second, establishing a clear causal relationship between social disruption and negative outcomes is challenging, as disruptions often occur alongside multiple other influencing factors. Third, structural concerns, including systemic inequities, discrimination, and political corruption, are not adequately addressed, despite their potential contribution to social problems. Fourth, the hypothesis assumes social stability is the norm and disruptions are anomalies, overlooking the possibility that disruptions may stimulate necessary societal transformation. Fifth, it focuses primarily on negative consequences, neglecting potential beneficial outcomes such as enhanced social awareness, mobilisation for positive change, and the dismantling of oppressive systems. Sixth, the impact of social disruption varies across contexts; what constitutes a disruption in one society or community may not in another. Seventh, critics argue that the theory overemphasises deviance or criminal behaviour as a response to disruption, potentially stigmatising affected individuals and communities. Finally, the hypothesis has been criticised for ethnocentrism, as it relies on Western notions of social order and may not adequately capture cultural differences in how disturbances are perceived and managed.

The potential sources of social disruption include neighbourhood environmental factors such as crime, natural disasters, loss of land, and relocation, which can cause social disruption (Brown & Perkins, 1992; Milligan, 2003; Haskell & Randall, 2009; Deacon et al., 2018; Stretesky & Grimmer, 2020). These sources of social disruption are often interconnected. For example, political instability can lead to economic crises, and economic disparities can fuel social movements. The severity of disruption can vary widely, from localised protests to widespread societal collapse. Effective governance, social policies, and community resilience can help mitigate the impact of these disruptions and promote stability. Some of the potential sources of social disruption are discussed below.

2.4.1 Social disruption due to economic crises

“Economic crisis represents a situation in which a country's economy passes through a sudden decrease of its force, a decrease usually brought about by a financial crisis. The economic crisis

may take the shape of stagflation, a recession, or an economic depression" (Zafiu & Saracu, 2013:21). Economic crises can cause social disruption at both micro (individual or household) and macro levels.

At the micro level, an economic crisis can cause three forms of social disruption. First, it can lead to increased incidences of poverty (Suryahadi & Sumarto, 2003; Ramesh, 2009; Ahmed & O'Donoghue, 2010; Thern et al., 2017; Panori & Psycharis, 2018). Poverty rates may rise as more people fall below the poverty line due to loss of income or reduced social safety nets. For instance, the United Nations (2011) report states that between 47 million and 84 million more individuals fell into or remained entrenched in extreme poverty due to the 2007-2008 global financial crisis.

Second, economic crises can lead to increased unemployment (Cai & Chan, 2009), widespread job losses, reduced employment opportunities (Palaskas et al., 2015), and heightened job insecurity, causing financial stress and anxiety for individuals and families (Guichard & Rusticelli, 2010). The United Nations (2011) report noted that global unemployment increased from 178 million in 2007 to 205 million in 2009. The report states that this significant growth in unemployment increased vulnerability, particularly in emerging nations lacking robust social safety nets.

Third, financial instability caused by economic crises can lead to a rise in mental health problems, such as anxiety and depression (Tyu & Fan, 2023). Higher financial stress leads to psychological distress (Guan et al., 2022). This aligns with the United Nations (2011) report, which identified that mental health issues caused by financial instability may be more prevalent among lower-income individuals compared to wealthier individuals.

At the macro level, an economic crisis can cause six forms of social disruption. First, economic crises can increase inequality (Atkinson & Morelli, 2011; Cheong, 2001). Income inequality may widen as wealthier individuals and corporations are often better positioned to weather economic storms (United Nations, 2011).

Second, economic crises can increase crime (Ivaschenko et al., 2012; Mittal et al., 2019). Economic downturns are linked to higher property crimes, theft, and violent crimes, as individuals may resort to criminal behaviour out of desperation or lack of alternatives (Malby & Davis, 2009).

Economic downturns are marked by sharper increases in most reported crime categories during periods of economic distress (United Nations Social Defence Research Institute, 1976). Almost three decades later, the United Nations Office on Drugs and Crime (2012) similarly found an overall association between economic changes and crime.

Third, economic crises influence both domestic and foreign migration (Koser, 2009). Although the impact on migration is less immediate than on employment or poverty, increased internal and international migration patterns were observed during the five major economic crises of the twentieth century: the Great Depression (1930s), the Oil Crisis (1973), the Asian financial crisis (1997-1999), the Russian financial crisis (1998), and the Latin American financial crisis (1998-2002). Economic crises can lower remittances, exacerbate brain drain, and result in large-scale returns of highly skilled expatriates (Koser 2009).

Koser's (2009) findings are consistent with Castles (2009), who identified five short-term consequences of economic crises on worldwide migration: (i) a decrease in migration flows to developed countries due to fewer job opportunities, (ii) increased return of migrant workers to their homelands in response to unemployment or lower earnings, (iii) government incentives for unemployed migrant workers to leave, (iv) significant declines in irregular migration, (v) decreased remittances sent by migrant workers, and (vi) increased hostility toward migrants from host populations.

Fourth, economic crises can spark social unrest and protests (Grasso and Giugni, 2016). European countries most severely affected by the 2008-2009 global economic crisis saw the most protests. Economic crises fuel political instability as people lose faith in their government's ability to manage the economy and address their issues, particularly if living standards fall (Lust-Okar, 2004).

Fifth, the relationship between the economic and health is dual, with the economy influencing health and the other way around. In this setting, the emphasis is on the economic impact on health. Economic activity influences population health. Prędkiewicz et al. (2022) found that economic

activity and the unemployment rate both had a favourable impact on population health. As a result, rising unemployment is associated with greater health, which is an unusual finding.

Prędkiewicz et al. (2022:6) note: “As for the impact of unemployment on health, the estimated models indicate a positive relationship between these phenomena. The increase in unemployment thus extends life expectancies. This relationship is weaker for men aged 65 years (statistical significance at p-value < 0,1 for life expectancy for men aged 65, and statistically insignificant for healthy life expectancy for men aged 65).”

Sixth, economic crises often result in funding cuts to education systems, reducing the quality of education and limiting access to educational opportunities, potentially hindering long-term social and economic development. During downturns, government revenues typically decrease, leading to budget cuts for schools and universities. This can result in larger class sizes, fewer resources, and less support for students and teachers. Rising unemployment rates make it more difficult for graduates to find their first jobs (European Training Foundation, 2023).

In summary, economic crises significantly impact social disruption. At the micro level, disruption occurs through increased poverty, unemployment, and mental health challenges. At the macro level, disruption occurs through increased inequality, crime, disturbances in migration patterns, social unrest, health impacts, and reduced access to education.

2.4.2 Social disruption due to natural disasters

A disaster is defined as the impact of a hazard, which is any natural process or event that directly affects the human environment. Typically, this refers to an event that takes place within a particular time period inside a certain geographic area. The term disaster refers to the interplay of humans and natural processes that causes severe property damage, injury, or death (Dastrup, 2020). A disaster is additionally defined as a "serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its resources" (UNDRR).

Disasters are generally classified into two categories. First, sudden-onset disasters comprise hydrometeorological hazards, such as flooding, windstorms, or mudslides, and geophysical hazards, including earthquakes, tsunamis, or volcanic eruptions. Second, slow-onset disasters relate to environmental degradation processes, such as drought, desertification, increased salinisation, rising sea levels, or thawing of permafrost (Platform on Disaster Displacement, 2021).

Disasters are typically grouped into two groups. First, sudden-onset disasters include hydrometeorological risks like flooding, windstorms, and mudslides, as well as geophysical hazards like earthquakes, tsunamis, and volcanic eruptions. Second, slow-onset disasters are associated with environmental degradation processes such as drought, desertification, increased salinization, rising sea levels, or permafrost thawing (Platform on Disaster Displacement, 2021).

The Internal Displacement Monitoring Centre (2022) provides a global overview of displacement-related disruption caused by natural disasters. The report indicates that disaster-induced displacement is a significant global challenge, with the majority of cases occurring in Asia and the Pacific. Between 2010 and 2021, an estimated 225,3 million internal displacements were recorded.

While the impact of social disruption due to natural causes is substantial, this study will not discuss it further, as the focus is on other sources of social disruption.

2.4.3 Social disruption due to failing health systems

Failing health systems, particularly during pandemics, can lead to social disruption, including overwhelmed healthcare facilities, limited access to care, social fear and anxiety, economic impacts, strain on public services, and social isolation. Overwhelmed healthcare facilities can increase morbidity and mortality, restrict access to care for marginalised populations, and exacerbate health disparities. Health crises can also place additional pressure on emergency response, law enforcement, and social support systems, leading to loneliness and mental health issues.

2.4.4 Social disruption due to technological advancements

The first form of social disruption resulting from technological advancements is job displacement. Automation and the introduction of advanced technologies can lead to the loss of traditional or routine jobs. This may result in unemployment and underemployment in certain industries, which can be disruptive to affected individuals and communities. The debate begins with the premise that advances in information technology are profoundly reshaping the employment structure. Jobs with a high share of routine tasks are at risk of automation, as computers can replace work in repeated task structures by following specific rules (Dermont & Weisstanner, 2020). There are increasing employment risks associated with technological change (Sacchi et al., 2019).

Another form of social disruption due to technological advancements is economic inequality. While technological progress can foster economic growth, it can also exacerbate income inequality. Those with the skills to work with and benefit from new technologies may experience substantial gains, while others are left behind. This has prompted some technology entrepreneurs to argue for a universal basic income (UBI) as a means of mitigating workforce disruptions caused by automation. Smith et al. (2001) investigated the idea that occupational risk linked with technological progress influences redistribution preferences, specifically support for social policies that shield workers from income loss. Their findings show that increased objective exposure to the possibility of technological unemployment is highly associated with support for income protection policies. This confirms Sacchi et al.'s (2019) claim that technological development does not cause mass unemployment, but rather creates unevenly dispersed hazards, particularly for middle-skilled workers in regular occupations, worsening economic inequality.

Mental health impacts also arise from technological advancements. Increased screen time and digital interactions can affect mental well-being. Issues such as digital addiction, cyberbullying, and social isolation have emerged as potential disruptors. Many individuals develop dependency on these technologies, which can result in emotional exhaustion, psychological distress, social isolation due to reduced face-to-face interactions, and other mental health challenges (Zara & Monteiro, 2021).

Technological advancements have disrupted traditional industries such as print media, retail, and taxi services. This can lead to the decline of established businesses and job losses. From a business

innovation perspective, social disruption can be defined as the broad displacement of traditional business models by new ones, driven by societal change and enabled by technological capabilities.

2.4.5 Educational challenges

Technology has revolutionised education by providing access to vast amounts of information, new methods of learning and teaching, and enhanced collaboration opportunities. It has improved educational access and quality, offering online courses and digital resources for learners unable to access traditional settings. Artificial intelligence-powered educational tools enable personalised learning by analysing student data to provide feedback, identify knowledge gaps, and suggest areas for improvement. Integrating technology into traditional classrooms allows for more interactive and tailored learning experiences.

However, the use of technology in education also presents challenges, such as the potential replacement of human interaction and the digital divide. Access to technology, data privacy, and unequal technological resources can exacerbate educational inequalities. AI technologies impact personalised learning, intelligent tutoring systems, adaptive assessments, curriculum design, real-time grading and feedback, language learning, and cybersecurity.

In conclusion, while technology can transform education, it also presents challenges, including the potential for educational disparities and the need for lifelong learning to keep pace with rapidly evolving technologies.

2.4.6 Healthcare disruption

Technological advancements in healthcare have significantly improved patient outcomes but raise concerns about data security, costs, and job displacement. While such advancements improve disease prevention, diagnosis, and treatment, they also pose potential risks to physical and mental health. Positive impacts include medical innovations, early diagnosis, telemedicine, remote healthcare, health information management, and personalised medicine. Negative impacts include sedentary behaviour, mental health challenges, sleep disturbances, privacy and security concerns, and health inequality. Medical innovations have led to new drugs, therapies, and devices, enhancing treatment for various conditions. Imaging, genetic testing, and wearable devices enable

early diagnosis and prevention. Telemedicine and remote care improve access, while electronic health records streamline data management. Despite these benefits, balancing the adoption of technology with mitigating potential drawbacks is essential for optimising health and well-being.

2.4.7 Environmental impact

Technology can both harm and benefit the environment. Renewable energy technology, like solar panels and wind turbines, help to minimize greenhouse gas emissions. Resource depletion from production and energy generation can be mitigated through efficiency, recycling, and circular economy practices. Remote sensing and monitoring systems facilitate conservation by tracking species and habitats. Advances in pollution control, including electric vehicles and precision agriculture, reduce environmental impacts. E-waste can be managed through recycling technologies and producer responsibility policies. Prioritising sustainable technologies and implementing policies to minimise environmental harm is crucial.

2.4.8 Political disruption

Technology can lead to political polarisation and disinformation, disrupting democratic processes and causing societal division. Public policy is crucial in shaping technology's development and use, influencing its interaction with society, governance, democracy, and public services. Policymakers must balance the benefits and risks of technological innovation. To foster collaboration, forums for dialogue and engagement should involve diverse stakeholders. Regulations must keep pace with rapid technology development, balancing innovation with privacy and security. Digital inclusion and equitable access to technology are also important in addressing the digital divide. Technology can improve public services, enhance government transparency, and promote citizen engagement. Ethical and governance issues arise from the increasing use of data and AI in decision-making.

2.4.9 Cultural disruption

Technology can exacerbate political polarisation and disinformation, disrupting democratic processes and causing societal division. Public policy plays a critical role in shaping technology’s development, governing its interaction with society, and ensuring equitable access. Policymakers

must balance the benefits and risks of innovation. Forums for dialogue and engagement should involve diverse stakeholders, and regulations must keep pace with technological advances, balancing innovation with privacy and security. Digital inclusion is essential to address the digital divide. Technology can improve public services, transparency, and citizen engagement, but ethical and governance issues arise from the use of data and AI in decision-making.

Globalised media and access to global content have transformed culture, facilitating the exchange of ideas, values, and practices. However, globalisation can erode traditional cultural practices, homogenise culture, and exacerbate digital divides. Technology enables new forms of artistic expression and communication but challenges the preservation of local traditions. Digital tools democratise creativity and expand possibilities but raise concerns about ownership, intellectual property, and misuse of cultural assets. The digital divide may exacerbate cultural inequalities, leaving some communities excluded from global exchanges. Generational divides emerge as younger individuals adapt more readily to new technologies, potentially marginalising older generations.

Technological advancements bring substantial benefits, including increased productivity, healthcare improvements, and enhanced communication. Social disruption is not inherent in technology but arises from its development, regulation, and societal integration. Governments, businesses, and individuals must manage these challenges while harnessing potential benefits.

2.4.10 Social disruption due to political upheaval

Policy decisions, at global and local levels, can cause social disruption. Local-level decisions are particularly relevant in this context.

Gintis (1976) argues that neoclassical theory views capitalist enterprise as a solution to finding least-cost production techniques given factor prices. Discrepancies between production techniques and societal expectations may drive social disruption.

Potter and Thurnau (2021) link contemporary social disruption theory to Lenin's theory of change, which emphasises three characteristics: first, the erosion of faith in central institutions; second, the

elevation of fringe ideas to the centre of a revamped political order; and third, a coherent leadership group committed to change. Political change arising from such disruption often occurs where economic activity diverges significantly from societal expectations.

2.4.11 Social disruption due to social movements

King and Carberry (2020) define social movements as collective actions to create social change. Protest movements achieve major concessions through disruption (Fishman & Everson, 2016). Empirical evidence linking social disruption, as defined in this study, to social movements is limited. Prominent movements, such as the Arab Spring, primarily challenged governments, corruption, and authoritarian leadership (Kumaraswamy, 2011). Disruption from large-scale movements advocating civil rights, gender equality, or environmental change is not connected to social disruption from development and is therefore not further discussed.

2.4.12 Summary

Economic downturns can cause job losses, unemployment, property crimes, theft, and violence. Government cuts to social services and healthcare exacerbate vulnerability, mental health issues, and strained relationships. Social unrest, political instability, and food insecurity may also arise. The severity and duration of disruption depend on economic conditions, government policies, and societal resilience. Effective policy and community support can mitigate these effects. Technological advancements generate new products and services but disrupt markets, industries, and employment, contributing to economic inequality and political disruption. They also influence mental health, healthcare, education, and the environment, requiring policies to ensure continued societal benefit. Natural disasters create displacement, loss of life, infrastructure damage, economic consequences, healthcare strain, and social vulnerability, stressing emergency and mental health services. Pandemics overwhelm healthcare systems, limit access, cause fear, economic impacts, social isolation, and exacerbate health disparities. Policy decisions affect social disruption. Lenin's theory of change highlights the role of ideas and leadership in managing societal upheaval. Empirical evidence linking social disruption to social movements is limited. Movements such as the Arab Spring focus on protests against governments, corruption, and authoritarianism. Large-scale developmental movements are not connected to social disruption.

This section demonstrates that social disruption arises from multiple factors. Rapid economic growth or decline emerges as a principal source of social disruption.

2.5 Social Disruption in the Context of Different Economic Sectors

2.5.1 Introduction

The United Nations (2008) International Standard Industrial Classification of All Economic Activities (ISIC) establishes a global framework for classifying economic activities. ISIC has assisted countries in constructing national classifications and has become an indispensable instrument for comparing statistical data on economic activity on a global scale. According to the Industrial Classification of businesses, the primary sector includes agriculture, forestry, and fishing, as well as mining and quarrying. This study focuses on the primary sector, specifically the mining and quarrying industries.

2.5.2 Social disruption in the primary sector

Social disruption can historically be linked to the transitional period between the industrial and post-industrial eras in highly industrialised nations such as the United States (Fukuyama, 1999). During this period, spanning from the mid-1960s to the early 1990s, the socioeconomic conditions of much of the industrialised world deteriorated significantly. In line with Shaw and McKay (1942), Fukuyama (1999) found that the wealthiest societies experienced rising crime and social unrest, rendering inner-city areas nearly uninhabitable.

Other manifestations of social disruption were also evident during this transition. Marriage and birth rates declined, while divorce rates increased sharply. One in three children in the United States lived in single-parent households, and more than half of all children in Scandinavia were born out of wedlock. Additionally, public trust and confidence in institutions declined. However, a key challenge during this period was quantifying the extent and forms of such social disruption.

2.5.3 Social disruption in the Agriculture, forestry, and fishing industry

Otanez (2008) found that child labour and deforestation are integral parts of the tobacco farming process, and that the actions of the tobacco industry contribute to social and environmental

disruption in tobacco-farming communities. The industry generates significant externalities, forcing farmers and consumers to bear hidden costs while concealing the true price of tobacco leaves and related products. The use of children, bonded labour, and exploitative contract terms in tobacco production further undermines the economic emancipation of vulnerable, particularly rural, populations. These findings are notable as they show that the tobacco industry perpetuates social disruption through exploitative labour practices and by imposing substantial hidden costs on local communities.

Smith and Scherr (2003) examined the trade-offs between the social benefits of large-scale industrial plantation projects and their cost-effectiveness. Their study identified several social risks associated with large-scale carbon forestry plantations. The first risk involves the acquisition of land by large companies without adequate recognition of local land rights or sufficient compensation to affected communities. The second concerns the involuntary resettlement of communities, leading to local displacement. Third, environmental risks such as lower water tables in semi-arid areas and surface run-off and erosion in wetter regions can adversely affect local livelihoods. Fourth, such projects can exacerbate existing income and power disparities, disadvantaging those engaged in diverse land uses. Lastly, communities that have long relied on customary access to land and forests may face the loss of these resources.

Similarly, Obidzinski et al. (2012) reviewed oil palm development in Indonesia and its linkages to biofuel production, identifying both positive and negative social impacts. On the positive side, oil palm plantations provide employment opportunities for local communities, both as permanent and seasonal workers, and allow small-scale farmers to earn income from cultivating and selling palm fruits. However, the expansion of plantations often leads to land ownership disputes between local communities and plantation companies, resulting in the displacement of indigenous populations and small-scale farmers. The benefits of oil palm cultivation are also unevenly distributed, as large plantation companies and investors derive the greatest profits, while local communities face marginalisation and poverty, thereby deepening social inequality.

Furthermore, workers on oil palm plantations face occupational health and safety risks, such as pesticide exposure and excessive working hours, with enforcement of safety standards often

inadequate. The establishment of plantations also disrupts traditional livelihoods and cultural practices, leading to the erosion of indigenous heritage and identity. Although biofuels derived from oil palm contribute to energy security and the reduction of greenhouse gas emissions, the associated social costs raise concerns regarding the sustainability and ethical implications of such production.

Drawing from the findings of these studies, the social impacts of large-scale agricultural and forestry projects align with social disruption theory. They provide evidence of land rights violations or inadequate compensation to locals, exploitative labour practices including child labour, land conflicts leading to displacement, heightened social and income inequality, and significant health and safety risks to workers and communities.

2.5.4 Social disruption in the mining and quarrying industry

The literature discussed in the previous section proposed the social disruption hypothesis, which states that community effects are associated with energy growth (Murdock and Leistritz, 1979) and defined social disruption as a crisis period (England and Albrecht, 1984). Dimensions or indicators of social disruption have been identified in the literature at individual, household, and community levels, making the measurement of social disruption a multi-level construct.

This section applies social disruption theory to the mining and quarrying industries. The ISIC defines the mining and quarrying industry as the extraction of minerals that occur as (a) liquids (petroleum) or gases (natural gas), or (b) naturally as solids (coal and ores). Extraction can be accomplished using a variety of processes, including underground or surface mining, well operating, and seabed mining. The evidence supporting the concept that mining activities cause societal disruption is discussed below.

a) The Oil and Gas Industry

Oil and gas exploration and production occur both onshore and offshore. Figure 2.4 below shows global crude oil production in million barrels per day.

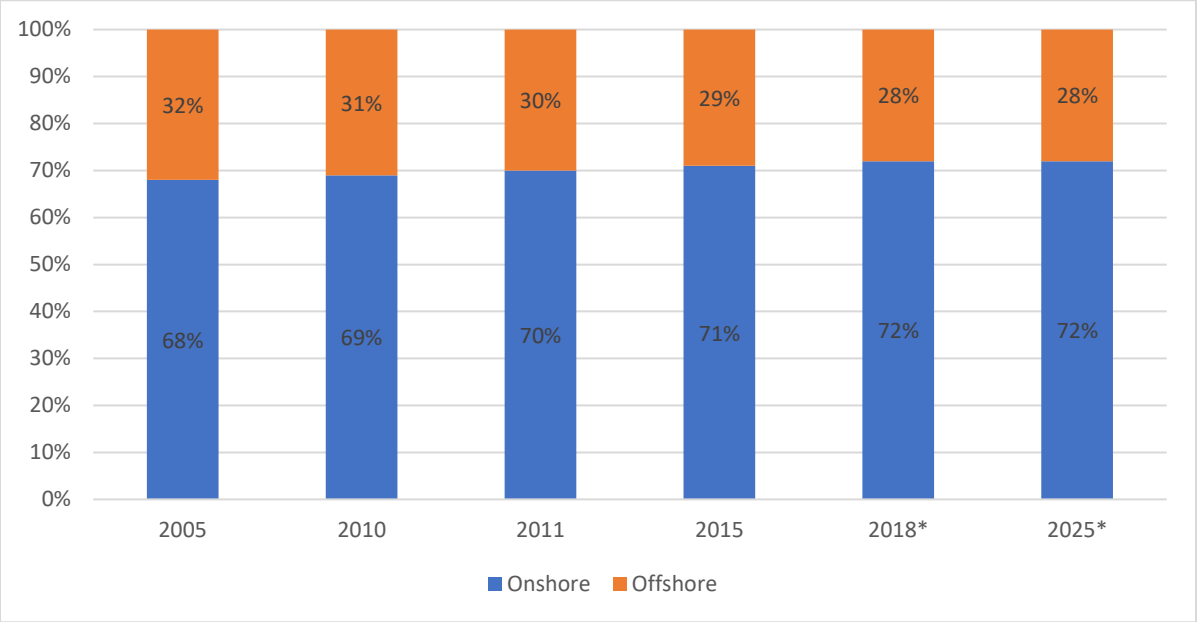


Figure 2.7: Global crude oil production, 2005-2015

Source: Statista (2025)

Figure 2.7 illustrates that global offshore oil production has been declining since 2005 and is projected to continue decreasing. In contrast, onshore production has increased over recent years and accounts for approximately 70% of total oil production, where local communities reside.In 2008, most of the world's onshore oil fields were located in the Middle East (OECD, 2023). The African Energy Chamber (2023) reports that East and North African markets are expanding to dominate onshore oil and gas production. These figures and projections highlight the importance of examining the social disruption resulting from onshore oil and gas exploration and production.

The Niger Delta case in Nigeria provides a clear example of social disruption caused by onshore oil and gas activities. Historically, the oil boom in Nigeria boosted national economic activity,

particularly in the Niger Delta, where most oil extraction occurs. However, this economic growth has not benefited the local communities where extraction takes place, especially in the southern Niger Delta region (Stanley, 1990). A similar trend is observed in West Papua (discussed in the next section), where local residents seldom secure employment in the extractive sector, leading to marginalisation.

Petroleum has been the primary driver of Nigeria's economic development since 1958, contributing over 90% of total exports and 80% of federal government revenue. However, revenue distribution has been inequitable, with limited benefits reaching the local communities affected by extraction. This has resulted in income and social inequality in the Niger Delta. Gilmore (1976) observed that such inequitable resource distribution and associated externalities lead to social disruption in boomtowns. The imbalance has exacerbated ethnic conflict, increased criminal activity, and sustained clashes between the central government and various ethnic groups across the country (Okeagu et al., 2006).

Nkem et al. (2022) investigated evidence of oil industry-related social exclusion and its impact on community health and well-being in Africa. Although most empirical research concentrated on Nigeria and the Niger Delta, which have a long history of oil-related activity and local strife, their evaluation indicated major social, economic, political, and cultural consequences. These include insufficient investment in social infrastructure, relocation of families and communities, loss of livelihoods, unfair distribution of oil revenues, and environmental deterioration.

In terms of health and well-being, oil-related social exclusion has exacerbated pollution-related diseases, a lack of access to healthcare and education, social fragmentation, and war. Culturally, the loss of land has weakened collective identity, traditional ways of life, and cultural values. The review also underlined the political components of exclusion, pointing out that the use of state and corporate power through legislative and administrative measures has marginalized landowners, limited local participation in decision-making, and enabled property confiscation.

Social disruption caused by offshore oil and gas exploration is also worth noting. Forsyth et al. (2007) discovered a largely positive attitude toward offshore oil drilling in Louisiana. Their

research examined the relationship between the rise of the offshore oil business and patterns of social disruption, particularly criminality. The findings revealed little evidence of disorganizing consequences, with most respondents holding neutral or favourable opinions. As a result, the boom-bust model of social disturbance gained little empirical support in this setting.

In contrast, Owusu (2018) investigated the conflict between small-scale fishermen and the offshore oil and gas industry in Western Ghana. The establishment of no-go buffer zones around offshore installations has limited access to traditional fishing grounds, leading in disputes over marine resources. Small-scale fishers who have been excluded from their customary livelihoods have faced frustration and economic hardship. The oil and gas industry frequently operates as an enclave, producing income that generally bypasses local populations. This exclusion has led to alienation, inequality, and power disparities between corporate and local actors. Furthermore, environmental deterioration induced by industrial activities, such as pollution and disruption of marine ecosystems, has exacerbated conflicts between fishermen and oil companies (Owusu 2018).

b) The Mining and Quarrying Industry

Boomtown study provides a framework for understanding social disruption caused by mining activity. The links between mining, economic growth, and the resulting social and governance concerns are widely understood. A considerable body of scholarship has investigated the role of mining in economic growth, as well as the complex social dynamics that follow rapid resource-based development (Walker, 2012; Measham et al., 2012).

2.6 Boomtown research

According to Jiao et al. (2021), a booming mining town is defined by rapid economic growth, similar to the urban expansion seen by Park and Burgess (1925) and Shaw and McKay (1945), as well as a considerable population influx caused by resource extraction. Jones and Mayzer (2021:1) define a boomtown as "rapid growth communities, often associated with natural resource development (e.g., gold, coal, oil/gas), and generally rural". Jones and Mayzer (2021) focus on the many stages of boomtown research and the social consequences of rapid economic expansion.

They highlight a change away from a sole focus on economic development and toward a greater emphasis on social disturbances and the emergence of social pathologies. Their findings also highlight the importance of contextual factors like location and community characteristics in understanding the effects of boom expansion. They also stress the unequal distribution of economic advantages and the burden on infrastructure that is prevalent in boom zones.

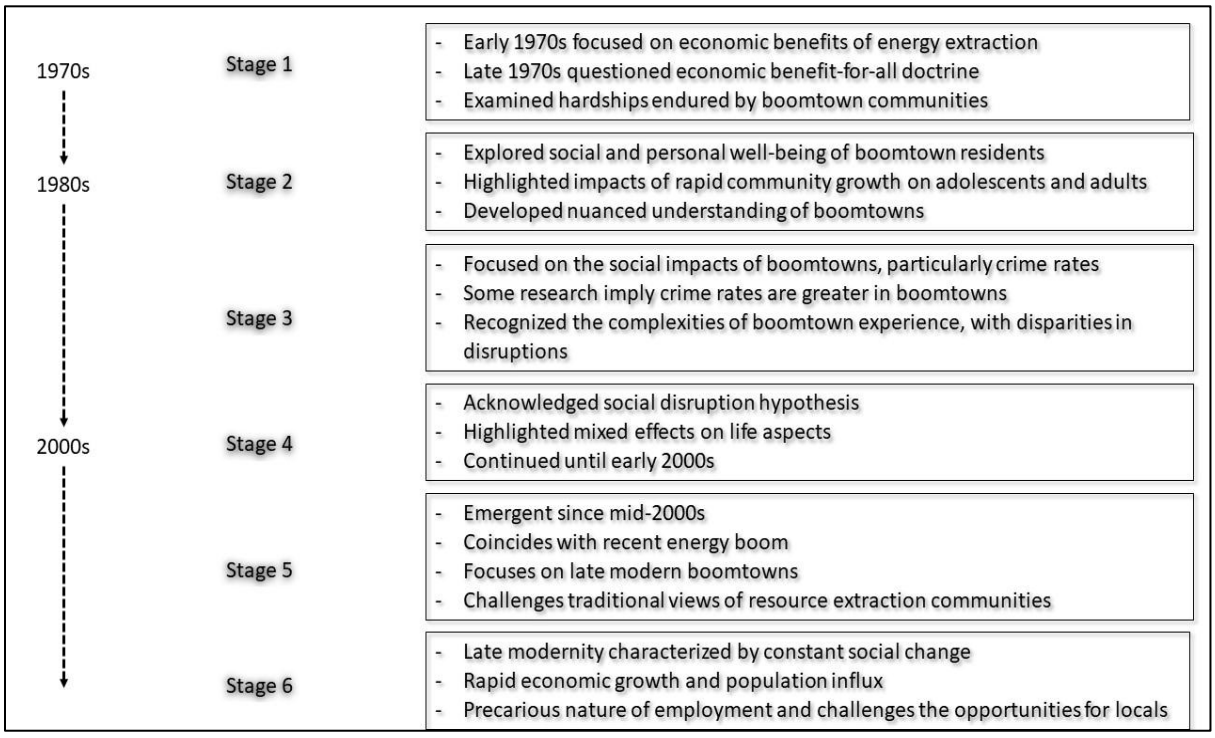


Figure 2.8: Perceptions of boomtown research in the period 1970s to date

Source: Author's summary of boomtown research

Figure 2.8 illustrates how perceptions of boomtowns have evolved from a narrow focus on economic benefits to a broader understanding that incorporates social, personal, and community-level impacts of rapid growth and resource extraction. These factors are discussed below.

2.6.1 Phase 1: Boomtown and the Perceived Positive Economic Benefits of Resource Extraction

Phase 1 of boomtown research focused on the economic benefits of development, paying limited attention to social issues. This early literature emphasised industrial expansion and economic prosperity but offered little analysis of the accompanying social consequences.

Jones and Mayzer (2021) argue that there was a lack of literature on social disruption during this initial stage, as most studies concentrated on the economic gains associated with rapid growth in booming regions. Although Smith et al. (1971) examined a water resource development project rather than mining, their study was among the first to suggest that rapid economic growth prompted communities to expand their services. While Smith et al. (1971) did not explore the social ills linked to economic expansion, their work laid the foundation for later research (Jones & Mayzer, 2021). It can therefore be deduced that, while the early boomtown literature acknowledged the economic benefits of resource extraction, it provided little evidence of the associated social consequences. Research at this stage largely portrayed boomtown development in a positive light, focusing on its economic advantages rather than its disruptive effects.

2.6.2 Phase 2: Boomtown and the Negative Social Consequences of Mining

Phase 2 of boomtown research focused on examining the disruptions and detrimental effects experienced by communities during periods of rapid growth and social change. This stage was influenced by Durkheim's (1897) concept of anomie, which posits that rapid social transformation can lead to heightened social ills. Researchers in this phase explored a wide range of social consequences of boomtown development, including suicide, crime, stress and related health issues, and substance abuse. The central emphasis was on understanding how rapid economic and demographic changes could destabilise social order in boomtowns.

Smith et al. (1971) were among the first to identify the negative consequences of rapid economic growth for social well-being. Gilmore (1976) similarly noted that boomtowns can cause significant social turmoil within communities or regions, particularly by exacerbating tensions between different levels of government. In the South African context, such conflicts could arise between national, provincial, and local authorities. Boomtown expansion often requires more time and

resources than initially projected, and the rapid exploitation of energy resources in rural or isolated areas tends to produce sudden population influxes. Most of these towns lack the infrastructure and services needed to accommodate such expansion, which in turn undermines productivity, inflates project costs, and hinders the sustainable management of growth.

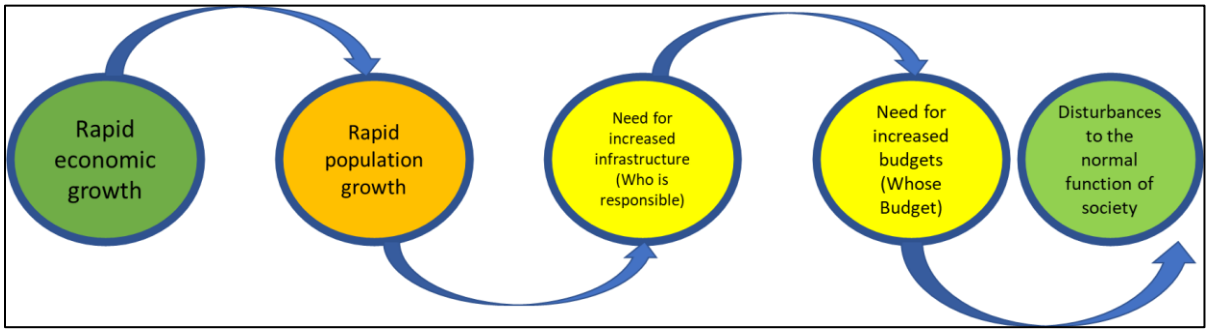


Figure 2.9: Stage 2 - Boomtown research

Figure 2.9 summarises the argument that the economic growth of boomtowns, driven by large-scale resource development, results in rapid and often unmanageable population growth. This creates intense pressure on essential services and infrastructure, producing a cascading effect that disrupts the normal functioning of society.

Krannich and Luloff (1991) argue that natural resource-based communities are heavily dependent on extractive industries that are labour-intensive and externally controlled. Such communities are often economically vulnerable, suffer from human capital loss, and lack diversification. This dependency reflects deep-seated structural inequalities and imbalanced power relations between local populations and external institutions.

A substantial body of literature also documents the social problems that emerge during boom periods. These include substance abuse, crime, disorder, income inequality, health challenges (Parkins & Angell, 2010), increased pregnancies, sexually transmitted infections, and mining-related injuries (Brown et al., 2005). Despite differing interpretations across studies, these social issues align with the social disruption paradigm (McKenzie, 2019).

However, as Brown et al. (2005) caution, not all of these social challenges can be directly attributed to economic growth alone. Some arise from the internal social dynamics within boomtown communities. This observation reaffirms the relevance of the social order hypothesis, suggesting that disruption results from the interaction between structural change and community characteristics. Research on mining boomtowns tends to be one-sided focusing on the relationship between mining, and the social problems identified above.

A prominent contemporary example of the adverse social consequences of mining is found in West Papua (renamed Irian Jaya in 1973 by the Indonesian President, General Soeharto). The Freeport copper and gold mine in the central highlands has been at the centre of conflict, with mining activities contributing to prolonged tensions between Indonesian authorities and indigenous groups (Australia West Papua Association, 1995). The Grasberg mine, operated by Freeport since 1973, is one of the world's largest and most profitable gold-producing operations. Despite generating approximately $3,8 billion in revenue for its parent company, Freeport, West Papua remains the poorest region in Indonesia, with 28% of its population living below the poverty line.

Indonesia also has some of the highest infant mortality rates and lowest literacy rates in Asia (Jong, 2017), as well as inadequate housing, healthcare, and education (Kuum, 2022). The Kamoro and Amungme tribes, whose ancestral lands include the area surrounding Freeport's mining town of Timika, have suffered severe displacement and marginalisation. Traditionally reliant on subsistence farming, fishing, and hunting, these communities were deprived of over 100 000 hectares of ancestral land following the mine's establishment in 1967. Migration from other parts of Indonesia, driven by mining-related opportunities, has further intensified local displacement (Jong, 2017). As a result, the Amungme and Kamoro remain disadvantaged and alienated, with the mining development fracturing traditional culture and deepening generational divides. Misunderstandings and resentment have arisen from cultural differences and poorly conceived development initiatives (Rifai-Hasan, 2010).

Comparable patterns of adverse mining impacts are observed in Peru. Slack (2009) notes that the country's remote and underdeveloped Andean highlands have experienced rapid mining expansion accompanied by escalating conflict and violence centred around large-scale mining operations.

Since 1996, Peru has been Latin America's leading gold producer, driven largely by the open-pit mines of Barrick Gold Corporation and Newmont Mining Corporation in the regions of Ancash, Cajamarca, and La Libertad. In a context of weak governance, these developments have produced extensive social disruption (Triscritti, 2013). Despite the enormous profits generated, local communities report minimal improvements in their living conditions, echoing the earlier discussion of negative externalities. According to the Latin American Observatory of Mining Conflicts, social unrest and negative externalities associated with mining currently affect approximately 90% of countries in the region (Salem et al., 2021). In the Andes, poverty rates reach 70%, with 40% of Peruvians living in poverty (Slack, 2009).

Lawrie et al. (2011) evaluated the effects of large-scale resource development and rapid expansion in three Australian resource-dependent regions: Kalgoorlie-Boulder (gold), Port Hedland (iron ore), and Karratha-Dampier (iron ore and petroleum products). Their findings show that Port Hedland and Karratha-Dampier have significantly higher living and housing costs than the Perth metropolitan area. Although relatively high salaries compensate for some of this, rising inequality implies that lower-income groups experience major disadvantages. However, the study finds no solid evidence that poverty levels rose during the boom years, implying a complex link between boomtown growth and poverty. This is similar with Fischer's (2009) findings, which showed no consistent evidence that resource extraction lowers or worsens poverty. Instead, the link between extraction and poverty appears to be site dependent.

Slack and Jensen (2004), in their study of underemployment across the extraction industries, agriculture, forestry, and mining, using the March Current Population Survey from 1974 to 1998, found that while underemployment in the mining industry was lower than in agriculture and forestry, workers in extractive industries were more likely to experience underemployment compared to other sectors. Greenwood (1999:2) defines underemployment as "... underemployment affects only persons in employment and reflects underutilisation of workers' productive capacity. It is about persons who have not attained their full employment level where full employment ensures that (i) there is work for all persons who are available for and seeking work, (ii) that such work is as productive as possible, and (iii) that it is freely chosen by workers, who should have the fullest possibility to qualify and use their skills and endowments in a job for

which they are well suited". This suggests that mining and other extractive industries contribute to social disruption through underemployment, reinforcing the idea that the benefits of mining rarely extend to local communities. Most of the labour is sourced externally, leaving nearby populations marginalised and excluded from the economic gains.

2.6.3 Phase 3: Positive and Negative Effects of Mining Town Growth

This phase is characterised by criticism of the findings and methods used in Phase 2. Researchers questioned the plausibility of the results depicting an increase in social problems on studies which had very small samples. However, it is acknowledged that the third-stage researchers may have overreacted to the biases present in the earlier studies. From the mid-1980s, Phase 3 began to show a more balanced and comprehensive assessment of the social impacts of boomtown development, highlighting the complexities of the boomtown experience and disparities in the level of disruption.

Smith et al. (2001) demonstrate that, while social disruptions occur in various dimensions of well-being during boom periods, not all dimensions appear to be impacted by such expansion. Furthermore, when boom-induced decreases in well-being occur, they are frequently followed by a fast recovery, with no evidence of long-term disruption. Their findings also show that mining developments have impacted local culture, community structures, and place attachment. The magnitude of extraction is also crucial. Gamu et al. (2015) discovered that industrial mining is more typically associated with rising poverty levels, but small-scale artisanal mining can ameliorate poverty, emphasizing the complexity and heterogeneity in disruption caused by resource exploitation.

2.6.4 Phase 4: An Improvement in Research Methodologies

Phase 4 of boomtown research began in the mid-1980s and offered a more comprehensive assessment of social impacts. This phase acknowledged the biases in earlier studies and aimed to address them through improved methodologies. It reported a more nuanced pattern of social disruption, where some areas of life were significantly affected, while others remained largely undisturbed or even improved.

Donnermeyer and DeKeseredy (2014) dispute standard theoretical conceptions of resource extraction communities as being exclusively marked by disruption. The fourth phase highlights new trends, such as migration patterns, demographic shifts, and the rise of megacities, emphasising the complex interconnections between resource development and social change. Furthermore, this phase called for longitudinal research to replace earlier cross-sectional approaches, enabling a more complete understanding of boomtown dynamics. Collectively, these insights underscore the multifaceted nature of this stage, which integrates economic, social, and urban development perspectives.

2.6.5 Phase 5: Modern Sociodemographic Characteristics that Could Be Affected by Boomtowns

Phase 5 of boomtown study arose concurrently with the renaissance of literature in the United States, Canada, and Australia. This phase took a more critical approach, with theme examinations of public health and gender issues in the boomtown setting. It also called for examining boomtowns through the prism of late modernity. While this theoretical paradigm is underutilised, it has significant potential for future research.

Carrington et al. (2016) indicate that during mining boom, masculinity functions as a key social resource through which order, conflict, and identity are negotiated in mining communities. Masculinity is not fixed but dynamically shaped by economic change, labour relations, and demographic instability. Within this context, masculine norms may promote social order by regulating behaviour in male-dominated spaces, while violence can serve as a symbolic and practical means of resolving conflict within a highly gendered rural social structure. Male violence also operates to assert boundaries, maintain power, and re-establish status in the face of destabilising forces such as migrant labour and declining local cohesion. Where alternative expressions of masculinity are constrained, violence may be perceived as an authentic and legitimised form of masculine identity, particularly among men experiencing social or economic marginalisation.

Ruddell, et al. (2022) examine how North Dakota's oil boom affected youth crime, finding that while some studies link booms to increased crime, their specific analysis of youth showed mixed

or limited significant links, highlighting the complexity of boomtown impacts and suggesting localized effects on that youth demographic. While general boomtown research points to increased crime, the authors found few significant links between the oil boom and youth disorder in some analyses, suggesting impacts are localized or nuanced. Similarly, Jayasundara et al. (2016) found that following an oil boom in North Dakota and Montana, human service workers reported an increased volume and seriousness of cases related to interpersonal violence, domestic violence, sexual assault, and stalking.

Marais et al. (2022) contend that previous research on social disruption interpreted the effects of mining booms and busts as linear, occurring in a succession of discrete periods. However, more recent research indicates that these processes cause long-term dependence and are frequently the product of numerous overlapping cycles. The authors emphasize the necessity of recognizing the long-term implications of boom-and-bust cycles, as opposed to viewing them as discrete or linear events.

2.6.6 Phase 6 (Proposed)

The suggested sixth phase of boomtown research focuses on the social disruption caused by mine decline in the Global South. This contrasts with data from the Global North, where there is little evidence of social disruption caused by mine decline (Marais et al., 2022). This phase emphasizes the link between mining booms and busts, stating that both growth and decline can cause societal disturbance.

Marais et al. (2022) suggest that the sixth phase should focus on the societal consequences of mine decline, notably its relationship to increased crime. Their findings suggests that mining decline causes social upheaval, particularly in South Africa's gold mining industry. They also point out that crime rates are greater in places undergoing mining decline, which contradicts international research findings. This emphasizes the necessity for social disruption theory to include more empirical evidence and a broader geographical perspective.

2.6.7 Boomtown Research Criticism

A critical review of boomtown research by Albrecht et al. (1982) identifies several weaknesses within the literature. First, the authors criticise early research on social disruptions caused by large-scale energy development for lacking empirical grounding and relying heavily on anecdotal evidence. They argue that many studies identified the same social problems in energy-impacted communities without substantiating these claims with data.

Second, the authors stress the importance of using sociologically vetted source data to analyze the negative societal repercussions of energy development initiatives. Third, they challenge the assumption that rural communities in the West have universally experienced negative social outcomes from energy projects, based on their analysis of social problem indices.

Fourth, Albrecht et al. (1982) question the reliance on secondary indicators such as mental health and crime rates as sufficient evidence of disruption, calling instead for robust primary data. Lastly, they criticise the use of inadequate operational indicators, questionable interpretations, and superficial analyses in several studies assessing the social impacts of energy development.

2.6.8 Summary

Acknowledging the criticisms raised by Albrecht et al. (1982), boomtown research has evolved over the past five decades from an initial focus on the economic benefits of energy extraction to a more nuanced understanding of social and personal well-being, crime, and the complex consequences of rapid community growth.

The fourth stage, continuing into the early 2000s, recognised the social disruption hypothesis but demonstrated that the effects of boomtowns are mixed across different aspects of life. The fifth wave, emerging in the mid-2000s, coincided with a renewed energy boom and focused on the changing characteristics of boomtowns in late modernity. This framework helps explain the evolving challenges and opportunities faced by individuals and communities in resource-dependent regions, stressing the need for adaptability in dynamic social environments.

Overall, the perception of boomtowns has shifted from a narrow economic focus to a comprehensive understanding of their social, cultural, and community dimensions. The proposed sixth phase extends this trajectory by examining the social disruption linked to mine decline in the Global South, underscoring the need for further empirical evidence and comparative research across global contexts.

2.7 Social Cohesion

2.7.1 Introduction

Social cohesion is widely acknowledged as a key characteristic of resilient communities and cities, mediating the ability to tolerate and recover from social, economic, and environmental crises (Fonseca et al., 2019). It is an essential construct for understanding human needs and the functioning of societies. However, social cohesion is inherently complex, as its manifestations and challenges vary according to sociodemographic characteristics, cultural norms, and structural contexts. Within a social system, cohesion facilitates collective resilience, enabling societies to maintain stability, cooperation, and mutual support in the face of external or internal pressures (Fonseca et al., 2019).

This section examines the evolution of social cohesion from a theoretical and empirical perspective, tracing its historical foundations and the development of its definitions over time. The discussion begins with classical perspectives on collective behaviour and social integration, subsequently addressing contemporary interpretations that situate cohesion within broader societal and structural contexts.

2.7.2 The development of social cohesion

The conceptualisation of social cohesion can be linked to early studies of collective behaviour. Tönnies (1887) distinguished between two social types: Gemeinschaft (Community), based on close, traditional, emotional bonds (family, village), and Gesellschaft (Society), characterized by impersonal, rational, contractual relationships (modern cities, markets). His work explored modernity's shift from organic community to mechanical society, influencing political thought and

social analysis by examining how these contrasting social forms affect all aspects of life, from politics and economics to culture and selfhood.

Le Bon (1897) introduced the notion of the psychological crowd, describing a gathering of individuals united for a common purpose that exhibits characteristics distinct from those of the individuals themselves. Le Bon's (1897) insight emphasises the emergent properties of collective action, wherein the group exerts an influence that transcends individual behaviours.

Building on this, Durkheim (1897) theorised social integration as the attachment of individuals to shared values and norms, arguing that cohesion arises when society functions harmoniously, with minimal conflict stemming from sociodemographic differences. In Durkheim's view, socially cohesive societies are characterised by strong bonds that tie individuals to collective institutions, norms, and expectations, reflecting the principle that the whole surpasses the individual in shaping social order.

Cooley (1909) further elaborated on this principle by highlighting the unity of the social mind, which he argued resides in organisation rather than mere agreement. He identified primary groups, specifically families and neighbourhoods, as the foundational units of society, distinguished by intimate interactions, cooperation, and shared values. These groups, according to Cooley, constitute the psychical whole of society, providing a framework for both social belonging and collective identity.

Freud (1921) introduced a psychological dimension, suggesting that group membership confers security but simultaneously diminishes individual consciousness, rendering behaviour subject to collective emotions and impulses. This dynamic underscores the influence of group psychology on individual behaviour and decision-making.

Lewin (1946) advanced the understanding of cohesion by situating individual behaviour within an interactional framework, in which personal history, motivation, and personality interact with both physical and social environments. Cartwright and Zander (1953) expanded on this viewpoint, arguing that power is derived not only from individuals, but also from bilateral relationships that mediate formal and informal control. French and Raven (1959) established five types of power:

referent, expert, legitimate, reward, and coercive, underlining the situations under which group influence can promote or impede cohesion.

The potential limitations of group cohesion were later examined by Janis (1972), who warned that excessive conformity, or “groupthink,” can undermine individual judgement and critical evaluation. Members may defer excessively to group leadership or suppress dissenting views, illustrating that cohesion can have both stabilising and constraining effects. Granovetter (1973) complements this perspective, emphasising that individual experiences are embedded within broader social structures that are often beyond personal control.

Stokes (1983) synthesized these findings, indicating three essential determinants of group cohesion: attractiveness to individual members, the group's instrumental value, and risk-taking behaviours that occur within the collective framework. This concept emphasizes the complex aspect of cohesiveness, which includes interpersonal relationships, functional utility, and shared difficulties.

2.7.3 Defining social cohesion

Social cohesion refers to the degree of bonds and solidarity between a system of social division (Fonseca et al., 2019). It encompasses two primary dimensions: the sense of belonging and the quality of relationships among members. Social cohesion arises from democratic efforts to establish equity, sustain economic dynamism, and prevent social rifts, thereby reinforcing national identity (Manca, 2014). Reducing inequality and social divisions promotes citizenship diversity by connecting individual freedom to social justice and economic efficiency to equitable resource allocation (Manca, 2014).

Putman (2000) demonstrates that social capital in the United States increased steadily from the early twentieth century until the late 1960s, after which it experienced a pronounced decline. He attributes this erosion to generational succession, the expansion of television, urban sprawl, and intensifying time and economic pressures. The weakening of social capital has had significant implications for social cohesion, contributing to deteriorating educational outcomes, economic strain, and rising social conflict both within and between groups. Putnam (2000) argues that

restoring social cohesion requires the deliberate rebuilding of social capital, drawing lessons from the Progressive Era while adapting strategies to contemporary social conditions. However, he cautions that social capital is not inherently cohesive or equitable. Bonding social capital may strengthen internal solidarity and help groups to get by, but it can also reinforce exclusion and social fragmentation. In contrast, bridging social capital is central to social cohesion, as it fosters generalized trust, reciprocity, and cooperation across social divides. Putnam's (2000) work thus underscores that sustainable social cohesion depends not merely on the density of social ties, but on the capacity of communities to cultivate inclusive, bridging forms of social capital.

Table 2.3: The social cohesion framework

Social Cohesion		
Individual	**Community**	**Institutions**
Self- motivation	Environment	Conflict management
Perceptions, norms, and values	Relations and ties	Human rights
	Participation and Performance	Environment

Source: Fonseca et al. (2019)

Table 2.3 demonstrates the interdependence of individuals, communities, and institutions in fostering social cohesion. Individuals require self-motivation and adherence to group norms to integrate socially. Communities thrive on shared values, communication, and social networks. Institutions provide governance through conflict management, human rights protection, and structural support, reducing inequalities and fostering inclusion.

However, Foucault's (1980) concept of normalization offers a critical lens on social cohesion by framing it as an outcome of power rather than purely shared values or voluntary cooperation. Norms established by social institutions function as systems of judgment that regulate behaviour, promote order, and enable economic productivity and knowledge formation. While such normalization may enhance social cohesion by aligning individual conduct with collective expectations, it simultaneously produces exclusion by marginalising those who fall outside dominant norms. From a Foucauldian perspective, social cohesion is therefore not inherently

emancipatory, but a disciplinary process that stabilises social life while reinforcing existing power relations.

2.7.4 Summary

Social cohesion extends beyond merely preventing conflict. It involves strong ties, shared values, and a sense of belonging. Achieving it requires coordinated interactions among individuals, communities, and institutions, supported by self-motivation, effective communication, and conflict management. Social cohesion is essential for addressing inequality and enhancing citizenship diversity. By cultivating inclusive environments, societies can reduce disparities, promote equity, support personal growth, enhance collective well-being, and foster a strong national identity, ensuring resilience and adaptability in the face of challenges.

2.8 Synthesis

Social cohesion and social disruption are contrasting concepts relating to societal stability. Social cohesion reflects unity, shared values, and cooperation, while social disruption denotes the breakdown of social order due to unrest, conflict, or crises.

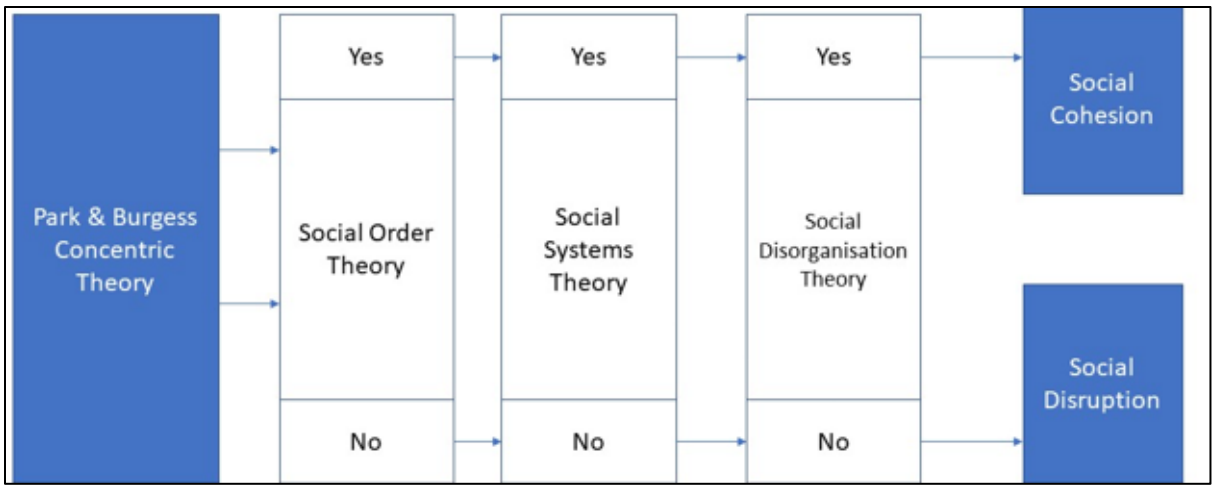


Figure 2.10: Summary of the theories

Figure 2.10 illustrates the connections between key sociological and urban theories, including Park and Burgess's (1925) concentric zone theory, Durkheim's (1897) social order theory, Parson's

(1951) social systems theory, Shaw and McKay's (1942) application of social disorganisation theory, and the social disruption theory. Social cohesion encompasses trust among community members, a sense of belonging, shared values and norms, low levels of crime and violence, and a robust social support system. In contrast, social disruption is characterised by high crime rates, civil unrest, political instability, violence, protests, and the breakdown of social institutions.

Social cohesion typically arises from shared cultural or religious values, strong social networks, effective governance, and inclusive policies that promote equality and social justice. Conversely, social disruption can emerge from factors such as economic inequality, political corruption, discrimination, ethnic or religious tensions, natural disasters, and external conflicts. High social cohesion is associated with enhanced social stability, cooperation, and resilience. It contributes to greater well-being, security, and collective capacity to address common challenges. Social disruption, on the other hand, can lead to negative outcomes, including violence, economic instability, a breakdown of trust, and a decline in the overall quality of life for affected communities.

			Author(s)	Year	Contribution
Durkehims theory of social order (1897)	Parson's social systems theory (1951)	Social disorganisation theory	Park and Burgess	1925	Developed the Concentric Model, which analysed social classes and identified social problems
			Shaw and McKay	1942	We hypothesised that the CBD has the highest physical deterioration and greatest social disorganisation.
			Sampson and Groves	1989	Refined the Social Disorganisation (S.D.) hypothesis and proposed a community social disorganisation theory
			Bursik and Grasmick	1993	It expanded the S.D. theory perspective into a "systemic control" model that links the effectiveness of local crime control to the broader "public controls" of political and economic institutions beyond the neighbourhood.
		Social disruption theory	Murdock and Leistritz	1979	They developed the social disruption hypothesis that states that community effects are associated with energy development.
			England and Albrecht	1984	Social Disruption is a period of social disturbance characterized by loss of conventional patterns and attitudes.
			Greider et al.	1991	Social disruption theory also asserts that rapid community change resulting from population increases will lead to various social problems indicative of overall community disorganisation.
			Brown and Perkins	1992	Add an element to the definition of social disruption at the household level (Place attachment).

Figure 2.11: Linking theories that lead to the social disruption theory

The social disruption theory can be understood as a sociological development theory, evolving from the foundational work of Park and Burgess (1925) to that of Shaw and McKay (1942). Park and Burgess (1925) specifically examined rapidly growing urban towns, with a focus on Chicago, and identified a range of social problems associated with such expansion. These problems included increases in disease, crime, disorder, vice, mental health issues, suicide, and high population mobility.

2.9 Evidence of place attachment

Empirical studies provide evidence for the application of place attachment theory. The following sections first discuss international literature on place attachment, followed by an overview of empirical research conducted within the South African context.

2.9.1 International literature

Fullilove (2014) investigates the effects of serial forced relocation, specifically how it relates to place attachment when people are repeatedly forced away from their homes. Fullilove (2014:141) suggested the "Frayed Knot Hypothesis," which holds that continuous upheaval impairs the purpose of a place and the reciprocal relationships that bind individuals to it. Nonetheless, the connection can be maintained by "community practices" of attachment to the area that once was and may be again. Individuals and groups that have been displaced are typically traumatized and cut off from their home. Fullilove (2014) illustrates this by describing the displacement of Native Americans in the United States, who were continuously relocated until they were forced to relocate to reservations in remote regions of the Southeast Indian Territory. Similarly, African Americans were compelled to leave Africa during the slave trade and are still estranged from their homeland.

Fullilove (2014), citing Greene et al. (2011), identifies a four-phase process experienced by displaced people. Phase 1, the Antecedent Phase, involves acknowledging the threat leading to displacement, which may range from individual circumstances to the need for family relocation, such as pursuing better economic opportunities elsewhere. Phase 2, the Uprooting Phase, entails broken relationships with family members or communities and disruption to day-to-day activities, as outlined by Pellow (1992). Phase 3, the Transition Phase, is an ambivalent period in which individuals move from one place to another. Phase 4, the Resettlement Phase, occurs when individuals accept the movement and begin to connect with the new place. Fullilove (2014) further proposes that place attachment is not solely an individual psychological process but also involves a community practice of love.

Carrus et al. (2014) examined research that found a positive or negative relationship between location attachment and pro-environmental behaviour. Empirical research suggests that location

attachment and pro-environmental behaviour are positively related (Scannell & Gifford, 2009; Feldman, 1996; Manzo, 2006; Carrus et al., 2005; Mishra et al., 2010). However, there is evidence relating place attachment to anti-environmental behaviour, especially when governments implement conservation measures (Stoll-Kleemann, 2001) or when communities regard protected regions adversely due to limited access to natural resources. As a result, the relationship between location attachment and environmentally conscious behaviour is complex.

Devine-Wright (2014), in a review of place attachment and climate change, emphasises the need for further research. Kenz (2005), cited in Devine-Wright (2014), studied residents of Gothenburg, Sweden, concluding that climate change may disrupt continuity with the past and affect place-related distinctiveness (Adger et al., 2011). Scannell and Gifford (2011) examined the effects of place attachment on climate change engagement, finding that stronger place attachment correlates with heightened engagement.

While place attachment has mostly been researched positively (Lewicka, 2011), the impacts of mobility are not always bad (Gustafson, 2014). Lewicka (2011) contends that location attachment and mobility may complement one another. Longevity in one place is not an accurate indicator of attachment, nor are attachments limited to a single area. Manzo (2014) investigates place attachment in the setting of poverty and restricted authority, emphasizing the negative effects of forced displacement. Poverty, mixed feelings, stigma, and displacement all influence place bonds.

The concept of having several place attachments has also drawn attention (Gustafson, 2014), as well as research on place attachment and the environment (Devine-Wright, 2014). Devine-Wright and Batel (2017) extended these ideas to energy infrastructure, examining local, national, and international place attachments, climate change issues, power line perceptions, and support for energy system reform. Their findings indicate that infrastructure ideas and attitudes alter depending on the intensity of attachments at various levels. Individuals with strong national attachments were less inclined to support European grid integration, whereas those with strong global attachments were more inclined to support decentralized energy. Strong local attachments have been linked to hostility to neighbouring electricity lines.

Furthermore, people with strong local, national, and international attachments were more inclined to limit their energy consumption, whereas those with lesser affiliations were less inclined to trust grid operators. Support for decentralized energy was positively connected with a stronger global instead of national affiliation, which was mostly mediated by concerns about climate change.

Nientied et al. (2019) studied place attachment variables such as sense of identity, familiarity, identity as an individual, and neighbourhood experience in seven neighbourhoods in Tirana, Albania. Their results indicated that these indicators were not significantly influenced by education, gender, or age, but had a high correlation with length of residence.

2.9.2 South African literature

In South Africa, methods to place attachment studies are divided into three categories: a) community attachment and cultural symbol studies, b) research on place, sense of place, and place-identity, and c) historical environmentalism studies (Dlamini and Tesfamichael, 2021).

According to Chigeza et al. (2013), the sense of community in remote South African settings stems from interdependent ties among community members. They claim that these contacts foster attachment, which manifests itself as identification with the neighbourhood and a commitment to its long-term viability. Their findings show that strong social links and a sense of belonging are essential for developing community attachment, which improves shared action and resilience.

Marais et al. (2018) examine the effects of mining on place attachment in Postmasburg, Northern Cape. Their study finds that mining activities can disrupt people-place bonds, as residents perceive a deterioration of social values and environmental quality. Disturbances to cultural symbols or valued spaces were found to precipitate social disruption within communities. Homeownership was identified as a significant factor in sustaining attachment among mineworkers, even amidst concerns regarding social disruption caused by mining. The authors emphasise that, while place attachment generally promotes positive outcomes, it may have negative implications if living conditions or access to services are compromised, suggesting that policies promoting place attachment in mining towns must consider potential long-term adverse effects on residents' well-being and community cohesion.

Hook and Vrdoljak (2002) explore place attachment within gated communities and security villages, noting that these enclaves foster strong territorial attachment. Residents develop a heightened sense of ownership and protection of their environment, yet this attachment can generate intergroup tensions, as outsiders may experience exclusion. These dynamics underscore the interplay between attachment, socioeconomic disparities, and perceptions of belonging.

Tsoriyo (2024) and Dlamini et al. (2020) converge in their emphasis on sociodemographic factors influencing place attachment in Gauteng province. Both studies highlight population group as a key predictor of residents' preferences to remain in an area and their overall satisfaction. Additional influential variables include dwelling type and socioeconomic status. Dlamini et al. (2020) address a broad range of sociodemographic determinants affecting satisfaction and emigration intentions, while Tsoriyo (2024) employs statistical models to examine these relationships in greater detail. Collectively, these findings illustrate the multifaceted nature of place attachment and the necessity for policymakers to incorporate sociodemographic considerations into urban planning and service delivery.

Marais et al. (2021) further discuss the complexities of place attachment within mining communities. They caution that while fostering place attachment is desirable throughout a mine's lifecycle, overreliance on attachment may create economic lock-ins, potentially resulting in long-term financial harm, particularly in anticipation of mine closure. Their study of Postmasburg reiterates that disturbances to cultural symbols or valued spaces can erode social cohesion and weaken people-place bonds.

Homeownership has consistently emerged as a strong driver of place attachment in South Africa. This has been reinforced through policies such as the shifting ownership initiatives (COGTA, 2015) and the Revitalisation of Distressed Mining Towns Programme (The Presidency, Republic of South Africa, 2014).

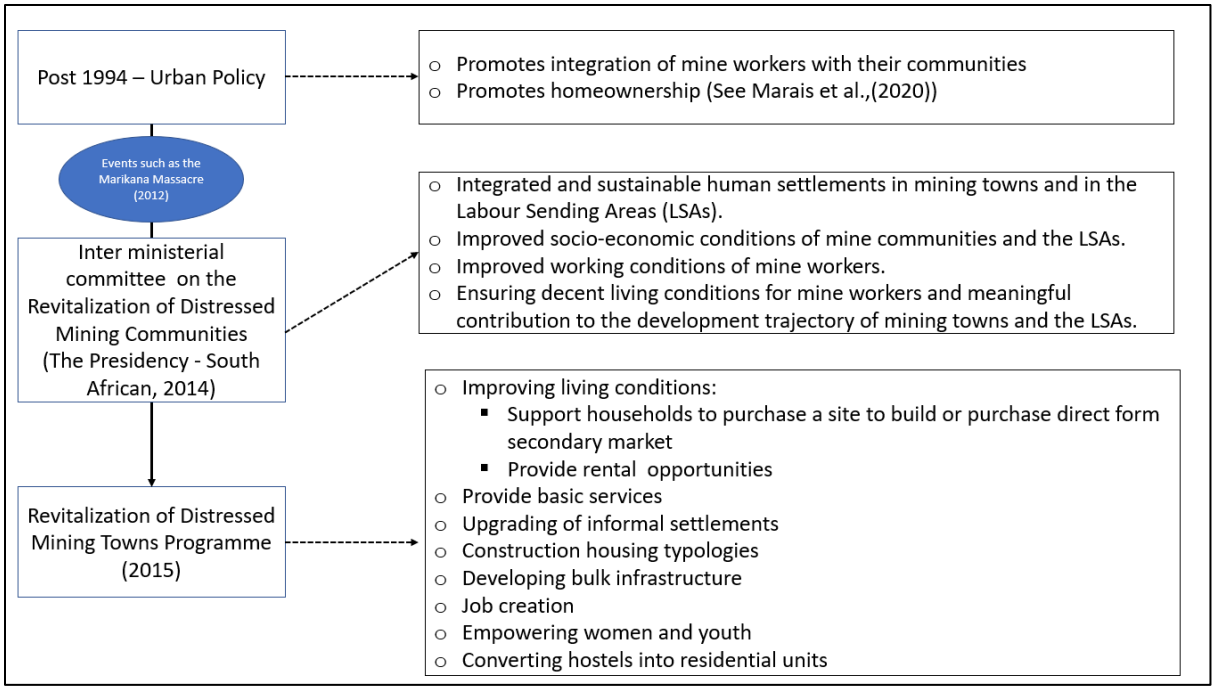


Figure 2.12: Homeownership and how it fits in the South African policy environment and mining

The South African National Urban Development Policy (COGTA, 2015), among other policy levers, identified shifting ownership and promoting homeownership as mechanisms to achieve integrated and sustainable human settlements. Events such as the Marikana massacre of 2012 prompted the Presidency to establish an Inter-Ministerial Committee on the Revitalisation of Distressed Mining Communities. One of the four focus areas of this initiative was ensuring decent living conditions for mineworkers. This objective was further articulated in the Revitalisation of Distressed Mining Towns Programme in 2015, which included improving living conditions through supporting households to acquire land for construction or purchase directly from the housing market. Collectively, these initiatives promoted homeownership as a central strategy.

In summary, the empirical evidence surrounding Place Attachment Theory highlights several key conclusions. Firstly, place attachment encompasses a range of emotions and experiences that influence individuals' attitudes and behaviours toward their environments. It arises from both personal interactions and broader socio-political processes. Secondly, the strength of place attachment is shaped by various factors, including sociodemographic characteristics, length of

residence, and homeownership. The consequences of strong place attachment include higher life satisfaction, stronger social bonds, and increased civic engagement. Thirdly, empirical studies indicate that individuals with strong place attachments are more likely to engage in pro-environmental behaviours and participate in community activities. This connection underscores the potential for leveraging place attachment in conservation and urban planning initiatives. Fourthly, serial forced displacement can undermine place attachment, as repeated upheaval disrupts emotional bonds to locations. Nonetheless, community practices can help maintain these connections, mitigating the negative effects of displacement (Fullilove, 2014). Fifthly, the physical and social environments significantly shape place attachment. Factors such as the availability of public facilities, neighbourhood cohesion, and perceived safety contribute to the strength of attachment. Finally, the nature and intensity of place attachment vary across cultural and sociodemographic contexts, highlighting the need for further research to fully understand these dynamics.

The empirical evidence reviewed illustrates the complex interplay between individuals and their environments, emphasising the significance of place attachment in fostering community engagement, environmental stewardship, and overall well-being. The studies discussed demonstrate the multifaceted nature of place attachment and underscore the importance of policies that recognise and support this phenomenon. In the South African context, however, there remains a limited number of studies, and further research is necessary to address existing methodological and theoretical gaps (Dlamini & Tesfamichael, 2021).

2.9.3 Summary

This section has provided a comprehensive overview of the empirical evidence on place attachment. Empirical studies underscore that factors such as duration of residence, sociodemographic characteristics, community cohesion, and cultural context significantly influence attachment strength. In South Africa, research shows that community bonds rooted in interdependence are central in rural areas, while in urban contexts, social and environmental resources, including safety and amenities, foster attachment. Conversely, repeated displacement

or environmental degradation can weaken these bonds, occasionally resulting in social and emotional dislocation, particularly in communities with limited resilience.

2.10 Theoretical and Conceptual Frameworks

This study has an overall theoretical framework based on the earlier discussions above. Figure 2.9 depicts the overall theoretical framework employed in this study. However, conceptual frameworks have been developed for measuring and exploring social disruption (Objective 1) and place attachment (Objective 2).

2.10.1 Theoretical framework

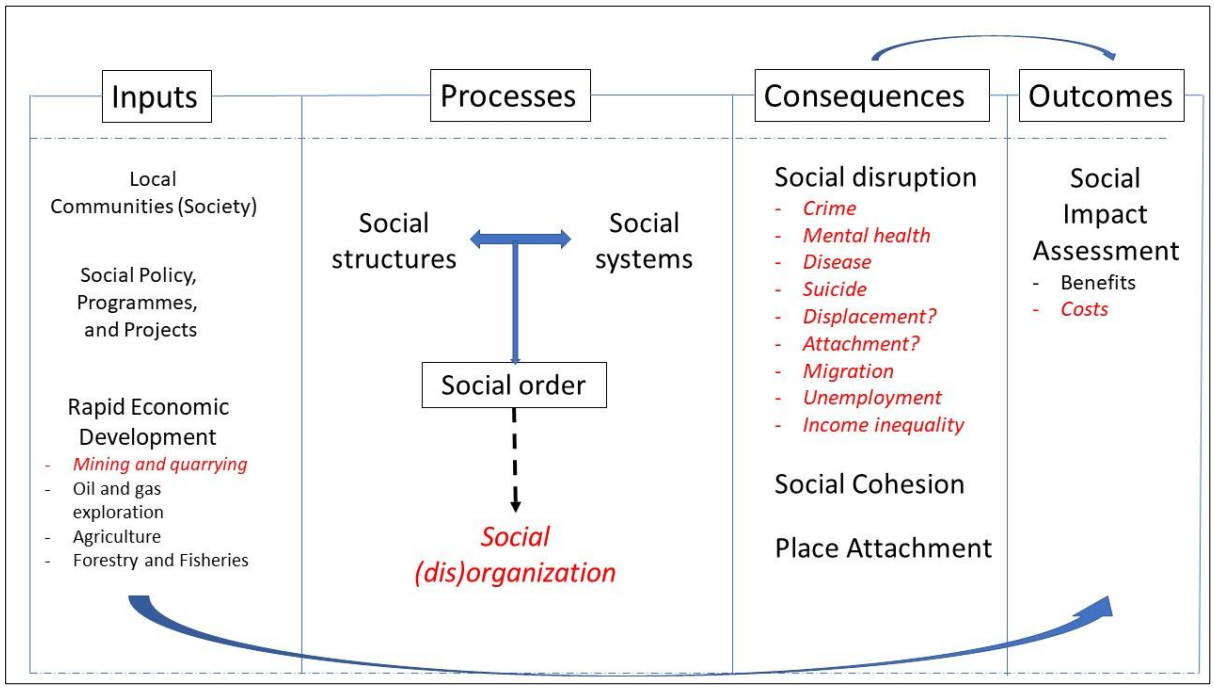


Figure 2.13: Theoretical framework

Figure 2.13 presents the theoretical framework that guides this study. This diagram presents a process-based framework for understanding how rapid economic development, particularly mining, translates into social outcomes at the community level. It is organised into four sequential columns: Inputs, Processes, Consequences, and Outcomes.

Inputs represent the starting conditions. These include local communities, existing social policies and programmes, and forms of rapid economic development such as mining, oil and gas exploration, agriculture, and forestry. These inputs introduce economic opportunities but also place pressure on local social environments.

Processes describe how these inputs interact with society. Rapid economic development affects social structures (such as families, labour markets, and community networks) and social systems (such as governance, service delivery, and institutions). The interaction between these produces a form of social order, which may either stabilise communities or weaken them. Where this balance is disturbed, the result is social (dis)organisation, reflecting breakdowns in norms, institutions, and social regulation.

Consequences capture the observable social effects of this (dis)organisation. These include various forms of social disruption, such as crime, mental health challenges, disease, suicide, migration, unemployment, income inequality, and changes in displacement or place attachment. At the same time, these disruptions directly affect broader dimensions of social cohesion and place attachment, which reflect the strength of social bonds and people's connection to place.

Outcomes represent the evaluative stage of the framework. Here, the cumulative effects of social disruption and cohesion are assessed through Social Impact Assessment, focusing on the social costs and benefits of economic development. These outcomes can then feed back into policy and planning, influencing future interventions and development trajectories.

The framework draws primarily on social disruption theory to explain how mining and quarrying activities generate social consequences for local communities through rapid economic change, population shifts, and institutional strain. Although social disruption theory has been criticised for its tendency to emphasise negative outcomes and to assume linear and uniform effects across contexts, it remains highly relevant to this study because it provides a systematic lens for examining variations in social disruption across different levels of mining activity and across different phases of the mining cycle. Rather than assuming disruption as an inevitable outcome,

the framework uses the theory as an empirical guide to test whether and how such disruption manifests in diverse mining contexts.

In addition, the framework integrates place attachment theory to address limitations commonly associated with social disruption and boomtown approaches, particularly their insufficient attention to residents' emotional, cultural, and cognitive ties to place. Place attachment theory is relevant in this study because it helps explain why communities may exhibit resilience, stability, or resistance to relocation even in contexts characterised by social disruption and economic volatility. By combining social disruption and place attachment theories, the framework captures both structural processes (such as employment change and crime) and subjective dimensions (such as attachment and willingness to relocate), thereby offering a more holistic and context-sensitive analysis of the social consequences of mining. This integrated approach allows the study to retain the explanatory strengths of both theories while mitigating their individual limitations, making them an appropriate and defensible foundation for the research.

2.10.2 Social disruption – Conceptual Framework

Owing to the complex nature of social disruption, there is a need to develop a visual organising tool and mental maps that guide research (Van der Walt, 2020). Figure 4.1 illustrates the conceptual framework used in this chapter.

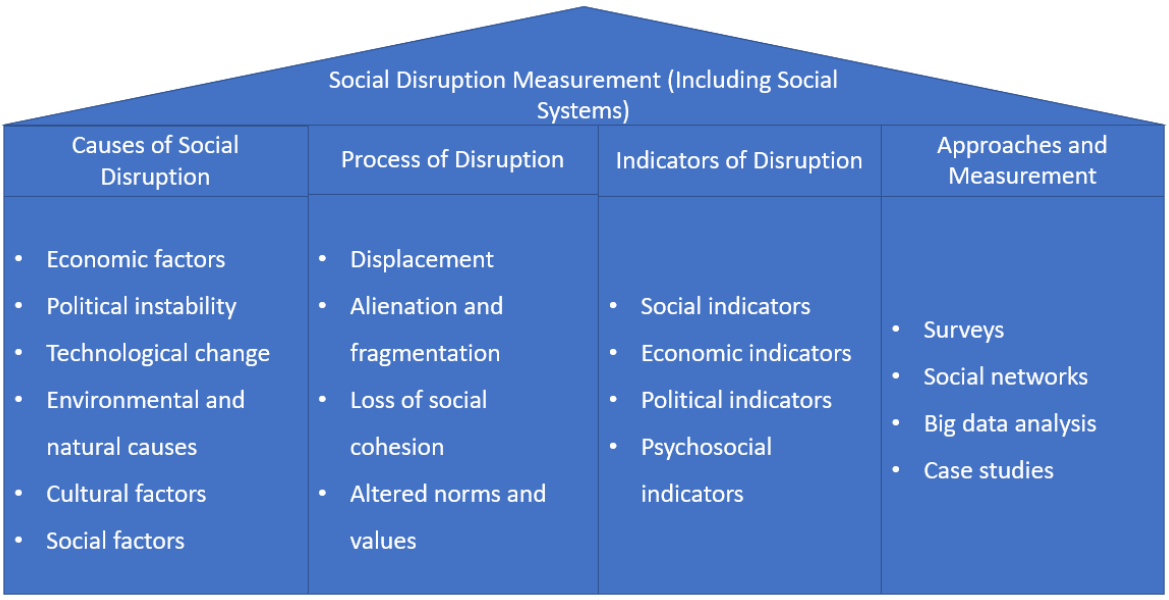


Figure 2.14: Conceptual framework: Authors' summary

Figure 2.14 presents the four dimensions involved in measuring social disruption: Causes of Social Disruption, Process of Disruption, Indicators of Disruption, and Approaches and Measurement of Disruption. These dimensions align closely with the indicators available in NIDS (2017). The Causes of Social Disruption encompass economic factors, political instability, technological change, environmental and natural causes, cultural factors, and social factors. The Process of Disruption includes displacement (in- and out-migration), alienation and fragmentation, loss of social cohesion, and alterations in norms and values. Indicators of disruption comprise social indicators, such as crime; economic indicators, such as unemployment; political indicators; and psychosocial indicators, including physical and perceived health. Sociodemographic indicators include age, gender, employment status, levels of education, and welfare. Displacement is measured through migration variables in NIDS (2017), while crime is assessed via perceptions of household crime. Social cohesion is operationalised using measures such as trust and responses to hypothetical lost wallet scenarios. Psychosocial indicators in NIDS (2017) also cover perceived health, emotional (mental) health, and physical health. Approaches to measuring social disruption include surveys, social network analysis, big data analytics, and case studies.

2.10.3 Place attachment - Conceptual framework

The conceptual framework underpinning this chapter is based on the Person-Process-Place model developed by Scannell and Gifford (2010). This model conceptualises place attachment as the interaction between three interconnected dimensions: person, process, and place. The person dimension relates to demographic and socioeconomic characteristics; the process dimension refers to the psychological and emotional mechanisms through which attachment develops; and the place dimension pertains to the physical and symbolic meanings attributed to the environment (Scannell & Gifford, 2010; Scannell & Gifford, 2014).

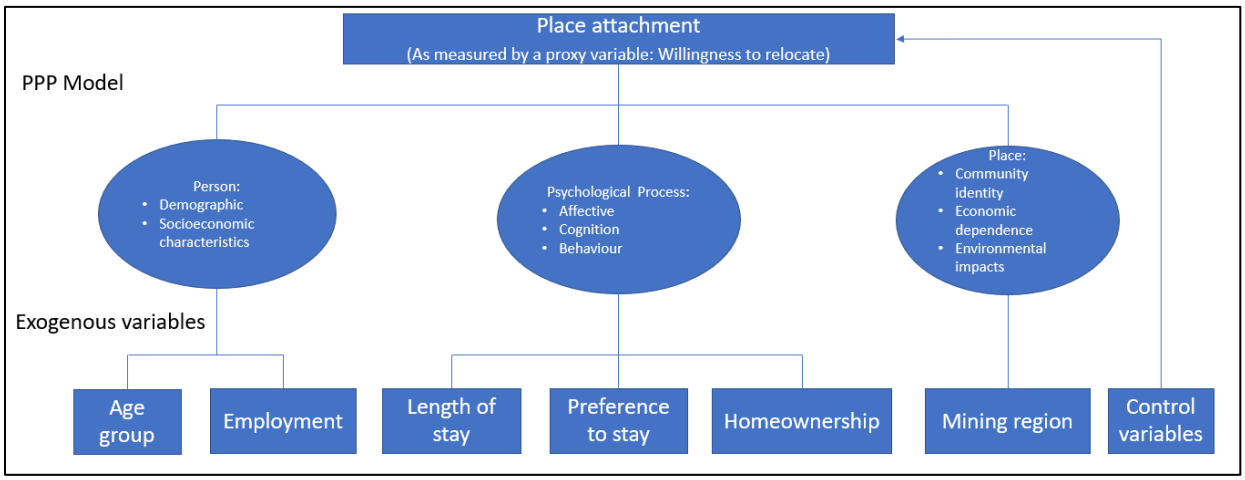


Figure 2.15: Conceptual framework (The direct effects model)

Figure 2.15 illustrates that, according to the Person-Process-Place (PPP) model, a person's demographic and socioeconomic characteristics such as age, gender, education level, employment status, income position, life satisfaction, and migration status influence how individuals develop attachments to place. Selected variables from these characteristics are used as control variables in the logistic regression analysis.

The model further demonstrates that the key exogenous variables are associated with psychological processes, encompassing affective (emotional), cognitive, and behavioural dimensions. For example, a longer duration of residence can deepen these psychological

connections, fostering stronger emotional bonds and a sense of identity with a particular place (Inez, 2005; Smaldone, 2006; Scannell & Gifford, 2014). Extended periods of residence also contribute to the formation of enduring memories, relationships, and emotional associations with one's surroundings (Comstock et al., 2010; Inalhan et al., 2021).

Homeownership can be understood from two perspectives. On the one hand, it represents an investment in the physical environment and symbolises commitment to a place of residence. On the other hand, it reflects a psychological process underlying place attachment, encompassing more than a financial investment. Homeownership engages all three psychological processes in the P-PP model: the development of affective bonds with the home, cognitive reinforcement of identity, and behavioural proximity maintenance (Meagher & Cheadle, 2020).

The conceptual framework demonstrates that place attachment is shaped by personal experiences, social relationships, physical features, and broader socio-political processes. Literature reveals variability in definitions and measurement approaches, often leading to fragmented research and stagnation in theoretical development. Criticisms centre on limited exploration of physical place attributes, insufficient attention to the mechanisms underpinning attachment, and an overemphasis on positive aspects, sometimes overlooking negative consequences such as displacement or social disruption.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This quantitative study focuses on the non-metropolitan regions of South Africa. The research adopts a positivist paradigm, grounded in existing theories: social disruption theory and place attachment theory. The chapter presents the methods used in this study in the following manner. First, the research design is discussed. Second, the study area is presented. Third, data and data sources are discussed. Fourth, the theoretical frameworks are presented. Then objective specific methods are presented in terms of empirical model specification, pre-estimation tests, estimation techniques and procedures, post-estimation and diagnostic tests. Lastly, ethical considerations, and other relevant aspects of the data population and sampling strategy are discussed.

3.2 Research design

This study adopts a quantitative research design to examine the social consequences of mining activity in non-metropolitan regions of South Africa. The design integrates cross-sectional and panel data approaches to address the study's three objectives.

To investigate the extent of social disruption and variations in place attachment across areas with different levels of mining activity (Objectives One and Two), a cross-sectional explanatory design is employed. Comparative analysis is conducted across mining regions characterised by different levels of mining activity. Willingness to relocate is used as a proxy indicator for place attachment, with lower willingness to relocate reflecting stronger attachment to place. The relationships between mining activity, social disruption variables, and relocation intentions are estimated using Generalized Structural Equation Modelling (GSEM).

To assess the relationship between crime and mining-related employment (Objective Three), the study applies a panel regression design using longitudinal data on crime indicators and full-time equivalent (FTE) mining employment. This approach enables the examination of temporal dynamics while controlling for unobserved regional heterogeneity.

Overall, the quantitative research design allows for both spatial and temporal assessment of social disruption and place attachment in mining-affected non-metropolitan regions.

3.3 Study area

The study focuses on non-metropolitan regions of South Africa. The 44 districts (excluding metropolitan areas) were classified into one of five mining regions: Region 1 (very low mining), Region 2 (low mining), Region 3 (medium mining), Region 4 (high mining), and Region 5 (very high mining). A mining region is defined as an area where socioeconomic development is dominated by mining activities, including resource extraction and mineral processing (Martinez-Fernandez et al., 2012).

In this study, mining regions were defined based on the percentage contribution of mining to each district's total GVA. The GVA data for each district municipality were sourced from the District Development Model (DDM) Diagnostic Report (COGTA, 2020). The DDM is a Presidential initiative in South Africa aimed at enhancing the coherence and impact of government service delivery. It focuses on 44 districts and eight metropolitan areas, designated as development spaces that can serve as centres for service delivery and economic development, including job creation.

The DDM involves joint and collaborative planning at local, district, and metropolitan levels across all three spheres of government, resulting in a single, strategically focused "One Plan" for each of the 44 districts and eight metropolitan areas. Within this framework, the district serves as the primary centre for development (SALGA, 2021). The first stage in developing the DDM involved a diagnostic report that included an economic analysis as part of the municipality profile. This financial analysis documented the contribution of each industry to the district's total GVA.

Table 3.1: Summary Statistics regarding mining contribution to total GVA in the districts

Variable	Number of districts	Mean	Std. Dev	Min	Max
% contribution of mining towards a districts total GVA	44	12,92	17,09621	0	57

Table 1.3 shows 44 districts in the analysis (excluding metropolitan regions). The average mining contribution to the total GVA for the 44 districts is 12,92%, the minimum is 0%, and the highest is 57%. Figure 1.1 provides a histogram of the mining contributions to the total GVA distribution for the 44 districts.

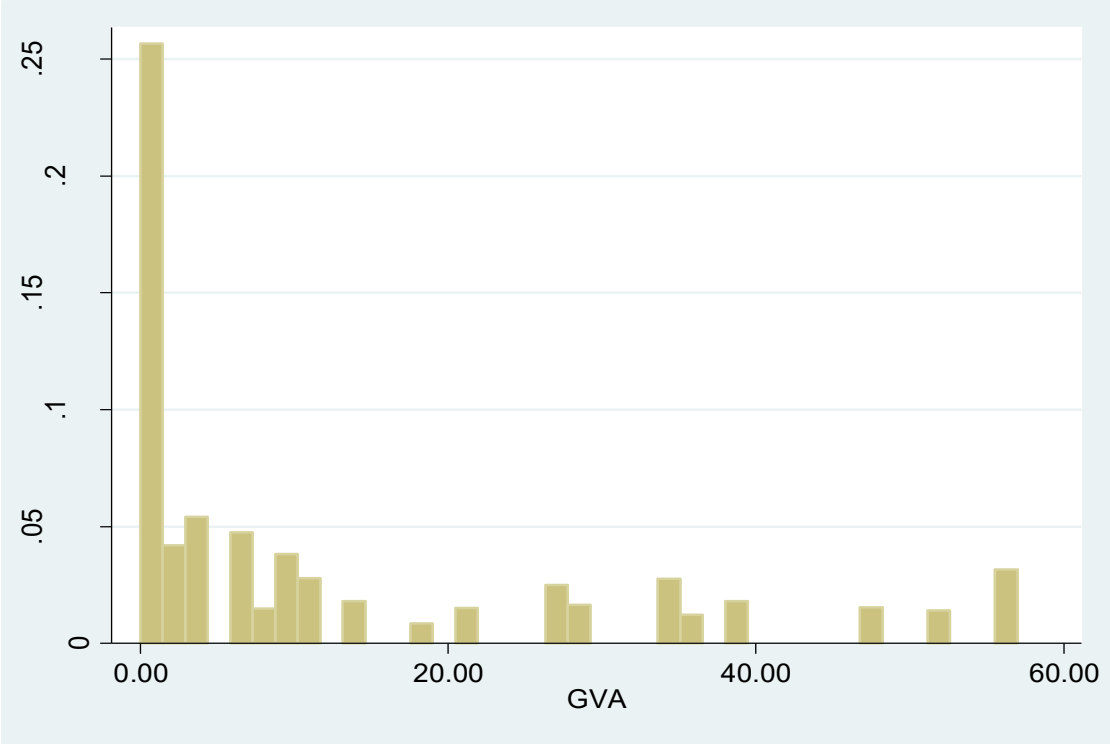


Figure 3.1: GVA

Source: Own calculations using data obtained from 2017 DDMs for each municipality, excluding metros.

Figure 3.1 presents a histogram illustrating the distribution of the percentage contribution of mining to total Gross Value Added (GVA) across district municipalities. For each district, mining's share of total economic activity was calculated and grouped into intervals to show how this contribution varies spatially. The horizontal axis represents the percentage contribution of mining to total GVA, while the vertical axis indicates the density of districts within each percentage range. The distribution is highly skewed to the right, with a pronounced concentration

of districts clustered near zero. This indicates that, for the majority of districts, mining contributes only a small proportion of overall economic activity.

As the percentage contribution of mining increases, the frequency of districts declines markedly. Only a limited number of districts exhibit relatively high mining contribution, with some districts showing exceptionally large contributions. These districts can therefore be characterised as mining-dependent local economies. Overall, the histogram demonstrates that mining activity is unevenly distributed across districts in South Africa. While most districts have diversified economies with minimal reliance on mining, a small subset of districts is strongly dependent on mining, suggesting heightened vulnerability to mining-related economic, social, and demographic changes.

3.3.1 Classification of regions by level of mining activity

South Africa has a globally competitive mining industry, with significant activities in gold, coal, platinum group metals, diamonds, and other minerals such as chrome, manganese, and vanadium (Minerals Council South Africa, 2024). However, the level of mining activity differs spatially, with some regions having no mining activity and others being heavily dependent on mining (see Figure 1.1).

To facilitate understanding and comparison of regions' economic contributions from mining, it was necessary to categorise regions. The first approach involved dividing regions into two categories: "No mining regions" (0% mining contribution to GVA) and "Mining regions" (any contribution greater than 0%). This method was problematic because it oversimplified the economic significance of mining in different regions. For example, a region with 0% mining contribution was treated as fundamentally different from a region with a small contribution, such as 0,10% of GVA, potentially misrepresenting the importance of mining in those areas.

The second approach classified regions relative to the national contribution of mining to GDP, which was 7% in 2017. Under this approach, a region contributing 7,1% was treated the same as a region contributing 57%. This introduced bias, as it assumed all regions above 7% were equal in significance, ignoring substantial differences in magnitude. Minor differences (e.g., 0,1 percentage

points) may be negligible for policy or analysis, whereas large differences (e.g., 50 percentage points) are highly significant. Thus, classifying regions using a simple "mining versus non-mining" threshold failed to capture the nuanced variations in mining contributions.

A more sophisticated classification was therefore required. The chosen method was based on the distribution of GVA data across all regions (Figure 1.1). Mining contributions to each municipality's GVA were used to classify regions into five categories: 0 = very low, 1 = low, 2 = medium, 3 = high, and 4 = very high. The percentile pinning method, implemented in STATA, was employed to create these categories. This method mitigates the impact of outliers, focuses on the overall data distribution rather than individual values, and is suitable for datasets that do not follow a normal distribution. It reduces the risk of model overfitting due to extreme values, creating more generalised results, and enables comparison of social disruption across specific regions. The generated categories and their descriptions are presented in Table 1.4.

$$\boldsymbol{Mining\ region} = \begin{cases} \boldsymbol{Region\ 1\ (Very\ low\ mining), 0 \leq GVA \leq 0,2} \\ \boldsymbol{Region\ 2\ (Low\ mining\ region)\ 0,3 \leq GVA \leq 1,26} \\ \boldsymbol{Region\ 3\ (Medium\ mining\ region)\ 1,27 \leq GVA \leq 4,78} \\ \boldsymbol{Region\ 4\ (High\ mining\ region) 0,49 \leq GVA \leq 15,7} \\ \boldsymbol{Region\ 5\ (Very\ high\ mining\ region)\ 27,0 \leq GVA \leq 57,0} \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots - \text{Equation 3-1}$$

Table 3.2 shows the definitions and classifications of the mining regions.

Table 3.2: Definitions and classifications of the mining regions

Mining region	GVA	Description
Region 1 - Very low-mining region	0,0 -0,28	The mining sector contributes minimally to the GVA.
Region 2 - Low-mining region	0,30-1,40	The mining sector has a modest impact on the GVA.
Region 3 - Medium mining region	1,52-7,0	The mining sector contributes significantly, but is not one of the main contributors to the GVA.
Region 4 - High-mining region	8,0-21,3	The mining sector is a significant contributor to the GVA.
Region 5 - Very high mining region	26,8-57,0	The mining sector is economically significant and has a major impact on the district's GVA.

3.3.2 Spatial distribution of regions by level of mining activities

Figure 1.2 shows the spatial distribution of regions by level of mining activity in South Africa.

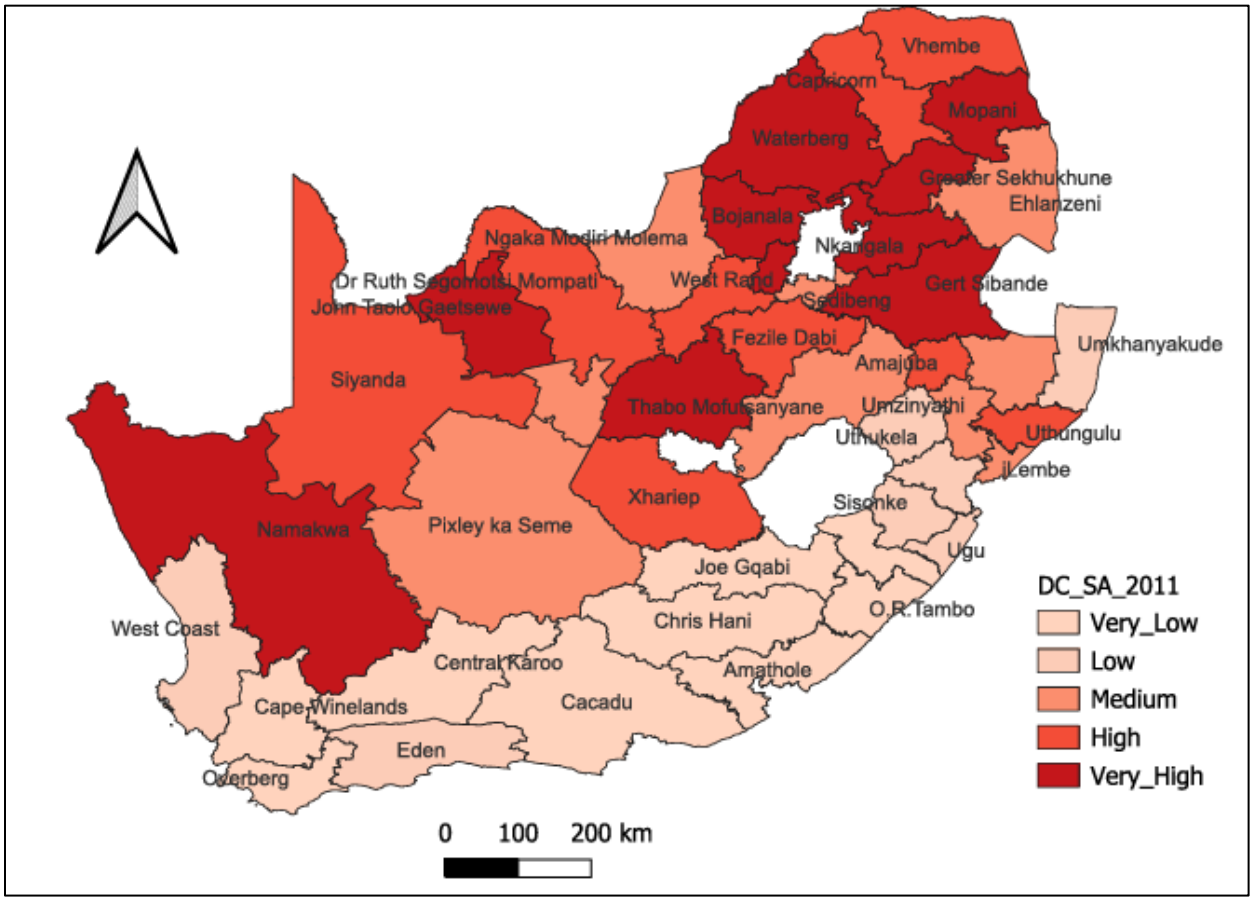


Figure 3.2: Regions by mining activity (Source: Author's calculations using 2017 data from DDMs.)

Figure 3.2 illustrates that very high mining regions are primarily located in Limpopo, North West, Mpumalanga, and Northern Cape. This finding is consistent with the Stats SA Mining Report 2017 (Stats SA, 2017). The results also align with those of Cole and Broadhurst (2020), who applied a different approach to classify mining communities. This triangulation suggests that the classification method employed in this chapter produces a regional distribution comparable to that observed in other studies. The external triangulation thus serves to validate the methodology described above.

3.4 Samples

Table 3.3 shows the sample of the data given the methods above and derived from the NIDS and the mining classification above.

Table 3.3: Sample sizes

Classification	Individuals			Households		
	Number	Per cent	Cum.	Number	Per cent	Cum.
Very low-mining regions	3 563	18,57	18,57	1 777	19,85	19,85
Low-mining regions	3 732	19,46	38,03	1 600	17,88	37,73
Medium mining regions	4 058	21,16	59,19	1 878	20,98	58,71
High-mining regions	3 598	18,76	77,94	1 609	17,98	16,68
Very High mining regions	4 231	22,06	100,00	2 087	23,32	100
Total	19 182	100		8 951		

There are 3 563 individuals and 1 777 households in regions classified as “very low-mining regions”, 3 732 individuals and 1 600 households in “low-mining regions”, 4 058 individuals and 1 878 households in “medium mining regions”, 3 598 individuals and 1 609 households in “high-mining regions”, and 4 231 individuals and 2 087 households in “very high mining regions”. This approach results in a realised sample of 19 182 individuals and 8 951 households.

South Africa’s geographical hierarchy is structured into three strata: the first comprises nine provinces; the second consists of 44 district municipalities and eight metropolitan areas; and the third includes 257 local municipalities. This study utilises two primary data sources: GVA figures, obtained from each district municipality’s DDM Diagnostic Reports, and the NIDS, Wave 5 (2017). The NIDS (2017) data are representative at the district-level. Metropolitan regions were excluded due to their heterogeneous economies and because social disruption and mining activities predominantly occur in remote or rural areas.

3.5 Data and analysis: Objective 1

3.5.1 Data

The primary data source for this objective was the National Income Dynamics Study (NIDS) 2017 wave. At the time this study was conducted, NIDS (2017) was the most recent nationally representative dataset containing variables relevant to the analysis undertaken. The dataset includes a range of indicators suitable for examining social disruption and place attachment, thereby directly addressing Objectives One and Two of this study.

NIDS (2017) collected both household-level and individual-level data within district municipalities, which were subsequently classified as mining regions (see Table 1.5). At the household level, the household served as the primary unit of analysis, with variables capturing perceptions of crime and safety, as well as welfare indicators such as household income and asset ownership. In addition, individual-level data were collected from members of these households. These data include demographic characteristics, health-related variables (encompassing both emotional and physical health), and measures of social cohesion. Table 3.4 presents the alignment between the social disruption variables employed in this study and the corresponding variables available in the NIDS (2017) dataset.

Table 3.4: Alignment of Social Disruption Themes to NIDS (2017) Questions

Social Disruption Theme	Question (s)	Description
Crime and Safety	There are six questions about crime and safety in the respondents' neighbourhood. All questions asked how common different types of crime are in the neighbourhoods. The six perceptions of crime were: 1) Burglaries, muggings or thefts. 2) Violence between members of the same household. 3) Violence between members of different families. 4) Gangsterism. 5) Murder, shootings or stabbings. 6) Drug abuse.	All questions were measured using the responses: 1 - Never happens, 2 - Very rare, 3 - Not common, 4 - Fairly common, and 5 - Very common.
Health	Perceived Health: The question asked how the respondents would describe their health during the survey.	The options were: 1 - Excellent, 2 - Very Good, 3 - Good, 4 - Fair, 5 - Poor.
	Emotional Health: Ten questions focused on emotional health. The questions asked how the respondents felt during the week preceding the interviews. The feelings included feeling bothered, having trouble concentrating, feeling depressed, feeling that everything they did needed an effort, feeling hopeful about the future, feeling fearful, having restless sleep, being happy, feeling lonely, and not being able to get going.	All ten questions appeared in the same manner, and the possible responses were: 1 - Rarely or none of the time (less than 1 day), 2 - Some or little of the time (1 - 2 days), 3 - Occasionally or moderate amount of time (3 - 4 days), 4 - All the time (5 - 7 days).
	Physical Health: There were seven questions. They were all asked in the same manner whether the respondent had been told by a doctor, nurse, or healthcare professional that they had ever had the disease. The diseases were Tuberculosis (TB), High Blood Pressure (HBP), Diabetes (High Blood Sugar), Stroke, Asthma, Heart Problems, and Cancer.	These were all yes or no questions.
Social Cohesion	Social cohesion was measured using lost wallets and trust questions. There were two lost wallet questions. The first case asks the respondent about the likelihood that their wallet or purse is returned in the imaginary event that their lost wallet or purse contains R250 if found by someone close to them. The	The possible responses were: 1 - Very likely, 2 - Somewhat likely, 3 - Not likely at all.

	second scenario asks the respondent the likelihood of their wallet or purse being returned in the imaginary event that their lost wallet or purse contains R250 if found by a total stranger.	
	Regarding the trust questions, the first question was how much the respondents trusted South Africans.	The responses were on a 1 to 8 scale where: 1 - Extremely little and 8 - A great deal.
	The rest of the trust questions asked how much the respondents trusted different people. The types of people included relatives, other people the respondents knew, people from their race groups, and people from other race groups.	The possible responses were: 1 - Not at all; 2 - Just a little, 3 - I trust them somewhat, and 4 - I trust them a lot.
Migration	Respondents had to answer two questions about the different places that they have lived in. Respondents had to state whether they had lived in another suburb, town, or village (internal migration). The second question asked where the respondent was born (external migration).	This question was a yes or no question.
Unemployment	This is a derived variable from the question on employment history. The question asked the respondents what best described what they had been doing the previous year.	The derived variable had response options: 1 - Not economically active, 2 - Unemployed discouraged, 3 - Unemployed Strict, and 4 - Employed.
Welfare	Mean Household Income: What was this household's total income (after income tax) in the last month? Please note that this includes all the household members' salaries and wages, grants, interest, rental income and income from agriculture earned by household members in the last month.	This gave the actual amount in Rands
	Asset index:	These assets included ownership of radio, Hifi,

	The respondents had to answer questions about items the household may or may not own.	television, satellite dish, DVD, computer, camera, cell phone, electric stove, gas stove, paraffin stove, microwave, fridge, washing machine, sewing machine, lounge suite, motor vehicle, scooter, bicycle, non-motorised boat, motorboat, donkey or ox cart, plough, tractor, plough, tractor, wheelbarrow, and grinding mill.
	Poor-rich step ladder: This indicator used the question that asked respondents to rate themselves on a step scale running between 1-Poorest and 6-richest people in South Africa.	This was measured at the time of the survey. The higher the score, the richer the respondents ranked themselves.
	Satisfaction levels This indicator measures how respondents felt about life as a whole at the moment.	This was measured on satisfaction levels from 1(very dissatisfied) to 10 (very satisfied).

3.5.2 Measurement

This section describes the transformations applied to variables to operationalise the identified constructs and themes. As shown in Table 3.4, most Likert-type responses were dichotomised to create binary outcomes; an illustrative example is provided in section 3.5.2.1. In addition, indices for household assets and social disruption were constructed. Further details regarding these measurement procedures are provided in the subsequent sections.

3.5.2.1 Dichotomizing the Variables

To analyse the Lickert scale data, variables were dichotomised. For example, for the variable "D34,1nbthmf - How common are burglaries, muggings or thefts in your neighbourhood?", the variable was dichotomised as follows:

$$\boldsymbol{Burglary} = \begin{cases} \mathbf{0}\ \boldsymbol{if}\ \mathbf{w5_h_nbthmf(1,2\ or\ 3)} \\ \mathbf{1}\ \boldsymbol{if}\ \mathbf{w5_h_nbthmf\ (4\ or\ 5)} \end{cases} \text{.....Equation 3-2}$$

Where; 1 = Never happens; 2 = Very rare; 3 = Not Common; 4 = Fairly Common; 5 = Very Common

Chi-square association tests were employed to determine whether an association exists between mining classification and the variables under investigation. Furthermore, logistic regression models were used to estimate the odds ratios for variables that demonstrated a significant association. In some cases, simple linear regression models were applied to validate the results.

3.5.2.2 Continuous Variables

The dataset included two continuous variables: education and total household income. The education variable was transformed into years of education. Categories from 0 to 12 were retained as they were, where 0 represents no formal education, 1 corresponds to one year of education, continuing up to 12 years of education. All values exceeding 12 years were recoded as follows:

Table 3.5: Recoding the education variable

Education code and name	Number of years of education
25 = No schooling	0
16 = Certificate not requiring Grade 12/Std 10 27 = National Certificate Vocational 2 (NCV 2) 30 = N1 (NATED)/ NTC 1	10
14 – 17 = Diploma not requiring Grade 12/ Std. 10 28 = National Certificate Vocational 3 (NCV 3) 31 = N2 (NATED)/ NTC 2	11
15 – 32 = N3 (NATED)/ NTC 3 29 = National Certificate Vocational 4 (NCV 4)	12
18 = Certificate requiring Grade 12/ Std. 10	13
19 = Diploma requiring Grade 12/ Std. 10	14
20 = Bachelor's degree	15
21 = Bachelor's degree and diploma 22 = Honours Degree	16
23 = Higher Degree (Master's, Doctorate)	18

The recoding of the education variable enabled the creation of a continuous variable that was named "Years of education". The average "Years of education" were calculated and compared across mining regions. The mean total household income is already a continuous variable in the dataset. The mean total household income was calculated and compared across the mining regions.

3.5.2.3 Asset Index

This index is a non-financial asset index based on the respondents indicating whether or not the household owned the asset. To create this index, the variables under durable goods in NIDS (2017) were used. The respondents had to respond to a list of household items that the household may or may not own (see Table 5.4). Following Marais et al. (2021) and Geldenhuys et al. (2021), the formula below was used to calculate the average number of assets.

$$\boldsymbol{Average\ number\ of\ assets} = \frac{\boldsymbol{Total\ number\ of\ assets\ in\ area\ i}}{\boldsymbol{number\ of\ households\ in\ area\ i}} \quad \text{……..Equation 3-3}$$

The average (mean) number of assets was compared across the five different mining regions. This method assumes that the higher the average number of assets, the higher the household wealth.

3.5.2.4 Emotional Health Composite Index

A composite index was developed to measure the level of depression within the population, using a modified version of the Centre for Epidemiologic Studies Depression Scale (CES-D) (Siddaway et al., 2017). Respondents answered ten questions (Appendix 5.1) on their feelings or behaviours over the preceding seven days, scored on a four-point scale: 1 - rarely or none of the time (less than 1 day); 2 - some or little of the time (1–2 days); 3 - occasionally or a moderate amount of time (3–4 days); 4 - all the time (5–7 days).

Two of the ten questions were positive items and were reverse scored. Responses were assigned numerical values as follows: first column = 0, second column = 1, third column = 2, fourth column = 3. Total scores ranged from 0 (minimum) to 30 (maximum).

3.5.2.5 Index for Social Cohesion

The index for social cohesion was created to identify the differentials in social cohesion across the five mining regions. The social cohesion index is usually derived from three dimensions: inequality, trust, and diversity (Dragolov & Boehnke, 2025). However, in this chapter, trust variables are used as a proxy for social cohesion. The proposed index is a variable reduction method used solely for the comparison of social cohesion in this chapter. Due to the limitations of the dimensions (one out of three), the index is to be used for comparison purposes only. The following steps were followed in constructing the index,

Step 1: Data preparation: The proportion of households that positively responded to each of the social cohesion questions were calculated per district.

Step 2: A correlation matrix was run to identify the correlations between the variables. The correlations between the variables were mixed with some very weak correlations (r=0,0004) and other strong correlations (r=0,6605).

Step 3: Principal Component Analysis was done and the variables Trust South Africans and Trust relatives had uniqueness values greater than 0,5 and therefore dropped from further factor analysis.

Step 4: A re-run of the PCA excluding the two variables above was done and all the variable had uniqueness values less than 0,5. Factor 1 had variance contribution of 43,37% and Factor 2 had a variance contribution of 29,68%.

Step 5: The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was run and all the KMO values were greater than 0,5.

Step 6: A pattern matrix showed two factors: Factor 1 (Trust other people, Trust own race, and Trust other races with rotated variance = 0,4247) and Factor 2 (Lost wallet found by close person and Lost wallet found by stranger, with rotated variance = 0,3059).

Step 7: The composite index was created with the rotated variances as the weights for the respective principal components or factors.

Step 8: The composite index was standardised using the minimum value and range of the variables.

3.5.2.6 Social Disruption Index (SDI)

The SDI is a composite index that combines all social disruption indicators into a single measure using factor analysis. The variables used to develop the SDI index included perceived health, emotional health, physical health, social cohesion variables, migration, household crime, unemployment, and mean total household income. The index development progressed through seven steps.

Step 1: The proportion of each indicator exposed to an event (each variable mentioned in the previous paragraph) per district was calculated. Standardised observations for each district were

generated using the STATA code, for example, *"egen float N_Perceived_health = std (Perceived_health), mean (0) std (1)"*.

Step 2: A correlation matrix that indicates the correlation coefficients between all the variables was generated. The correlation matrix showed a few coefficients above 0,5, but mostly below 0,5 (see Appendix 5.8). This means that there are low correlations between the variables.

Step 3: The Kaizer-Meyer-Olkin (kmo) measure of sampling adequacy was performed. The results showed kmo<0,5 for all variables except the variable Depressed. This result indicated that the data is unsuitable for further factor analysis.

Step 4: Alternative methods of creating a composite index exist. The available methods are the Simple Ranking Method, Indices Method, Range Equalisation Method, and the Mean Standardisation Method. The Mean Standardisation Method was chosen because it is a more robust method among the three methods as it: 1) standardises data to a common scale by calculating the mean and the standard deviation; 2) mitigates the impacts of outliers as it considers the entire data distribution; and 3) it aligns with standard statistical practices.

Step 5: A principal component analysis was performed on the standardised observations. The pattern matrix (Rotated factor loadings – see Appendix 9) and unique variances were visible, and all Uniqueness values were less than the prescribed 0,5 except "N_Cancer" which was dropped from further analysis (see Appendix 5.8).

Step 6: To generate the scores for each principal component the following STATA command was used:

"Predict pc1 pc2 pc3 pc4 pc5 pc6 pc7 pc8 pc9 pc10 pc11"

This created 11 new variables pc1, pc2, …, pc11 which are predicted scores for each of the 11 principal components.

Step 7: To create a composite index, the individual principal component scores were combined into a single variable using the weighted sum of the component scores. The explained variance for

each component was used as the weight. The following STATA code was used to generate the composite score:

"gen composite_index = (0,1289*pc1)+(0,10028*pc2)+(0,938*pc3)+(0,789*pc4)+(0,775*pc5)+(0,733*pc6)+(0,617*pc7)+(0,614*pc8)+(0,415*pc9)+(0,404*pc10)+(0,396*pc11)"

Step 8: Finally, the formula below created a standardised Social Disruption Index:

$$\boldsymbol{Standardized\ SDI = \frac{SDI_i - SDI_{min}}{SDI_{max} - SDI_{min}}} \ldots\ldots\text{Equation 3-4}$$

Where;

SDI_i is the SDI for District i

SDI_{min} is the minimum SDI in the data set

SDI_{max} is the maximum SDI in the data set

3.5.3 Analysis

Logistic regression was the main analysis method in this chapter and it takes the form:

$$\boldsymbol{logit\ (p) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k} \ldots\ldots\ldots\text{Equation 3-5}$$

Where:

P is the probability of the event occurring,

$logit\ (p) = Ln\ (\frac{p}{1-p})$ are the log odds of the outcomes

β_0 is the intercept,

β_1, β_2, …,β_k are the coefficients and are interpreted as odds ratios in the outputs.

$x_1, x_2, \ldots, x_3$ are continuous or categorical independent variables.

Using the same form of logistic regression, two sets of regression models were performed. The first set of regression models was based on household level data. The dependent (outcome) variables were each of the indicators of crime and safety, namely burglary, domestic violence, violence, gangsterism, murder, and drug abuse. The principal regressor (explanatory variable) was the mining region. Control variables included household income and the household asset index. The results of these models are presented in Appendix 5.1.

The second set of regression models were based on individual level data. The dependent variables were each of the indicators for perceived health (Appendix 5.2), emotional health (including bothered, mind, depressed, effort, hope, fearful, restless, happy, lonely, and get going – Appendix 5.3), physical health (tuberculosis, high blood pressure, diabetes, stroke, asthma, heart disease, and cancer – Appendix 5.4), and social cohesion (lost wallet found by a close individual, lost wallet found by a stranger, trust in South Africans, and trust in people of one's own race – Appendix 5.5). In these logistic regression models, the main regressor was the mining region variable. Control variables included gender, age group, employment status, highest level of education, and whether the individual had ever lived in another town.

3.5.4 Limitations

Several limitations of this objective are acknowledged. First, other potential determinants of social disruption, such as the physical characteristics of the regions or their proximity to metropolitan areas, could have been included as control variables in the regression models. However, these data were not available in the NIDS (2017) dataset. Second, the analysis is conducted at the district-level. While finer-grained data at the local municipality, main place, or sub-place level could provide additional insights, NIDS (2017) is representative only at the district-level. Third, many variables in this study are either perceptual (Crime and Safety, Perceived Health) or self-reported (Physical Health), which may introduce reporting bias. Fourth, the study does not differentiate between regions experiencing economic booms or busts, which could influence social disruption patterns. Finally, the dataset is cross-sectional rather than longitudinal, limiting the ability to make causal inferences or assess temporal changes in social disruption.

3.6 Data and analysis: Objective 2

3.6.1 Data

Table 3.6 presents the NIDS questions identified and employed to measure place attachment, using the psychological approach described earlier.

Table 3.6: Variables used in the analysis, NIDS, 2017

Variable Name	Question
w5_a_wblv	"Think about the area (village or suburb) in which you live. How strong is your preference to continue living in this area?"
w5_a_relocate	"What is the likelihood that you will move in the next two years?"
w5_a_moveyr	"In which year did you move?"
w5_a_lvevoth	"Have you ever lived in another suburb/town/or village?"

The variable *w5_a_wblv* – "Think about the area (village or suburb) in which you live, How strong is your preference to continue living in this area?", represented the independent variable "Preference to stay" in the analysis. The variable "w5_a_relocate" - What is the likelihood of moving within the next two years was used as a proxy for place attachment. The third variable, (c) length of stay, is derived using the variables *w5_a_moveyr* and *w5_a_lvevoth* and was one of the independent variables.

3.6.2 Measurement

3.6.2.1 Dependent variables

This chapter hypothesises that place attachment is a function of the person, process, and place dimensions. This section describes the dependent variable used in this analysis. The variable Willingness to relocate in NIDS (2017) is used as a proxy for place attachment. The corresponding survey question asks: *"What is the likelihood that you will move in the next two years?"* This variable measures the likelihood of an individual moving out of their current region of residence.

The underlying assumption is that individuals with strong place attachment have a lower propensity to move than those who are not attached. The variable was dichotomised as follows:

$$\boldsymbol{Relocate} = \begin{cases} \mathbf{0}\ \boldsymbol{if}\ \boldsymbol{w5-a-relocate} == \mathbf{4} \mid \boldsymbol{w5-a-relocate} == \mathbf{3} \\ \mathbf{1}\ \boldsymbol{if}\ \boldsymbol{w5-a-relocate} == \mathbf{2} \mid \boldsymbol{w5-a-relocate} == \mathbf{1} \end{cases} \text{.....Equation 3-6}$$

Where:

w5_a_relocate is the relocate variable in NIDS (2017);

w5_a_relocate==1 is Definitely relocating;

w5_a_relocate ==2 is Possibly relocating;

w5_a_relocate ==3 is Unlikely to relocate;

w5_a_relocate == 4 is Definitely not relocating

This new variable combines those who are definitely relocating and possibly relocating into one category (1) and combines those who are unlikely to relocate and definitely not relocating into another category (0).

3.6.2.2 Independent variables

This section discusses two sets of variables. The first set comprises the immediate determinants of willingness to relocate. Immediate determinants are those specified in the conceptual framework (Figure 2.15) under each dimension of the P-P-P model: 1) Person (age and employment), 2) Psychological Processes (length of stay, preference to stay, and homeownership), and 3) Place (mining region). The second set consists of sociodemographic variables, treated as control variables in the analysis.

3.6.2.3 Immediate Determinants

From the direct effects model (Figure 2.15), six immediate determinants of place attachment were identified: 1) Mining region, 2) Length of stay, 3) Preference to stay, 4) Homeownership, 5) Age group, and 6) Employment status.

Mining region: The primary explanatory variable is the mining region variable. Chapter 3 provides an overview of the five categories forming the mining region continuum.

Length of stay: This variable was derived from two questions in NIDS (2017): *"Have you ever lived in another suburb/town/village?"* and *"In which year did you move here?"* These questions were used to create a variable named Length of stay as follows:

Step 1: The first question separates respondents into two groups: those who have ever moved and those who have never moved. The two subsets were treated separately.

Step 2: For respondents who had moved, the following formula was applied:

$$\boldsymbol{Length\ of\ stay_{moved} = Survey\ year\ (2017) - Year\ moved\ .....}\text{Equation 3-7}$$

This formula gave an approximate number of years the individual has stayed in that region. The weakness is that the formula captures the last movement, not multiple movements.

Step 3: For those who never moved, the following formula applied:

$$\boldsymbol{Length\ of\ stay_{nevermoved} = Survey\ year\ (2017) - Year\ of\ birth.....}\text{Equation 3-8}$$

Step 4: Create another variable*, length of stay_1*, which combines those who moved and those who never moved to determine their length of stay in number of years.

Step 5: Create a binary variable as follows:

$$\boldsymbol{Length\ of\ stay_{final}} = \begin{cases} \boldsymbol{0\ if\ length\ of\ stay_1 < 20} \\ \boldsymbol{1\ if\ length\ of\ stay_1 \geq 20} \end{cases} \text{.....Equation 3-9}$$

The decision to have a cut-off of 20 years is a common theoretical threshold in place attachment literature (see Kasarda and Janowitz, 1974), who define Length of Residence = 1 for less than one generation (twenty years) and = 2 for more than one generation (including born here).

1. Preference to stay. The following question measured the preference to stay variable, *"Think about the area (village or suburb) in which you live. How strong is your preference to continue living in this area?"*. This question was measured with five possible responses: 1) Strong preference to stay. 2) Moderate preference to stay. 3) Unsure (no strong preference to stay or leave). 4) Moderate preference to leave. 5) Strong preference to leave. Option 3 was dropped from the analysis, and the variable was dichotomised as follows:

$$\boldsymbol{Preference} = \begin{cases} \boldsymbol{0\ if\ w5 - a - wblv == 4 \mid w5 - a - wblv == 5} \\ \boldsymbol{1\ if\ w5 - a - wblv == 1 \mid w5 - a - wblv == 2} \end{cases} \text{... ....Equation 3-10}$$

2. Homeownership. The question that measured homeownership states *"Does a household member own this dwelling?"*. This was a binary Yes or No question, and it was dichotomised already.
3. Employment status was dichotomised with those who were employed (=1) and unemployed (=0).
4. Age group. Six age groups were created. Only the adult population in considered in NIDS and these were categorised into six groups: (15-24), (25-34), (35-44), (45-54), (55-64), and 65+.

3.6.2.4 Sociodemographic Variables

These are control variables used in the regression models. These include the highest education level attained (as defined in the previous chapter), income stepladder, life satisfaction, and dwelling type. The type of dwelling has been dichotomised as formal and informal. The question was, *"Indicate the type of main dwelling the household occupies*." The variable was dichotomised as follows:

$$\boldsymbol{Type\ of\ dwelling} = \begin{cases} \mathbf{0}\ \boldsymbol{if}\ \boldsymbol{w5-h-dwltyp\ in}\ (\mathbf{7};\mathbf{8}) \\ \mathbf{1}\ \boldsymbol{if}\ \boldsymbol{w5-h-dwltyp\ in}\ (\mathbf{1};\mathbf{2};\mathbf{3};\mathbf{4};\mathbf{5};\mathbf{6};\mathbf{9};\mathbf{10}) \end{cases} \text{.....Equation 3-11}$$

Where is the variable in the question $w5-h-dwltyp$ had the following categories:

1 = Dwelling/house or brick structure on a separate stand or yard or on farm.

2 = Traditional dwelling/hut/structure made of traditional materials.

3 = Flat or apartment in a block of flats.

4 = Town/cluster/semi-detached house (simplex, duplex or triplex).

5 = Unit in retirement village.

6 = Dwelling/house/flat/room in backyard.

7 = Informal dwelling/shack in backyard.

8 = Informal dwelling/shack not in backyard, e.g., in an informal/squatter settlement or on farm.

9 = Room/flatlet.

10 = Caravan/tent.

The dichotomised variable "Type of dwelling" combined "7 = Informal dwelling/shack in backyard" and "8 = Informal dwelling/shack not in backyard e.g., in informal/squatter settlement or on a farm" into one category (0 = informal dwellings) and the rest were combined into the second category (1 = formal dwellings).

3.6.3 Analysis

The previous section dealt with the variables used in this chapter. This section deals with the methodology used to measure place attachment and compares it between the mining regions. The analysis follows four phases.

Phase 1: Descriptive analysis:

This initial phase shows the distribution of the respondents across the mining regions.

Phase 2: Tests of associations:

Testing the association between the dependent variable (willingness to relocate) and different sets of mining regions. The aim is to understand the overall associations between an individual's willingness to relocate (dependent variable) and how the association differs between mining regions. The initial procedure was to construct a 2 by 2 contingency table between the dependent variable and each combination of mining regions. Chi-square tests were done to test the association. Cramer's V statistics was used to check the strength and direction of the association.

Phase 3: Logistics regression.

Running the logistic regressions with *the willingness to relocate* as a proxy for place attachment. All the explanatory variables in section 5.2.4 were used in the analysis. The odds ratios were interpreted in this analysis.

Phase 4: Logistic regression with interaction terms.

A logistics regression model with interaction terms was employed to explore whether the relationship between place attachment and its determinants varies across different mining regions. Following Shiroshita et al. (2024), the model was specified as follows:

$$\boldsymbol{log}\left(\frac{\boldsymbol{P((Relocate=1)}}{\boldsymbol{1-P(Relocate=1)}}\right)=\boldsymbol{\beta_0}+\sum_{\boldsymbol{i=1}}^{\boldsymbol{k}}\boldsymbol{\beta_i X_i}+\sum_{\boldsymbol{j=1}}^{\boldsymbol{m}}\boldsymbol{\gamma_j R_j}+\sum_{\boldsymbol{i=1}}^{\boldsymbol{k}}\quad\sum_{\boldsymbol{j=1}}^{\boldsymbol{m}}\boldsymbol{\delta_{ij}}\left(\boldsymbol{X_i R_j}\right)+\boldsymbol{\varepsilon}\ldots\text{Equation 3-12}$$

Equation 3-12: The logistic model with interaction terms

Where:

X_i represents the explanatory variables

R_j represents the mining region

$X_i\ R_j$ denotes the interaction terms between explanatory variables and mining regions

The model was estimated in STATA 16, and the interaction terms allowed for testing of the relationship between each predictor and willingness to relocate across mining regions.

Phase 5: Generalised Structural Equation Modelling:

The previous phases assumed the direct model, Figure 5.1, based on the P-P-P model proposed by (Scannell & Gifford, 2010). This section assumes that there is a path in Place Attachment Theory that the path diagram in Figure 2.15 can represent.

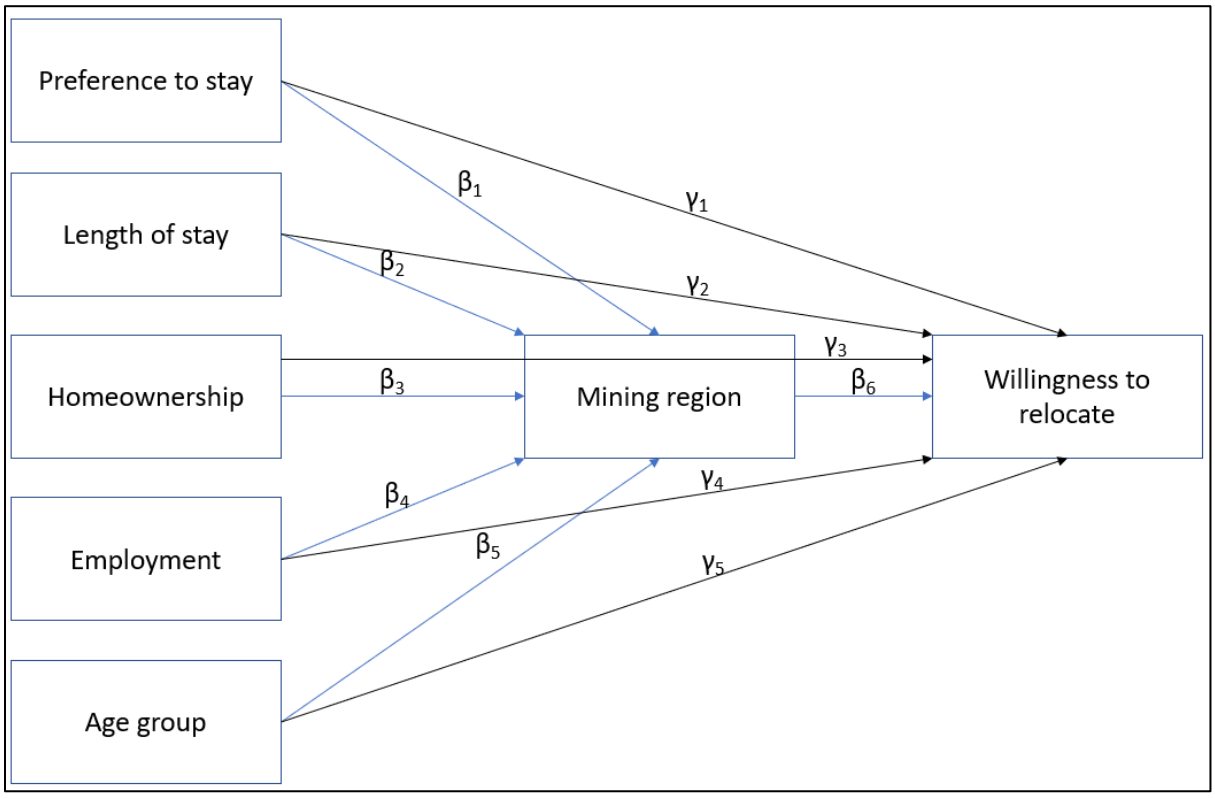


Figure 3.3: Path diagram - A modification of the direct model in the Conceptual Framework

Figure 3.3 shows that the mining region can be an intermediary variable for the effects of the explanatory variables on willingness to relocate. Generalised Structural Equation Modelling (GSEM) enables estimating direct, indirect, and total effects. The β_i are the indirect coefficients, while the γj are the direct effects. The total effects will be the sum of the direct and indirect effects, where the indirect effect is the product of the indirect coefficient multiplied by β_6. The direct effects are a direct estimation of the effects of the explanatory variables on the response variable (Willingness to relocate). The indirect effects are the effects of the explanatory variables on the response variable (Willingness to relocate) via the intermediary variable (Mining region) (Shown in Figure 3.3). This holistic approach enables the comparison of the effects of mining regions on place attachment.

3.7 Validity and Reliability of the NIDS Data

The selection of a data collection tool is guided by the research design, methods, aims, and objectives (Spolarich, 2023). The validity and reliability of the survey instrument are critical for determining the quality and effectiveness of the research (Thanasegaran, 2009). Three key attributes are commonly assessed when evaluating reliability in quantitative research. First, stability refers to the consistency of results when a data collection tool is used repeatedly. Second, equivalence evaluates inter-rater reliability, ensuring that different users applying the instrument produce comparable results. Third, internal consistency measures the degree to which items within a scale reliably assess the same construct. This is often quantified using inferential statistics, including Cronbach's alpha, Kuder-Richardson, split-half reliability, or item-total correlations. Cronbach's alpha, the most frequently used measure, ranges from 0 to 1, with acceptable reliability scores between 0,7 and 1,0. Scores below 0,7 indicate moderate or weak correlation, suggesting the items may not reliably measure the intended construct (Olmsted, 2024).

In this secondary data analysis, Cronbach's alpha was applied to assess internal consistency. The results were as follows: 0,8079 for the crime construct, 0,5132 for emotional health, 0,4527 for

physical health, and 0,5596 for social cohesion. These findings indicate that while the crime scale reliably measures its construct, the emotional health, physical health, and social cohesion scales only moderately capture their intended attributes. This limitation reflects a common challenge in secondary data analysis. For instance, social cohesion comprises trust, inclusive identity, and cooperation; however, NIDS measures only trust.

3.8 Data and analysis Objective 3

3.8.1 Data

SAPS crime statistics for the period 2014 to 2023 and mining FTE employment data from the National Treasury, also for the period 2014 to 2023 were also utilised at the district municipality level. The two datasets were merged using the district municipality as a unique identifier to facilitate analysis addressing Research Objective 3.

3.8.1.1 Crime Data

SAPS crime statistics document offences reported at 1 163 police stations across South Africa, including satellites and ports of entry. Crimes are recorded either when reported by the public or detected by the police. Each crime type is assigned a code, aggregated into Daily Summary of Serious Crime (DSSC) codes for operational and strategic purposes. The data primarily focus on 25 community crimes, grouped into five categories: contact crimes, sexual offences, contact-related property crime, property crimes, and crimes detected through police action. Further methodological details are provided in the empirical chapters.

Crime data were obtained from the South African Police Services (SAPS) as raw data at the police station level and subsequently aggregated to the district-level. Mid-year population estimates were sourced from Stats SA to calculate crime rates using Equation 6-1. SAPS crime statistics are categorised into community-related reported crimes and crimes detected through police action (SAPS, 2025). This chapter focuses on community-related crimes. Table 6.3 presents the five crime categories and the specific offences included under each category. Data from three ports of entry: Gauteng: Ports of Entry: Air, KwaZulu-Natal: Ports of Entry: Air, and KwaZulu-Natal: Ports

of Entry: Sea were excluded, as these were considered non-community-related. Table 3.7 summarises the SAPS classification of crimes used in this chapter.

Table 3.7: Categories and types of crimes in South Africa

Crime categories				
Contact Crimes	Sexual Offences	Contact-Related Property Crimes	Property-Related Crimes	Crime due to police action
• Murder • Attempted Murder • Assault with intent to cause gross bodily harm • Common Assault • Common Robbery • Robbery With Aggravated Circumstances (RWAC)	• Rape • Sexual assault • Attempted Sexual Assault • Contact sexual offence	• Robbery at non-residential premises • Robbery at residential premises • Carjacking • Arson • Malicious damage to property	• Burglary at non-residential premises • Burglary at residential premises • Theft of a motor vehicle and motorcycle • Theft out of or from a motor vehicle • Stock theft • Shoplifting*	• Drug-related crime • Illegal possession of a firearm • Driving under the influence of alcohol or drugs • Kidnapping

Source: (SAPS, 2025)

*The SAPS classified shoplifting under “Other serious crimes”

Contact crimes are offences in which victims are directly subjected to violence, or where property is targeted and individuals present during the commission of the crime are exposed to threats or actual violence (SAPS, 2025). These crimes include murder, sexual offences, attempted murder, assault gross bodily harm (GBH), common assault, common robbery, and RWAC. Although

sexual offences are classified under contact crimes, they are discussed separately under the sexual offences category. According to the South African Department of Justice (2007), key elements of sexual offences include the perpetrator's intent and the victim's lack of voluntary, unforced consent.

Contact-related crimes encompass offences arising from interactions with other people that may also involve property, often in a property-related context (SAPS, 2025).

Property crimes are acquisitive in nature and include theft, burglary, fraud, and other acts in which the perpetrator unlawfully seeks to obtain goods or money from another person's property. This category also includes vandalism, which is intended to damage property (McGuire, 2004).

Crimes detected due to police action are generally not reported by victims but are identified through intelligence gathering and law enforcement operations. These crimes are recorded following the apprehension of suspects and typically include offences such as unlawful possession of firearms or ammunition, drug-related crimes, driving under the influence of alcohol or drugs, and certain sexual offences (SAPS, 2025).

The crime rates for each district were calculated as follows:

$$\boldsymbol{Crime\ rate\ per\ 100,000\ in\ Year\ (i)} = \frac{\boldsymbol{Total\ number\ of\ reported\ cases\ in\ Year\ (i)}}{\boldsymbol{Mid-year\ population\ estimates\ in\ Year\ (i)}}\ \boldsymbol{x\ 100,000} \quad \text{... ... .Equation 3-13}$$

Metropolitan areas were excluded from the analysis.

3.8.1.2 Mining employment data

Mining employment data were obtained from the South African National Treasury Spatial Tax Panel (SEAD-SA) database. Originally, this data was accessible only at the secure National Treasury data facility, requiring special permission for on-site use. With the publication of the SEAD-SA database, the data are now publicly available. According to the data custodians, several limitations exist, including human errors (Nell & Visagie, 2025). A notable issue is the head office effect, where mining companies report employees at the head office rather than the district in which

the mine is located. This leads to spikes in metropolitan areas and undercounting in other districts (Nell & Visagie, 2025). The data are presented as FTE employment, representing the number of full-time equivalent employees. As defined by Nell and Visagie (2025:10), 1 FTE corresponds to an individual working 100% of the temporal period, while 0,5 FTE represents a person working 50% of the corresponding period (e.g., six months for a tax year or 15 days for a 30-day month). The dataset spans ten years (2014–2023) at the district municipality level, with metropolitan areas excluded from the analysis.

3.8.2 Analysis

This section outlines the statistical methods applied in the analysis. First, temporal patterns and relationships between each type of crime were examined from 2014 to 2023, based on the 25 distinct crime types identified by SAPS (see Table 6.3). Second, mining employment, measured in FTE, was analysed across the mining regions over the same period, enabling a comparative understanding of trends in employment. Third, lagged panel regression analysis was conducted to assess the relationship between each type of crime and lagged mining employment per mining region. The general formula used for the lagged panel regression was:

$$\boldsymbol{Y_{it} = \beta_0 + \beta_1 FTE_{i,t-1} + \varepsilon_{it}}$$ .....Equation 3-14

Where:

- Y_{it}: Crime rate (per 100,000 people) in district *i* at time *t*
- $FTE_{i,t-1}$: Full-Time Equivalent employment in district *i* at time $t-1$
- ε_{it}: Error term

Fourth, a lagged panel regression analysis assessed the relationship between crime and the interaction between mining employment and mining region for each crime type. Each crime type was regressed on mining employment, allowing for variation across mining regions (very low, low, medium, high, very high). The general model specification used in the panel regression analysis is shown below:

$Y_{it} = \beta_0 + \sum_{k=0}^{4} \beta_k (FTE_{it-1} * Mining_region_{ik}) + \varepsilon_{it}$----------Equation 3-15

Where:

- Y_{it} is the crime rate in region *i* at time *t?*
- FTE_{it-1} represents the one-year lagged number of full-time equivalent mining employees;
- $Mining_region_{ik}$ are dummy variables for the mining region categories (0 = very low to 4 = very high);
- ε_{it} is the idiosyncratic error term.

Interaction terms were incorporated into the panel regression models to examine how mining employment affects crime across different mining regions (see Equation 6-3). Specifically, mining employment (measured in FTEs) was interacted with a categorical mining region variable (coded 0 = very low to 4 = very high), allowing estimation of region-specific effects.

Given the challenges of interpreting interaction coefficients in non-linear or semi-log panel models, marginal effects were calculated and interpreted. These represent the estimated change in the dependent variable (crime rate) for a unit change in mining employment, conditional on the mining region category (see Equation 6-3). Marginal effects capture the average partial effect of mining employment within each region, with standard errors estimated using the delta method. Statistical significance was assessed at conventional thresholds ($p < 0,05$ and $p < 0,10$). This approach provides a more intuitive interpretation of the interaction than raw coefficients, enabling insights into how mining employment influences crime differently across regions.

The following assumptions were considered; 1) Linearity: The relationship between the dependent variable (crime rate) and the independent variable (mining employment, FTEs) is linear in parameters. Residual plots against predicted values showed no systematic patterns, indicating that the linearity assumption holds. 2) Independence: Observations within each panel are assumed independent, with no correlation across panels. 3) Homoscedasticity: Residual variance should be

constant across all levels of the independent variables. Robust standard errors were used to ensure valid inference even if homoskedasticity or no autocorrelation assumptions were violated. 4) Multicollinearity: Independent variables should not be highly correlated. As only one independent variable was included in the models (Equations 6-2 and 6-3), multicollinearity was not a concern. 5) Endogeneity: Occurs when an independent variable is correlated with the error term. Fixed effects (FE) models were employed to control for time-invariant, unobserved regional characteristics. FE models use within-region variation, while random effects (RE) models use both within- and between-region variation. The Hausman test compared FE and RE estimators; p-values > 0,05 indicated that the RE model is more appropriate. These tests were conducted for all 25 models (Appendix 6.2). 6) Normality: Residuals are assumed normally distributed. Given the panel sample size (n = 440), normality is justified via the Central Limit Theorem. 7) Finally, diagnostic checks were performed to confirm the robustness and appropriateness of each panel regression model.

3.9 Conclusion

This chapter has outlined the methodological framework adopted to examine the social consequences of mining activity in non-metropolitan regions of South Africa. Anchored within a positivist paradigm, the study employs a quantitative research design informed by social disruption theory and place attachment theory to ensure theoretical coherence and empirical relevance. The methodological approach was structured to address the study's three objectives through complementary analytical strategies that capture both cross-sectional relationships and temporal dynamics.

Objectives 1 and 2 were investigated using a cross-sectional explanatory design, drawing on nationally representative data from the National Income Dynamics Study (NIDS) Wave 5 (2017). Generalized Structural Equation Modelling (GSEM) was employed to estimate the relationships between mining intensity, social disruption, and place attachment, allowing for the simultaneous modelling of multiple dependent variables and mixed data types. Place attachment was operationalised using willingness to relocate as a proxy, while social disruption was captured

through validated indicators of emotional health, physical health, and social cohesion derived from the NIDS dataset.

Objective 3 adopted a longitudinal panel regression design to assess the relationship between crime and mining-related employment over the period 2014–2023. This analysis utilised official crime statistics from the South African Police Service and Full-Time Equivalent (FTE) mining employment data from the South African National Treasury Spatial Tax Panel (SEAD-SA). Lagged specifications and interaction terms between mining employment and mining region were incorporated to account for delayed effects and region-specific dynamics, while diagnostic tests, including the Hausman test, guided the selection of appropriate panel estimators.

Across all objectives, the study focused on 44 non-metropolitan district municipalities, classified into five mining regions based on the contribution of mining to district-level Gross Value Added, using data from the District Development Model Diagnostic Reports. This classification enabled a systematic comparison of social outcomes across varying intensities of mining activity.

Overall, the methodological approach adopted in this study provides a robust and integrated framework for analysing the multidimensional social impacts of mining. By combining cross-sectional and panel data techniques, leveraging high-quality secondary datasets, and applying advanced econometric modelling, the study ensures methodological rigour and positions the empirical findings to make a meaningful contribution to the literature on mining, social disruption, and place attachment in South Africa.

CHAPTER 4: SOCIAL DISRUPTION AND MINING IN NON-METROPOLITAN MINING REGIONS IN SOUTH AFRICA.

4.1 Introduction

The theoretical framework and key concepts discussed in Chapter 2 provide the foundation for this chapter, which examines social disruption across different mining regions in South Africa. As noted earlier, the social disruption hypothesis suggests that increased economic activity, often driven by mining, in small urban areas or rural settings can disturb the functioning and structure of local communities. Forms of social disruption include increased crime, poorer health outcomes, displacement and migration, higher poverty and unemployment rates, inequality, social unrest and protests, and a loss of social cohesion and trust. This chapter analyses empirical evidence of social disruption by comparing non-metropolitan regions in South Africa according to the degree of mining activity.

Mining produces both positive (Smith et al., 1971; Cust & Poelhekke, 2015; Jones & Mayzer, 2021) and negative (Gilmore, 1976; Krannich & Luloff, 1991; Brown et al., 2005; Slack, 2009) socioeconomic effects on local communities. Positive outcomes include increased local income, employment opportunities, and dynamism in small businesses (Worlanyo & Jiangfeng, 2021). Adverse effects include rising crime, rapid urbanisation and displacement, housing shortages, social fragmentation, negative attitudes towards education, and concerns regarding community well-being (White, 2013; Cust & Poelhekke, 2015; Esposito & Abramson, 2021; Leuenberger et al., 2021). Overcrowding and heightened resource demand can fuel criminal activity, while economic inequality contributes to social discontent and unrest. Inadequate housing may exacerbate living conditions, particularly for lower-income residents. Social fragmentation can weaken networks and reduce overall well-being, while job competition and rising living costs can contribute to mental health challenges.

Research on economic benefits or resource attraction during boom periods often overlooks the social consequences for local communities (Chuhan-Pole & Aragon, 2015). Rapid economic development frequently leads to social disruptions, including increased crime, high levels of in- and out-migration, housing shortages, health issues, and other social ills. A growing body of research has examined social disruption in local communities (Dyer et al., 1992; White, 2013; Williams & Measham, 2013; Ntema et al., 2017; Lebre et al., 2021; Marais et al., 2022), although outcomes may differ between the Global North and Global South.

Existing research identifies several themes (see Chapter 2). First, resource extraction exhibits a dual nature: its economic benefits coincide with negative social consequences, such as increased crime (Perez-Sindin, 2021), health problems (Beleche & Cintina, 2018), and social conflict (Okeagu et al., 2006). Mining activities are associated with adverse health outcomes, including mental health disorders and increased rates of infectious diseases (Haggerty et al., 2014). Literature also highlights workplace health and safety risks and, more recently, community-level impacts such as HIV prevalence (Hermanus, 2007; Chanda-Kapata, 2020; Leuenberger et al., 2021; Dietler et al., 2022). High incidences of silicosis and tuberculosis among mineworkers further exemplify health risks (Ololade et al., 2021). Migration can destabilise communities, affecting social cohesion and increasing pressure on housing and public services (Lawrie et al., 2011; Jong, 2017). Mining may also contribute to conflict, violence, and poverty (Okeagu et al., 2006; Slack, 2009; Haggerty et al., 2014).

Second, some studies argue that social disruption is initially pronounced but diminishes over time as communities adapt and new social structures emerge (Parsons, 1951; Freudenburg, 1984; Petrova & Marinova, 2013), suggesting that negative effects of mining are not necessarily permanent. Third, despite this attenuation, there is limited discussion of positive social consequences associated with mining.

In South African mining towns, three primary forms of social disruption have been observed. First, increases in crime, drug abuse, prostitution, and cannabis use have been documented (Marais et al., 2019; Marais et al., 2022). Comparative studies indicate that murder rates are higher in regions experiencing mining decline than in other areas (Marais et al., 2022). Second, social disruption manifests as pressure on social infrastructure, declines in service provision, and deteriorating living standards (Siyongwana & Shabalala, 2019; Marais et al., 2019; Marais, Cloete et al., 2022). Third, in-migration initially exacerbated challenges, increasing the number of households in informal settlements and creating distinctions between newcomers and long-term residents (Marais et al., 2019; Marais, Cloete et al., 2022). Evidence regarding social disruption from mine closures and out-migration is mixed; some studies find that closures induce out-migration (Siyongwana & Shabalala, 2019), whereas homeownership appears to inhibit mobility (Ntema et al., 2017; Marais & De Lange, 2021).

Methodological limitations characterise many South African studies. Most are single-case studies and do not provide national-level or comparative data (Marais, Ndaguba et al., 2022; Marais, Cloete et al., 2022 are exceptions). Analyses often assume a binary distinction between mining and non-mining regions, rarely considering the varied impact of mining intensity. Furthermore, limited research exists on differences in social disruption across regions with varying levels of mining activity. This chapter addresses these gaps by comparing social disruption across mining regions and categorising them according to mining intensity. A national comparative assessment outside metropolitan areas using a scaled approach is therefore warranted.

This chapter is structured in four parts. The first part discusses the methods, including the conceptual framework, sample, data, dependent and independent variables, analysis methods, and measurements. The second part presents results according to social disruption themes, followed by a discussion and conclusion.

This chapter addresses the research gap identified above by examining the social disruptions associated with mining activities in non-metropolitan districts of South Africa. The primary objective is to determine whether differences exist across selected social disruption indicators such

as perceived health, physical health, emotional health, perceived crime, social cohesion, migration, welfare, and unemployment between regions with varying levels of mining activity.

4.2 Results

The results are organised according to the thematic dimensions of social disruption. The section begins with sociodemographic characteristics, followed by findings from the logistic regression analyses for perceptions of crime, social cohesion, perceived health, emotional health, including CES-D scores, physical health, and, finally, the composite Social Disruption Index.

4.2.1 Sociodemographic variables of the sample

The highest proportion of males (23,80%) is observed in the very high mining regions, corresponding with the highest sex ratio (76,19%) in these areas. This trend likely reflects historical restrictions on women in underground mining, as mining remains a globally male-dominated sector. The highest proportion of employed individuals is also found in very high mining regions (23,95%), which aligns with migration patterns indicating that the largest share of individuals who have ever moved resides in these regions (26,33%).

Household income perceptions display a complex pattern. The highest proportion of households perceiving their income as being in the lowest rung of the six-step ladder is in very high mining regions (24,82%). Simultaneously, the highest proportion of respondents reporting extreme dissatisfaction with life is found in these regions (31,08%), yet the highest proportion of those expressing very high life satisfaction is also recorded in very high mining regions (30,33%). This indicates a polarised distribution of well-being within the same mining category.

Educational attainment shows a modest increase with mining intensity, with very high mining regions recording the highest average years of education (9,20). Similarly, the highest average total household income is found in these regions (R7 533,46), alongside the highest asset index (7,95), suggesting comparatively greater household welfare relative to very low-mining regions.

Overall, these statistics indicate that very high mining regions are characterised by higher incomes, greater assets, male predominance, and elevated in-migration. At the same time, these regions also

include the largest percentages of respondents perceiving their incomes as low and reporting both high dissatisfaction and high satisfaction with life. The descriptive data highlight the presence of the fundamental conditions for social disruption, setting the stage for the subsequent analysis of the main indicators of social disruption.

4.2.2 Crime and safety variables

This subsection presents the results for perception of crime (see Appendix 5.2). Individuals were asked how common a type of crime was in their neighbourhood and the statistically significant results are presented in Figure 4.1. Furthermore, the results of the crime rates per mining region are presented in Figure 4.2.

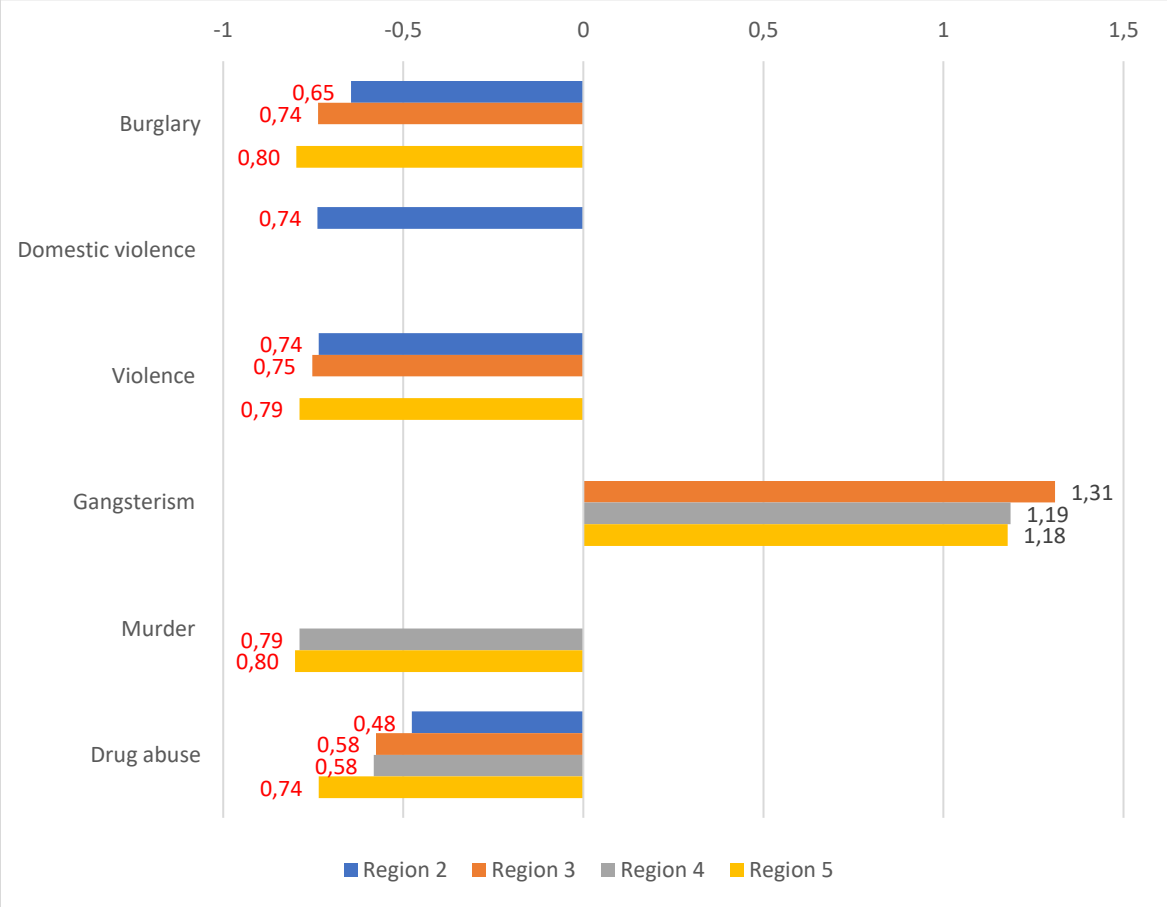


Figure 4.1: Odds ratios of all the other mining regions vs the very low-mining region by type of crime

*Note: Only statistically significant results at 95% level are shown

The results show that households in very high mining regions have lower odds of indicating that burglary is common in their neighbourhood than households in very low-mining regions (OR=0,80). The same pattern is observed for violence (OR=0,79), murder (OR=0,80), and drug abuse (OR=0,74). For domestic violence, the odds of households in low-mining regions indicating that domestic violence is common in their neighbourhood are lower than households in very low-mining regions (OR=0,74). The presence of gangsterism is contradictory to the above findings. The odds of households in very high mining regions indicating gangsterism is common in their neighbourhood is higher than that of households in very low-mining regions (OR=1,18). The results show that mining activities are, excluding the evidence on gangsterism, not linked to higher crimes, as stated by the social disruption hypothesis.

4.2.3 Trends in perceived crime rates

This section presents the crime rates per mining region (Figure 4.2). The crime rates were calculated using the number of cases per 100 of the sample respondents.

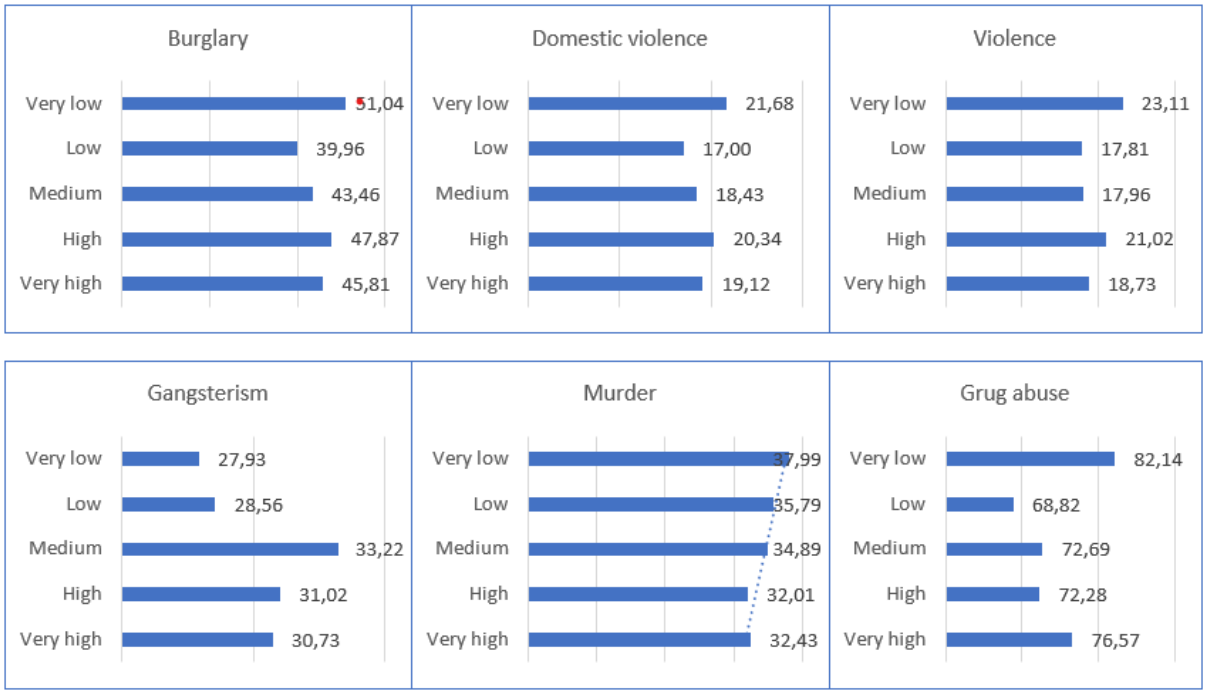


Figure 4.2: Trends in perceived crime per 100 respondents by mining region

Figure 4.2 shows that the crime rate for burglary is highest in the very low-mining region (51,04 per 100 respondents), decreases in the low-mining regions (39,96 per 100 respondents), and gradually increases for the medium mining regions (43,46 per 100 inhabitants) and high-mining regions (47,87 per 100 respondents) and decreases for very high mining regions (45,81 per 100 respondents). Similar trends are observed for domestic violence and violence. The trend for gangsterism, in general, increase from 27,93 per 100 respondents in the very low-mining regions to 30,73 per 100 respondents in the very high mining regions. However, there is a noticeable peak of 33,22 per 100 respondents in the medium mining region. Murder rates show declining crime rates from 37,99 per 100 respondents in very low-mining regions to 32,43 per 100 respondents in very high mining regions. Drug abuse shows a trend where the crime rates are highest in the very low-mining regions (82,14 per 100 respondents), decreases to 68,82 per 100 respondents in low-mining regions and increases to 72,28 per 100 respondents in the high-mining regions before it increases to 76,57 per 100 respondents in very high mining regions.

4.2.4 Social cohesion

The literature suggests that the adverse effects of mining are visible in the lack of social cohesion within mining regions (see Chapter 2). This disruption can result from new community entrants (migrants) causing instability. Appendix 5.3 provides detailed results of the logistic regression. Figure 4.4 provides the odds ratio for those indicators that were statistically significant compared to very low-mining regions.

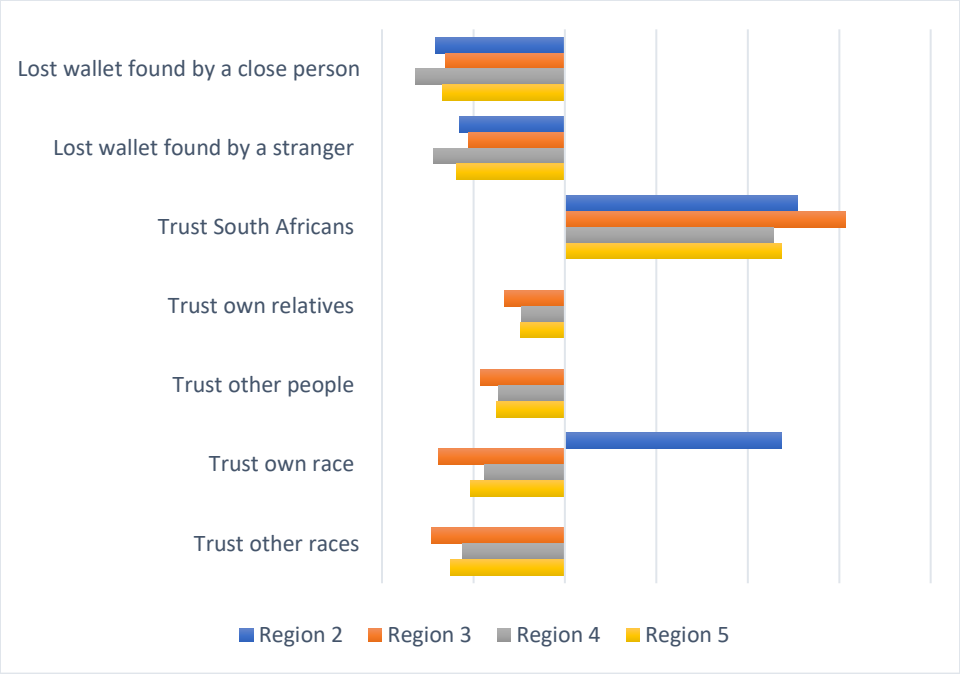


Figure 4.3: Odds ratios of all the other mining regions vs the very low-mining region by social cohesion variables

*Note: Only statistically significant results at 95% level are shown

Figure 4.3 shows that the odds of an individual in very high mining regions getting back their lost wallet, given that a close person found it, are lower than for individuals in very low-mining regions (OR=0,672). The same pattern is observed for returning a lost wallet that a stranger found but with even lower odds (OR=0,59). These results mean that social cohesion, as measured by the recovery of lost wallets, is lower in very high mining regions than in very low-mining regions.

Figure 4.4 further indicates that the odds of individuals in very high mining regions trusting their own relatives are lower than those in very low-mining regions (OR=0,25). The same pattern is observed for trusting other people (OR=0,38), trust own race (OR=0,51), and trusting other races (OR=0,62). In contrast, the results show the opposite regarding trusting South Africans, where the odds of individuals in very high mining regions trusting their South Africans are higher than individuals in very low-mining regions OR=1,18).

The results show that while individuals in very high mining regions do trust South Africans more than individuals in very low-mining regions, social cohesion at the local level is lower in very high mining regions compared to very low-mining regions. This confirms the social disruption theory that mining disrupts local communities' norms and functions, resulting in less social cohesion (Figure 4.4).

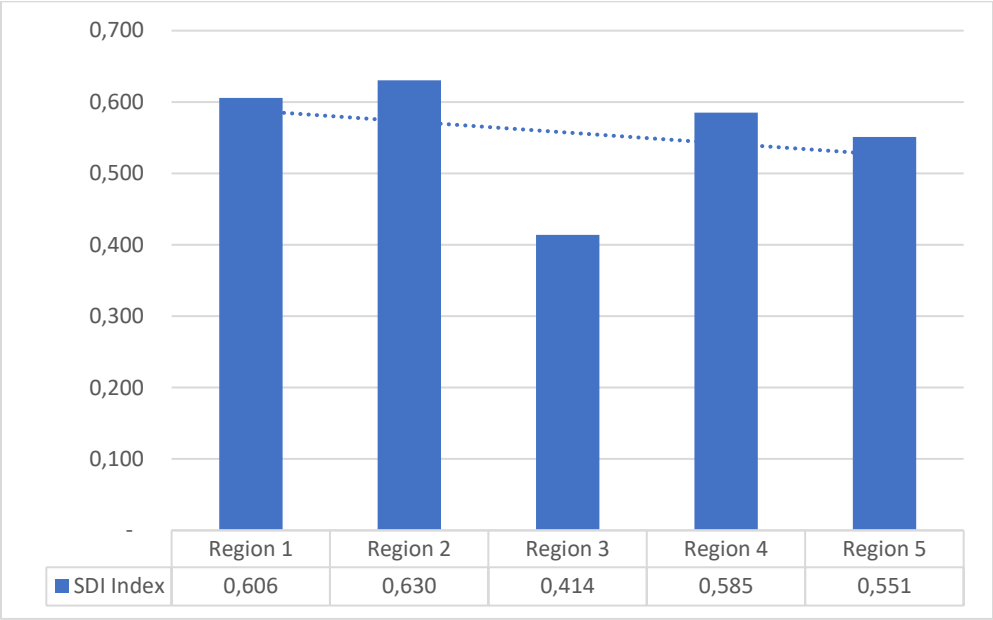


Figure 4.4: Index of cohesion across the mining regions

Figure 4.4 shows that the index of cohesion is highest in the very low-mining regions and decreases to 0,49 for both high and very high mining regions. This further confirms the support of the social disruption theory.

4.2.5 Health

Research has shown that mining activities create health problems (Pretorius & Blaaw, 2021). Health indicators in this chapter are measured using three variables: perceived, emotional, and physical health (see Table 3.4 for the detailed questions). The literature refers to mental health problems as part of social disruption theory.

4.2.5.1 Perceived Health

Perceived health was measured using only one question, which asked the respondent how they would describe their health at the time of the survey. There is no statistically significant difference in the odds of individuals in very high and very low-mining regions perceiving themselves to be in good health. Only one comparison is statistically significant (see Appendix 5.4). The odds of individuals in a low-mining region perceiving themselves as in good health is 43,9% higher than in a very low-mining region.

4.2.5.2 Emotional Health

Two instruments were utilised to obtain emotional health results: the individual items that measure emotional health and how they score between the five categories and the CED-S methodology. No South African study has compared mental health outcomes based on the level of mining activities in a region. Figure 4.6 provides the odd ratios for those statistically significant aspects. The emotional health questions are in Appendix 5.5 and the detailed results are in Appendix 5.6.

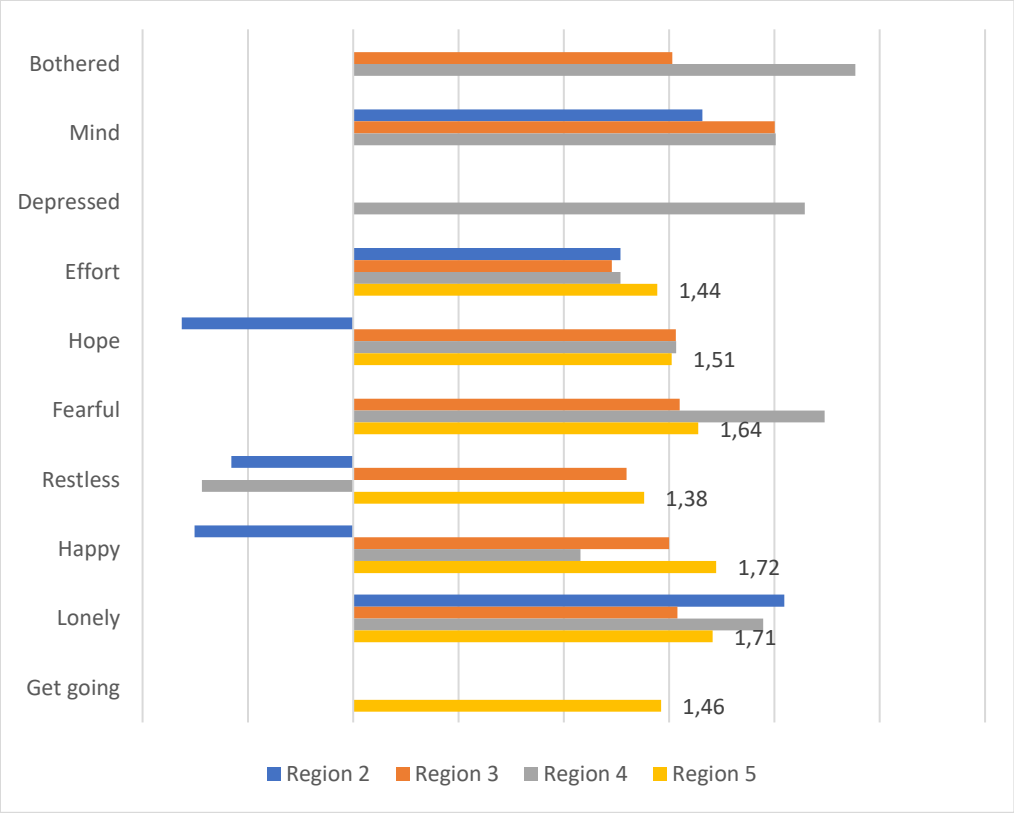


Figure 4.5: Odds ratios of all the other mining regions vs the very low-mining region by emotional health variables

*Note: Only statistically significant results at 95% level are shown

Figure 4.5 shows the odds for individuals in very high mining areas indicating that they felt that everything they did needed an effort is 44% higher than those in very low-mining regions (OR=1,44). The same pattern is observed for feeling fearful (64% higher in very high mining regions than very low-mining regions, OR=1,64), feeling restless (38% higher in very high mining regions than very low-mining regions, OR=1,38), feeling lonely (71% higher in very high mining regions than very low-mining regions, OR=1,71), and get going (46% higher in very high mining regions than very low-mining regions, OR=1,46). Counterintuitively, there are higher odds for feeling hopeful about the future (51% higher in very high mining regions than very low-mining regions, OR=1,51), and feeling happy (72% higher in very high mining regions than very low-mining regions, OR=1,72).

Overall, Figure 4.5 shows that despite feeling happier and hopeful, individuals in higher mining activities have higher odds of feeling symptoms of emotional distress than those in regions with lower mining activities.

4.2.4.3 CES-D index scores

The CES-D score was calculated to combine the individual emotional scores, and a summary of the results is shown in Table 4.1.

Table 4.1: Mean CES-D index scores per mining region

Mining region	**Mean-CES-D Score**	**Std.Dev.**	**Freq.**
Very low	6,562	4,217	3,246
Low	6,684	4,143	3,516
Medium	6,404	4,152	3,786
High	7,126	4,706	3,37
Very high	5,834	4,153	3,947
Total	**6,498**	**4,293**	**17,865**

The CES-D methodology stipulates that the higher the score, the higher the presence of depression symptomatology. Table 4.1 shows that respondents in very high mining regions have a lower symptomatology of depression, with a score of 5 834, compared to individuals in very low-mining regions, with a score of 6 562. This is counterintuitive as the social disruption theory stipulates that rapid economic growth results in higher levels of depression. However, the pattern shows that indeed, the CES-D score increases in the continuum, drops in the medium mining region, and increases steeply in the high-mining regions and drops significantly in very high mining regions. Further analysis in Figure 4.6 shows even more interesting results.

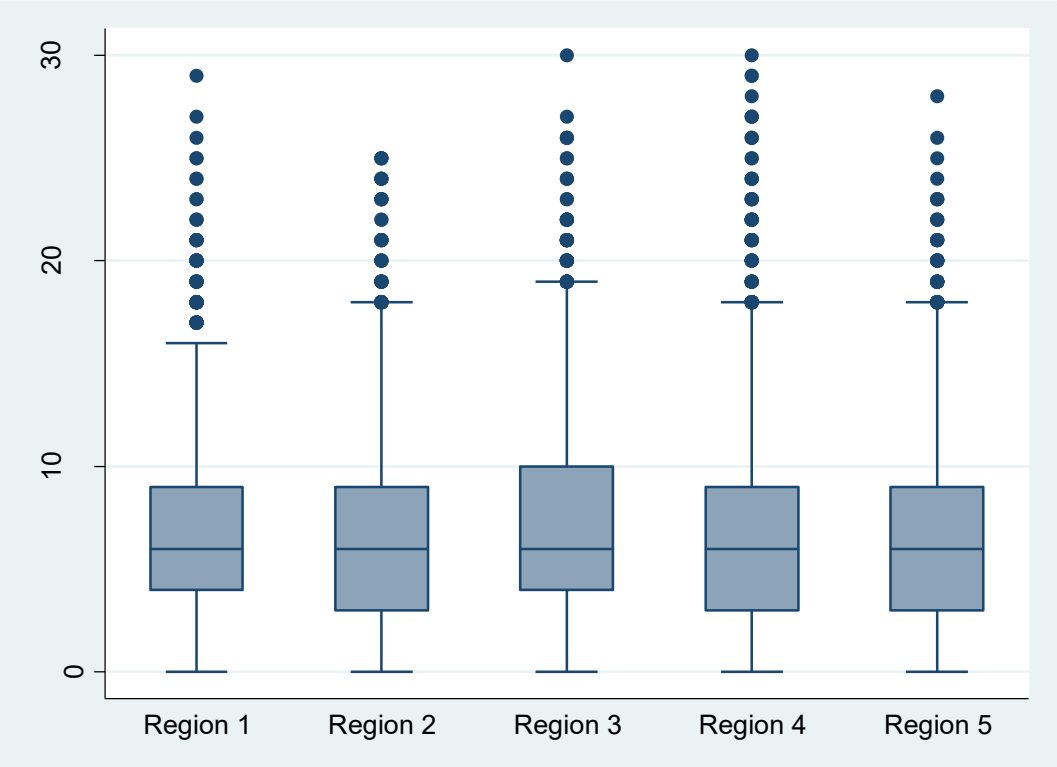


Figure 4.6: Box-and-whisker plot showing the CES-Depression scores across the mining regions

Figure 4.6 shows that all five categories have many outliers in the data. However, the medians show that the CES-D scores increase in the continuum up until high-mining regions and drop significantly in very high mining regions. Because of the many outliers identified in the data, the non-parametric Kruskal Wallis test for equality of populations rank test was done to compare the means for the five mining regions. Furthermore, post hoc Dunn's test was performed to examine the significance of the differences between the CES-D scores, the results of which are shown in Table 4.2 The difference between very low-mining areas and very high mining regions was 8,509 and p-value=0,000. This means that the CES-D rank score of very low-mining regions is higher by 8,509 points than the rank score for very high mining regions indicating higher symptomatology of depression in very low-mining regions compared to very high mining regions.

Table 4.2: Dunn's test results for the difference in CES-D rank scores between the mining regions

Difference	**Values**
Very low-Low	-0,84274
p-value	*0,1997*
Very low -medium	1,886447
p-value	*0,0296*
Very low-high	-3,85991
p-value	*0,0001*
Very low - Very high	**8,509287**
p-value	***0,0000***

4.2.5.3 Physical Health

The social disruption hypothesis suggests that increased economic activity increases disease burden. The methodology used in this section captures diseases per mining region as classified above. The regression analysis controlled for age.

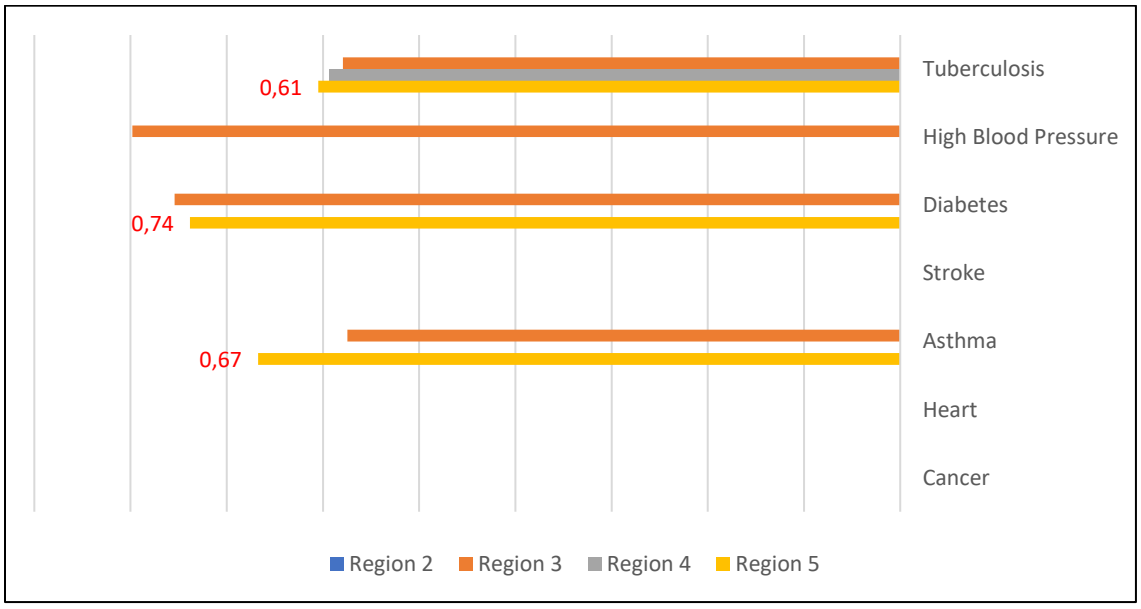


Figure 4.7: Odds ratios of all the other mining regions vs the very low-mining region by physical health variables

*Note: Only statistically significant results at 95% level are shown

Figure 4.7 indicates lower odds for Tuberculosis (OR = 0,61), Diabetes (OR = 0,74), and Asthma (OR = 0,67) in very high-mining regions compared to very low-mining regions. There are no statistically significant differences in the likelihood of being diagnosed with stroke, heart disease, or cancer across the mining regions (see Appendix 5.8). These findings are counterintuitive, as they suggest a lower disease burden in very high-mining regions than in very low-mining regions.

4.2.6 Social Disruption Index (SDI)

The Social Disruption Index (SDI), described in section 3.5.2.6, is a composite measure that integrates all factors indicative of social disruption (see the list of variables in Table 3.4). Table 4.3 presents the mean SDI values across the five mining regions. The results indicate that very low-mining regions exhibit a higher mean SDI (0,6056) compared to very high-mining regions (0,5509), suggesting comparatively greater social disruption in regions with minimal mining activity.

Table 4.3: Mean SDI scores per mining region

Mining region	Mean SDI	Std dev	N
Very low	0,6056	0,2306	8
Low	0,6303	0,2406	7
Medium	0,4140	0,1882	8
High	0,5853	0,2301	10
Very high	0,5509	0,2807	11
Total	0,5564	0,2392	44

The results show that low-mining regions have on average, the highest SDI index (0,6303), followed by very low-mining regions (0,6056). The lowest SDI index is in the medium mining regions (0,4140). High-mining regions have an SDI index of 0,5853, while very high mining regions have an SDI index of 0,5509. The box-and-whisker plot (Figure 4.8) shows further insights.

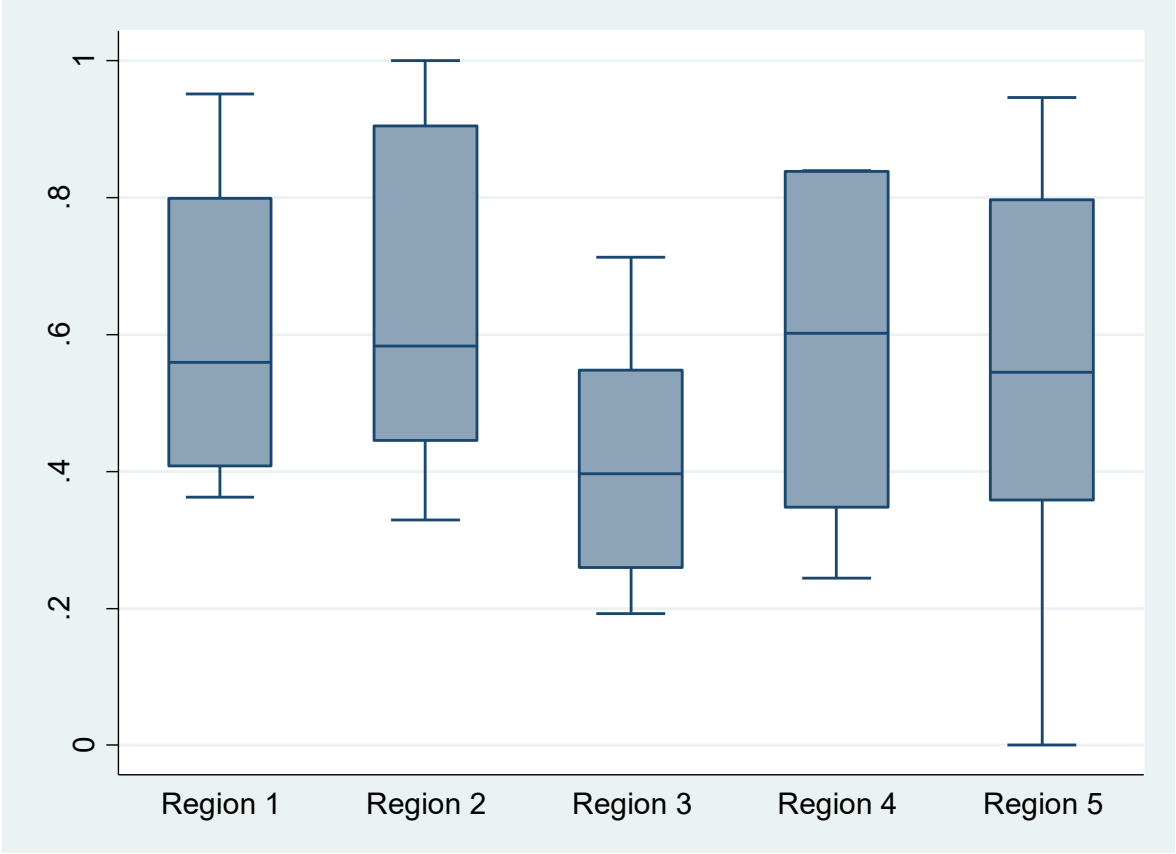


Figure 4.8: Box-and-whisker plot for the Social Disruption Index

The box-and-whisker plot does not indicate any outliers. Among the five mining regions, the medium mining region exhibits the lowest median SDI. Of particular interest is the very high-mining region, which displays the largest range, extending from 0 to approximately 0,95. This indicates that very high-mining regions experience both minimal and severe social disruption. Table 4.4 provides an extract illustrating the distribution of both GVA and SDI within very high-mining regions. For example, John Taolo Gaetsewe District Municipality (GVA=57,0; SDI=0,00)

demonstrates a very high mining contribution alongside minimal social disruption, whereas Bojanala Platinum District Municipality (GVA=52,10; SDI=0,9272) exhibits a similarly high mining contribution but substantial social disruption. These findings highlight the nuanced and heterogeneous relationship between mining activity and social disruption across South African districts.

Table 4.4: Distribution of very high mining regions by mining % contribution to GVA, SDI and main resource in the region

District Name	GVA	SDI	Main resource
John Taolo Gaetsewe District Municipality	57,00	0,0000	Iron ore, Manganese
Waterberg District Municipality	56,00	0,3000	Coal
Sekhukhune District Municipality	48,00	0,3582	Platinum
Mopani District Municipality	35,00	0,4629	Copper and Phosphates
West Rand District Municipality	29,20	0,4716	Gold
Lejweleputswa District Municipality	34,70	0,5450	Gold
Nkangala District Municipality	38,70	0,6026	Coal
ZF Mgcawu District Municipality	21,30	0,6497	Coal
Namakwa District Municipality	35,60	0,7966	Diamonds / copper / scarce metals
Bojanala Platinum District Municipality	52,10	0,9272	Platinum
Gert Sibande District Municipality	26,80	0,9459	Coal

Table 4.4 shows that the regions with the highest GVA have the lowest SDI. In general, the relationship between SDI and GVA is not statistically significant (Coeff=-0,001554, p=0,473) but the negative coefficient shows that as the intensity of the mining increase, the SDI decreases (see Appendix 5,10). However, Bojanala Platinum District Municipality is an outlier, with a very high GVA of 52,10% and a very high SDI of 0,9272. These results might need further investigation as they can possibly indicate that mining activity or intensity alone might not be the major contributor to social disruption.

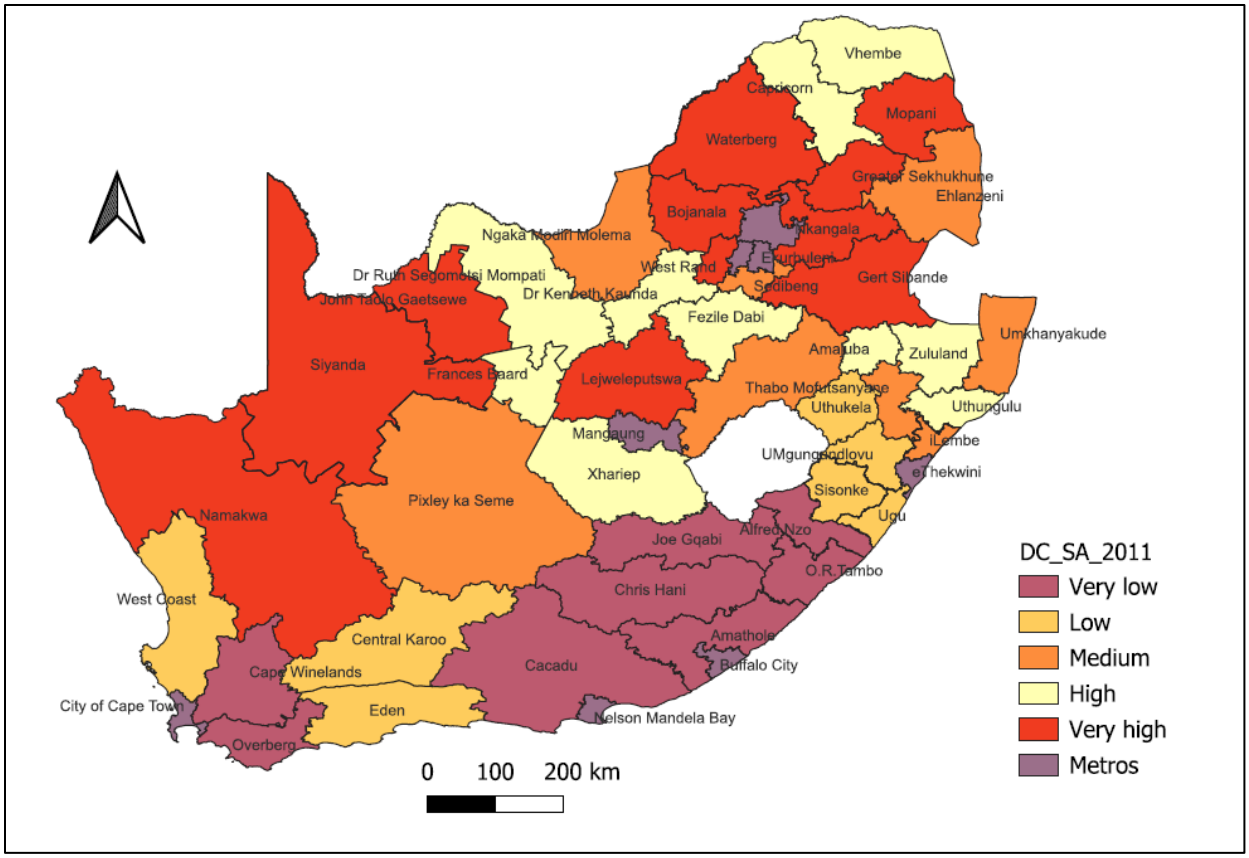


Figure 4.9: Spatial distribution of the Social Disruption Composite Index

Figure 4.10 above shows that, in general, the SDI is higher (darker shade) in lower mining regions than in high-mining regions. The highest indices are found in non-mining regions: Ugu, Central Karoo, Cape Winelands, Overberg, and West Coast (Figure 4.7). The lowest indices are found in the mining regions of John Taolo Gaetsewe, Waterberg, Bojanala, and Dr Ruth Segomotsi.

4.3 Discussion

The social disruption theory posits that rapid economic growth is associated with disturbances in a society's normal functioning, systems, and structures. The conceptual framework (Figure 4.1) identifies social, economic, and psychosocial indicators of social disruption. The comparative analysis presented in this chapter reveals nuanced patterns: some findings align with the social disruption hypothesis, while others are counterintuitive or mixed. The discussion below synthesises the main findings, their implications, and their relationship to previous studies,

providing possible explanations for the observed patterns. It begins with an overview of the themes and evaluates whether the evidence supports or contradicts the theory (Table 4.5).

Table 4.5: Evidence that supports or is against the social disruption hypothesis

Theme	Measure	Observation (Very low-mining regions vs very high mining regions)	Supports theory
Crime and Safety	Burglary	Lower odds for those in very high mining regions	No
	Domestic violence	No difference	No
	Violence	Lower odds for those in very high mining regions	No
	Gangsterism	Higher odds for those in very high regions	Yes
	Murder	Lower odds for those in very high mining regions	No
	Drug abuse	Lower odds for those in very high mining regions	No
Social Cohesion	Lost wallet found by a close person	Lower odds for those in very high mining regions	Yes
	Lost wallet found by a stranger	Lower odds for those in very high mining regions	Yes
	Trust South Africans	Higher odds for those in very high mining regions	No
	Trust own relatives	Lower odds for those in very high mining regions	Yes
	Trust other people	Lower odds for those in very high mining regions	Yes
	Trust own race	Lower odds for those in very high mining regions	Yes
	Trust other races	Lower odds for those in very high mining regions	Yes
	Perceived health	No difference	No

Perceived and Emotional Health	Bothered	No difference	Yes
	Mind	No difference	Yes
	Depressed	No difference	Yes
	Effort	Higher odds for those in very high mining regions	Yes
	Hope	Higher odds for those in very high mining regions	No
	Fearful	Higher odds for those in very high mining regions	Yes
	Restless	Higher odds for those in very high mining regions	Yes
	Happy	Higher odds for those in very high mining regions	No
	Lonely	Higher odds for those in very high mining regions	Yes
	Get going	Higher odds for those in very high mining regions	Yes
CES Index	Presence of depression symptomatology	Lower in very high mining regions	No
Physical health	Tuberculosis	Lower odds for those in very high mining regions	No
	High Blood Pressure	No difference	No
	Diabetes	Lower odds for those in very high mining regions	No
	Stroke	No difference	No
	Asthma	Lower odds for those in very high mining regions	No
	Heart	No difference	No
	Cancer	No difference	No
SDI	Overall measure of social disruption	No clear pattern – Mixed results	

4.3.1 Sociodemographic variables of the sample

In South Africa, high-mining areas exhibit several attributes commonly associated with social disruption: a high proportion of males, elevated employment levels (likely reflecting male-dominated employment), significant in-migration, and greater household income and asset levels. At the same time, there is contradictory evidence: the population in high-mining areas is not necessarily younger, and education levels are higher than in lower mining regions. These elevated education levels may result from changes in mining employment practices and increasing mechanisation, which require higher skill levels. Consequently, evidence of social disruption must be interpreted within the socioeconomic realities specific to mining areas.

Before discussing the social disruption themes in detail, Table 4.5 summarises the themes, their operationalisation, the observations from this study, and the extent to which they support the social disruption hypothesis.

4.3.2 Crime and safety

The analysis shows that five of the six crime and safety measures are counterintuitive. The only indicator that aligns with social disruption is gangsterism. Theoretical perspectives and international studies (Rawashdeh et al., 2016) suggest that crime increases with mining activity. However, the present study finds that household perceptions of burglary, violence, murder, and drug abuse all decrease as mining activity increases. These findings are consistent with Marais et al. (2022), who argue that economic stability, as generated by high mining activity, is associated with lower crime rates. The results are also partially supported by Ruddell et al. (2022) who found insignificant links between oil boom and youth crime. In contrast, mining decline, rather than growth, drives social disruption and increased criminal activity. The results are also supported by O'Connor and Ruddell (2021) who found that respondents in the oil-impacted region were less fearful of being victimized than their counterparts in non-impacted communities and did not believe that a lack of law enforcement was a problem. Employment opportunities in the mining sector raise the opportunity cost of engaging in crime (Axbard et al., 2019). This contrasts with findings from the Global North, where mining activity has often been associated with higher crime. In these South African contexts, mining appears to contribute tangible economic benefits to

communities. Apart from gangsterism, which is often linked to drugs, there is no evidence that residents in high and very high mining regions experience elevated crime relative to the rest of the country.

4.3.3 Social cohesion

The findings indicate lower social cohesion in very high mining regions compared to very low-mining regions. Six of the seven social cohesion indicators, with the exception of "Trust South Africans", support the hypothesis. This aligns with the notion that rapid economic activity can weaken social cohesion, driven by high migration rates and the heterogeneous composition of mining communities (Freudenburg & Gramling, 1992; Campbell, 2009; Mancini & Sala, 2018). Displacement and migration disrupt local networks and dilute cultural norms, while economic disparities and community fragmentation, often influenced by mining companies, exacerbate tensions. Cultural disruption, particularly among indigenous populations, further undermines cohesion. Interestingly, while social cohesion shows clear signs of disruption, crime indicators do not reflect similar patterns. The sustained high levels of trust in South Africans may reflect interactions with significant numbers of non-South African residents, as corroborated by migration statistics.

4.3.4 Perceived health

The key finding regarding perceived health reveals a statistically significant difference between regions with very low and low mining activity. Theoretically, health outcomes are expected to decline as mining activity increases. Counterintuitively, however, there is no difference in the proportion of individuals in very low and very high mining regions who perceive their health as good. This finding contradicts Leuenberger et al. (2021), who identified secondary health implications related to morbidity, mortality, and overall well-being. This result may indicate that the impact of mining on health perception becomes pronounced only below a certain threshold of mining intensity, as reflected in the contrast between very low and low-mining regions. It is also plausible that contextual factors such as local infrastructure, access to healthcare, or community resilience mitigate perceived health impacts in areas with moderate or high mining activity. The

absence of significant differences in other regions suggests a complex interplay of determinants influencing perceived health, which cannot be attributed to mining activity alone.

4.3.5 Emotional health

The emotional health indicators present mixed results and are discussed here in relation to the individual measures of emotional well-being and the symptomatology of depression. First, mixed outcomes were observed: the initial three indicators (feeling bothered, mindful, and depressed) show no statistically significant differences between individuals in very low and very high mining regions, while the remaining seven indicators show significance. These findings reflect both the negative and positive dimensions of mining. On one hand, elevated emotional distress in high-mining areas, manifested through feelings such as fear, loneliness, and restlessness, suggests that mining may exacerbate mental health challenges. On the other hand, positive emotions such as hope and happiness are also significantly higher in these regions, possibly reflecting the economic security and opportunity associated with mining employment. This duality aligns with the broader evidence that mining generates both social strain and socioeconomic benefits within host communities.

Second, the results support the hypothesis that individuals in high-mining regions exhibit a higher symptomatology of depression than those in low-mining regions. Previous studies attribute this to environmental degradation, occupational hazards, and socioeconomic pressures common in mining environments (Hendryx & Ahern, 2008; Blackley et al., 2018; Zierold et al., 2022). However, individuals in very high mining regions present a more complex picture: they display significantly fewer depressive symptoms than those in very low-mining regions. Although this seems counterintuitive, it may be explained by factors such as greater income security, stronger social identity linked to shared industrial work, and higher levels of physical activity inherent in mining occupations. Nonetheless, such outcomes depend heavily on local working conditions, social support systems, and individual resilience, all of which shape mental health outcomes in mining communities.

4.3.6 Physical health

No evidence suggests that physical health problems are more prevalent in high-mining regions than in low-mining regions. In fact, the odds of individuals reporting that a medical practitioner has diagnosed them with a chronic illness decrease as mining activity increases. This finding is counterintuitive, as theory anticipates a higher disease burden in mining-intensive areas. Furthermore, these results contradict the findings of Rawashdeh et al. (2016), who reported a higher disease burden in mining regions than in non-mining regions in Jordan.

The results of this study may be explained by contextual differences. Regions with high mining activity may experience a lower observed disease burden due to enhanced access to healthcare and social services provided by mining companies as part of corporate social responsibility initiatives. Such initiatives often include clinics, improved sanitation, and clean water infrastructure in remote communities. In addition, mining companies frequently develop essential infrastructure such as roads, hospitals, and schools, which benefits both employees and surrounding communities (Cole & Broadhurst, 2022; Rey-Marti et al., 2023). Routine health screenings and occupational medical checks mandated for mine workers can further facilitate early detection and treatment of health issues. Consequently, while mining presents environmental and occupational health risks, its institutional and infrastructural contributions may offset some of these adverse effects at the community level.

4.3.7 Social Disruption Index (SDI)

The proposed SDI was developed to measure overall social disruption by combining all relevant indicators through factor analysis. The results show that very low-mining regions have a higher SDI than very high mining regions, while medium mining regions record the highest SDI overall. This contradicts the social disruption theory, which posits that higher mining intensity leads to greater disruption. This nuanced relationship is evident across several outputs. For instance, the box-and-whisker plot indicates that very high mining regions exhibit both very low and very high levels of disruption, while the medium mining regions display the lowest median SDI of all

regions. This suggests that the effects of mining are complex and heterogeneous: within high-mining contexts, some districts experience significant disruption while others remain relatively stable.

Furthermore, the data show that the relationship between GVA and SDI is not statistically significant, though a negative correlation exists, implying that higher mining intensity tends to correspond with lower disruption. The Bojanala Platinum District Municipality, however, is an exception in that it has both a very high GVA and an equally high SDI, indicating that factors beyond mining intensity influence social disruption in certain areas. This outlier highlights the need for further, more granular research to understand the underlying regional dynamics.

Overall, the SDI results contradict the theoretical expectation that mining intensity directly drives social disruption. Low-mining regions in the Eastern Cape, Western Cape, and KwaZulu-Natal show the highest average SDI scores. These findings support the notion that social disruption occurs in phases rather than as a constant condition. At some point, equilibrium is reached (Parsons, 1951; Freudenburg, 1984; Petrova & Marinova, 2013). Moreover, the relationship between mining activity and social disruption appears non-linear, suggesting a complex, context-specific interaction that requires examination at a micro-regional scale.

4.4 Conclusions

The social disruption theory posits that rapid economic growth leads to disturbances in the normal functioning and structure of local communities. The objective of this chapter was to assess the existence and extent of social disruption across regions with differing levels of mining activity. Mining is frequently portrayed as inherently disruptive socially, economically, and environmentally, however, the findings in this chapter reveal a more complex and context-dependent picture.

On the one hand, the results contradict both theory and international literature, indicating that mining does not necessarily contribute to social disruption. First, according to the crime and safety indicators, five of the six crime and safety measures were counterintuitive. Household perceptions of burglary, violence, murder, and drug abuse all decrease as mining activity increases when

comparing very high mining regions to very low mining regions. This contradicts theoretical perspectives and international studies that suggest crime increases with mining activity. The findings align instead with the idea that economic stability from high mining activity is associated with lower crime rates, possibly because employment raises the opportunity cost of crime. Second the physical health indicators show that the odds of individuals reporting a medical diagnosis of a chronic illness (such as Tuberculosis, Diabetes, Asthma) decrease as mining activity increases. No evidence suggested physical health problems were more prevalent in high-mining regions compared to low-mining regions. This is counterintuitive, as theory anticipates a higher disease burden in mining-intensive areas. The explanation offered is that mining companies often provide enhanced access to healthcare and social services (CSR initiatives), which may offset environmental and occupational health risks at the community level. Third, the emotional health inidicators (Depression Symptomatology) show that individuals in very high mining regions display significantly fewer depressive symptoms than those in very low mining regions. While some emotional distress indicators were higher in high-mining areas, the overall measure of depression symptoms runs against the hypothesis. Potential explanations include greater income security, stronger social identity from shared work, and higher levels of physical activity in mining occupations. Last, the Social Disruption Index (SDI), the composite SDI index, which measures overall social disruption, found that very low-mining regions have a higher SDI than very high mining regions, and medium mining regions recorded the highest SDI overall. This directly contradicts the social disruption theory, which posits that higher mining intensity leads to greater disruption. Furthermore, the analysis found that the relationship between mining intensity (GVA) and SDI was not statistically significant, and a negative correlation existed, suggesting that higher intensity tends to correspond with lower disruption.

In conclusion, the chapter argues that in the South African context examined, mining activity, particularly in low- and middle-income regions, can provide economic stability through employment and infrastructure, potentially offsetting social instability. The disruption is not directly or uniformly associated with mining intensity, contrasting with theoretical expectationsOn the other hand, some indicators, particularly social cohesion, suggest that disruption is more pronounced in very high mining regions. These areas exhibit weaker community ties, likely due to in-migration and rapid socioeconomic change. Migration rates are highest in high-mining

regions, reflecting the economic opportunities these areas provide. Moreover, social disruption appears most evident in very high mining regions, while low- and medium mining regions exhibit relatively little disruption. This finding highlights that mining can play a stabilising role in some rural economies, even as it generates challenges in others.

The analysis in this chapter is limited by the absence of certain control variables (e.g., physical characteristics of regions and proximity to metropolitan areas), the use of district-level rather than local-level data, potential bias in self-reported measures, and the lack of consideration for boom-bust cycles. Nonetheless, the findings contribute to the body of knowledge on social disruption in three key ways. First, contrary to the widespread assumption that mining inherently causes disruption, evidence shows that in South Africa's context, particularly in low- and middle-income regions, mining can provide economic stability through employment and infrastructure, potentially offsetting social instability. Second, the degree of disruption appears contingent on the level of mining activity: significant disruption tends to occur only in very high mining regions. While this is concerning, it also suggests that lower levels of mining are not necessarily destabilising. Third, the SDI highlights internal variation within high-mining regions. Although the overall averages do not indicate elevated disruption, several districts, especially those with coal and platinum dominance and long histories of unrest, exhibit substantially higher SDI values. Makhari (2019) attributes the persistence of protests in municipalities within the Gert Sibande District to factors such as political grievances, poor resource allocation, service delivery failures, and the co-option of protests by criminal elements.

Overall, these findings underscore the need for more detailed research into the broader implications of living in mining regions, particularly regarding health, crime, and social cohesion. The evidence demonstrates that while mining activity can generate social disruption, it can also foster socioeconomic stability. Moreover, many mining towns have evolved into open communities whose residents have developed strong emotional and social attachments to their localities. The following chapter explores these attachments and how they differ across regions with varying levels of mining activity.

5. CHAPTER 5: PLACE ATTACHMENT AND MINING IN NON-METROPOLITAN MINING REGIONS IN SOUTH AFRICA

5.1 Introduction

The previous chapter established the link between mining activities and social disruption, showing that both high and low levels of disruption occur in very high mining regions. Furthermore, Chapter 3 highlighted changes in labour regimes and the conversion of mining towns into open towns. In practice, South African mineworkers now have access to homeownership, a privilege previously reserved for white mineworkers. Government policy actively promotes homeownership, which may foster place attachment. Through homeownership, residents of these towns can develop emotional bonds with their places of residence. Chapter 3 laid the foundation for this chapter by discussing the concept of place attachment and its relationship to mining activity in South Africa.

Place attachment theory originated in the 1960s with early work by researchers such as Fried (1963). Initially, it focused on the emotional ties people had to their homes after being displaced, drawing from urban planning and a recognition of sentimental connections to neighbourhoods. Several researchers have established the link between space, place, and place attachment, providing a more defined concept (Relph, 1976; Marques & Alexio, 2021). The current focus is on analysing space through individual experiences. Different types of spatial experiences exist: instinctual, physical, and instantaneous (pragmatic, perceptual, and existential spaces), as well as more cerebral, ideal, and intangible (planning, cognitive, and abstract space) (Relph, 1976). Furthermore, Marques and Alexio (2021) assert that space becomes a place when people interact with it, attributing meanings and values to it or its characteristics. This approach highlights the relational aspect of place attachment, where emotional and cultural connections form through experiences and interactions. Place attachment refers to the emotional bond between people and their environments, with emotions and experiences contributing significantly to one's connection

with a specific place (Fried, 1963; Relph, 1976; Shumaker & Taylor, 1983; Low & Altman, 1992; Manzo, 2005; Scannell & Gifford, 2010).

Several factors influence place attachment (see Chapter 3). These include environmental determinants (Shumaker & Taylor, 1983; Low & Altman, 1992), individual experiences (Stedman, 2002), cultural influences (Hunter, 1974; Chawla, 1992; Inalhan et al., 2021), psychological processes (Scannell & Gifford, 2014), and sociodemographic factors (Fleury-Bahi et al., 2008; Lewicka, 2011; Gustafson, 2014).

Post-apartheid housing policies for mining areas in South Africa sought to create integrated communities and encourage homeownership. This approach reflects the emphasis on open towns instead of company towns, where the mine provided housing. Although homeownership for black mineworkers became possible in the mid-1980s, post-1994 housing policies further promoted homeownership and the integration of mining and non-mining communities (Marais et al., 2018; Marais et al., 2020). Consequently, households increased their assets and other forms of wealth. This focus on stability and ownership may limit mobility as residents develop place attachment. It contrasts with the history of migrant labour, where migration was legally enforced.

Place attachment theory posits that there is a deep emotional bond between individuals and their environments, often conceptualised as fostering stability and representing an inherently positive experience. However, mining activities can disrupt place attachment through environmental degradation, mining-induced displacement and resettlement (MIDR), and social disruption (see Chapter 4. Mining activities directly or indirectly affect both the emotional bonds individuals have with their locations and the social dynamics within mining communities. This occurs, for instance, during relocations associated with mining activities (Ofori et al., 2023). Furthermore, disturbances to cultural symbols or valued spaces due to mining can lead to social upheaval (Leyton-Flor & Sangha, 2024). Residents may experience a loss of community cohesion and identity as mining alters the familiar environments to which they are attached (Askland, 2018).

Despite its disruptive nature, mining can foster place attachment in three ways. Firstly, as discussed in the previous chapter, mining generates economic opportunities that can improve community

welfare. Economic opportunities may promote stability and a sense of belonging. Secondly, mining activities can lead to infrastructure development such as roads, housing, and schools, thereby improving quality of life and fostering a sense of community (Cole & Broadhurst, 2022; Rey-Marti et al., 2023). Mining companies may also invest in community initiatives such as social programmes and cultural events, which strengthen social bonds and create a sense of place. Finally, the approach to mine housing may also promote place attachment. International literature demonstrates that homeownership plays a crucial role in creating place attachment (Bonaiuto et al., 1999; Lewicka, 2005; Hernández et al., 2007; Ji et al., 2023), and there is no reason to assume this would differ in mining regions.

However, this dichotomous view oversimplifies the complex and often contradictory ways in which people experience attachment to mining regions. It overlooks how emotional bonds to place are continuously shaped, negotiated, and redefined in response to mining activities, particularly across different regional and socioeconomic contexts. This study addresses this gap by conceptualising place attachment as a social consequence of mining and examining its variation across mining regions. By problematising the assumption of a uniform relationship between mining and place attachment, the study seeks to uncover how differing mining regions and factors such as length of stay, preference to stay, homeownership, type of housing, and other sociodemographic variables contribute to the strengthening or weakening of place attachment, and how this differs between mining regions (as defined and used in this study). This comparative approach generates a more nuanced understanding of place attachment in extractive environments, with implications for theory and mining-related policy interventions.

This chapter investigates place attachment and its variation across mining regions. The objective is to measure place attachment and its determinants and compare them across mining regions. The chapter builds on the methods used in the previous chapter, using the same dataset, NIDS (2017). Logistic regression and Structural Equation Modelling (SEM) are the primary analytical methods employed. The rest of the chapter is structured as follows: Section 5.2 presents the methods, section 5.3 provides the analysis of the results, section 5.4 discusses the findings, and section 5.5 concludes the chapter.

5.2 Results

The first part of this section presents the distribution of the immediate variables across the five mining regions. The results are structured into four components. First, contingency tables test the associations between willingness to relocate and the six immediate explanatory variables of place attachment. Second, a multivariate logistic regression model is presented. Third, differentials between mining categories are analysed, including the models' control variables. Finally, the section presents the results of Generalised Structural Equation Modelling (GSEM), providing an in-depth analysis of how place attachment interacts with the individual immediate explanatory variables.

5.2.1 Distribution of the five variables across the five mining regions

Table 5.1 shows the main variables and their distributions across the mining regions.

Table 5.1: Distribution of the key variables across the mining regions

Variable		Very low	Low	Medium	High	Very high	Total
Willingness to relocate	0=Unlikely to relocate	18,58	20,13	21,48	19,39	20,43	100,00
	1=Likely to relocate	15,43	15,11	19,32	16,11	34,03	100,00
	Total	18,15	19,45	21,19	18,95	22,27	100,00
Preference to stay	0 = 0=Preference to leave (not attached)	17,86	11,16	25,91	23,11	21,96	100,00
	1=Preference to stay (attached)	18,81	20,68	19,83	17,84	22,83	100,00
	Total	18,70	19,50	20,58	18,49	22,73	100,00
Length of stay	Less than one generation (Not Attached)	16,60	19,27	20,99	19,65	23,49	100,00
	More than one generation (Attached)	19,27	19,46	21,50	18,24	21,53	100,00
	Total	18,18	19,38	21,29	18,82	22,33	100,00

Homeownership	Owner not staying in dwelling unit (Not attached)	20,29	21,34	19,65	17,22	21,50	100,00
	Owner staying in dwelling unit (Attached)	17,50	18,72	21,85	19,34	22,59	100,00
	Total	18,16	19,34	21,33	18,84	22,34	100,00
Type of dwelling	Informal	16,99	7,56	18,78	23,98	32,68	100,00
	Formal	18,29	20,16	21,50	18,45	21,60	100,00
	Total	18,20	19,29	21,32	18,83	22,36	100,00

Table 5.2 shows the distribution of place attachment indicators across the five mining regions. By examining how attitudes and behaviours associated with place attachment vary across mining regions, it is possible to gain an understanding of how mining-related dynamics may influence community stability, emotional bonds to place, and residents' willingness to relocate.

5.2.1.1 Willingness to Relocate

There are notable regional differences in residents' willingness to relocate. Among those likely to relocate, more than a third (34,03%) are in very high mining regions, substantially higher than in other areas. Conversely, individuals unlikely to relocate are more evenly distributed, with slightly higher proportions in medium mining regions (21,48%) and very high mining regions (20,43%). This suggests that intensive mining activity may simultaneously create conditions that motivate both movement (for example, due to disruption or environmental concerns) and rootedness (for example, due to employment or long-standing settlement). Willingness to relocate may also reflect the transient populations in mining regions. These ambivalent effects are consistent with Scannell and Gifford's (2010) tripartite framework, where personal ties, physical settings, and processual experiences collectively shape attachment.

5.2.1.2 Preference to Stay

Residents' preference to stay varies across mining regions. Among those preferring to remain, higher proportions are found in very high mining regions (22,83%) and low-mining regions (20,68%). Conversely, those preferring to leave are concentrated in medium mining regions (25,91%) and high-mining regions (23,11%). This suggests that while high mining intensity may generate economic incentives to stay, it may also introduce environmental or social stressors that motivate others to consider leaving. This duality supports Altman and Low's (1992) assertion that place attachment is a layered and sometimes contested experience.

5.2.1.3 Length of Stay

Temporal attachment, proxied by length of stay, shows that residents who have lived in the area for more than one generation are more evenly distributed across regions. Slightly higher proportions of long-term residents are observed in very high mining regions (21,53%), medium mining regions (21,50%), and very low-mining regions (19,27%). Among newer residents (less than one generation), 23,49% reside in very high mining regions, likely reflecting recent inward migration associated with mining opportunities. These findings suggest that long-term residence, and thus deeper historical or emotional ties to place, may be weaker in high-mining regions, consistent with the mobility often associated with extractive economies (Lewicka, 2011).

5.2.1.4 Homeownership

Non-homeowners are concentrated in very high mining regions (21,50%), low-mining regions (21,34%), and very low-mining regions (20,29%), suggesting weaker ties or investment in these areas. Among homeowners, higher proportions are found in very high mining regions (22,59%) and medium mining regions (21,85%), indicating stronger residential stability. Homeownership has been widely recognised as a stabilising factor that enhances place-identity and commitment (Brown et al., 2003), especially when paired with long-term residence. However, homeownership is not a necessary condition for place attachment (Windsong, 2010).

5.2.1.5 Type of Dwelling

Housing type reveals a striking pattern. Informal dwellings are concentrated in very high mining regions (32,68%), with much smaller shares in other regions. In contrast, formal dwellings are more evenly distributed, with notable shares in very high mining regions (21,60%), medium mining regions (21,50%), and low-mining regions (20,16%). While informal housing is often associated with transience and weaker institutional support, the high concentration in high-mining regions may reflect rapid urbanisation, in-migration, and limited planning in resource boomtowns. Despite infrastructural challenges, residents in informal areas may still exhibit strong social and symbolic attachments to place (Manzo, 2003; Altman & Low, 1992).

The findings highlight the multifaceted and ambivalent nature of place attachment in mining-intensive regions. In very high mining regions, residents exhibit both a strong preference to stay and a heightened willingness to relocate, indicating that mining simultaneously fosters conditions encouraging both settlement and mobility. While indicators such as homeownership and long-term residence suggest stability and attachment, the concentration of informal dwellings and the presence of recent in-migrants point to transience and weaker historical ties. These dynamics reflect the dual impact of extractive economies, which generate economic incentives for staying while also introducing social and environmental stressors that may compel departure. This complexity aligns with theoretical frameworks conceptualising place attachment as a layered and contested experience, shaped by personal relationships, physical environments, and lived processes.

5.2.2 Tests of association between willingness to relocate and the immediate explanatory variables

Six variables affecting place attachment originate from the literature and the NIDS (2017) data. To explore the association between willingness to relocate (used as a proxy for place attachment) and the explanatory. Cross-tabulations were conducted to examine the association between willingness to relocate and different mining regions. The results are shown in Table 5.2.

Table 5.2: Tests of associations between willingness to relocate and different mining regions

		Mining region				
Mining region	Statistic	Very low	Low	Medium	High	Very high
Very low	Chi-Square					
	Cramer's V					
	p-value					
Low	Chi-Square	0,6317				
	Cramer's V	- 0,0098				
	p-value	0,427				
Medium	Chi-Square	1,2996	3,9336**			
	Cramer's V	0,0137	0,0235			
	p-value	0,254	0,047			
High	Chi-Square	0,0452	1,0333	0,8627		
	Cramer's V	0,0026	0,0124	- 0,0111		
	p-value	0,832	0,309	0,353		
Very high	Chi-Square	108,1210**	130,2822**	95,1534**	105,7392**	
	Cramer's V	0,1234	0,1338	0,1120	0,1216	
	p-value	0,000	0,000	0,000	0,000	

**p<0,05

Residents in **very low-mining** regions show the same willingness to relocate as residents in low-mining regions (X^2 = 0,6317, p=0,427), medium mining regions (X^2 = 1,2996, p=0,254), and high-mining regions (X^2 = 0,0452, p=0,832), as their chi-square confirms that the difference is not statistically significant. However, there is a statistically significant difference in the willingness to relocate for residence in very low and high-mining regions (X^2 = 108,1210, p=0,00).

Residents in **low-mining** regions have the same willingness to relocate as residents in high-mining regions (X^2 = 1,0333, p=0,309) but different willingness to relocate as residents in medium mining regions (X^2 = 3,9336, p=0,047) and very high mining regions (X^2 = 130,2822, p=0,000).

Residents in **medium mining** regions have the same willingness to relocate as high-mining regions (X^2 = 0,8627, p=0,353) but a different willingness to relocate from very high mining regions (X^2 = 95,1534, p=0,000).

Residents in **high-mining** regions are more willing to relocate than those in non-high-mining regions (X^2 = 105,7392, p = 0,000). Residents in very high mining regions have a different willingness to relocate than residents in other regions. The chi-square and p-values have already been discussed. This analysis shows various levels of desire to relocate between different mining regions. The next step in the study is to perform logistic regressions with willingness to relocate as the dependent variable.

5.2.3 Logistic regression analysis between willingness to relocate and the explanatory variables

The previous subsection showed the strengths and direction of the associations between willingness to relocate and the mining regions. This subsection uses logistic regression to estimate the odds ratios of each explanatory variable on the dependent variable. Table 5.3 shows the results of this analysis.

Table 5.3: Results of the logistic regression models – odds ratios

Willing to relocate	**Odds ratio**	**p-value**
Mining regions (Base category = Very low)		
Low	1,2276	0,118
Medium	1,6497 **	0,000
High	1,2127	0,145
Very high	2,8492 **	0,000
Length of stay (Base category = Those who stayed shorter than 20 years)		
Those who stayed longer than 20 years	0,7169**	0,000
Preference to stay (Base category = Those who prefer to leave)		
Those who prefer to stay	0,2204**	0,000
Homeownership (Base category = Those households where the owner does not stay in the dwelling)		
Those households whose owner stays in the dwelling	0,7505**	0,000
Employment (Base category = Unemployed)		
Employed	1,0075	0,928
Age group (Base category = 15–24-year age group)		
25-34	1,1041	0,318
35-44	0,7464**	0,010
45-54	0,6299**	0,000
55-64	0,6331**	0,009
65+	0,3213**	0,016
_cons	0,5603**	0,000

Odds ratio > 1: factor is associated with higher odds of being willing to relocate vs. the base.

Odds ratio < 1: lower odds vs. base.

** statistical significance: $p < 0,05$

Table 5.3 shows that, compared to residents in very low-mining regions, individuals in medium mining regions have statistically significantly higher odds of relocating (OR=1,6497, p-value = 0,000). Similarly, residents in very high mining regions have statistically significantly higher odds (OR=2,8492, p-value = 0,000) than in very low-mining regions. The rest of the mining regions are not statistically significant.

The results reveal that those who stayed longer than 20 years have a statistically significant odds ratio below 1 (OR=0,7169, p-value=0,000) compared to those with a shorter stay (less than 20 years). This means a longer residential tenure is associated with a meaningfully lower willingness to relocate, aligning with established literature on place attachment.

Table 5.3 further indicates that those who prefer to stay have a statistically significant odds ratio far below 1 (OR=0,2204, p-value=0,000), meaning that preference to remain firmly aligns with actual willingness, underscoring the importance of subjective intentions. This indicates that attitudinal factors are powerful predictors even after controlling for other observed characteristics.

Households where the owner resides in the dwelling have statistically significantly lower odds of willingness to relocate (OR=0,7505, p-value=0,000), meaning that owner-occupiers are more tied to their neighbourhood, and may be less flexible than renters or non-resident owners. This produces a structurally lower propensity to move. This result gives more insights than in Table 5.3.

Employed individuals show a not statistically significant odds ratio close to 1 (OR=1,0075, p-value=0,928), meaning there is no substantial difference in willingness to relocate between the employed and the unemployed. Employment status alone does not meaningfully distinguish desire to relocate. Two possibilities: (a) supply and demand side forces offset (employed may feel less need to move, unemployed may be more willing but constrained), or (b) employment effects are mediated by other variables (e.g., sector, income, local opportunities) not visible in the excerpt.

No statistically significant difference exists in the willingness to relocate between individuals aged 15-24 and 25-34 (χ^2 1,1041, p-value = 0,318). However, there are statistically significantly lower odds for those in the age groups 35-44 (OR= 0,7454, p-value=0,010), 45-54 (OR=0,6299, p-

value=0,000, 55-64 (OR=0,6331, p-value=0,009), and 65+ (OR=0,3213, p-value=0,016). These results show that the propensity of individuals to relocate decreases as age increases, which is in line with place attachment theory.

5.2.4 Logistic regression with interaction effects.

The previous section established the link between place attachment and the immediate explanatory variables in the mining context. This section presents the results of Equation 1: logistic regression with interaction terms. The analysis incorporates interactions between the mining region and the other explanatory variables as predictors in the logistic regression model specified in section 5.2.5. For each interaction, the odds are compared to the base category. For instance, in the interaction between length of stay and mining region, the base category comprises individuals who have resided in the area for longer than 20 years, and the odds for other categories are interpreted relative to this group. The complete set of results is provided in Appendix 5.4.

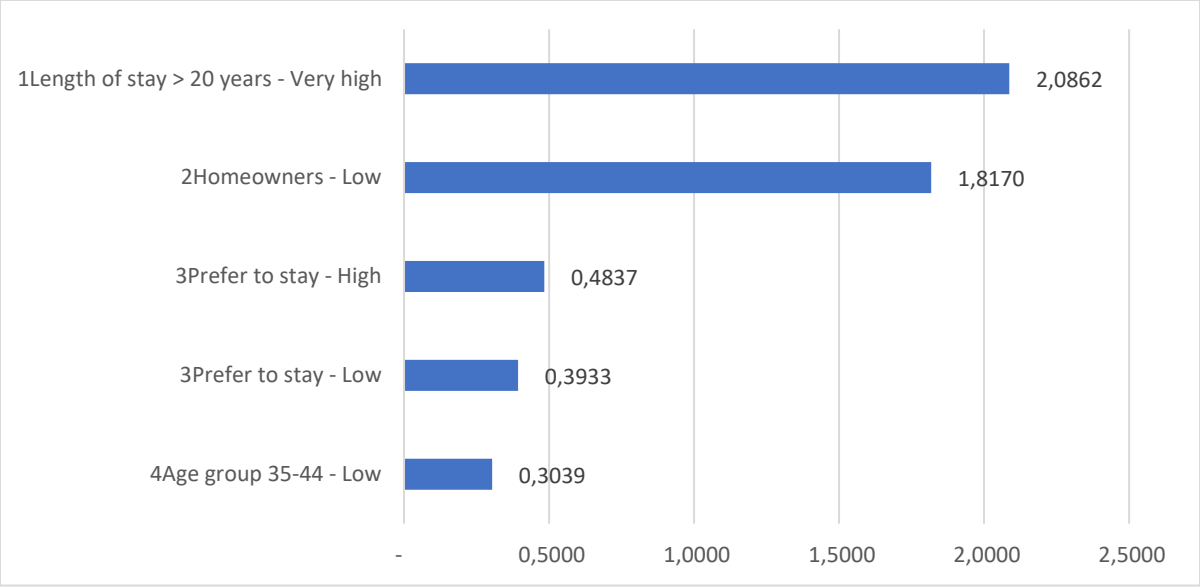


Figure 5.1: Results of the logistic regression with interaction terms – Odds Ratios

**Only statistically significant odds ratios at 5% significance level are shown.

[1]Base = Length of stay > 20 years # Very low.

[2]Base = Homeowners # Very low.

[3]Base = Prefer to stay # Very low.

[4]Base = 35-44 # Very low.

Figure 5.1 shows that among individuals who have stayed in their residence for longer than 20 years, there are statistically significant odds of willingness to relocate for those residing in very low-mining regions compared to those in very high mining regions (OR=2,0862). No statistically significant differences are observed between residents of very low-mining regions and the other mining regions.

For homeowners, statistically significant odds of willingness to relocate exist between those residing in very low-mining regions and those in low-mining regions (OR=1,8170). No statistically significant differences are observed between homeowners in very low-mining regions and those in medium, high, or very high mining regions. This finding questions the assumed importance of homeownership for place attachment, as the propensity to relocate does not differ between homeowners in very low and very high mining regions.

Among individuals who prefer to stay in their current region, statistically significant odds of willingness to relocate are found between residents of very low-mining regions and those in high-mining regions (OR=0,4837), as well as between very low and low-mining regions (OR=0,3933). The remaining mining regions do not show statistically significant differences.

Finally, statistically significant odds of willingness to relocate are observed for individuals aged 35–44 residing in very low-mining regions compared to those of the same age in low-mining regions (OR=0,3039). No statistically significant differences are observed for the other age groups.

5.2.5 Generalised structural equation models – Path Analysis

Previous studies have measured place attachment directly using constructs such as sense of belonging, sense of community, or sense of place (Kasarda & Janowitz, 1974; Hernández et al., 2007). In this study, the variable “Willingness to relocate” is used as a proxy for place attachment.

Willingness to relocate may be directly or indirectly influenced by the explanatory variables. In the path diagram (Figure 5.2), willingness to relocate and mining region are treated as exogenous variables, while preference to stay, length of stay, homeownership, employment, and age group are also included as exogenous variables. Figure 5.2 shows the path diagram for the modified direct model.

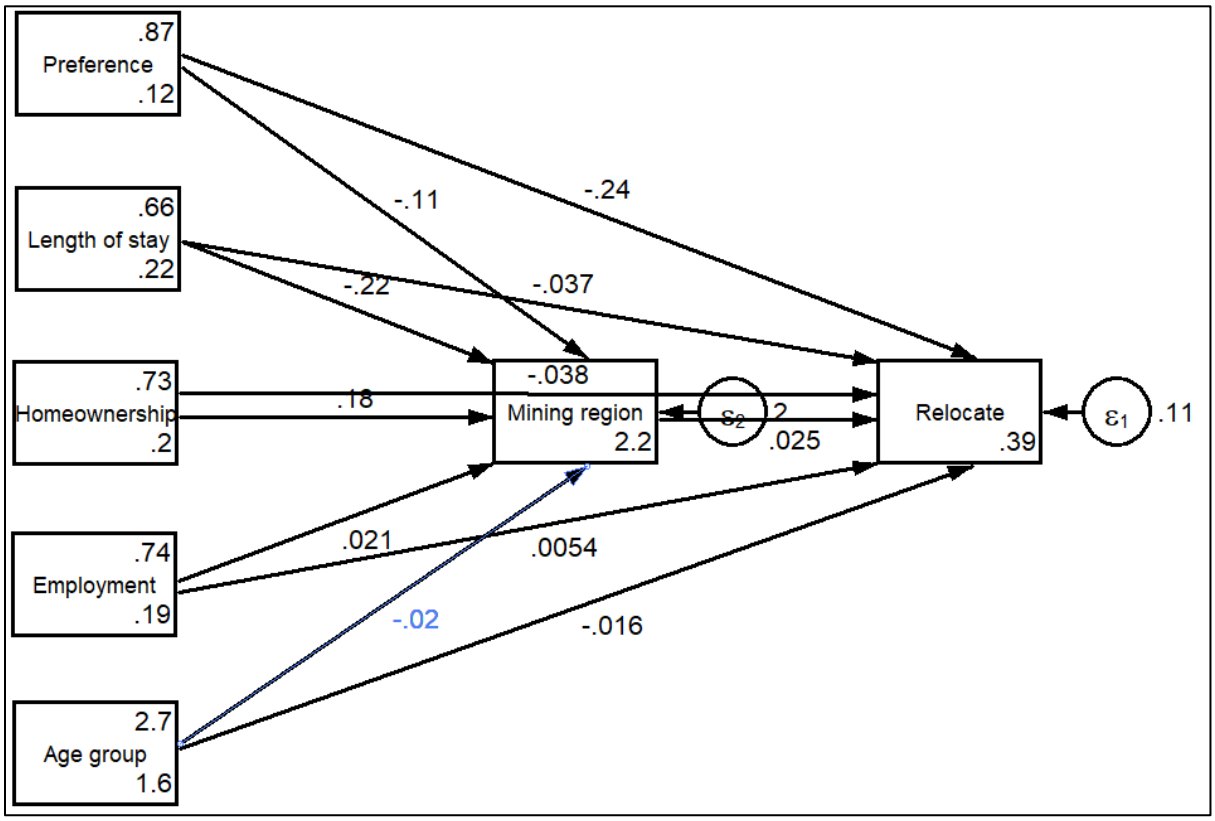


Figure 5.2: Structural equation coefficients with willingness to relocate as the response variable and mining region as the intermediary variable

The following tables are used to estimate and interpret the results.

Table 5.4: Direct effects

Structural Path	Coefficient	Std. Err.	z	P>z	[95% Conf.Interval]	
Willing to relocate <-						
Mining region	0,0246**	,0026563	9,27	0,000	,0194303	,029843
Preference to stay	-0,2406**	,0113076	-21,28	0,000	-,2627427	-,2184178
Homeownership	-0,0382**	,0088569	-4,31	0,000	-,0555671	-,0208486
Length of stay	-0,0372**	,0082716	-4,49	0,000	-,0533646	-,0209405
Employment	0,0054	,0091407	0,59	0,557	-,0125471	,0232838
Age group	-0,0161**	,0032232	-5,01	0,000	-,0224505	-,0098158

**p<0,05

Table 5.4 indicates that mining region, preference to stay, homeownership, length of stay, and age group all have statistically significant direct effects on willingness to relocate. Holding all other explanatory variables constant, mining region has a positive effect on willingness to relocate, suggesting that the propensity to move increases with the intensity of mining activity. In contrast, preference to stay has a statistically significant negative coefficient, indicating that individuals who prefer to remain in their current location are less likely to relocate than those who prefer to leave. Similarly, homeownership has a statistically significant negative effect, showing that homeowners are less willing to relocate than non-homeowners. Length of stay and age group also exhibit statistically significant negative coefficients, suggesting that longer-term residents and older individuals are less inclined to move. Employment, however, is not statistically significant, indicating no meaningful difference in willingness to relocate between employed and unemployed individuals.

Table 5.5: Indirect effects

Structural Path	Coefficient	Std. Err.	z	P>z	[95% Conf.Interval]	
Willing to relocate						
Mining region	0	(no path)				
Preference to stay	- 0,0027**	,0012474	-2,15	0,032	-,0051218	-,0002322
Homeownership	0,0045**	,0010676	4,24	0,000	,0024362	,006621
Length of stay	- 0,0055**	,0010639	-5,14	0,000	-,007551	-,0033807
Employment	0,0005	,0009829	0,53	0,593	-,0014008	,002452
Age group	- 0,0005**	,0003499	-1,39	0,165	-,0011712	,0002004

**p<0,05

Table 5.5. shows that preference to stay, homeownership, length of stay, and age group had statistically significant paths. This suggests that the mining region partially mediates the effect of the exogenous variables on willingness to relocate. Table 5.7 presents the sum of the direct and indirect effects.

Table 5.6: Total effects

Structural Path	Coefficient	Std. Err.	z	P>z	[95% Conf, Interval]	
Willing to relocate <-						
Mining region	0,0246**	,0026563	9,27	0,000	,0194303	,029843
Preference to stay	- 0,2433**	,0113688	-21,40	0,000	-,2655398	-,2209747
Homeownership	- 0,0337**	,0088943	-3,79	0,000	-,0511117	-,0162468
Length of stay	- 0,0426**	,008298	-5,14	0,000	-,0588822	-,0263546
Employment	0,0059	,009193	0,64	0,521	-,0121241	,0239119
Age group	- 0,0166 **	,0032413	-5,13	0,000	-,0229714	-,0102658

**p<0,05

Table 5.6 shows that the total effect of preference to stay on willingness to relocate is statistically significant, with a strong negative coefficient. This indicates that individuals with a higher preference to stay are substantially less likely to relocate, both directly and indirectly through the mining region. Homeownership has a statistically significant but weak effect, suggesting minimal

differences in relocation propensity between homeowners and non-homeowners, whether directly or indirectly via the mining region. Length of stay also exhibits a statistically significant but weak effect, indicating that individuals who have lived in the area for more than 20 years are slightly less likely to relocate than those with shorter residence periods, both directly and indirectly through mining. Age group shows a statistically significant negative but weak effect, meaning older individuals are less likely to relocate than younger individuals, directly and indirectly through the mining region. Employment, however, is not statistically significant, either directly or indirectly through mining.

In summary, the analysis of direct, indirect, and total effects demonstrates that mining region acts as a significant mediator, strongly predicting relocation both directly and indirectly.

5.3 Discussion

This chapter provides three main discussion points. Firstly, it confirms the multidimensional nature of place attachment. Secondly, it questions the notion that place attachment inherently brings stability to a region. Thirdly, it interrogates whether current policy directives emphasising homeownership in mining areas are the most appropriate. The findings demonstrate that place attachment varies significantly across mining regions, with factors such as length of stay, preference to stay, homeownership, and other demographic characteristics influencing residents' emotional bonds to their communities. While individuals in lower mining regions generally exhibit stronger attachments, the pressures associated with high mining activities often weaken these bonds.

The temporal dimension of attachment, captured through residents' length of stay, indicates that individuals who have lived in a community for over 20 years generally exhibit lower odds of relocating compared to those with shorter residence durations. This finding aligns with prior literature linking longer residence to stronger place attachment (Hidalgo & Hernández, 2001; Brown et al., 2003; Lewicka, 2011). From the perspective of cognitive appraisal theory, long-term residents positively appraise their environment, drawing on accumulated memories, social networks, and symbolic meanings that reinforce attachment. In this sense, place attachment

functions as a stabilising factor, discouraging mobility, consistent with the theoretical view that attachment promotes stability.

However, the results also reveal a more complex pattern: residents with over 20 years of residence in very high mining regions exhibit twice the odds of relocating compared to those in very low-mining regions. This indicates that even deeply rooted attachments can be disrupted by contextual factors such as environmental degradation, economic instability, or social disruption commonly associated with mining regions (see Chapter 4). Cognitive appraisal theory suggests that in such contexts, residents may reappraise their environment, with the perceived costs of staying outweighing the benefits of attachment. Mobility, therefore, can be appraised as a positive adaptive strategy, enabling residents to escape declining conditions and seek better opportunities elsewhere.

Taken together, these findings highlight that the relationship between mobility and place attachment is not unidirectional but contingent on context. While long-term residence generally strengthens attachment and reduces relocation intentions, adverse structural conditions, as observed in very high mining regions, may override these attachments. This duality reinforces the dynamic and context-dependent nature of appraisals within cognitive appraisal theory, shaped by both individual histories and structural environments.

The findings regarding homeownership carry important policy implications. In theory, homeownership strengthens tenure security, facilitates investment in local infrastructure, and can mitigate the willingness to relocate (Beer, et al., 2011; Rolfe, et al., 2020). Consistent with Lewicka (2010) and Kelly and Hosking (2008), this study found that homeownership alone, independent of length of residence, does not significantly predict place attachment. Homeowners in very high mining regions were, paradoxically, more likely to relocate than homeowners in very low-mining regions. These findings suggest that emotional bonds are more closely tied to the duration of residence and accumulated experiences than to ownership status alone.

In the South African context, the national government's Revitalising Distressed Mining Towns Programme (2015) promotes homeownership as a model of local development to enhance stability and support economic diversification. The evidence presented here indicates that homeownership

alone has limited impact on place attachment. Policymakers should therefore consider holistic strategies that extend beyond ownership, incorporating long-term residency, community engagement, preservation of social networks, and attention to residents' emotional needs. Such approaches can strengthen residents' sense of belonging and resilience, critical for the success of programmes aimed at revitalising distressed mining towns.

Employment status is another influential factor in place attachment. Stable employment can foster emotional connections to communities by providing financial security, social interaction, and a sense of purpose. However, this study shows that employment alone is not a sufficient determinant of attachment; factors such as length of residence, social cohesion, and preference to stay are equally important. In distressed mining towns, policies promoting employment may simultaneously enhance economic revitalisation and strengthen social and emotional bonds, supporting sustainable regeneration.

Similarly, the affective dimension of attachment, reflected in residents' stated preference to stay, demonstrates that emotional ties to place are shaped by social cohesion, cultural identity, and personal history (Scannell & Gifford, 2010; Hidalgo & Hernández, 2001). Yet, in very high mining regions, this attachment weakens, challenging the assumption that longer residence invariably strengthens attachment. Sociodemographic factors such as age, gender, education, and migration status further nuance these patterns. Older and long-term residents tend to exhibit stronger attachment, while migrants and more highly educated individuals may display greater mobility tendencies, potentially reflecting broader livelihood aspirations (Gustafson, 2009).

Overall, this study contributes to place attachment theory by illustrating how emotional, temporal, and material dimensions interact in extractive economies. It also emphasises the role of housing and employment policies in either supporting or undermining residents' connection to place, highlighting the need for context-sensitive interventions in mining regions.

5.3.1 Place attachment vs immediate explanatory variables

The strongest association observed was the negative relationship between willingness to relocate and preference to stay, indicating that residents who express a stronger preference to remain are less likely to consider moving. A moderate negative association was also observed with age group, reflecting higher mobility among younger individuals and stronger place attachment among older residents. The mining region variable showed a significant positive association, suggesting that the desire to relocate increases with mining activity. This pattern may be linked to socioeconomic or historical factors specific to each mining region. Longer residence durations and homeownership exhibited weaker associations, implying that individuals with longer residence histories and homeownership may be somewhat more attached to their locality, although these effects are relatively small. The minor effect of homeownership is attributable primarily to the statistically significant difference in willingness to relocate between homeowners in very low-mining regions compared to those in low-mining regions, with no significant effect observed in other mining regions (see Figure 5.3). Employment did not show a significant impact on place attachment. Overall, these results largely support place attachment theory, though further analysis is required to examine regional differentials.

5.3.2 Predicting place attachment

Multivariate directional analysis reinforced the associations identified above. Preference to stay emerged as a strong negative predictor of willingness to relocate, whereas homeownership and longer residence durations exhibited weaker but still negative effects. Notably, mining region had a positive and significant impact, with individuals in very high mining regions more likely to consider relocation. This may reflect deteriorating living conditions, environmental or economic pressures, or the influence of migrant populations.

5.3.3 Mining regions and place attachment

Very high mining regions display higher levels of employment, preference to stay, and homeownership. However, these factors are less influential in high-mining regions, where willingness to relocate remains elevated. This indicates that place attachment is weaker in areas of intense mining activity, raising questions about the efficacy of policies promoting homeownership

as a stabilising mechanism. Despite high homeownership rates in high-mining regions, residents continue to express intentions to relocate, which may complicate the strategy of converting mining towns into open towns. Mining settlement policies should therefore account for mobility as a strategic asset, particularly in the context of potential mine closures (Ntema et al., 2023).

Place attachment erodes in unstable or extractive environments. Emotional bonds develop through personal experiences and environmental characteristics, yet mining regions often undergo transformations due to environmental degradation, socioeconomic disruption, and community restructuring. Such changes can weaken residents' emotional ties to place, consistent with theoretical assertions that stable and positive environments foster attachment, whereas disruption diminishes it.

Mining activities present both opportunities and challenges for communities (see Chapter 4). While economic benefits and infrastructure development may support attachment, displacement, community fragmentation, and threats to cultural symbols can undermine it. Place attachment theory suggests that strong emotional connections rely on a sense of community and shared identity (Scannell & Gifford, 2010). Mining operations can disrupt residential stability and social cohesion, reducing the sense of belonging and identity.

The relationship between mining activities and place attachment is not uniform; it varies significantly across regions. This variability demonstrates that attachment is shaped not only by individual experiences but also by broader socioeconomic and contextual factors. These findings provide empirical support for place attachment theory, showing that external environmental factors, social changes, and economic conditions directly influence residents' emotional bonds. A nuanced understanding of these dynamics is essential for policy and community engagement strategies aimed at fostering sustainable attachment.

5.3.4 Generalised Structural Equation Model (GSEM): Synthesising direct and indirect effects

The GSEM approach integrated direct and indirect effects to provide a holistic assessment of place attachment. Length of stay, preference to stay, homeownership, and age were all found to significantly reduce willingness to relocate, suggesting that these variables enhance attachment.

Mining region exerted both a direct positive effect on willingness to relocate and an indirect weakening effect on other attachment dimensions. This dual mechanism indicates that residents in higher mining regions face direct pressures, such as declining quality of life, alongside indirect effects that undermine psychological and material connections to place.

Overall, GSEM provides a comprehensive framework for examining the complex interrelationships among determinants of place attachment. The results demonstrate that mining activities influence emotional connections to place both directly and indirectly, highlighting the nuanced ways in which attachment is shaped in extractive economies.

5.4 Limitations

The study's focus on specific mining regions in South Africa may limit the generalisability of its findings to other geographical areas or contexts. The analysis assumes that place attachment is a relatively stable attribute among residents, despite being dynamic and influenced by external factors. The methods employed to measure place attachment may not fully capture its complex emotional and social dimensions. Moreover, interaction effects between mining activities and other explanatory variables may complicate the interpretation of results. Additional factors potentially influencing place attachment were not examined, resulting in an incomplete understanding of the dynamics at play. The quantitative approach used may overlook the qualitative, lived experiences of residents. This chapter thus acknowledges these limitations and highlights opportunities for future research, including longitudinal studies, qualitative analyses, and broader geographic comparisons, which could deepen the understanding of place attachment dynamics in mining contexts. Addressing these gaps would provide a more comprehensive

framework for analysing the emotional landscapes of communities affected by extractive industries.

5.5 Recommendations for Future Research

Future research should consider longitudinal designs to track changes in place attachment over time. This would allow researchers to assess how ongoing mining activities and other socioeconomic changes influence emotional bonds to place, thereby capturing the dynamic nature of attachment. Integrating qualitative methods, such as in-depth interviews or focus groups, could enrich understanding by revealing residents' personal narratives and experiences, which quantitative measures may overlook. Subsequent studies should also investigate additional factors affecting place attachment, including community engagement initiatives, historical context, and cultural variations, yielding a more holistic perspective on the drivers of attachment and its variations.

Policy-focused recommendations include strategies to mitigate the negative impacts of mining on place attachment. Investments in community development programmes that foster social cohesion, improve local infrastructure, and preserve cultural sites are essential. Urban planners and mining companies should incorporate place attachment considerations into development and operational planning. Meaningful community engagement in decision-making processes can ensure that local knowledge, needs, and values are respected, strengthening residents' emotional connections to their environment. Furthermore, thorough environmental and social impact assessments conducted before and during mining operations can help identify potential disruptions to place attachment and facilitate the implementation of measures to minimise adverse effects.

5.6 Conclusion

This chapter demonstrates the complex and sometimes contradictory nature of place attachment in mining regions. Mining activities can generate economic opportunities and improve community infrastructure, yet they simultaneously pose risks through social disruption, displacement, and environmental degradation. The findings challenge simplistic narratives that categorically praise or critique the impact of mining on communities, emphasising the need for nuanced understanding.

The results contribute significantly to place attachment theory by illustrating how external factors, particularly the intensity of mining activity, influence residents' emotional bonds to place. These insights have practical implications for urban planners, policymakers, and mining companies seeking to foster community stability and well-being.

Ultimately, understanding place attachment is crucial for designing policies and interventions that mitigate the adverse effects of mining. By promoting a sense of belonging and connection among residents, stakeholders can strengthen the resilience of communities navigating the challenges associated with extractive industries. This chapter provides a foundation for further research and discussion on maintaining and enhancing place attachment in contexts of socio-environmental change, thereby contributing to more sustainable and harmonious community development.

CHAPTER 6: CRIME AND MINING EMPLOYMENT – A LONGITUDINAL ANALYSIS OF THE EFFECT OF LAGGED MINING EMPLOYMENT ON CRIME IN SOUTH AFRICA

6.1 Introduction

Building on the theoretical and empirical evidence presented in Chapters 4 and 5, this chapter analyses the relationship between reported crime and mining employment across different non-metropolitan mining regions in South Africa over a ten-year period (2014–2023). Unlike Chapters 4 and 5, which primarily examined perceptions of social disruption and place attachment, this chapter utilises actual data on mining employment and recorded crime incidents. The aim is to provide a longitudinal perspective on whether changes in mining employment influence crime levels over time. The chapter is structured as follows: section 6.2 presents the results, section 6.3 offers a discussion, and section 6.4 concludes the chapter.

Table 6.1 presents a snapshot of the top ten districts based on total mining FTE over the 2014–2023 period, alongside the 2017 district rankings according to mining's contribution to total district GVA. The left panel of Table 6.1 displays total mining employment (measured as FTE) over the ten-year period, while the right panel indicates the 2017 mining contribution to total GVA, which forms the basis for the mining classification used in this study (see Appendix 6.1 for the complete list of districts).

Table 6.1: Top ten ranking districts according to FTE and GVA. Source: Own summary of FTE data and GVA data

District	Annual Average mining FTE employment	District	GVA
Bojanala District Municipality	11 4037,10	John Taolo Gaetsewe District Municipality	57,00
West Rand District Municipality	46 325,70	Waterberg District Municipality	56,00
Waterberg District Municipality	37 817,80	Bojanala Platinum District Municipality	52,10
Nkangala District Municipality	33 741,40	Sekhukhune District Municipality	48,00
Lejweleputswa District Municipality	23 812,10	Nkangala District Municipality	38,70
Sekhukhune District Municipality	19 894,70	Namakwa District Municipality	35,60
John Taolo Gaetsewe District	14 673,70	Mopani District Municipality	35,00
Gert Sibande District Municipality	14 337,40	Lejweleputswa District Municipality	34,70
Dr Kenneth Kaunda District Municipality	10 790,00	West Rand District Municipality	29,20
Ehlanzeni District Municipality	9 407,50	Gert Sibande District Municipality	26,80
Fezile Dabi District Municipality	7 897,80	ZF Mgcawu District Municipality	21,30

Note* The complete list is in Appendix 6.2

Table 6.1 demonstrates a strong correspondence between the FTE and GVA rankings. Seven of the ten districts that rank highest in total mining FTE also appear among the top ten in terms of mining's contribution to total district GVA.

6.1.1 Mining Decline Regions

Marais et al. (2022) identified five local municipalities in South Africa experiencing declining mining activity. These are Matjhabeng local municipality (under Lejweleputswa district municipality), Mogale City, Merafong City, and Rand West local municipalities (all three under West Rand district municipality), and the City of Matlosana (under Dr Kenneth Kaunda district municipality). In this study, the three corresponding district municipalities are analysed as regions experiencing mining decline.

6.2 Results

The results are presented in five parts. The first part examines trends in different types of crime rates across the five mining categories over the ten-year period (2014–2023). The second part analyses mining employment, measured in FTEs, for each mining region over the same period. The third part presents fixed-effects panel regression results assessing the lagged effect of mining employment (FTE) on crime across mining regions. The fourth part reports the results of panel regressions incorporating interaction terms between lagged mining employment (FTE) and mining region, evaluating their impact on different crime types. Finally, the fifth part presents panel regression results for a sub-sample of districts experiencing mining decline, examining the lagged effect of mining employment (FTE) on various crime categories.

6.2.1 Crime rates per mining region

The results follow the crime categories in Table 6.3. These are: contact crimes, sexual offences, contact-related property crimes, property-related crimes, and crimes detected by police action (CDRPA).

a) Contact Crime

This section shows the trends and levels of various property-related crimes across mining regions from 2014 to 2023.

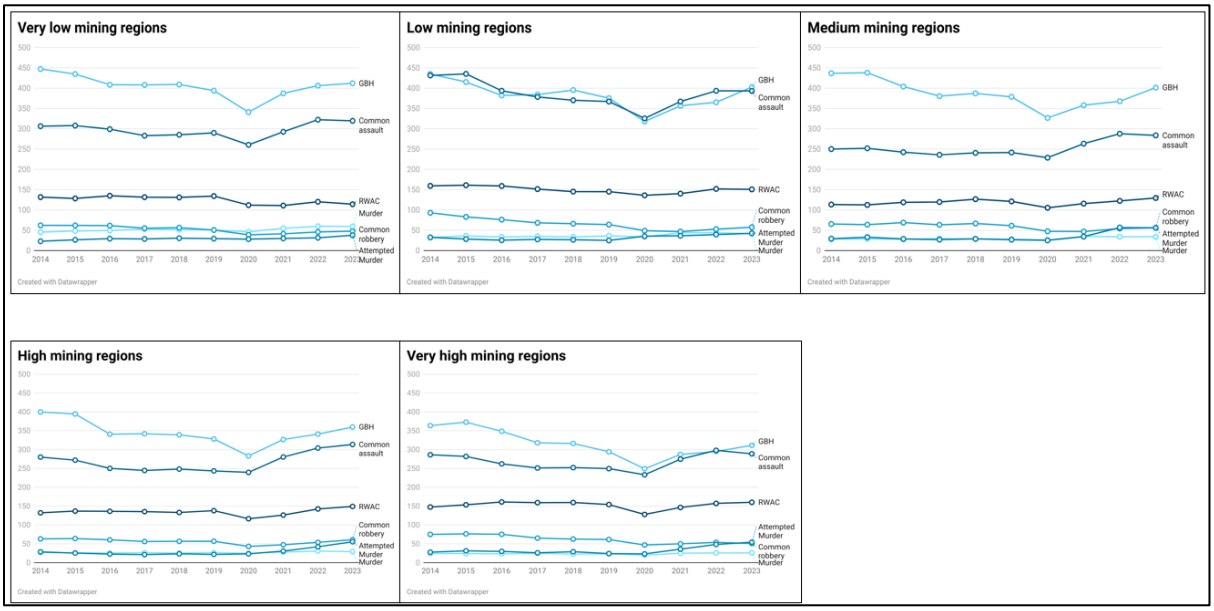


Figure 6.1: Mining regions by type of contact crime (2014-2023). Own calculation using SAPS data and Stats SA mid-year population estimates

Figure 6.1 indicates that assault with intent to inflict GBH and common assault are the most prevalent contact crimes across all mining regions over the ten-year period. While the general pattern of contact crimes is consistent across regions, the intensity varies. The following section examines trends for each type of contact crime by mining region. Figure 6.2 presents a comparative analysis of crime rates across the mining regions from 2014 to 2023.

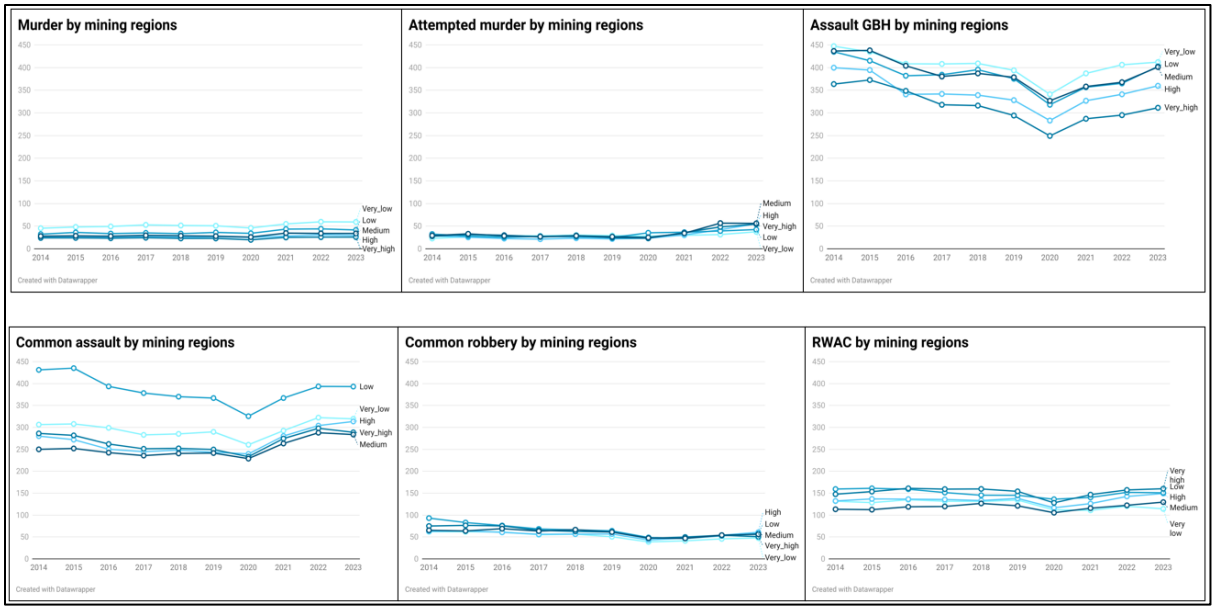


Figure 6.2: Contact crimes across the mining regions over the period 2014-2023.

Own calculation using SAPS data and Stats SA mid-year population estimates

Murder rates were the lowest among all contact crimes from 2014 to 2023, with similar levels across all mining regions. Attempted murder rates were also comparable across regions between 2014 and 2019, with a slight increase observed since 2020. In 2023, medium mining regions recorded the highest attempted murder rates, followed by high, very high, low, and very low-mining regions. No clear linear relationship between attempted murder rates and mining intensity was evident.

Assault with GBH rates were high across all mining regions. Very low-mining regions exhibited the highest rates, decreasing from approximately 450 reported cases per 100 000 population in 2014 to 410 per 100 000 in 2023. Similar patterns, though at lower levels, were observed in other mining regions, with rates declining in the following order: low, medium, high, and very high mining regions. This pattern suggests that GBH rates decrease as mining intensity increases.

Common assault remained persistently high in low-mining regions, followed by very low, very high, high, and medium mining regions. No clear linear relationship between common assault rates and mining intensity was observed.

Common robbery rates were low and similar to those of murder and attempted murder, with minimal variation across mining regions. In 2023, all regions reported approximately 60 cases per 100 000 population, indicating no clear linear relationship with mining intensity.

RWAC had higher levels than murder, attempted murder, and common robbery, but lower than GBH and common assault. No consistent pattern emerged between RWAC rates and mining intensity.

In summary, the relationship between contact crime and mining intensity is mixed. Some crimes, such as GBH and murder, show a decreasing trend with higher mining intensity, whereas others, including attempted murder, common assault, common robbery, and RWAC, exhibit no clear relationship.

b) Sexual Offences

This section shows the trends and levels of various types of sexual offences across different mining regions over the period 2014 to 2023.

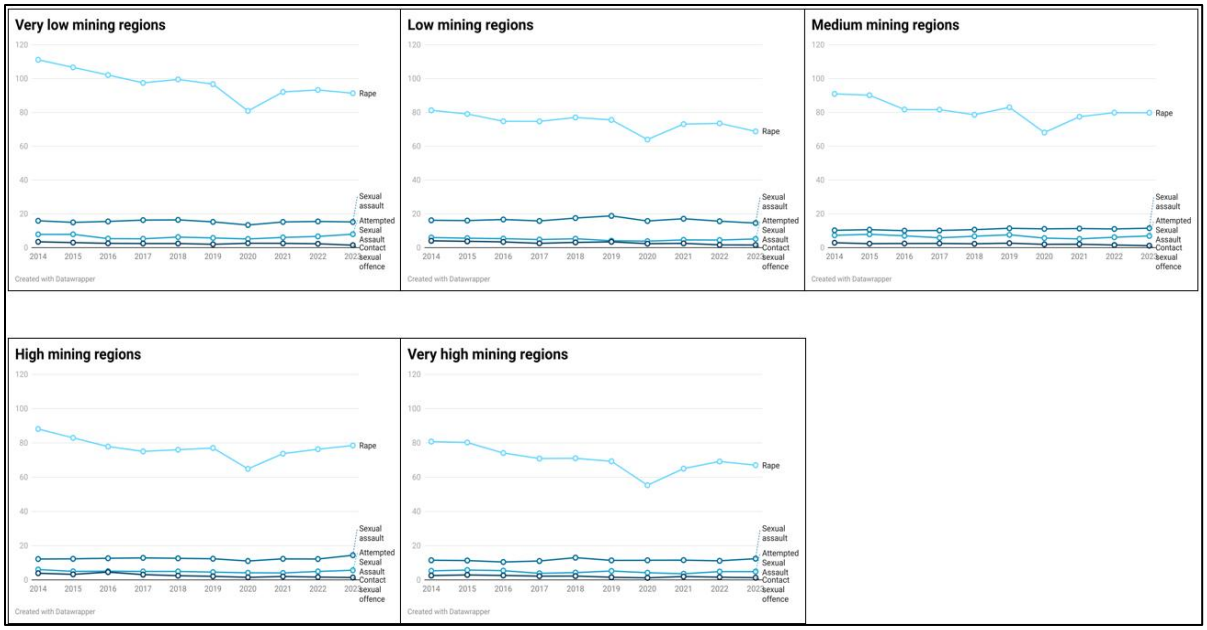


Figure 6.3: Mining regions by type of sexual offences (2014-2023). Own calculation using SAPS data and Stats SA mid-year population estimates

Figure 6.3 shows that rape consistently recorded the highest rates among sexual offences across all mining regions. Reported rape cases declined gradually until 2019, dropped more sharply in 2020, and then increased slightly from 2021 onwards. Other sexual offences remained at consistently low levels, exhibiting minimal variation regardless of mining intensity. The uniformity of patterns across mining regions suggests that mining intensity does not strongly influence trends in reported sexual offences. The pronounced decline around 2020 likely reflects external factors, such as the COVID-19 lockdowns, rather than an actual reduction in incidents. The following section further examines these trends, analysing the patterns of different types of sexual offences by mining region.

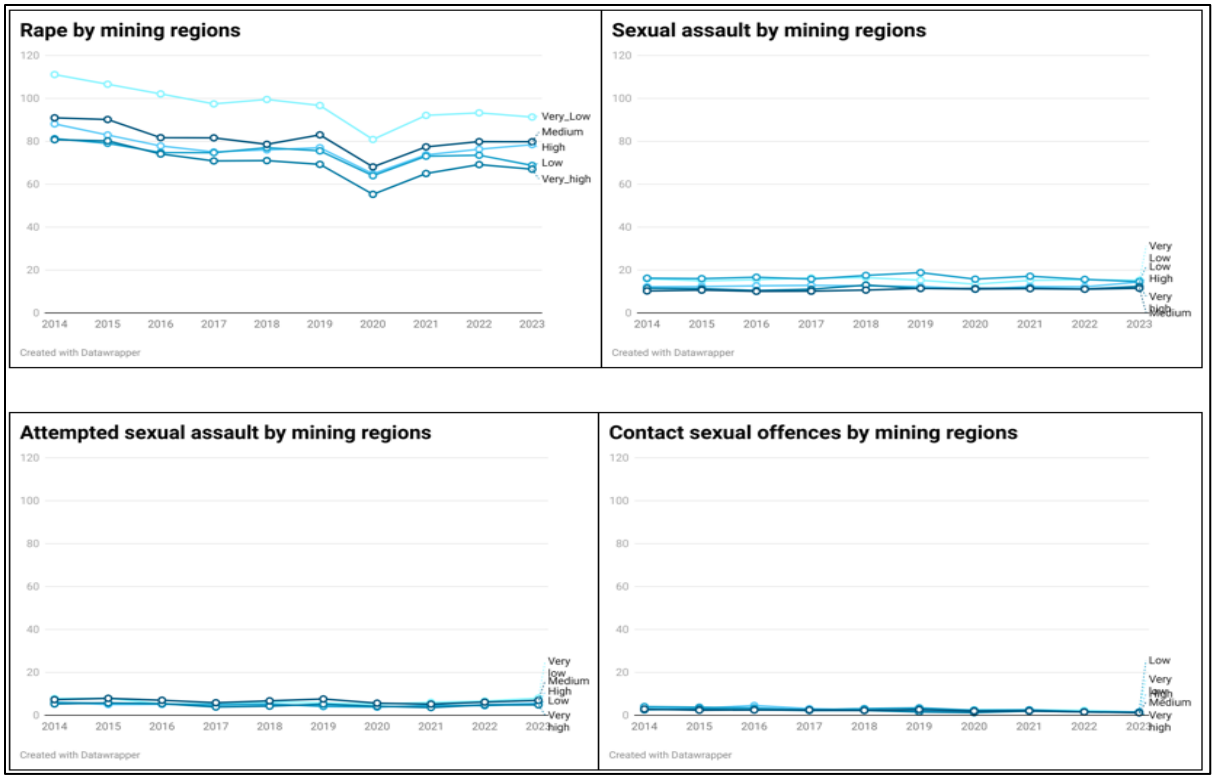


Figure 6.4: Sexual offences cross the mining regions over the period 2014-2023

Own calculation using SAPS data and Stats SA mid-year population estimates

Figure 6.4 shows that, on average, very low-mining regions recorded the highest rates of rape and sexual assault over the ten-year period from 2014 to 2023. No discernible pattern emerges for attempted sexual assault and contact sexual offences, as the levels remain largely similar across all mining regions. Among the various types of sexual crimes, rape exhibits the clearest differentiation across the five mining regions, with very low-mining regions consistently showing the highest rates, while very high mining regions report the lowest. This variation warrants further investigation in the subsequent panel regression analysis with interaction terms.

c) Contact-related Property Crimes

This section shows the trends and levels of various types of contact-related property crimes across different mining regions from 2014 to 2023.

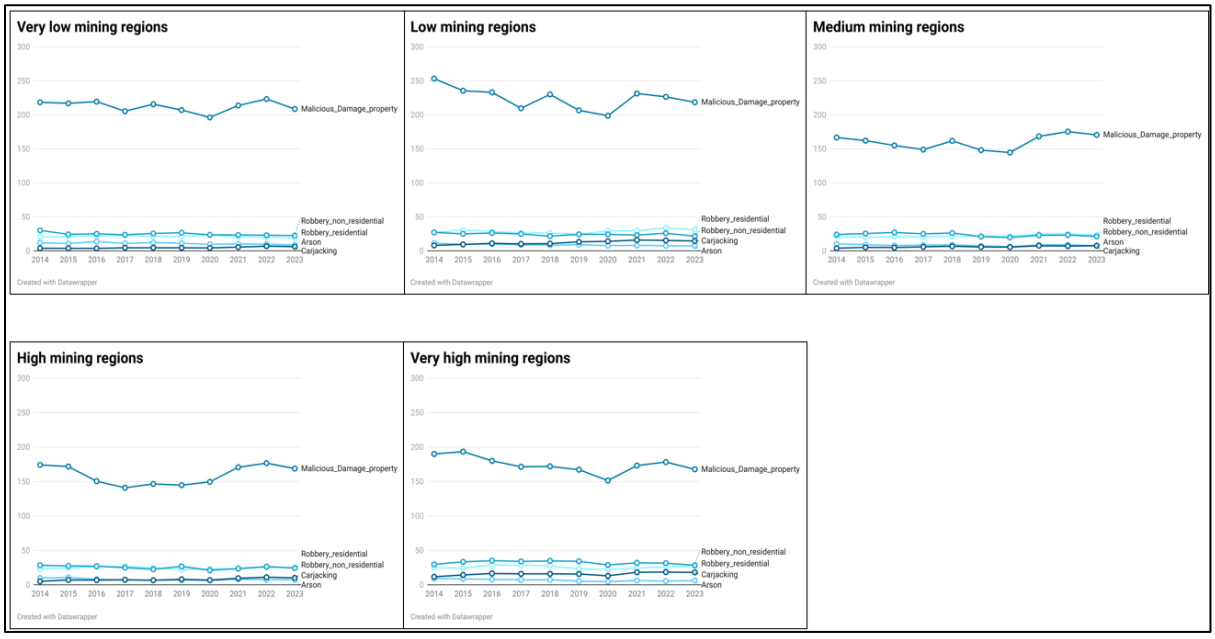


Figure 6.5: Mining regions by contact-related property crimes (2014-2023)

Own calculation using SAPS data and Stats SA mid-year population estimates.

Figure 6.5 shows that malicious property damage exhibits the highest rates across all mining regions, followed by robbery at non-residential premises in all regions except for very high mining regions. While absolute crime levels differ by region, the overall trends are similar across all areas. Malicious property damage is the most prevalent type of contact-related property crime, and its incidence shows little variation over time. Overall, the levels of all contact-related property crimes remain relatively stable across mining regions. The following section examines the trends for each type of contact-related property crime by mining region.

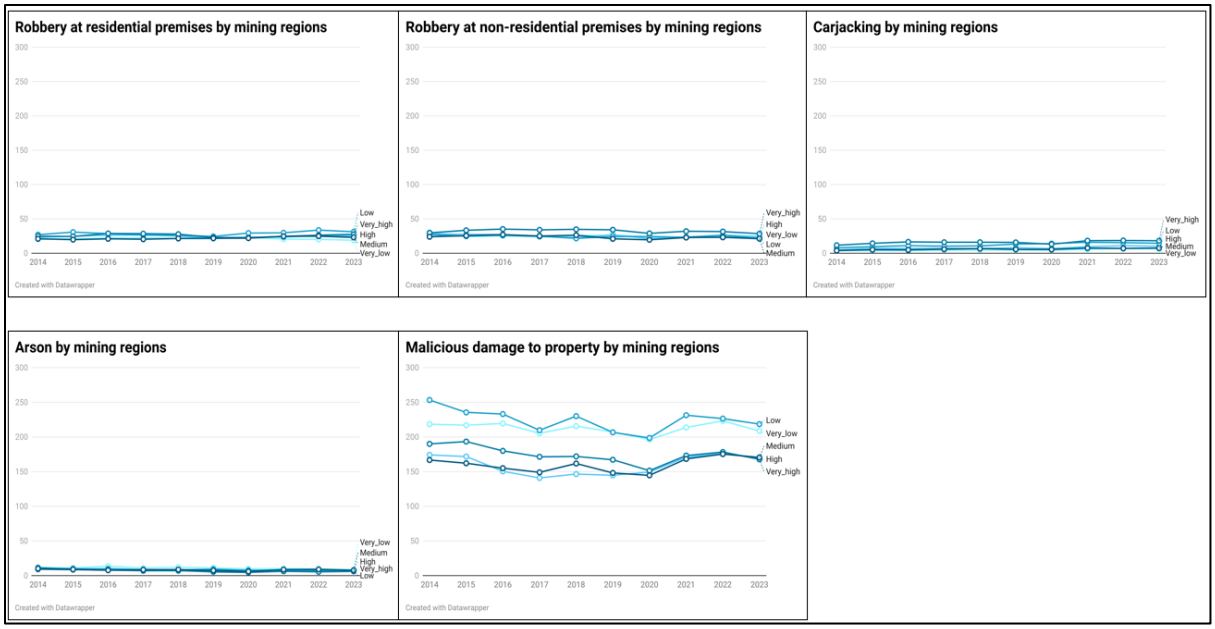


Figure 6.6: Contact-related property crimes cross the mining regions from 2014 to 2023

Own calculation using SAPS data and Stats SA mid-year population estimates.

Figure 6.6 shows a more nuanced distribution of the type of crime by mining region. Robbery at residential premises, robbery at non-residential premises, carjacking, and arson have remained relatively low and flat compared to malicious damage to property. Malicious damage to property shows at least some variation. It has been significantly higher in low and very low-mining areas than in high and very high mining regions.

d) Property-related Crimes

This section shows the trends and levels of various property-related crimes across mining regions from 2014 to 2023.

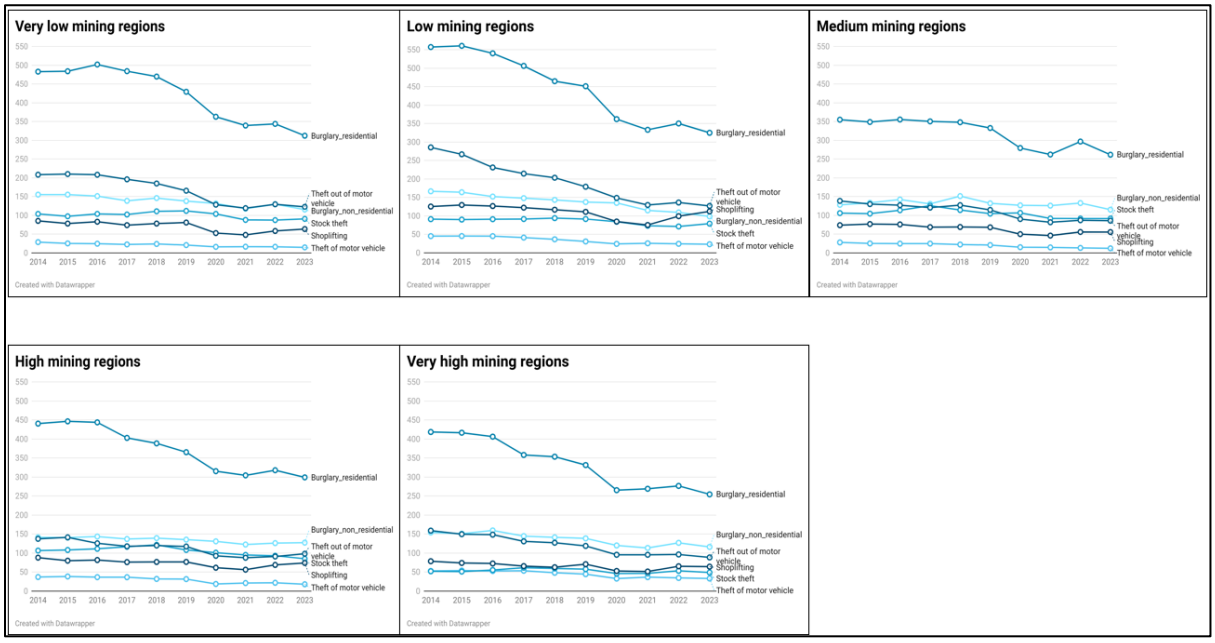


Figure 6.7: Mining regions by property-related crimes (2014-2023)

Own calculation using SAPS data and Stats SA mid-year population estimates.

Figure 6.7 depicts property-related crimes for each mining region. Burglary at residential premises consistently has the highest rates compared to the other property-related crimes across all mining regions. A similar trend for burglary at residential premises is observed for all the different areas. Residential burglary has been the dominant crime in all mining regions, sharply declining between 2014 and 2023. Other property-related crimes, such as theft, also decreased. More substantial institutional presence and security measures could contribute to this decline. The following section presents the results of property-related crimes per mining region.

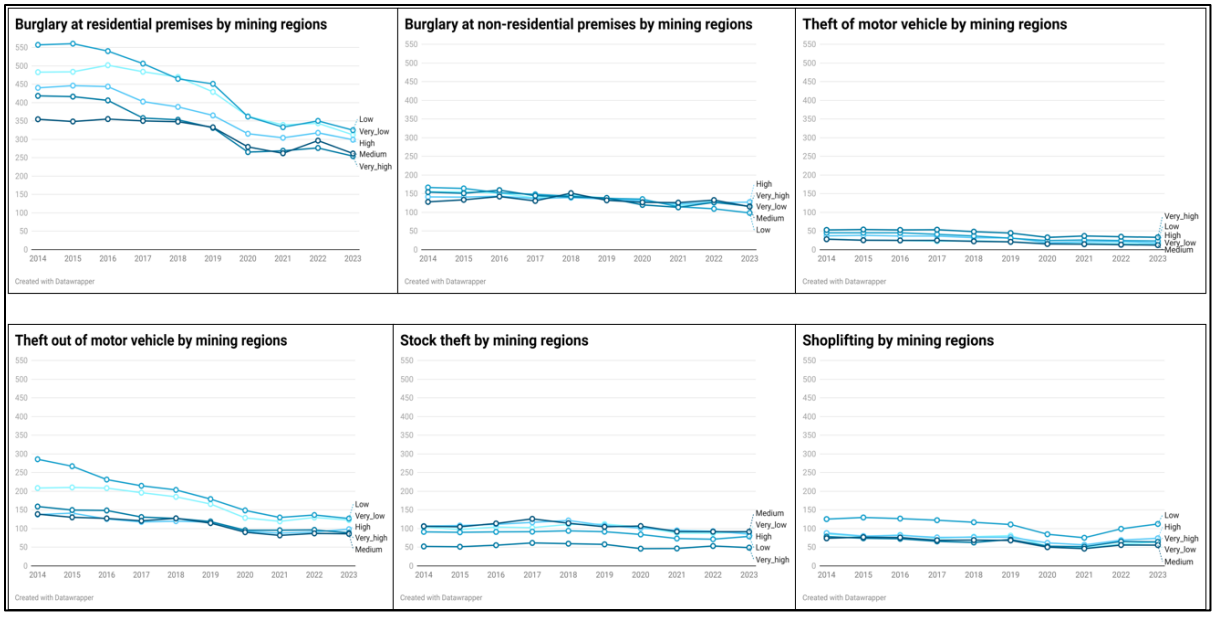


Figure 6.8: Property-related crimes cross the mining regions over the period 2014-2023

Own calculation using SAPS data and Stats SA mid-year population estimates.

Figure 6.8 shows that burglary at residential premises declined across all mining regions between 2014 and 2023. Low-mining regions recorded the highest rates, followed by very low and high-mining regions, while very high and medium mining regions displayed similar, lower levels. The lower burglary rates in very high mining regions may be attributed to access to alternative security measures provided by mining companies, though the relatively low rates in medium mining regions remain unexplained.

No clear pattern is evident for burglary at non-residential premises. Theft of motor vehicles has remained consistently high in very high mining regions, whereas theft out of motor vehicles is highest in low-mining regions. Conversely, stock theft is notably lower in very high mining regions, approximately half the rate observed in very low-mining regions. Shoplifting exhibits similar levels between very low and very high mining regions.

These patterns suggest that variations in property-related crime are associated with the type and intensity of mining activity and can be linked to the socioeconomic context of each region, as reflected in the asset index discussed in Chapter 5.

e) Crimes Detected As a Result of Police Action

This section shows the trends and levels of various types of crimes detected due to police action across different mining regions from 2014 to 2023.

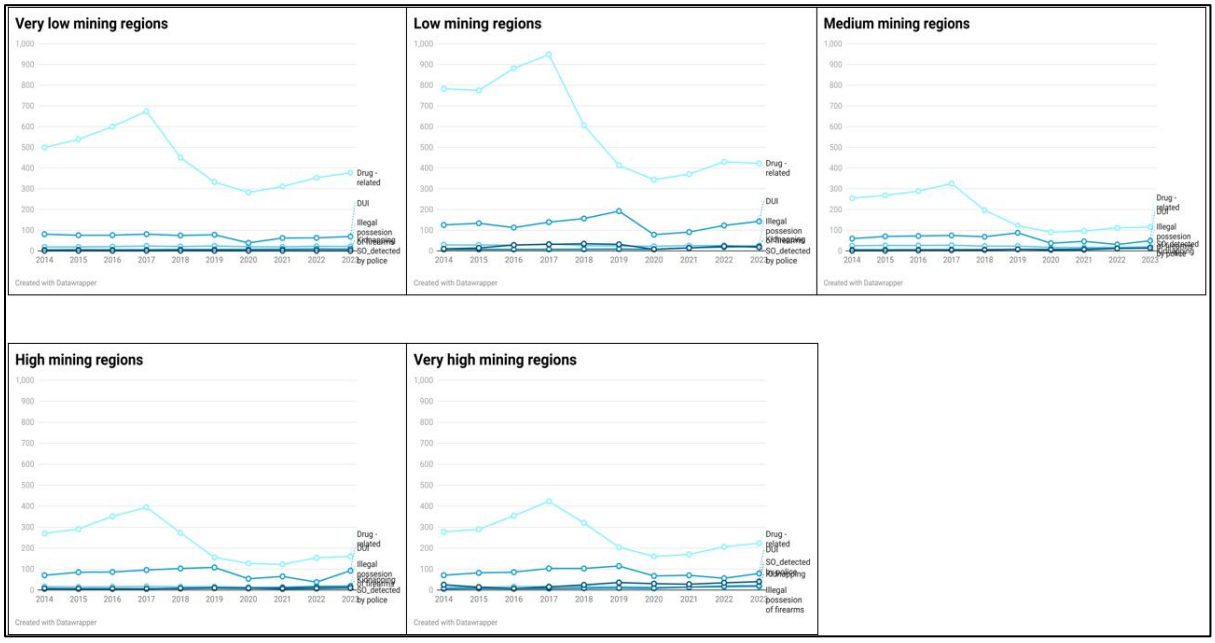


Figure 6.9: Mining regions by crimes resulting from police action (2014-2023)

Own calculation using SAPS data and Stats SA mid-year population estimates.

Figure 6.9 shows that drug-related crimes consistently record the highest rates among all offences detected through police action across all mining regions. In very low-mining regions, these crimes were particularly prominent. Other police-detected offences such as driving under the influence (DUI), illegal possession of firearms, and other police detections remained consistently low over the study period. Overall, drug-related crimes overwhelmingly dominate police-detected offences in all mining regions. This pattern suggests that fluctuations in drug-related crime rates are likely

more reflective of changes in police enforcement intensity than of actual variations in underlying criminal behaviour. Figure 6.10 presents each category of crime detected through police action by mining region.

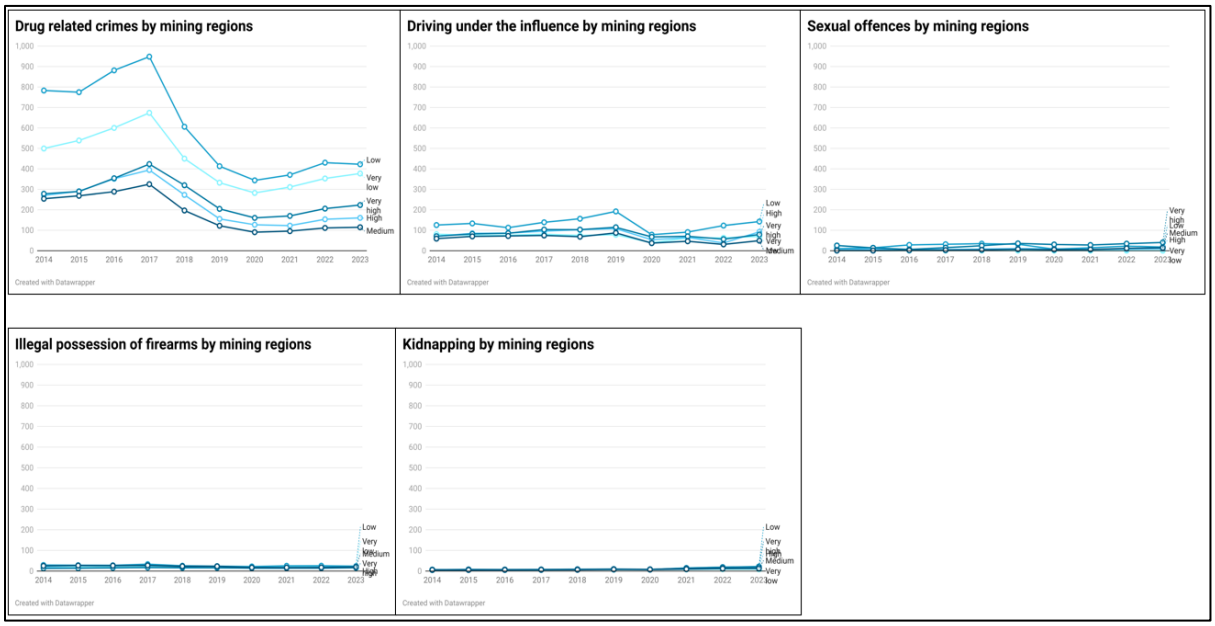


Figure 6.10: Crimes due to police action across the mining regions for the period 2014-2023

Own calculation using SAPS data and Stats SA mid-year population estimates.

Figure 6.10 shows that drug-related crimes have been persistently high in low-mining regions. There is a drop in the drug-related crime rates for all mining regions in 2017. Very low-mining regions experience the second-highest drug-related crime rates. Driving under the influence of alcohol or drugs is also persistently high in low-mining regions. There is no clear pattern for sexual offences. Illegal possession of firearms is also highest in low-mining regions. There was a significant increase in kidnapping rates for all mining regions in 2020. Generally, low-mining regions have the highest incidence rates for crimes detected due to police action.

6.2.2 Mining employment

This section presents the descriptive statistics of mining employment in different mining regions.

a) Regional Variation in Mining Employment

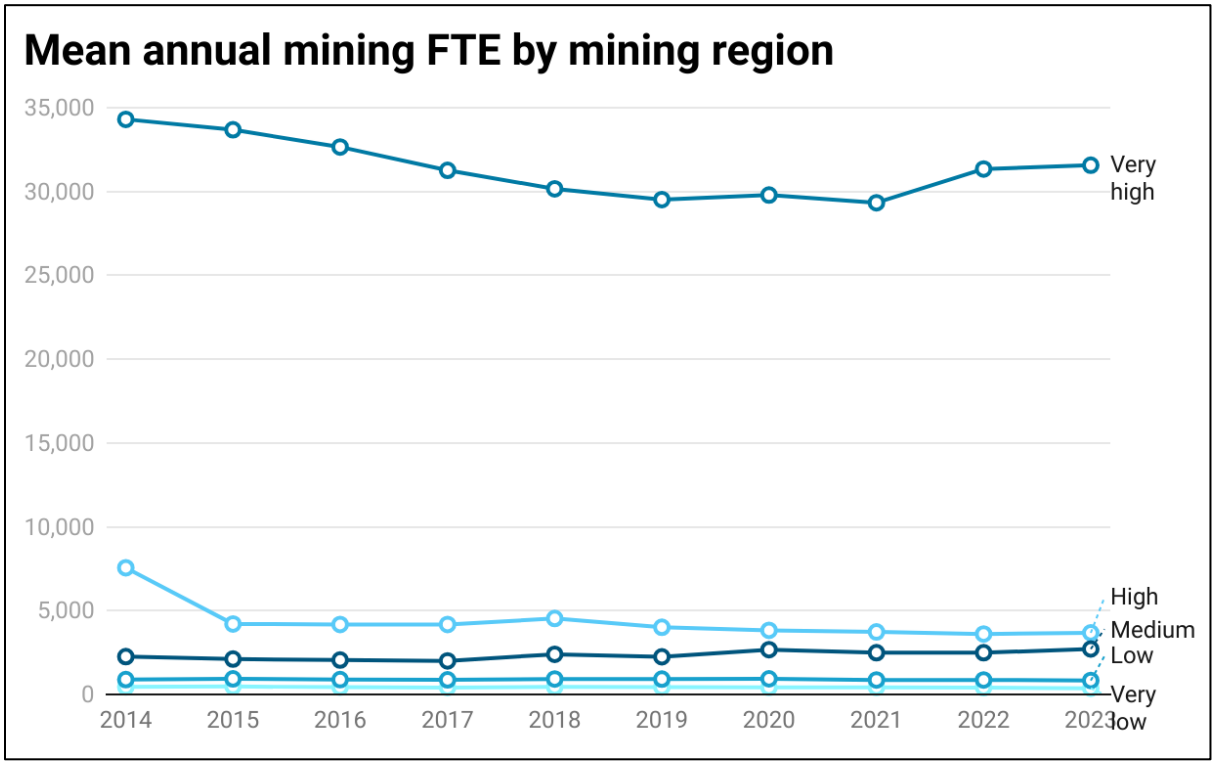


Figure 6.11: Mean annual mining FTE per mining region over 2014-2023.

Own calculation using SARS data.

Figure 6.11 shows that the average annual mining FTE employment in very high mining regions is far higher than the mining FTEs for the other regions, averaging around a yearly mean of 30 000 mining FTEs.

6.2.3 Crime and mining employment

The previous two sections, 6.3.1 and 6.3.2, presented some statistics on the dependent variable (Crime rates) and the independent variable (Mining FTE) over a ten-year period (2014 – 2023). The crime statistics reveal a nuanced pattern. Certain types of crime remained persistently high in very high mining regions, including theft of motor vehicles, carjacking, robbery at non-residential premises, and RWAC. Conversely, other crimes such as murder, assault with intent to inflict grievous bodily harm (GBH), rape, and arson were consistently higher in very low-mining regions. Mining employment, measured as FTEs, also displayed considerable variation across mining regions. For instance, the very high mining region recorded a mean of 31 324 FTEs and a standard deviation of 31 081 (see Appendix 7.3).

This section presents the panel regression results examining the relationship between crime rates (dependent variable) and mining employment (independent variable, measured as FTEs). First, the lagged panel regression results are presented for each mining region (Equation 6-2). This is followed by the results of the lagged panel regressions incorporating the interaction between one-year lagged mining employment and the mining region classification (Equation 6-3). The analysis began with the Hausman test, which determines the appropriate model specification, fixed or random effects, based on the following hypothesis:

H_0: Random effects are uncorrelated with the regressors → The random effects model is appropriate.

H_1: Random effects are correlated with the regressors → The fixed effects model is appropriate.

Interpretation:

If p-value > 0,05 - Fail to reject H_0 → Use random effects model, and if p-value < 0,05, reject H_0 → Use fixed effects model. The Hausmann test was run for each model; the full results are presented in Appendix 7.2. In the models, mining FTE is treated as a continuous variable, and mining region as a categorical variable. The RWAC and stock theft models have p-values greater than 0,05; hence, the RE model was used. The second step was to run the panel regression models

for each crime variable using the relevant model (FE or RE), considering the robust standard errors. The results of the panel regression models are presented next.

6.2.3.1 Lagged Effect of Mining Employment on Crime per mining region.

a) Contact Crimes vs Lagged FTEs Per Mining Region

This section presents the panel regression results between the types of contact crimes and mining employment (Equation 6.2). Table 6.3 shows the fixed effects panel regression coefficients between the types of contact crimes and the one-year lagged period in mining employment for each mining region.

Table 6.2: Panel regression results (Coefficients – fixed effects model): types of contact crimes and the one-year lagged mining employment per mining region

	Mining regions				
Type of contact crime	Very low	Low	Medium	High	Very high
Murder	-0,0861	-0,0792	0,0452**	0,0008	0,001
Attempted murder	0,3477**	-0,051	0,041**	-0,0056	0,002**
Assault GBH	-0,3175	-0,0548	0,0497	-0,0008	0,0245**
Common assault	-1,0051**	0,0943	0,1026**	-0,0108	0,0098
Common robbery	-0,2599**	0,0594	0,0014	-0,0058	0,0094**
RWAC	0,5902**	0,104	0,3273**	0,0049	0,0118**

*p < 0,10, **p < 0,05, ***p < 0,01

Table 6.3 shows that mining FTE has a positive and significant effect (β = 0,0452**) on murder only in medium mining regions. In other regions (very low, low, high, and very high), the effects of mining FTE on murder are not statistically significant. These results suggest that mining employment may increase murder rates only in medium mining regions.

Table 6.2 further shows that mining FTE has positive statistically significant effects on attempted murder in very low-mining regions (β = 0,3477**), medium mining regions (β = 0,041**), and

very high mining regions (β = 0,002**). These results suggest that mining employment may increase attempted murder rates in very low and medium mining regions, with a minimal but significant response in very high mining regions.

Mining FTE has a statistically significant effect on assault GBH only in very high mining regions (β = 0,0245**). However, assault GBH rates were high, amongst all contact crimes, in all mining regions. Very low-mining regions have the highest rates (See Figure 6.2). This relationship exposes the complex nature of social disruption. On one hand, in very high mining regions, there are high assault GBH rates (relative to other contact crimes) which are statistically significantly related to mining FTE employment.

On the other hand, in very low-mining regions, assault GBH is highest compared to all other mining regions, but has no statistically significant relationship with mining FTE employment. The within-region variation of the FE model can explain this. This could be linked to the high social disruption expected in high-mining regions, where crime (assault and GBH) rises with a rise in mining activities.

Mining FTE has a negative effect on common assault in very low-mining regions (β = -1,0051**). This suggests that in very low-mining regions, an increase in mining FTE employment is associated with a decrease in common assaults. However, mining FTE has a positive effect (β = 0,1026**); an increase in mining full-time equivalent employment is associated with an increase in common assault incidents. This suggests that in medium mining regions, more mining jobs are linked with more common assaults. The results for common assaults are mixed. Mining jobs reduce common assaults in very low-mining regions. At the same time, mining employment increases common assaults in medium mining regions.

Mining FTE has a negative effect on common robbery in very low-mining regions (β = -0,2599**), suggesting that mining employment reduces common robbery. At the same time, mining FTE has a positive effect on common robbery in very high mining regions (β = 0,0094**), suggesting that mining employment slightly increases common robbery. These results indicate that, like common

assaults, common robbery patterns are mixed with adverse effects in very low-mining regions and a positive impact in very high mining regions.

Lastly, mining employment has positive and statistically significant effects on RWAC in very low-mining regions (β = 0,5902**), medium mining regions (β = 0,3273**), and very high mining regions (β = 0,0118**). These results suggest that mining employment increases RWAC crimes across most regions.

In summary, the effect of mining employment on crime is not uniform. In some regions, mining employment reduces crime (for example, common assault and common robbery in very low-mining areas). In other regions, mining employment increases crimes (for example, common assault, attempted murder, RWAC in medium and very high mining regions).

b) Sexual Offences vs Lagged FTEs Per Mining Region

This section presents the results of the panel regression between types of sexual offences and mining employment. Table 6.4 shows the coefficients of the fixed effects panel regression between the types of sexual offences and one-year lagged mining employment in each mining region.

Table 6.3: Panel regression results (Coefficients – fixed effects model): types of sexual offences and one-year lagged mining employment per mining region

	Mining regions				
Type of sexual offence	Very low	Low	Medium	High	Very high
Rape	-0,0311	-0,0317	0,0406**	-0,0050	0,0079**
Sexual assault	-0,0517**	0,0092	0,0041**	-0,0004	0,0001
Attempted sexual assault	0,0039	0,0080	-0,0001	-0,0004	0,0005**
Contact sexual assault	0,0195**	0,0086**	0,0005	0,0005	0,0002

*p < 0,10, **p < 0,05, ***p < 0,01

Table 6.4 shows that there is a statistically significant positive effect of mining employment on rape in medium mining regions (β = 0,0406**), suggesting that increased mining employment is

linked to higher rape rates. The same positive effect is also observed in very high mining regions (β = 0,0079**), although the effect is small. The other regions (very low, low, high) show effects that are not statistically significant. These results suggest that rape rates increase with mining employment in medium and very high mining regions. Rape has been the highest type of sexual offence for all mining regions, but again, this shows the within-region effects of the relationship.

Table 6.4 further shows, on one hand, a statistically significant negative effect of mining employment on sexual assault in very low-mining regions (β = -0,0517**), implying that increases in mining employment are linked to decreases in reported cases of sexual assault. On the other hand, mining employment has a statistically significant positive effect on sexual assault in medium mining regions (β = 0,0041**), implying that increases in mining jobs in medium mining regions are linked to slight increases in reported cases of sexual assault. There is no statistically significant effect in all the other regions. These mixed results suggest that mining employment may reduce sexual assault in very low-mining areas, but may raise it in medium mining areas.

Mining employment has a statistically significant positive effect on attempted sexual assault in very high mining regions (β = 0,0005**). This effect is small, but significant, implying that increased mining employment is linked with slight increases in attempted sexual assault. The effects are not statistically significant in the other mining regions (very low, low, medium, and high).

Lastly, mining employment has statistically significant effects on contact sexual assault in very low-mining regions (β = 0,0195**) and low-mining regions (β = 0,0086**), implying that increases in mining employment increase contact sexual assault in these mining regions. In the other mining regions, the effects are statistically not significant.

In summary, the mixed results suggest that the relationship between mining employment and sexual offences is highly region-dependent. In some regions, mining employment seems to reduce certain crimes, while it increases opportunities for offences in others.

c) Contact-related Property Crimes vs Lagged FTEs Per Mining Region

This section presents the panel regression results between the types of contact-related property crimes and mining employment. Table 6.5 shows the fixed effects panel regression coefficients between the types of contact-related property crimes and one-year lagged mining employment in each mining region.

Table 6.4: Panel regression results (Coefficients – fixed effects model): types of contact-related property crimes and one-year lagged mining employment per mining region

	Mining regions				
Type of contact-related property crime	Very low	Low	Medium	High	Very high
Robbery at non-residential premises	0,1092**	0,0009	0,0342**	0,0072**	0,0014
Robbery at residential premises	0,0445	-0,0449	0,0669**	0,0004	0,0021**
Carjacking	0,0026**	-0,0083	0,0777**	0,0012	-0,0006
Arson	0,0984**	0,0082	0,0052**	-0,0004	0,0010**
Malicious damage to property	-0,5593**	-0,0176	0,0300	0,0037	0,0110**

*p < 0,10, **p < 0,05, ***p < 0,01

The results in Table 6.5 show that mining employment has statistically significant positive effects on robbery at non-residential premises in very low-mining regions (β = 0,1092), medium (β = 0,0342**), and high (β = 0,0072**) mining regions. Mining employment does not have a statistically significant effect on the other regions (low-mining regions and very high mining regions). Furthermore, mining employment has a statistically significant effect on robbery at residential premises in medium mining regions (β = 0,0669) and very high mining regions (β = 0,0021**). Mining employment has a positive effect on carjacking in very low-mining regions (β = 0,0026) and medium mining regions (β = 0,0777**). It has no effect in the other mining regions. Mining employment has statistically significant positive effects on arson in very low-mining

regions (β = 0,0984), medium mining regions (β = 0,0052**), and very high mining regions (β = 0,0010**). There is no statistically significant effect in low-mining regions and high-mining regions. There is a statistically significant, strong negative effect of mining employment on malicious damage to property in very low-mining regions (β = -0,5593**). At the same time, mining employment has a statistically significant positive effect on malicious damage to property in very high mining regions (β = 0,0110**).

These results suggest that mining employment (FTE) tends to increase property-related crimes in medium and very high mining regions. In contrast, in very low-mining regions, the effects are mixed, with mining employment appearing to stabilise certain crime types (such as property damage) while exacerbating others (such as robbery and arson).

d) Property Crimes vs Lagged FTEs Per Mining Region

This section presents the panel regression results between the types of property crimes and mining employment. Table 6.6 shows the fixed effects panel regression coefficients between the types of property crimes and one-year lagged mining employment in each mining region.

Table 6.5: Panel regression results (Coefficients – fixed effects model): types of property crimes and one-year lagged mining employment per mining region

	Mining regions				
Type of property crime	Very low	Low	Medium	High	Very high
Burglary at a non-residential premises	-0,0318	0,2083	-0,0136	-0,0031	0,0115**
Burglary at a residential premises	-0,5234	1,0989**	-0,1290	-0,0009	0,0550**
Theft of a motor vehicle	0,0913	0,0253	-0,0681	0,0106**	0,0094**
Theft out of a motor vehicle	-1,0450	0,4639	-0,0068	-0,0171	0,0191**
Stock theft	-0,0649	-0,0851	-0,0246	0,0059	-0,0001
Shoplifting	-0,0971	0,1427	-0,0073	0,0034	0,0050**

*p < 0,10, **p < 0,05, ***p < 0,01

The results in Table 6.6 show that mining employment has a positive effect on burglary at non-residential premises only in very high mining regions (β = 0,0115**). There are no statistically significant effects in all the other mining regions. Mining employment has statistically significant positive effects on burglary at residential premises in low-mining regions (β = 1,0989**) and very high mining regions (β = 0,0550**). Mining employment also has statistically significant positive effects on theft of motor vehicles in high-mining regions (β = 0,0106**) and very high mining regions (β = 0,0094**). Mining employment has a statistically significant positive effect on theft out of motor vehicles in very high mining regions (β = 0,0191**). Mining employment has no statistically significant effect on stock theft in mining regions. Mining employment has a statistically significant positive effect on shoplifting in very high mining regions (β = 0,0050**). These results suggest that the more intense the mining, the more mining employment is linked with property-related crime increases, especially in very high mining regions.

e) Crimes Detected As a Result of Police Action vs Lagged FTEs Per Mining Region

This section presents the panel regression results between the types of crimes detected due to police action and mining employment. Table 6.7 shows the fixed effects panel regression coefficients between the types of crimes detected due to police action and one-year lagged mining employment in each mining region.

Table 6.6: Panel regression results (Coefficients – fixed effects model): types of crimes detected as a result of police action, and one-year lagged mining employment per mining region

	Mining regions				
Crimes detected as a result of police action	Very low	Low	Medium	High	Very high
Drug-related crimes	-2,7085	2,4568**	-0,3486**	0,0323	0,0461**
Illegal possession of firearm	0,0897	-0,0378	-0,0153	0,0018	0,0010
DUI	-0,3438**	0,2455	-0,0754	-0,0009	0,0100**
Kidnapping	0,0750**	-0,0163	0,0304**	-0,0030	0,0005

*p < 0,10, **p < 0,05, ***p < 0,01

Table 6.7 shows a statistically significant positive effect of mining employment on drug-related crimes in low-mining regions (β = 2,4568**) and a small but positive effect in very high mining regions (β = 0,0461**). However, mining employment has a statistically significant negative effect in medium mining regions (β = -0,3486**). These results suggest that mining employment is associated with more drug-related crimes in low and very high mining regions, but a reduction in drug-related crimes in medium mining regions. Mining employment has no statistically significant effect on the illegal possession of firearms in mining regions. Mining employment has a statistically significant negative effect on DUI in very low-mining regions (β = -0,3438**) and at the same time has a statistically significant positive effect on DUI in very high mining regions (β = 0,0100**). Mining employment has statistically significant effects on kidnapping in very low-mining regions (β = 0,0750**) and medium mining regions (β = 0,0304**), implying that mining employment increases kidnapping cases in very low and medium mining regions.

These results suggest that mining employment drives drug-related crimes up in low and very high mining regions, but reduces them in medium mining areas. Mining employment has mixed effects on DUI, with reductions in very low-mining regions and increases in very high mining regions. Increased mining employment is associated with higher kidnapping cases in very low and medium regions. Finally, there is no statistically significant link between mining employment and illegal possession of firearms.

6.2.3.1 Lagged Effect of Mining Employment (FTE) Interacted With Mining Regions on Different Types of Crime.

This section presents the results of the panel regression between the types of crime and the one-year lagged mining FTE interacted with the mining region. The lagged panel regression models are represented by equation 6.3. The marginal effects for each model are presented and interpreted for each crime category.

a) Contact Crimes

This section presents the panel regression results between types of contact crimes and mining employment. Table 6.8 shows the marginal effects (of the interaction terms) of the relationship between types of contact crimes and one-year lagged mining employment.

Table 6.7: Panel regression results (Marginal effects): types of contact crimes and one-year lagged mining employment interacted with mining region

	Mining region				
Type of crime	Very low	Low	Medium	High	Very high
Murder	-0,2775**	-0,0829	0,0621**	0,0006	-0,0013
Attempted murder	-0,1062*	-0,0457	0,0665**	-0,0081	-0,0027
Assault GBH	-0,6882	-0,3716	-0,0495	-0,0029	0,0206**
Common assault	-1,1125**	-0,1830	0,0828**	-0,0188	-0,0015
Common robbery	-0,3453	0,0401	-0,0563**	-0,0063	0,0125**
RWAC	-0,0577	0,1973**	0,3342**	0,0042	0,0051

*p < 0,10, **p < 0,05, ***p < 0,01

Table 6.8 shows a mixed pattern of the marginal effects of mining employment on contact crimes across different mining regions.

Murder

Mining employment has a statistically significant negative effect on murder in very low-mining regions (β = -0,2775**). This suggests that a unit increase in mining FTE decreases murder by 0,2775 reported cases per 100,000 population. In practical terms, an increase of 100 mining FTEs decreases murder by 28 reported cases per 100 000 population. Conversely, mining employment has a statistically significant positive effect on murder in medium mining regions (β = 0,0621**). This suggests that a unit increase in mining FTE increases murder by 0,0621 reported cases per 100 000 population. In practical terms, an increase of 100 mining FTEs results in an increase of 6 reported murder cases per 100 n000 in these medium mining regions.

Attempted murder

Mining employment has a statistically significant negative effect on attempted murder in very low-mining regions (β = -0,1062**). This suggests that a unit increase in mining FTE decreases the number of attempted murders by 0,1062 reported cases per 100 000 population. In practical terms, an increase of 100 mining FTEs decreases 11 reported attempted murder cases per 100 000 population.

Conversely, mining employment has a statistically significant positive effect on attempted murder in medium mining regions (β = 0,0665**). This suggests that a unit increase in mining FTE increases the attempted murder rate by 0,0621. This means that an increase of 100 mining FTEs results in a decrease of about seven attempted murder cases reported per 100,000 in these medium mining regions.

Assault GBH

Mining employment has a statistically significant positive effect on assault GBH in very high mining regions (β = 0,0206**). This suggests that a unit increase in mining FTE increases assault GBH by 0,0206 reported cases per 100 000 population. In practical terms, an increase of 100 mining FTEs results in an increase of about two reported assault GBH cases per 100 000 population in these very high mining areas.

Common assault

Mining employment has a statistically significant negative effect on common assault in very low-mining regions (β = -1,1125**). This suggests that a unit increase in mining FTE decreases common assault by 1 1125 reported cases per 100 000 population. In practical terms, an increase of 100 mining FTEs decreases common assault by 111 reported cases per 100 000 population.

Conversely, mining employment has a statistically significant positive effect on common assault in medium mining regions (β = 0,0828**). This suggests that a unit increase in mining FTE increases the common assault rate by 0,0828. This means that an increase of 100 mining FTEs

increases about eight common assault reported cases per 100 000 population in these medium mining regions.

Common robbery

Mining employment has a statistically significant negative effect on common robbery in medium mining regions (β = -0,0563**). This suggests that a unit increase in mining FTE decreases the common robbery rate by 0,0563. This means an increase of 100 mining FTEs decreases about six common robbery reported cases per 100 000 in medium mining regions.

Furthermore, mining employment has a statistically significant positive effect on common robbery in very high mining regions (β = 0,0125**). This suggests that a unit increase in mining FTE increases the common robbery rate by 0,0125 per 100 000 population. In practical terms, an increase of 100 mining FTEs results in an increase of about one reported common robbery case per 100,000 in very high mining regions.

RWAC

Mining employment has a statistically significant positive effect on RWAC low-mining regions (β = 0,1973**). This suggests that a unit increase in mining FTE increases RWAC by 0,1973 reported cases per 100 000 population. In practical terms, an increase of 100 mining FTEs increases RWAC by about 20 reported cases per 100 000 population. Similarly, mining employment has a statistically significant positive effect on RWAC in medium mining regions (β = 0,3342 **). This suggests that a unit increase in mining FTE increases RWAC by 0,3342. In practical terms, an increase of 100 mining FTEs results in an increase of about 33 reported RWAC cases per 100 000 in medium mining regions.

Table 6.8: Summary: Panel regression results (Marginal effects): types of contact crimes and one-year lagged mining employment interacted with mining region

	Murder	Attempted murder	Assault GBH	Common assault	Common robbery	RWAC
Very Low	↓	↓	NS	↓	NS	NS
Low	NS	NS	NS	NS	NS	↑
Medium	↑	↑	NS	↑	↓	↑
High	NS	NS	NS	NS	NS	NS
Very high	NS	NS	↑	NS	NS	NS

↑ - Statistically significant positive effect

↓ - Statistically significant negative effect

NS – Not statistically significant

The summary table above shows that only a few results are statistically significant.

b) Sexual Offences

This section presents the results of the panel regression between types of sexual offences and mining employment. Table 6.10 shows the marginal effects (of the interaction terms) of the relationship between types of sexual offences and one-year lagged mining employment.

Table 6.9: Panel regression results (Marginal effects): types of sexual offence and one-year lagged mining employment interacted with mining region

	Mining region				
Type of sexual offence	Very low	Low	Medium	High	Very high
Rape	-0,1994	-0,0415	0,0344**	-0,0055	0,0085**
Sexual assault	-0,0967**	-0,0338	0,0055**	-0,0007	-0,0009
Attempted sexual assault	-0,0234**	-0,0169	-0,0007	-0,0004	0,0004*
Contact sexual assault	0,0169*	0,1163	-0,0015	-0,0010	0,0003**

*p < 0,10, **p < 0,05, ***p < 0,01

Rape

Mining employment has a statistically significant positive effect on rape in medium mining regions (β = 0,0344**). This suggests that a unit increase in mining FTE increases rape by 0,0344 reported cases per 100 000 population. In practical terms, an increase of 100 mining FTEs results in an increase of about three reported cases per 100 000 in these medium mining regions. Similarly, in very high mining regions, mining employment has a statistically significant positive effect on rape (β = 0,0085**). This suggests that 100 additional FTEs would result in an increase of about one reported case per 100 000 in these regions. Other mining regions (very low, low, high) do not have significant effects.

Sexual Assault

Mining employment has a statistically significant negative effect on sexual assault in very low-mining regions (β = -0,0967**). This suggests that a unit increase in mining FTE decreases sexual assault by 0,0967 reported cases per 100 000 population. In practical terms, an increase of 100 mining FTEs decreases sexual assault by about 10 reported cases per 100 000. Conversely, in medium mining regions, mining employment has a statistically significant positive effect on sexual assault (β = 0,0055**), implying that 100 additional FTEs increase sexual assault by about one reported case per 100 000. Other regions show no statistically significant effects.

Attempted Sexual Assault

In very low-mining regions, mining employment has a statistically significant negative effect on attempted sexual assault (β = -0,0234**). This translates to a decrease of about two reported cases per 100,000 for 100 additional FTEs. In very high mining regions, the effect is small but statistically significant at the 10% level (β = 0,0004*), resulting in an increase of ~0,04 reported cases per 100 000 for 100 FTEs, which is practically negligible. Other regions do not show significant effects.

Contact Sexual Assault

Mining employment has a statistically significant positive effect on contact sexual assault in very low-mining regions (β = 0,0169*), corresponding to an increase of ~2 reported cases per 100 000 for 100 additional FTEs. Similarly, in very high mining regions, mining employment has a statistically significant positive effect (β = 0,0003**), but the practical impact is negligible (~0,03 cases per 100,000 for 100 FTEs). Other regions show no significant effects.

Table 6.10: Summary: Panel regression results (Marginal effects): types of sexual offences and one-year lagged mining employment interacted with mining region

	Rape	Sexual assault	Attempted sexual assault	Contact sexual assault
Very Low	NS	↓	↓	NS
Low	NS	NS	NS	NS
Medium	↑	↑	NS	NS
High	NS	NS	NS	NS
Very high	↑	NS	↑	↑

↑ - Statistically significant positive effect

↓ - Statistically significant negative effect

NS – Not statistically significant

c) Contact-Related Property Crimes

This section presents the panel regression results between the types of contact-related property crimes and mining employment. Table 6.12 shows the marginal effects (of the interaction terms) of the relationship between the types of contact-related property crimes and one-year lagged mining employment.

Table 6.11: Panel regression results (Marginal effects): types of contact-related property crimes and one-year lagged mining employment interacted with mining region

	Mining region				
Type of contact-related property crime	Very low	Low	Medium	High	Very high
Robbery at non-residential premises	-0,0213	0,0620	0,0204	0,0072**	0,0001
Robbery at residential premises	-0,0540	0,0309	0,7046**	0,0003	-0,0010
Carjacking	-0,1701*	0,0105	0,0873**	0,0011	-0,0030
Arson	0,0213	-0,0055	0,0000	-0,0005*	0,0017*
Malicious damage to property	-0,6183**	-0,1338**	-0,0169	0,0026	0,0091**

*p < 0,10, **p < 0,05, ***p < 0,01

Robbery at Non-Residential Premises

Mining employment has a statistically significant positive effect on robbery at non-residential premises in high-mining regions (β = 0,0072**). This suggests that a unit increase in mining FTE increases robbery at non-residential premises by 0,0072 reported cases per 10 000 population. In practical terms, an increase of 100 mining FTEs results in an increase of about one reported case per 100 000. Other mining regions do not show significant effects.

Robbery at Residential Premises

In medium mining regions, mining employment has a statistically significant positive effect on robbery at residential premises (β = 0,7046**). This suggests that a unit increase in mining FTE increases residential robbery by 0,7046 reported cases per 100 000 population. In practical terms, an increase of 100 mining FTEs results in an increase of about 70 reported cases per 100 000 in these regions. Other regions do not show significant effects.

Carjacking

Mining employment has a statistically significant negative effect on carjacking in very low-mining regions (β = -0,1701*). This suggests that a unit increase in mining FTE decreases carjacking by 0,1701 reported cases per 100 000 population. In practical terms, an increase of 100 mining FTEs results in a decrease of about 17 reported cases per 100 000. Conversely, in medium mining regions, mining employment has a statistically significant positive effect on carjacking (β = 0,0873**), corresponding to an increase of about nine reported cases per 100 000 for 100 additional FTEs. Other regions show no significant effects.

Arson

Mining employment has a statistically significant negative effect on arson in high (β = -0,0005*) and very high mining regions (β = 0,0017*). In high-mining regions, 100 additional FTEs result in a decrease of about 0,05 reported cases per 100 000, while in very high regions, 100 additional FTEs lead to an increase of about 0,17 reported cases per 100 000. The practical impact in both cases is minimal. Other regions do not show significant effects.

Malicious Damage to Property

Mining employment has a statistically significant negative effect on malicious damage to property in very low (β = -0,6183**) and low-mining regions (β = -0,1338**). In practical terms, 100 additional FTEs result in a decrease of about 62 cases per 100 000 in very low-mining regions and about 13 cases per 100 000 in low-mining regions. In very high mining regions, mining employment has a statistically significant positive effect (β = 0,0091**), corresponding to an increase of about one reported case per 100,000. Medium and high regions do not show significant effects.

Table 6.12: Summary: Panel regression results (Marginal effects): types of contact-related property crimes and one-year lagged mining employment interacted with mining region

	Robbery at Non-Residential Premises	Robbery at Residential Premises	Carjacking	Arson	Malicious Damage to Property
Very Low	NS	NS	↓	NS	↓
Low	NS	NS	NS	NS	↓
Medium	NS	↑	↑	NS	NS
High	↑	NS	NS	↓	NS
Very high	NS	NS	NS	↑	↑

↑ - Statistically significant positive effect

↓ - Statistically significant negative effect

NS – Not statistically significant

d) Property Crimes

This section presents the panel regression results between types of property crimes and mining employment. Table 6.14 shows the marginal effects (of the interaction terms) of the relationship between types of property crimes and one-year lagged mining employment.

Table 6.13: Panel regression results (Marginal effects): types of property crimes and one-year lagged mining employment interacted with mining region

	Mining regions				
Type of property crimes	Very low	Low	Medium	High	Very high
Burglary at non-residential premises	-0,2035	0,0773	-0,0703*	-0,0039	0,0110**
Burglary at residential premises	-0,9853	1,3296	-0,5077**	-0,0110	0,0779**
Theft of a motor vehicle	-0,0908	0,0511	-0,1271*	0,0057	0,0081
Theft out of a motor vehicle	-1,6654	0,3502	-0,2638	-0,0218	0,0241**
Stock theft	-0,0109	-0,0996**	-0,0246	0,0056	-0,0001
Shoplifting	-0,2118	0,0300	-0,0520**	0,0033	0,0052**

*p < 0,10, **p < 0,05, ***p < 0,01

Burglary at Non-Residential Premises

In medium mining regions, mining employment has a statistically significant negative effect on burglary at non-residential premises (β = -0,0703*). This suggests that a unit increase in mining FTE decreases burglary at non-residential premises by 0,0703 reported cases per 100 000 population. In practical terms, an increase of 100 FTEs results in a decrease of about seven reported cases per 100 n000. In very high mining regions, mining employment has a statistically significant positive effect (β = 0,0110**), corresponding to an increase of about one reported case per 100 000. Other regions do not show significant effects.

Burglary at Residential Premises

Mining employment has a statistically significant negative effect in medium mining regions (β = -0,5077**), implying that 100 additional FTEs result in a decrease of about 51 reported cases per 100 000 population. Conversely, in very high mining regions, mining employment has a statistically significant positive effect (β = 0,0779**), resulting in an increase of about eight reported cases per 100 000. Other regions are not significant.

Theft of a Motor Vehicle

In medium mining regions, mining employment has a statistically significant negative effect (β = -0,1271*), suggesting that 100 additional FTEs lead to a decrease of about 13 reported cases per 100 000 population. Other regions do not show significant effects.

Theft out of a Motor Vehicle

Mining employment has a statistically significant positive effect in very high mining regions (β = 0,0241**), corresponding to an increase of about two reported cases per 100 000 for 100 additional FTEs. Other regions are not significant.

Stock Theft

In low-mining regions, mining employment has a statistically significant negative effect (β = -0,0996**). In practical terms, 100 additional FTEs result in a decrease of about 10 reported cases per 100 000 population. Other regions do not show significant effects.

Shoplifting

Mining employment has a statistically significant negative effect on shoplifting in medium mining regions (β = -0,0520**), corresponding to a decrease of about five reported cases per 100 000 for 100 additional FTEs. In very high mining regions, mining employment has a statistically significant positive effect (β = 0,0052**), resulting in a slight increase of approximately one case per 100 000. Other regions do not show significant effects.

Table 6.14: Summary: Panel regression results (Marginal effects): types of property crimes and one-year lagged mining employment interacted with mining region

	Burglary at Non-Residential Premises	Burglary at Residential Premises	Theft of a Motor Vehicle	Theft out of a motor vehicle	Stock Theft	Shoplifting
Very Low	NS	NS	NS	NS	NS	NS
Low	NS	NS	NS	NS	↓	NS
Medium	↓	↓	NS	NS	NS	↓
High	NS	NS	NS	NS	NS	NS
Very high	↑	↑	↓	↑	NS	↑

↑ - Statistically significant positive effect

↓ - Statistically significant negative effect

NS – Not statistically significant

e) Crimes Detected via Police Action

This section examines the relationship between mining employment and crimes primarily identified through active law enforcement rather than victim reports. These offences include drug-related crimes, illegal possession of firearms, DUI, and kidnapping. Unlike other crime categories, these offences are largely shaped by policing strategies, enforcement intensity, and resource allocation rather than community-based victimisation patterns. Table 6.16 presents the marginal effects of the relationship between crimes detected through police action and one-year lagged mining employment interacted with mining region.

Table 6.15: Panel regression results (Marginal effects): types of crimes detected as a result of police action and one-year lagged mining employment interacted with mining region

	Mining regions				
Types of crimes detected as a result of police action	Very low	Low	Medium	High	Very high
Drug-related crimes	-4,9214	1,4291	-1,0989**	0,0343	0,1031*
Illegal possession of a firearm	-0,0116	0,0613*	-0,0362**	0,0015	-0,0016
DUI	-0,4060	0,1667	-0,0040	-0,0010	0,0096**
Kidnapping	-0,0178	-0,0301	0,0777**	-0,0046	-0,0074

*p < 0,10, **p < 0,05, ***p < 0,01

Drug-Related Crimes

Mining employment has a statistically significant negative effect on drug-related crimes in medium mining regions (β = -1,0989**). This suggests that a unit increase in mining FTE decreases drug-related crimes by 1,0989 reported cases per 100 000 population. In practical terms, an increase of 100 mining FTEs results in a decrease of about 110 reported cases per 100 000. Conversely, in very high mining regions, mining employment has a statistically significant positive effect (β = 0,1031*), corresponding to an increase of about 10 reported cases per 100 000. Other regions do not show significant effects.

Illegal Possession of a Firearm

Mining employment has a statistically significant positive effect in low-mining regions (β = 0,0613*), suggesting that 100 additional FTEs result in an increase of about six reported cases per 100,000 population. In medium mining regions, mining employment has a statistically significant negative effect (β = -0,0362**), implying a decrease of about four reported cases per 100 000 for 100 additional FTEs. Other regions do not show significant effects.

DUI

In very high mining regions, mining employment has a statistically significant positive effect (β = 0,0096**). In practical terms, 100 additional FTEs result in an increase of about one reported case per 100 000. Other regions do not show significant effects.

Kidnapping

In medium mining regions, mining employment has a statistically significant positive effect (β = 0,0777**), suggesting that 100 additional FTEs lead to an increase of about eight reported cases per 100 000 population. Other regions do not show significant effects.

Table 6.16: Summary: Panel regression results (Marginal effects): types of crimes as a result of police action and one-year lagged mining employment interacted with mining region

	Drug-Related Crimes	Illegal Possession of a Firearm	DUI	Kidnapping
Very Low	NS	NS	NS	NS
Low	NS	↑	NS	NS
Medium	↓	↓	NS	↑
High	NS	NS	NS	NS
Very high	↑	NS	↑	NS

↑ - Statistically significant positive effect

↓ - Statistically significant negative effect

NS – Not statistically significant

Table 6.17 summarises the discussions above, showing the relationship between different crime categories and mining employment for each mining region.

Table 6.17: Summary: The effects of mining FTE on crime in different mining regions

	Crime Category				
Mining region	Contact Crimes	Sexual Offences	Contact-Related Property Crimes	Property Crimes	Police-Detected Crimes
Very Low	↓(Murder, Attempted murder, and Common assault)	↓(Sexual assault and attempted sexual assault)	↓ (Carjacking and malicious damage to property)	NS	NS
Low	↑(RWAC)	NS	↓ (carjacking, malicious damage to property)	↓ (stock theft)	↑ (illegal firearm possession)
Medium	Mixed ↑(Murder, Attempted murder, common assault, and Common robbery) ↓(RWAC)	↑(Rape and Sexual Offence)	↑(residential robbery and carjacking)	↓ (non-res burglary, res burglary, and shoplifting)	↑ (drug-related crimes and illegal possession of firearms) ↓ (kidnapping)
High	NS	NS	↑ (non-residential robbery) ↓(Arson)	NS	NS
Very High	↑(Assault GBH)	↑ (rape, sexual assault, and contact sexual assault)	Minor ↑ (arson, malicious damage)	↑ (non-res burglary, residential burglary, theft out of motor vehicle, and shoplifting) ↓(Theft of motor vehicle)	Minor ↑ (drug-related crimes, DUI)

↑ - Statistically significant positive effect

↓ - Statistically significant negative effect

NS – Not statistically significant results

Table 6.18 shows that mining employment has statistically significant and positive effects across all crime categories in very high mining regions. This finding supports two key points. First, while mining generates employment opportunities, it also contributes to the rise of opportunistic crimes. Second, it reinforces the earlier findings on the high willingness to leave observed in very high mining regions in the previous chapter on place attachment. Conversely, in very low-mining regions, mining employment has statistically significant negative effects on some crime categories, including contact crimes, sexual offences, and contact-related property crimes. The results for medium mining regions are mixed, suggesting the need for further investigation into the characteristics of the districts that comprise these regions.

Medium mining regions exhibited the most consistent positive effect of mining employment and contact crimes, including murder, assault with intent to inflict grievous bodily harm (GBH), and common assault. Table 6.19 shows the medium mining regions, the main minerals, and the highest contributors to GVA.

Table 6.18: Medium mining regions, their main minerals, and the highest contributors to GVA

District Name	DC Code	GVA	Minerals	The highest contributor to GVA	2nd highest contributor
Pixley ka Seme District Municipality	DC7	3,70	Diamond, Tiber-eye, Zinc	Community Services (28,5 %)	Agriculture (15,9%)
Thabo Mofutsanyana District Municipality	DC19	2,00	Uranium, Diamond, Sandstone	Community Services (29,4 %)	Trade (16,6%)
Umzinyathi District Municipality	DC24	3,20	Coal and metal ores	Community services (32,0%)	Finance (17,3%)
Umkhanyakude District Municipality	DC27	1,40	Coal and Anthracite	Community Services (30,6%)	Finance (15,8%)
iLembe District Municipality	DC29	2,14	Amethyst, calcite, fluorite, and various clay minerals	Finance (18,37%)	Manufacturing (18,18)
Ehlanzeni District Municipality	DC32	4,00	Gold, platinum, chrome, nickel, and antimony	Community Services (26%)	Trade (21%)
Ngaka Modiri Molema District Municipality	DC38	6,60	Copper, diamonds, fluorspar (fluorite), gold, lead, and manganese	Community Services (36,5%)	Finance (15,9%)
Sedibeng District Municipality	DC42	1,52	Iron and manganese	Manufacturing (25,43%)	Finance (22,94%)

Source: Information obtained from the DDMs diagnostic reports, 2017

The districts that make up the medium mining region have different minerals (diamond, zinc, uranium, coal, clay minerals, gold, platinum, iron, and manganese), showing a variety of mining

activities. However, their economies are mainly driven by community services and finance industries, which shows some homogeneity in their economic structures.

6.3.3.3 Lagged Effect of Mining Employment on Crime in Selected Districts With Local Municipalities Experiencing Mining Decline

This section investigates the relationship between mining employment and crime in the three district municipalities: Lejweleputswa, West Rand, and Dr Kenneth Kaunda municipality. This represents a subgroup of districts that experienced mining decline. The aim is to analyse the relationship between crime and mining employment in districts that experienced mining decline. The methodology remains the same, and Equation 6-2 was used in the analysis. Coefficients were interpreted, and the results are presented in Table 6.20.

Table 6.19: Panel regression results (Coefficients): All crime categories and one-year lagged mining employment for only the selected districts with municipalities experiencing mining decline

Category of crime	Coefficient
Type of contact crime	
Murder	0,0017
Attempted murder	0,0034**
Assault GBH	0,0075
Common assault	0,0101
Common robbery	0,0182**
RWAC	0,0022
Type of sexual offence	
Rape	-0,0035
Sexual assault	-0,0016**
Attempted sexual assault	-0,0004*
Contact sexual offence	-0,0006**
Type of contact-related property crime	
Robbery at non-residential premises	0,0032**
Robbery at residential premises	0,0019
Carjacking	-0,0038
Arson	0,0018**
Malicious damage to property	0,0196**
Type of property crime	
Burglary at non-residential premises	0,0008
Burglary at residential premises	0,0659**
Theft of a motor vehicle	0,0232**
Theft out of a motor vehicle	0,0239**
Stock theft	-0,0054*
Shoplifting	0,0054*
Type of crime detected as a result of police action	
Drug-related crimes	0,0209
Illegal possession of a firearm	-0,0038*
DUI	-0,0071
Kidnapping	0,0003

*p < 0,10, **p < 0,05, ***p < 0,01

The main motivation for this analysis is that previous research has shown that mine decline is associated with increased crime rates, particularly murder (see Marais et al., 2022). The central question, therefore, is whether mine decline contributes to social disruption manifested in higher crime levels. Table 6.20 shows that increases in mining FTE are statistically significant and positively associated with burglary at residential premises (β = 0.0659**), theft of motor vehicles (β = 0.0232**), theft out of motor vehicles (β = 0.0239**), malicious damage to property (β = 0.0296**), common robbery (β = 0.0182**), robbery at non-residential premises (β = 0.0032**), attempted murder (β = 0.0034**), and arson (β = 0.0018**). These relationships may reflect economic boom-and-bust cycles, given that these districts are predominantly gold mining areas, or social disruption resulting from in-migration, labour tensions, and inequality.

Mining employment is also statistically significant and negatively associated with sexual assault (β = -0.0016***), contact sexual offences (β = -0.0006**), stock theft (β = -0.0054**), and illegal possession of firearms (β = -0.0038**). These reductions in certain crime types may be linked to improved economic conditions (for example, reduced stock theft) or a reduction in opportunities for interpersonal crimes (for example, sexual offences). Some crimes, such as murder, rape, carjacking, and kidnapping, show no statistically significant relationship with mining employment.

Table 6.20: Summary: The effects of mining FTE on crime in regions experiencing mining decline

	Crime Category				
Mining region	Contact Crimes	Sexual Offences	Contact-Related Property Crimes	Property Crimes	Police-Detected Crimes
Regions experiencing mining decline	↑(Attempted murder and common robbery)	↓ (Sexual assault and Contact sexual offence)	↑ (Robbery at non-residential premises, Arson, and Malicious damage to property)	↑ (Burglary at residential premises, Theft of a motor vehicle, Theft out of a motor vehicle, and Shoplifting) ↓ (Stock theft)	↓(Illegal possession of a firearm)

↑ - Statistically significant positive effect

↓ - Statistically significant negative effect

NS – Not statistically significant results

Table 6.21 presents mixed results. In regions experiencing mining decline, mining employment shows statistically significant positive associations with several crime categories, including attempted murder, common robbery, robbery at non-residential premises, arson, malicious damage to property, burglary at residential premises, theft of motor vehicles, theft out of motor vehicles, and shoplifting. Conversely, mining employment exhibits statistically significant negative associations with sexual assault, contact sexual offences, stock theft, and illegal possession of firearms. However, there is no statistically significant relationship between murder rates and mining employment, despite the observed increase in murder rates in these regions.

6.3 Discussion

This chapter examined the complex relationship between mining employment and crime across South Africa's mining regions over the ten-year period from 2014 to 2023. Drawing on social disruption theory and the evolving phases of boomtown research, the findings challenge linear assumptions regarding the effects of mining activity on crime. Rather than uniform trends, the results reveal region-specific crime patterns shaped by the complex interaction between mining intensity and other contextual factors.

6.3.1 Non-Linearity in the mining-crime relationship

The analysis confirms that the relationship between mining employment and crime is neither direct nor consistent across regions. Contrary to expectations, very high mining regions exhibited lower levels of violent crime, which may be attributed to the stabilising presence of large-scale mining operations, better infrastructure, and enhanced security measures. It may also indicate that government provision of social infrastructure mitigates some of the expected negative effects. These findings suggest that the relationship between mining and crime is more nuanced and less linear than often portrayed in the literature.

6.3.2 Regional variation by crime type

Consistent with the observed non-linearity, the research found significant regional variation in crime patterns. Contact crimes were higher in medium mining regions, potentially reflecting increased social stress where economic growth outpaces public service delivery. In very high mining regions, property crimes, including vehicle theft and robbery at non-residential premises, were more prevalent. This may relate to asset concentration, socioeconomic inequality, and social disruption, as highlighted in Chapter 5 with respect to socioeconomic vulnerabilities.

Sexual offences also exhibited notable regional patterns. Rape consistently recorded the highest rates among all types of sexual offences, with very low-mining regions experiencing the highest levels. Attempted sexual assault followed a similar pattern. These results complicate and challenge simplistic explanations that attribute sexual offences primarily to mining-induced

hypermasculinity or male-dominated labour environments. If mining-related masculinity were the dominant driver, higher rates would be expected in high-mining regions.

Crimes detected through police action, such as drug-related offences and illegal possession of firearms, were highest in low-mining regions. This pattern may reflect both the actual incidence of crime and differences in law enforcement activity. Overall, the results underscore that crime patterns vary substantially across regions, depending on mining intensity. Such variations challenge linear explanations and caution against automatically attributing crime to mining activity.

6.3.3 Implications for theory and literature

The findings align with the third phase of boomtown research, which emphasises the importance of contextual variation in the social consequences of resource development. Rather than confirming a universal increase or decrease in crime linked to mining activity, this chapter demonstrates that mining regions (very low, low, medium, high, and very high) exhibit diverse crime trajectories depending on local conditions. Similarly, regions experiencing mining decline show heterogeneous crime patterns. These findings support arguments against generalising the "resource curse" and underscore the need for differentiated analytical frameworks when assessing the socioeconomic consequences of mining.

The chapter results suggest that a single narrative cannot explain the relationship between crime and mining employment in South Africa's non-metropolitan areas. Table 6.22 summarises the empirical findings about the four mining-crime hypotheses/themes identified in the literature.

Table 6.21: Summary of Empirical Findings about the Four Mining-Crime Hypotheses

Stance in Literature	Description	Empirical Support from Current Study	Regions/Examples
1. High mining activity increases crime	Economic growth leads to population influx, weak infrastructure, and rising crime (social disruption hypothesis).	Supported. Increased mining employment is positively associated with violent crimes (murder, assault, GBH, common assault).	Very high mining regions (Refer to Table 6.19).
2. High mining activity decreases crime	Economic growth improves the labour market, social conditions, and policing, reducing crime.	Supported. High employment correlates with decreases in contact crimes, sexual offences, and contact-related property crimes.	Very low-mining regions (Refer to Table 6.19).
3. Declining mining activity increases crime	Mine closures lead to job loss, economic insecurity, and higher crime rates.	Partially supported. Rising crime in declining towns with weak alternative economies.	Mining decline regions (Refer to Table 6.22).
4. Declining mining activity decreases crime	Declining mining activity coincides with reductions in crime due to out-migration or local adaptations.	Supported in selected cases. Crime decreased despite mine decline.	Mining decline regions (Refer to Table 6.22).

A disaggregated understanding of these dynamics was facilitated by the use of interaction terms in the panel regressions, highlighting that place-based contexts are essential for fully comprehending the social consequences of mining employment. Consequently, this chapter contributes to a more nuanced body of research on the relationship between crime and mining, underscoring the need for locally tailored, context-sensitive policy strategies rather than broad generalisations about boom or bust effects.

6.3.4 Methodological contribution

This study makes a methodological contribution by employing interaction terms within a panel regression framework to estimate the marginal effects of mining employment on crime across different region types. This approach provides a disaggregated understanding of the mining employment–crime relationship, improving on prior studies that often relied on aggregated data or

shorter timeframes. By stratifying regions based on mining contribution to total regional GVA, the analysis enables clearer identification of where and how mining activity intersects with criminal behaviour.

6.3.5 Limitations of the study

Despite the robustness of the methods employed, several limitations are acknowledged to provide transparency regarding the scope and boundaries of the research and to guide future investigations. First, although panel regression models are robust, they may not fully establish causal relationships between mining employment and crime, particularly if endogeneity issues persist. Consequently, definitive causal inferences should be interpreted cautiously. Second, the reliance on regional-level data may obscure micro-level dynamics and local community nuances. This spatial aggregation could limit insights into localised factors influencing crime. Third, the use of secondary data presents some weaknesses. Crime reporting rates in South Africa are low, and the gap between reported cases and convictions means the crime cycle (incidence, reporting, investigation, arrest, and conviction) is incomplete. Additionally, the study could not control for the number of police stations or officers per area; higher mining activity often corresponds with increased policing, which may reduce recorded crime levels and partly explain some observed null effects. Furthermore, some potential mediating variables, such as social cohesion, governance quality, or detailed socioeconomic indicators, are not included, limiting the comprehensiveness of the analysis. This represents a key limitation of relying on secondary data. Fourth, although the study spans 2014 to 2023, certain external shocks or policy changes may not be fully captured. For example, fluctuations in global demand for minerals could have been influenced by events such as the 2008 Global Financial Crisis. Longer panel datasets would allow for lagged or non-linear models, such as Auto Regressive Distributed Lag (ARDL) models, to assess both short- and long-term effects. Fifth, the selection of statistical models (fixed effects based on Hausman tests) may limit the depth of causal analysis and could be susceptible to model specification issues, as some models employed fixed effects while others used random effects. Finally, heterogeneity among regions, in terms of history, infrastructure, governance, and social fabric, may not be fully accounted for, potentially affecting the generalisability of the findings.

6.4 Conclusion

This chapter examined the longitudinal relationship between mining employment and reported crime across non-metropolitan mining regions in South Africa from 2014 to 2023. Using a panel regression framework with interaction terms between mining employment and mining region classifications, the analysis demonstrated that the relationship between crime and mining employment is complex and context-dependent.

The findings reveal that crime trends do not follow a uniform trajectory across regions or crime categories. Medium mining regions, often characterised by rapid expansion without adequate social infrastructure, exhibited the strongest positive associations between mining employment and contact crimes, including assault and attempted murder. In contrast, very high mining regions experienced lower levels of violent crime, potentially due to more stable institutional environments, better infrastructure, and investments in community safety measures. Property crimes, such as theft of motor vehicles and carjacking, were more prevalent in very high mining regions, likely reflecting higher concentrations of valuable assets.

Regions experiencing mining decline displayed mixed outcomes. Some showed rising crime, others decreasing or fluctuating trends, indicating that economic contraction does not automatically result in increased criminal activity. The observed variation underscores the role of mediating factors, including alternative economic opportunities, governance quality, and local resilience strategies.

The use of interaction terms and disaggregated marginal effects enabled a nuanced understanding of how mining employment shapes crime across regional contexts. Methodologically, this approach advances the literature by moving beyond aggregate assessments and highlighting the differentiated social consequences of resource-based economies.

From a policy perspective, the findings emphasise the need for spatially targeted and socially responsive interventions. Medium mining regions require strategic investments in social services and crime prevention infrastructure to manage the pressures associated with rapid economic expansion. Declining regions necessitate revitalisation strategies that prioritise inclusive

development and social cohesion. Even high-performing regions must remain vigilant in addressing inequality and ensuring sustainable development outcomes.

In conclusion, mining employment is not a straightforward catalyst for either social stability or disruption. Its effects on crime are mediated by local conditions, institutional capacity, and broader socioeconomic factors. Addressing the mining-crime nexus in South Africa therefore requires locally tailored policies, continuous monitoring, and integrated planning that accounts for the full spectrum of economic, social, and security outcomes.

CHAPTER 7: SYNTHESIS, DISCUSSION, AND RECOMMENDATIONS

7.1 Introduction

This chapter synthesises insights drawn from the theoretical chapters (Chapters 2 and 3) and the findings presented in the empirical chapters (Chapters 4, 5, and 6) and discusses their broader theoretical and policy implications. This synthesis is represented in Figure 7.1 and forms the basis of the discussion.

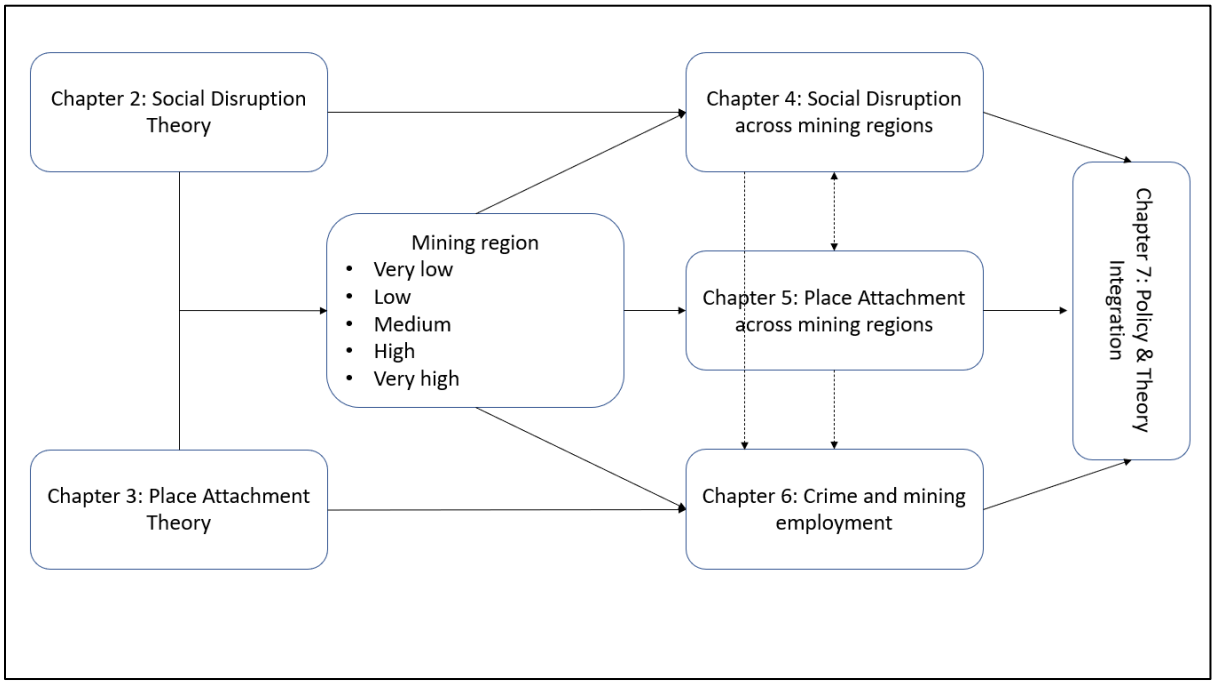


Figure 7.1:Synthesis integration framework, mining region, social disruption, place attachment, and crime and mining employment

This study examined the social consequences of mining in non-metropolitan South Africa. To my knowledge, it is the first study of this nature and scale in South Africa and Africa. The study focused on the theoretical foundations of social disruption theory and place attachment theory (Chapter 2). The study further empirically examined: mining, social disruption, and development

in non-metropolitan regions in South Africa (Chapter 4), mining, place attachment, and development in the non-metropolitan areas in South Africa (Chapter 5), and the relationship between the types of crime and mining employment in non-metropolitan regions in South Africa (Chapter 6). Chapter 5 also refers to the cognitive appraisal theory to explain the relationship between mobility and place attachment. The synthesis in this chapter (Chapter 7) integrated all four chapters (theoretical and empirical), demonstrating the effect of mining on social disruption and place attachment.

7.2 Research Problem and Key Findings

The central research problem focused on understanding the social consequences of resource extraction in South Africa. Specifically, the study examined two interrelated social and psychological phenomena: social disruption and place attachment across mining regions. The research sought to determine how mining activities influence social disruption and the extent to which place attachment varies across mining contexts. In addition, the study analysed the relationship between various types of crime, conceptualised as manifestations of social disruption, and full-time mining employment, considered as a determinant of local attachment.

The study addresses critical gaps in the literature, particularly regarding the non-linear nature of social disruption across mining regions, the role of homeownership-driven housing policies and employment in shaping community bonds, and the broader social consequences of mining activities across diverse regional contexts. By integrating these perspectives, the research provides a nuanced understanding of how economic activities, demographic factors, and policy interventions interact to influence community stability, mobility intentions, and crime patterns in mining-affected areas.

7.3 Mining, Social Disruption, and Community Stability

Social disruption theory explains how rapid economic change destabilises social patterns. Building on Park and Burgess's (1925) concentric zone concepts, Murdock and Leistritz (1979) described disruption as the loss of traditional attitudes and structures at the individual, community, or organisational level (England & Albrecht, 1984). Rapid population growth, economic shifts, or

technological change can erode social cohesion, weaken local identity, and increase crime, disorder, and mental health problems. The theory recognises that disruption can spark positive innovation and adaptation. Environmental quality, social cohesion, safety, and mental well-being are common indicators.

Earlier studies generally contend that intensive resource extraction triggers social disruption, linking mining booms to higher crime rates, poorer health outcomes, and weakened community ties. England and Albrecht (1984) and Szreter (1999) emphasise that such disruption can persist beyond the boom phase and into periods of economic decline. While some scholars acknowledge eventual community adaptation (Smith et al., 2001) and the growing sophistication of boomtown research has highlighted the complexity of impacts, most analyses assume a predominantly negative relationship between rapid economic change and social stability. This study, however, presents a more nuanced understanding of mining-related social disruption across South African regions:

- Five of the six indicators show lower perceived crime in very high mining regions (except gangsterism), contradicting the expectation of higher crime with greater economic activity (see Chapter 4).
- Residents of very high mining regions do not report poorer health than those in the low-mining areas, challenging the assumption that mining worsens health outcomes (see Chapter 4).
- Trust in relatives and neighbours declines in very high mining regions, indicating weakened community ties consistent with social disruption theory (see Chapter 4).
- Very high mining regions experience strong in-migration, fragmenting communities, and increasing cultural disruption (see Chapter 4).
- Mining generates jobs that can stabilise rural communities, particularly in low and medium mining region (see Chapter 4 and Chapter 6).
- Very high mining regions face service delivery pressures and deteriorating living standards, though the effects are not uniform. There is evidence of very high mining areas with very low levels of social disruption (see Chapter 4).
- Evidence supports that disruption can persist or escalate during the decline phase of mining cycles (see Chapter 4).

These results extend social disruption theory and the boomtown literature in several important ways. First, mining is not inherently destabilising; outcomes depend on regional mining intensity, institutional capacity, and historical context. For example, some very high mining regions, such as the John Taolo District Municipality, exhibited very low social disruption. Conversely, other very high mining regions experienced pronounced disruption, as in the Bojanala District Municipality, the site of the Marikana massacre. In Bojanala, the failure of mining companies, government, and traditional authorities to provide adequate settlement environments was a key contributor to this disruption. The type of mining, open-cast versus underground, may also influence social outcomes. Open-cast operations generally offer higher-paid employment, whereas Bojanala's underground mines employ many lower-paid workers who often cannot afford commercial housing, potentially exacerbating social disruption. Additionally, the relative ease of accessing land in traditional areas of Bojanala may have further contributed to instability.

Second, economic benefits such as employment can offset or mask disruptive forces, producing stabilising effects alongside social strain. For example, Ngaka Modiri Molema District Municipality, classified as a medium mining region, exhibits relatively low unemployment, low mining FTE employment, and low social disruption. Employment in this region is primarily derived from other industries, such as community services and finance. Conversely, John Taolo District Municipality, a very high mining region with low unemployment and high mining FTE employment, also shows low social disruption, with stabilisation largely attributed to intensive mining activity. In both cases, employment, regardless of its source, appears to play a stabilising role.

However, some cases present nuanced or contradictory findings. For instance, the West Coast District Municipality, classified as a low-mining region with low unemployment and low mining FTE employment, experiences moderate social disruption. In extreme instances, Sarah Baartman District Municipality, a very low-mining region with low unemployment and minimal mining FTEs, exhibits high social disruption. In such contexts, disruption appears to stem from broader social challenges that are not mitigated by employment, highlighting that the stabilising effects of jobs are context-dependent and insufficient to counteract all forms of social disruption.

Third, the relationship between mining and social disruption is not linear. Medium mining regions can remain relatively stable, while some very high and declining mining regions experience greater disruption. Interestingly, disruption levels can be similar in very low and very high mining regions. For example, the Social Disruption Index for Sarah Baartman District Municipality, a very low-mining region, is comparable to that of Gert Sibande District Municipality, a very high mining region. In both cases, the primary driver of disruption is crime, although the type of crime varies by region. In very high mining regions, property crimes, including vehicle theft and robbery at non-residential premises, are more prevalent, whereas in low-mining regions, sexual offences, such as rape and attempted sexual assault, occur more frequently.

Social cohesion may also be an important contributing factor. In very low-mining regions, cohesion could be influenced by within-region differences, whereas in very high mining regions, it may reflect high levels of in-migration. In both cases, the outcome is relatively low social cohesion. Furthermore, the observed non-linearity may relate to societal structure. For instance, John Taolo District Municipality, a very high mining region, exhibits the lowest social disruption, whereas Bojanala District Municipality (or Gert Sibande District Municipality), also very high mining regions, experience high disruption. These differences can be linked to how mining companies and municipalities collaborate within each region, highlighting the role of regional context in explaining the non-linear relationship between mining and disruption.

The panel regression analysis further examined the non-linearity in the crime-mining relationship. The effect of mining FTE employment on crime is non-linear and varies by region and crime type. Medium mining regions, characterised by rapid growth and inadequate infrastructure, show elevated violent crimes, whereas very high mining regions record lower violent crime rates but higher property crime levels. Property crimes, including burglary, theft, and robbery, increase with mining FTE employment, particularly in areas with high asset concentration and socioeconomic inequality. Conversely, sexual offences decline where mining employment stabilises households. Drug-related offences increase alongside employment growth, reflecting the expansion of informal economies, while offences such as illegal firearm possession and DUI tend to decrease, possibly due to workplace regulations and structured schedules. Crime trajectories differ across mining regions, with some areas experiencing rising instability and others relative stability, confirming

that boom-and-bust cycles shape local outcomes. Table 7.1 summarises these non-linear findings and situates them within the broader literature.

Table 7.1: Non-linearity of the crime-mining relationship

Dimension	Key results	Comparison with previous research	New Insights
Non-Linearity in Crime Rates	The relationship between mining employment and crime is not linear and varies significantly by mining region and the type of crime.	Smith et al. (2001) and (Jones & Mayzer, 2021) support the conclusion that the relationship is complex and context-dependent. Social Disorganisation Theory, however, assumes a linear relationship.	Mining-driven crime follows a non-linear trajectory, challenging the simple increase or decrease assumption. The disruption effect can fade, rebound, or stabilise, showing that local socioeconomic factors mediate outcomes rather than universal linear patterns.

Fourth, theory largely relate social disruption to mining growth. However, social disruption can also manifest during periods of economic decline (see Marais et al., 2022). Declining mining regions exhibited mixed results: some experienced rising crime, while others showed decreasing or fluctuating trends. This indicates that economic contraction does not automatically translate into higher crime. Instead, outcomes are mediated by factors such as alternative economic opportunities, governance quality, and local resilience strategies. These findings imply that declining mining regions require proactive social planning, environmental remediation, reliable service delivery, mental health support, and transitional housing to prevent the erosion of place attachment and community stability. Table 7.2 summarises the key findings on social disruption in declining regions and situates these results within the existing literature.

Table 7.2: Disruption in regions of mining decline

Dimension	Key results	Comparison with previous research	New Insights
Declining Mining Regions	Mining employment is positively associated with most contact and property crimes, particularly robbery, burglary, and theft. Residential burglary shows the most substantial effect.	Social Disruption Theory, Resource Curse/Masculinity Theory, and works by Rudell et al., 2014), James and Smith (2017), and Stretesky and Grimmer (2020) all support mining-related increases in crime.	Evidence sharpens the understanding of crime patterns by showing that households are the key site of vulnerability, with burglary emerging as the most substantial effect. This underscores the role of household-level insecurity in times of mining decline.
	Sexual offences exhibit a negative relationship with mining employment.	Contrasts with Marais et al. (2022) who found higher sexual offences in declining mining areas.	Suggests that mine decline does not uniformly drive gender-based violence. Local cultural norms, policing capacity, and community-level resilience may explain contradictory patterns.
	Police-detected offences: Results are mixed.	Some studies find policing data unreliable due to regional disparities.	Mixed outcomes highlight that official crime statistics may mask community realities, reflecting variations in law enforcement presence, reporting practices, and trust in the police.

These findings challenge deterministic interpretations of social disruption, showing that mining can destabilise and strengthen communities depending on context, and that careful policy design is critical for resilience. Table 7.3 provides a summary of the discussion above.

Table 7.3: Summary: Comparing the study's key social disruption findings to those of previous studies

Dimension (Factor)	Key result from the study	Comparison with previous research	New Insights
Crime	Five of six crime measures indicate lower perceived crime in high-mining regions. This contradicts the hypothesis that increased mining leads to higher crime rates.	Results contradict Haggerty et al. (2014) and Beleche and Cintina (2018), who hypothesised that resource development activities like mining can contribute to social disruption and social issues like crime.	Mining may not universally increase crime; in South Africa, stronger policing, surveillance, or economic stabilisation in mining regions could offset crime risks. Context matters more than the general hypothesis suggests.
Health	Individuals in very high mining regions do not report poorer health than those in very low-mining regions.	The results contradict Prędkiewicz et al. (2022) who supported the view that mining exacerbates health issues.	Mining's health impacts may be mitigated by access to health services, company provisions and policies, or infrastructure improvements, challenging the assumption of health deterioration.
Social cohesion	There is a noticeable decrease in social cohesion in very high mining regions compared to very low-mining regions.	Results support Haggerty et al. (2014) and Beleche and Cintina (2018), who found that energy development activities undermine social cohesion.	Confirms the robustness of the social disruption hypothesis in terms of cohesion, but in the South African context, open-town policies and rapid in-migration may amplify community divisions.
Migration	High-mining regions experience increased migration due to economic opportunities.	(Koser, 2009) and (Castles, 2009) suggest that mining regions attract migrants seeking economic opportunities.	This confirms the theory but highlights that rural-to-mining migration remains strong in South Africa even under broader economic restructuring, indicating mining's continued pull factor.
Employment opportunities	Mining activities create job opportunities, which	Perez-Sindin (2021) notes mixed evidence of social tensions, illnesses,	In this context, employment benefits appear stronger than the negative effects, suggesting a more balanced narrative

	can stabilise rural communities.	and energy development benefits.	between economic stabilisation and social costs.
Social infrastructure	Service provision declines and living standards deteriorate in very high mining regions.	McKenzie (2013) notes that mining developments puts pressure on housing and services.	Economic gains from employment are undermined by declining infrastructure and service delivery, suggesting a trade-off between mining-related jobs and community well-being.

7.4 Mining, Place Attachment, and Development

Place attachment theory explains how emotional bonds develop between individuals and specific places, influencing social cohesion, resilience, and sustainable development. It is a multidimensional concept that encompasses emotional ties, memories, social identity, and the physical characteristics of the environment. Theoretical frameworks, such as the Person-Place-Psychological (P-P-P) Model and the environment-behaviour (E-B) model, illustrate how individual traits, perceptions, and environmental attributes interact to generate attachment. The P-P-P model identifies direct determinants of attachment, including preference to stay, length of residence, homeownership, employment, age group, and place characteristics (Scannell & Gifford, 2010). Cognitive appraisal theory further elucidates how individuals reassess the costs and benefits of remaining in a location when conditions change, providing insight into mobility decisions under stress.

Empirical studies indicate that longer residence, voluntary preference to stay, and older age tend to strengthen place attachment (Kelly & Hosking, 2008; Lewicka, 2011). Attachment is positively associated with life satisfaction, civic engagement, and pro-environmental behaviour. Conversely, attachment is context-dependent and can weaken under environmental stress or rapid socioeconomic transformation. Although homeownership is frequently employed as a proxy for stability, its effects are inconsistent once other factors, such as duration of residence, are accounted for.

In addition to the main findings below, this linking of social disruption specifically to place attachment is an important contribution in this study. The results related to place attachment across South African mining regions reveal four key findings. First, residents in very low-mining regions

exhibit stronger place attachment, whereas attachment is weakened in very high mining regions, likely due to environmental degradation and socioeconomic disruption. Second, preference to stay and length of residence generally strengthen attachment, but their influence diminishes in regions of intense mining activity. Third, homeownership alone is not a reliable predictor of attachment; homeowners in very high mining regions were often more willing to relocate than those in other regions. This contradicts international research findings. Finally, attachment is not static. Structural pressures, like environmental decline and inadequate service delivery, prompt residents to re-evaluate their attachment and mobility options, consistent with cognitive appraisal theory.

The study also provides novel insights. First, residents with over 20 years of tenure were twice as likely to consider relocation in very high mining regions, indicating that environmental and economic costs can override strong historical attachment. In this context homeownership does not play a role. Second, programmes such as South Africa's Revitalisation of Distressed Mining Towns (2015) and the Integrated Urban Development Framework need to look beyond homeownership; effective stability requires tenure security, social cohesion, and active resident participation. Overemphasis on a single aspect may be counterproductive. Third, the research extends cognitive appraisal theory by demonstrating how emotional bonds are reassessed in response to cumulative environmental disruption, reframing mobility as an adaptive strategy. This underscores that policies concerning mining settlements and mine closure must consider both short- and long-term mobility. Simply put, mine closure strategies should include consider migration options. Fourth, the findings highlight that place attachment is multidimensional and context-specific, demanding nuanced policies to foster community resilience and sustainable urban development. Table 7.4 situates these results in relation to previous research.

Table 7.4: Comparing key place attachment findings to those of previous studies

Dimension (Factor)	Key result from the study	Comparison with previous research	New Insights
Preference to stay	The preference to stay is associated with stronger attachment.	Lewicka (2011), Lewicka (2014), Jorgensen and Stedman (2006), and Kelly & Hosking (2008) emphasise that longer residence and preference to remain foster attachment; complex mobility dynamics exist.	It confirms the theory but highlights that voluntary preference, rather than forced stability, drives attachment; it demonstrates in the South African mining context that residents' intentional choice to stay is key to emotional bonds.
Length of stay	Longer residence is associated with stronger attachment.	Lewicka (2010, 2011, 2014); Jorgensen & Stedman (2006); Kelly & Hosking (2008).	Confirms previous findings, showing longevity remains a strong predictor of attachment, but highlights that in mining-impacted areas, the interaction with the mining region may modulate the strength of attachment.
Mining region	Residents in lower mining regions generally exhibit stronger emotional bonds.	No direct studies; Lewicka (2010), Relph (1976), and others indicate that stable, less disruptive environments foster attachment.	New contribution: Shows that very high-mining regions, despite economic opportunities, may weaken place attachment, highlighting the social and environmental costs of intensive resource extraction on emotional bonds.
Homeownership	Homeownership alone does not guarantee stronger emotional bonds.	Lewicka (2010), Jorgensen & Stedman (2006), Kelly & Hosking (2008).	Confirms the theory, emphasising that engagement and time spent in a place matter more than ownership status in developing attachment.
Employment	Employment alone does not guarantee stronger emotional bonds.	No explicit prior studies.	New insight: Even when residents have stable employment, mining regions may not foster stronger attachment, suggesting economic security does not

			automatically translate to emotional bonds with place.
Age group	Older persons generally exhibit stronger emotional bonds.	Lebrusan et al. (2022) support that older adult develop emotional bonds with their neighbourhoods.	Confirms the theory that older persons generally exhibit stronger emotional bonds.

7.5 Limitations of the Study and Suggestions for Future Research

The main limitations identified in the study include:

a) Geographical Coverage
   - The study's focus on specific mining regions in South Africa may limit its applicability to other geographical areas or contexts. Furthermore, the results might differ if geographical boundaries change.

b) Methods

First, there are data issues.

- The analysis relied heavily on secondary quantitative data, which may lack contextual depth. The data was collected for other reasons so certain social variables were not directly measurable from available data.
- The use of reported crimes also has an influence on the results as the levels of reporting crime are low in South Africa, undercounting. Only murder has reliable reporting levels. There is therefore lack of control for policing variables.
- Furthermore, the number of police stations, visible policing was not including in the analysis. This has an effect on the crime levels in an area. Mixed outcomes highlight that official crime statistics may mask community realities, reflecting variations in law enforcement presence, reporting practices, and trust in the police. This secondary data could not be obtained to be included in the analysis.

- The cross-sectional nature of some indicators, for example GVA, may mask intra-regional variations over time.
- Potential variables influencing place attachment were not thoroughly examined, leading to an incomplete understanding of dynamics. For instance, there is insufficient exploration of physical attributes that can influence place attachment and an overemphasis on positive aspects of attachment.
- Possible unaccounted regional heterogeneity in history, infrastructure, governance, and social factors.

Second, methodological issues.

- The quantitative approach may overlook the qualitative experiences of individuals. There is a need to incorporate qualitative methodologies to understand lived experiences and nuanced dimensions of disruption.
- The methods used to measure place attachment may not fully capture attachment's complex emotional and social dimensions.
- The interaction effects between mining activities and other variables may complicate the analysis.
- Potential issues with establishing causal relationships between mining employment and crime due to reliance on regional-level data and possible endogeneity.
- The panel methods do not capture the short and long run effects of mining employment on crime which can be captured by other analysis methods like the Autoregressive Distributed Lag Models.

c) Theoretical Assumptions

- The analysis assumes that place attachment is a stable attribute among residents, which is dynamic and influenced by external factors. Hence, there is difficulty in fully capturing place attachment's complex emotional and social dimensions.

- There is also the challenge of addressing external shocks and policy changes over the study period that may influence results.

7.6 Recommendations

This study highlights the uneven and dynamic social consequences of mining across regions and over time. Based on the empirical findings, the following recommendations are proposed.

a) Theoretical and Further Research

There is a need to deepen understanding of the boom–bust nature of resource extraction by examining mining communities beyond the growth phase. Further research should focus on the post-boom and decline phases using longitudinal or panel data designs. This is important because the findings indicate that social disruption does not occur uniformly but evolves over the mining cycle. Capturing these trajectories would allow researchers to distinguish between short-term, reversible disruptions and longer-term structural social change, thereby improving both theoretical explanations and policy timing.

Building on the methods used to analyse place attachment, future studies could adopt sequential mixed-methods approaches. Explanatory designs that combine advanced quantitative techniques, such as GSEM, with qualitative methods like ethnography are particularly valuable. This is important because while the quantitative analysis identifies statistically significant relationships, it cannot fully explain the lived experiences, meanings, and coping strategies that underpin attachment or detachment in mining communities.

The latent variable approach used to measure place attachment could also be refined by incorporating additional indicators such as social networks, community participation, and cultural identity. Furthermore, alternative thresholds for length of stay could be explored, moving beyond the traditional one-generation assumption. This is important because place attachment is a multidimensional construct, and reliance on limited indicators may understate deeper forms of social embeddedness that shape mobility decisions and community stability.

There is also scope to further examine how intersectional factors such as gender, age, education, and migration status influence the relationship between mining employment and crime. This is particularly important given the non-linear patterns observed in this study, suggesting that mining-related employment does not affect all social groups uniformly. An intersectional lens would therefore improve explanatory power and avoid overly generalised conclusions.

Finally, further research should adopt a stronger policy-evaluation focus. Studies assessing the effectiveness of specific national or regional policies, such as housing or labour migration policies, would be valuable. This is important because empirical evidence on policy performance remains limited, despite the central role such policies play in shaping social outcomes in mining regions.

b) Policy and Planning Recommendations

Policies targeting mining regions should explicitly recognise the complex interactions between resource extraction, place identity, mobility, crime, and social cohesion. This is important because the study demonstrates that economic benefits from mining often coexist with heightened social disruption, meaning that narrowly economic policy approaches are insufficient for promoting sustainable community development.

Policymakers and planners must anticipate social disruption throughout the entire mining cycle rather than responding reactively. Social impact assessments should therefore extend beyond economic indicators and incorporate social and demographic dynamics across boom, peak, decline, and closure phases. This is crucial because failure to plan for downturns increases community vulnerability when mining activity contracts.

Strengthening local governance and policing capacity is also essential for managing crime and maintaining social cohesion in mining-affected areas. The findings suggest that social disruption is spatially uneven, making localised institutional capacity particularly important. Incorporating place-attachment indicators into municipal spatial development frameworks would allow planners to better understand community stability, mobility risks, and potential resistance to relocation.

Policies aimed at fostering community stability should move beyond homeownership as the sole marker of attachment and consider factors such as tenure security, community participation, and social networks. This is important because the study shows that attachment is not purely material but is also shaped by social relations, which become particularly salient during periods of environmental degradation or economic decline.

Improved data collection on crime and social indicators is also necessary to inform effective interventions. Given the limitations of official crime statistics, more granular and context-sensitive data, complemented by inclusive stakeholder engagement, would allow policymakers to respond more accurately to local realities and adjust interventions in real time.

Finally, there is a critical need for proactive post-closure planning through economic diversification. National and provincial governments should require mine operators to fund or implement post-closure diversification strategies. This is important because the long-term social costs of mine closure are often borne by host communities, and early diversification planning can mitigate unemployment, out-migration, and social disintegration.

Successful policy requires a nuanced understanding of each region's social fabric, promoting community engagement and sustainable development to manage mining activities' stabilising and destabilising effects.

7.7 Conclusion

This chapter synthesises the study's main findings and situates them within theoretical, empirical, and policy contexts. The social footprint of mining in South Africa is substantial, extending well beyond its economic contributions. The study underscores the need for integrated and anticipatory planning that accounts for the complex interplay between resource extraction, place-identity, crime, and social cohesion. Effective policy and planning must be grounded in these realities to ensure that mining towns can transition sustainably in the post-mining era.

Ultimately, the findings demonstrate that mining produces both stabilising and destabilising effects. The balance between these outcomes depends not only on the level of mining activity in a region but also on the social fabric, institutional capacity, and lived experiences of residents.

Finally, the empirical chapters of this study are intended for publication in peer-reviewed journals. The first paper, based on Chapter 4 and titled *"Mining, disruption, and development in non-metropolitan South Africa"*, is currently under review. Two additional articles are in progress.

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APPENDICES

Appendix 4.1: Analysis of the sociodemographic variables of the sample across the mining regions.

Characteristic	Very low	Low	Medium	High	Very high	Total
Gender						
Female	18,24	19,94	21,89	19,03	20,90	100,00
Male	18,23	19,16	20,02	18,79	23,80	100,00
Total	18,23	19,62	21,14	18,93	22,07	100,00
Sex Ratio	67,37	65,57	62,60	67,02	76,19	67,77
Age group						
15-24	17,14	20,68	22,09	19,81	20,27	100,00
25-34	15,59	19,74	21,72	19,09	23,86	100,00
35-44	18,05	18,35	20,10	19,13	24,37	100,00
45-54	20,53	19,48	21,41	17,25	21,32	100,00
55-64	20,83	18,70	19,38	19,43	21,66	100,00
65+	22,84	18,30	20,47	16,70	21,69	100,00
Total	18,57	19,46	21,14	18,76	22,07	100,00
Employment Status						
Unemployed	15,84	21,78	20,92	21,18	20,28	100,00
Employed	19,04	20,45	19,38	17,19	23,95	100,00
Total	18,19	20,80	19,79	18,25	22,97	100,00
Evermoved						
No	19,28	20,04	22,23	18,70	19,74	100,00
Yes	16,32	18,85	19,13	19,37	26,33	100,00
Total	18,23	19,62	21,14	18,93	22,07	100,00
Born outside SA						
No	16,60	19,01	18,82	19,46	26,12	100,00
Yes	3,79	9,85	33,33	17,42	35,61	100,00
Total	16,33	18,82	19,12	19,42	26,31	100,00
Income step of household today						
Ladder Rung 1 (Poorest)	10,30	19,32	21,55	24,01	24,82	100,00
Ladder Rung 2	16,01	23,40	20,76	19,15	20,69	100,00
Ladder Rung 3	21,67	18,90	20,24	17,45	21,73	100,00

Ladder Rung 4	22,54	14,56	22,72	17,10	23,08	100,00
Ladder Rung 5	20,05	10,59	28,83	17,57	22,97	100,00
Ladder Rung 6 (Richest)	20,22	3,37	24,72	21,35	30,34	100,00
Total	18,23	19,62	21,14	18,93	22,07	100,00
Satisfaction level of life currently						
Satisfaction level 1	12,10	18,42	17,54	20,87	31,08	100,00
Satisfaction level 2	23,40	27,82	12,42	19,28	17,07	100,00
Satisfaction level 3	20,18	23,33	19,67	22,18	14,64	100,00
Satisfaction level 4	23,62	19,02	19,19	18,45	19,71	100,00
Satisfaction level 5	19,75	17,06	21,27	17,64	24,29	100,00
Satisfaction level 6	20,80	18,56	22,15	15,14	23,36	100,00
Satisfaction level 7	14,75	21,61	25,66	18,48	19,51	100,00
Satisfaction level 8	13,75	21,78	25,97	18,06	20,43	100,00
Satisfaction level 9	14,49	21,34	22,27	20,09	21,81	100,00
Satisfaction level 10	12,83	12,51	21,31	23,01	30,33	100,00
Total	18,23	19,62	21,14	18,93	22,07	100,00
Means						
Education	8,58	8,68	8,92	8,81	9,20	8,85
Total month's household income	5 445,15	5 767,45	6 058,23	6 312,84	7 533,46	6 273,89
Asset index	7,06	6,77	7,47	7,31	7,95	7,35

Appendix 4.2: Logistic Regression Results – Crime and safety

Burglary	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,6452326	,050312	-5,62	0,000	,5537884	,7517765
Medium	,7374812	,0550722	-4,08	0,000	,6370692	,8537197
High	,8885896	,0690172	-1,52	0,128	,7631115	1,0347
Very high	,7972776	,0582359	-3,10	0,002	,6909313	,9199924
Household income	,9999933	2,73e-06	-2,47	0,013	,9999879	,9999986
asset_index	1,017404	,0077364	2,27	0,023	1,002353	1,03268
_cons	,961489	,0699508	-0,54	0,589	,8337142	1,108846
Domestic Violence	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,7382376	,0727786	-3,08	0,002	,6085287	,8955941
Medium	,8403132	,0781591	-1,87	0,061	,7002761	1,008354
High	,9278518	,0887867	-0,78	0,434	,7691776	1,119259
Very High	,8762266	,0797833	-1,45	0,147	,7330132	1,047421
w5_h_tinc	,9999903	4,28e-06	-2,26	0,024	,9999819	,9999987
asset_index	,9766588	,0095604	-2,41	0,016	,9580994	,9955777
_cons	,34142	,0303768	-12,08	0,000	,2867846	,406464
Violence	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,7354918	,0710212	-3,18	0,001	,6086721	,8887351
Medium	,7534545	,0696983	-3,06	0,002	,6285164	,9032281
High	,9112838	,0857719	-0,99	0,324	,7577689	1,095899
Very High	,7877063	,0713506	-2,63	0,008	,6595721	,940733
w5_h_tinc	,9999797	4,83e-06	-4,21	0,000	,9999702	,9999892
asset_index	,9976922	,0097663	-0,24	0,813	,978733	1,017019

_cons	,3343468	,0295278	-12,41	0,000	,2812052	,397531
Gangsterism	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	1,031246	,0886064	0,36	0,720	,8714158	1,220391
Medium	1,309875	,1065502	3,32	0,001	1,116838	1,536279
High	1,185577	,1013422	1,99	0,046	1,002697	1,401812
Very High	1,178353	,0951062	2,03	0,042	1,005944	1,38031
w5_h_tinc	,9999775	4,05e-06	-5,57	0,000	,9999695	,9999854
asset_index	,9992689	,0084621	-0,09	0,931	,9828204	1,015993
_cons	,438372	,0350477	-10,32	0,000	,3747914	,5127387
Murder	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,9271077	,0743249	-0,94	0,345	,7923016	1,08485
Medium	,8997477	,0696936	-1,36	0,173	,7730142	1,047259
High	,788021	,0645807	-2,91	0,004	,6710876	,9253295
Very High	,8008412	,0615157	-2,89	0,004	,6889099	,9309588
w5_h_tinc	,9999745	3,98e-06	-6,42	0,000	,9999667	,9999823
asset_index	1,00317	,0082131	0,39	0,699	,9872006	1,019397
_cons	,6811879	,0514654	-5,08	0,000	,5874306	,7899094
Drug abuse	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,4762586	,0443923	-7,96	0,000	,3967363	,5717206
Medium	,5758692	,0529027	-6,01	0,000	,4809806	,6894776
High	,5816963	,055459	-5,68	0,000	,4825503	,701213
Very High	,7348869	,0677694	-3,34	0,001	,6133733	,8804732
w5_h_tinc	,9999659	3,36e-06	-10,15	0,000	,9999593	,9999725
asset_index	1,013355	,009096	1,48	0,139	,9956828	1,03134
_cons	5,146753	,4699049	17,94	0,000	4,303458	6,155298

Annexure 4.3: Logistic Regression Results - Social Cohesion

Lost wallet found by close person	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,7119272	,0370244	-6,53	0,000	,6429366	,7883209
Medium	,6571908	,0336752	-8,19	0,000	,5943947	,7266211
High	,818827	,0423506	-3,86	0,000	,73989	,9061856
Very high	,6714199	,034006	-7,87	0,000	,6079707	,7414909
Gender						
Female	,9605991	,0321956	-1,20	0,230	,8995249	1,02582
Age group						
25-34	,9762506	,0480725	-0,49	0,625	,886434	1,075168
35-44	1,072459	,0595272	1,26	0,208	,9619098	1,195713
45-54	1,1839	,0696656	2,87	0,004	1,054938	1,328627
55-64	1,093629	,0693308	1,41	0,158	,965846	1,238318
65+	1,199072	,0835803	2,60	0,009	1,045955	1,374603
Employment Status						
Unemployed_Discouraged	1,071414	,1392728	0,53	0,596	,8304429	1,382308
Unemployed_Strict	,615322	,0357869	-8,35	0,000	,5490311	,689617
Employed	,7700273	,0318943	-6,31	0,000	,7099856	,8351465
Highest level of education						
Some primary	1,050174	,080182	0,64	0,521	,9042139	1,219696
Completed primary	1,217919	,1077055	2,23	0,026	1,024102	1,448417
Some secondary	1,213255	,0880254	2,66	0,008	1,052434	1,398651
Completed secondary	1,492981	,1219433	4,91	0,000	1,272126	1,752179
Post schooling	1,586781	,1259453	5,82	0,000	1,358175	1,853865
Other	2,327683	,6480253	3,03	0,002	1,348808	4,016963
Ever moved						

No	,9160942	,0313049	-2,56	0,010	,8567474	,979552
_cons	,6450049	,0592508	-4,77	0,000	,5387296	,7722451

Lost wallet found by stranger	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,5789806	,0361265	-8,76	0,000	,5123325	,6542989
Medium	,5295559	,032607	-10,32	0,000	,4693531	,5974808
High	,7225494	,0435822	-5,39	0,000	,6419857	,8132231
Very high	,5914364	,0354426	-8,76	0,000	,5258947	,6651466
Gender						
Female	1,020128	,0416899	0,49	0,626	,941604	1,1052
Age group						
25-34	,9467545	,0572542	-0,90	0,366	,8409336	1,065892
35-44	1,020926	,0692417	0,31	0,760	,8938482	1,166071
45-54	1,044784	,0751105	0,61	0,542	,9074707	1,202874
55-64	1,101538	,0831402	1,28	0,200	,9500657	1,277159
65+	1,116423	,092653	1,33	0,185	,9488266	1,313623
Employment Status						
Unemployed_Discouraged	1,332485	,1930684	1,98	0,048	1,003064	1,770092
Unemployed_Strict	,5255704	,0401432	-8,42	0,000	,4524972	,6104441
Employed	,7709459	,0387897	-5,17	0,000	,6985478	,8508474
Highest level of education						
Some primary	1,014234	,093969	0,15	0,879	,8458123	1,216192
Completed primary	1,169952	,1246382	1,47	0,141	,949483	1,441614
Some secondary	1,141742	,1003578	1,51	0,132	,9610553	1,3564
Completed secondary	1,383649	,1367882	3,28	0,001	1,139924	1,679485
Post schooling	1,355001	,1307261	3,15	0,002	1,12155	1,637046
Other	2,313626	,7202243	2,69	0,007	1,256947	4,258625

Ever moved						
No	1,031593	,0431913	0,74	0,458	,9503202	1,119817
_cons	,3328588	,03673	-9,97	0,000	,268122	,4132259
Trust South Africans	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	1,272868	,066937	4,59	0,000	1,148208	1,411062
Medium	1,533777	,0785145	8,36	0,000	1,387359	1,695647
High	1,142799	,0609072	2,50	0,012	1,029446	1,268633
Very high	1,184193	,0608812	3,29	0,001	1,070683	1,309737
Gender						
Female	,9552377	,0315079	-1,39	0,165	,8954371	1,019032
Age group						
25-34	,8638989	,0416105	-3,04	0,002	,7860751	,9494275
35-44	,9149289	,0499314	-1,63	0,103	,8221172	1,018218
45-54	,9816017	,0572047	-0,32	0,750	,8756487	1,100375
55-64	1,065726	,0666842	1,02	0,309	,9427241	1,204777
65+	,9942716	,0696876	-0,08	0,935	,8666527	1,140683
Employment Status						
Unemployed_Discouraged	1,350528	,1758623	2,31	0,021	1,046314	1,743191
Unemployed_Strict	1,092672	,0595924	1,63	0,104	,9818993	1,215942
Employed	1,034635	,0422535	0,83	0,404	,9550473	1,120855
Highest level of education						
Some primary	,8911241	,0666635	-1,54	0,123	,7695932	1,031847
Completed primary	,96037	,0838143	-0,46	0,643	,8093785	1,139529
Some secondary	,9823704	,0696366	-0,25	0,802	,8549423	1,128792
Completed secondary	1,052483	,0842938	0,64	0,523	,8995846	1,231369
Post schooling	1,187977	,0921324	2,22	0,026	1,020456	1,383
Other	,7676353	,2296393	-0,88	0,377	,4270873	1,379727

Ever moved						
No	1,03743	,0350982	1,09	0,277	,9708698	1,108553
_cons	,4703644	,0429653	-8,26	0,000	,3932617	,5625839
Trust own relatives	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,8266829	,1095496	-1,44	0,151	,6375881	1,071859
Medium	,3332077	,0381978	-9,59	0,000	,2661558	,4171516
High	,235743	,0264957	-12,86	0,000	,1891343	,2938376
Very high	,2454119	,0272768	-12,64	0,000	,1973728	,3051434
Gender						
Female	,9789252	,0563705	-0,37	0,711	,8744477	1,095886
Age group						
25-34	,774457	,0632261	-3,13	0,002	,6599421	,9088429
35-44	,8124006	,0753873	-2,24	0,025	,677302	,9744468
45-54	,9437419	,0972723	-0,56	0,574	,771115	1,155014
55-64	1,090042	,1249405	0,75	0,452	,8707206	1,364608
65+	1,289081	,1731283	1,89	0,059	,9907422	1,677257
Employment Status						
Unemployed_Discouraged	,9309989	,219306	-0,30	0,761	,5867326	1,477264
Unemployed_Strict	,922275	,0846685	-0,88	0,378	,7704008	1,104089
Employed	,9414515	,0665796	-0,85	0,394	,819598	1,081422
Highest level of education						
Some primary	,8956036	,1214344	-0,81	0,416	,6865969	1,168234
Completed primary	,8089331	,1240942	-1,38	0,167	,5988723	1,092675
Some secondary	,9855459	,1270447	-0,11	0,910	,7655088	1,26883
Completed secondary	1,081024	,1556007	0,54	0,588	,8152948	1,433361
Post schooling	1,248863	,1774198	1,56	0,118	,9453412	1,649836
Other	5,36774	5,47109	1,65	0,099	,7281165	39,57145

Ever moved						
No	,9643232	,0565841	-0,62	0,536	,85956	1,081855
_cons	33,23851	5,979909	19,47	0,000	23,3616	47,29121
Trust other people	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,9878362	,0801367	-0,15	0,880	,8426215	1,158077
Medium	,461419	,0331852	-10,75	0,000	,4007532	,5312682
High	,362426	,0259188	-14,19	0,000	,3150255	,4169585
Very high	,3767562	,0264526	-13,90	0,000	,3283192	,4323391
Gender						
Female	,9249316	,038779	-1,86	0,063	,8519652	1,004147
Age group						
25-34	,8967381	,0530097	-1,84	0,065	,798634	1,006893
35-44	,9961465	,0676016	-0,06	0,955	,8720834	1,137859
45-54	1,272256	,0967858	3,17	0,002	1,096024	1,476825
55-64	1,335395	,110438	3,50	0,000	1,135573	1,57038
65+	1,496239	,1418435	4,25	0,000	1,242531	1,801752
Employment Status						
Unemployed_Discouraged	1,087805	,1913739	0,48	0,632	,7705524	1,535678
Unemployed_Strict	1,002111	,0685563	0,03	0,975	,8763616	1,145903
Employed	,9055593	,0465995	-1,93	0,054	,8186809	1,001657
Highest level of education						
Some primary	,9041392	,088233	-1,03	0,302	,7467382	1,094718
Completed primary	,9664943	,1097082	-0,30	0,764	,77371	1,207315
Some secondary	1,046954	,0977399	0,49	0,623	,8718912	1,257166
Completed secondary	1,186967	,1242042	1,64	0,101	,9668722	1,457164
Post schooling	1,257584	,1289469	2,24	0,025	1,028629	1,537501
Other	2,581527	1,240739	1,97	0,048	1,006399	6,621907

Ever moved						
No	1,0334	,0439788	0,77	0,440	,9506997	1,123293
_cons	8,049483	,9882921	16,99	0,000	6,327905	10,23944
Trust own race	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	1,183562	,0751059	2,66	0,008	1,045144	1,340313
Medium	,6906093	,0402067	-6,36	0,000	,6161355	,774085
High	,4413566	,0253886	-14,22	0,000	,3942984	,4940309
Very high	,5141404	,0290331	-11,78	0,000	,4602726	,5743127
Gender						
Female	,9499524	,0343487	-1,42	0,156	,8849604	1,019717
Age group						
25-34	,8822541	,0457482	-2,42	0,016	,7969952	,9766337
35-44	,9442336	,0557352	-0,97	0,331	,8410767	1,060042
45-54	1,194835	,0777321	2,74	0,006	1,051796	1,357327
55-64	1,301103	,0914323	3,75	0,000	1,133693	1,493235
65+	1,406482	,110561	4,34	0,000	1,205654	1,640762
Employment Status						
Unemployed_Discouraged	1,215119	,1828607	1,29	0,195	,9047388	1,631978
Unemployed_Strict	1,202999	,0726427	3,06	0,002	1,068724	1,354144
Employed	1,050846	,0467527	1,11	0,265	,9630942	1,146594
Highest level of education						
Some primary	1,071908	,0869356	0,86	0,392	,9143697	1,256588
Completed primary	1,201824	,1148866	1,92	0,054	,9964867	1,449473
Some secondary	1,287048	,099876	3,25	0,001	1,105454	1,498472
Completed secondary	1,310464	,1147275	3,09	0,002	1,103836	1,55577
Post schooling	1,365822	,11673	3,65	0,000	1,15517	1,614886
Other	3,357453	1,389197	2,93	0,003	1,492149	7,554531

Ever moved						
No	1,066907	,0391836	1,76	0,078	,9928072	1,146537
_cons	2,859854	,287946	10,44	0,000	2,347687	3,483755
Trust other races	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,9579668	,0507042	-0,81	0,417	,8635693	1,062683
Medium	,7265561	,0371391	-6,25	0,000	,6572923	,8031186
High	,5593683	,029054	-11,18	0,000	,5052261	,6193126
Very high	,6234607	,0314658	-9,36	0,000	,564741	,6882859
Gender						
Female	,952219	,0311213	-1,50	0,134	,893135	1,015212
Age group						
25-34	,9230952	,0436159	-1,69	0,090	,8414486	1,012664
35-44	1,004254	,0540314	0,08	0,937	,9037467	1,115939
45-54	1,165259	,0676803	2,63	0,008	1,03988	1,305755
55-64	1,339876	,0842186	4,65	0,000	1,184573	1,51554
65+	1,41571	,0988307	4,98	0,000	1,234673	1,623292
Employment Status						
Unemployed_Discouraged	1,267449	,1683971	1,78	0,074	,976871	1,644461
Unemployed_Strict	1,189092	,0644454	3,20	0,001	1,069259	1,322356
Employed	1,151536	,0464646	3,50	0,000	1,063975	1,246303
Highest level of education						
Some primary	1,145817	,0837674	1,86	0,063	,992856	1,322343
Completed primary	1,317272	,1133223	3,20	0,001	1,11288	1,559203
Some secondary	1,362785	,095312	4,43	0,000	1,188215	1,563002
Completed secondary	1,407752	,1114434	4,32	0,000	1,205428	1,644034
Post schooling	1,506014	,1164072	5,30	0,000	1,294301	1,752357
Other	2,369048	,7360496	2,78	0,006	1,288577	4,355492

Ever moved						
No	,9383889	,0313872	-1,90	0,057	,8788442	1,001968
_cons	1,445451	,1300825	4,09	0,000	1,211713	1,724276

Appendix 4.4: Logistic Regression Results– Perceived health

Perceived health	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	1,438708	,2415037	2,17	0,030	1,035353	1,999202
Medium	,928194	,1402741	-0,49	0,622	,6902401	1,24818
High	,8926529	,134169	-0,76	0,450	,664881	1,198454
Very high	,9823603	,145994	-0,12	0,905	,7341233	1,314536
Poor-rich step ladder						
Ladder Rung 2	1,562298	,2055238	3,39	0,001	1,20722	2,021814
Ladder Rung 3	1,75023	,2403282	4,08	0,000	1,337256	2,290739
Ladder Rung 4	1,396467	,2579418	1,81	0,071	,9723102	2,005655
Ladder Rung 5	1,916396	,7352146	1,70	0,090	,9034965	4,064845
Ladder Rung 6 (Richest)	1	(empty)				
Satisfaction with life as a whole						
Satisfaction level 2	1,695114	,3299036	2,71	0,007	1,157545	2,482333
Satisfaction level 3	2,357043	,4669348	4,33	0,000	1,598611	3,475299
Satisfaction level 4	2,823783	,5515415	5,31	0,000	1,925638	4,140837
Satisfaction level 5	3,726779	,7261026	6,75	0,000	2,543845	5,459796
Satisfaction level 6	4,2165	,9079191	6,68	0,000	2,76482	6,43039
Satisfaction level 7	4,466037	1,011641	6,61	0,000	2,864898	6,962022
Satisfaction level 8	3,948628	,9089378	5,97	0,000	2,514823	6,199904
Satisfaction level 9	4,341767	1,483784	4,30	0,000	2,222139	8,48324
Satisfaction Level 10 (Very Satisfied)	1,980179	,3942722	3,43	0,001	1,340362	2,925409
Gender						
Female	,9096916	,0937052	-0,92	0,358	,7433851	1,113203
Age group						
25-34	,3722461	,0954721	-3,85	0,000	,2251736	,6153792
35-44	,1806501	,0441271	-7,01	0,000	,1119224	,2915813

45-54	,08461	,0189142	-11,05	0,000	,0545933	,1311305
55-64	,0766431	,0167683	-11,74	0,000	,0499164	,1176801
65+	,0539749	,0115025	-13,70	0,000	,0355462	,0819578
Employment Status						
Unemployed_Discouraged	1,537329	,7213904	0,92	0,359	,6128314	3,856492
Unemployed_Strict	1,935015	,4250261	3,01	0,003	1,258108	2,976123
Employed	2,571778	,3421393	7,10	0,000	1,981495	3,337905
Ever moved						
No	1,329073	,1286269	2,94	0,003	1,099436	1,606673
_cons	35,75931	9,860652	12,97	0,000	20,82907	61,39154

Appendix 4.5: Emotional Health Questions – CES-D Methodology

Question	NIDS (2017)
1. I was bothered by things that usually don't bother me.	Yes
2. I had trouble keeping my mind on what I was doing.	Yes
3. I felt depressed.	Yes
4. I felt that everything I did was an effort.	Yes
5. I felt hopeful about the future.	Yes
6. I felt fearful.	Yes
7. My sleep was restless.	Yes
8. I was happy.	Yes
9. I felt lonely.	Yes
10. I could not get "going."	Yes

Appendix 4.6: Logistic Regression Results– Emotional health

Bothered	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	1,355141	,2689012	1,53	0,126	,918502	1,999349
Medium	1,514399	,2907669	2,16	0,031	1,039461	2,206339
High	2,384839	,4340809	4,78	0,000	1,669268	3,407157
Very high	,941957	,1968579	-0,29	0,775	,6253742	1,418803
Gender						
Female	1,414903	,1713532	2,87	0,004	1,115941	1,793958
Age group						
25-34	1,344593	,2398773	1,66	0,097	,9478403	1,90742
35-44	1,305267	,2625488	1,32	0,185	,8800027	1,936043
45-54	1,786332	,3439637	3,01	0,003	1,224787	2,605336
55-64	1,972734	,3790942	3,54	0,000	1,353617	2,875023
65+	2,049812	,4084638	3,60	0,000	1,387062	3,029228
Employment Status						
Unemployed_Discouraged	1,261836	,5365914	0,55	0,584	,5483181	2,903845
Unemployed_Strict	1,264172	,2347506	1,26	0,207	,8785011	1,819157
Employed	1,045141	,1447066	0,32	0,750	,7967468	1,370974
Ever moved						
No	,8038138	,0910744	-1,93	0,054	,6437421	1,003689
_cons	,0082205	,0018546	-21,28	0,000	,0052827	,012792
Mind	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Low	1,65842	,3394424	2,47	0,013	1,110382	2,476948
Medium	2,001331	,391721	3,54	0,000	1,363682	2,937141
High	2,006576	,3999955	3,49	0,000	1,35761	2,965761
Very high	,9811146	,2193446	-0,09	0,932	,6330228	1,520618

Gender						
Female	1,057409	,1296959	0,46	0,649	,8314561	1,344766
Age group						
25-34	1,783804	,3514183	2,94	0,003	1,212429	2,624449
35-44	2,032138	,4345512	3,32	0,001	1,336389	3,090108
45-54	2,737967	,5605478	4,92	0,000	1,832991	4,089742
55-64	2,768616	,5660049	4,98	0,000	1,854583	4,133129
65+	3,006946	,6143397	5,39	0,000	2,014742	4,487784
Employment Status						
Unemployed_Discouraged	2,265549	,7667046	2,42	0,016	1,167107	4,397807
Unemployed_Strict	,9591739	,1972332	-0,20	0,839	,6410122	1,435253
Employed	,7353221	,1086459	-2,08	0,037	,5504403	,9823021
Ever moved						
No	1,222917	,1528717	1,61	0,107	,9571762	1,562436
_cons	,0055252	,0013525	-21,24	0,000	,0034197	,008927
Depressed	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Low	,8275617	,1519195	-1,03	0,303	,5774857	1,185931
Medium	1,273507	,208457	1,48	0,140	,923997	1,755223
High	2,144348	,3274203	5,00	0,000	1,589737	2,892445
Very high	1,255323	,2038302	1,40	0,161	,9131529	1,725708
Gender						
Female	,9817515	,0979068	-0,18	0,853	,8074471	1,193683
Age group						
25-34	1,518507	,2423819	2,62	0,009	1,110578	2,076272
35-44	2,356446	,382293	5,28	0,000	1,714607	3,238548
45-54	2,350554	,3945952	5,09	0,000	1,691516	3,266361
55-64	2,764385	,4491411	6,26	0,000	2,010482	3,800991

65+	1,350613	,2777527	1,46	0,144	,9025722	2,021064
Employment Status						
Unemployed_Discouraged	,720563	,3316246	-0,71	0,476	,2923638	1,775907
Unemployed_Strict	1,296102	,1968055	1,71	0,088	,9624748	1,745377
Employed	,8208547	,0971989	-1,67	0,095	,6508396	1,035282
Ever moved						
No	,914964	,0905493	-0,90	0,369	,7536418	1,110818
_cons	,0132109	,0025202	-22,68	0,000	,0090897	,0192007
Effort	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Low	1,268803	,1019607	2,96	0,003	1,083907	1,48524
Medium	1,227773	,0974825	2,58	0,010	1,050835	1,434503
High	1,269549	,1029365	2,94	0,003	1,083011	1,488215
Very high	1,443176	,1117872	4,74	0,000	1,239898	1,679781
Gender						
Female	1,062618	,052282	1,23	0,217	,9649332	1,170193
Age group						
25-34	,9575841	,0658173	-0,63	0,528	,8368962	1,095676
35-44	,9582331	,0750383	-0,54	0,586	,8218914	1,117192
45-54	,8278921	,0699355	-2,24	0,025	,701567	,9769634
55-64	,8354346	,0717417	-2,09	0,036	,7060197	,9885717
65+	,54993	,0560744	-5,86	0,000	,4503119	,6715858
Employment Status						
Unemployed_Discouraged	,6333944	,146187	-1,98	0,048	,4029188	,9957055
Unemployed_Strict	,9135405	,0733593	-1,13	0,260	,7805028	1,069255
Employed	,9335528	,0550679	-1,17	0,244	,8316272	1,047971
Ever moved						
No	1,409472	,0740606	6,53	0,000	1,27154	1,562366

_cons	,0906148	,00803	-27,10	0,000	,0761673	,1078029
Hope	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Low	,8136915	,0434705	-3,86	0,000	,7327998	,9035125
Medium	1,532042	,0773535	8,45	0,000	1,387692	1,691407
High	1,533028	,0794691	8,24	0,000	1,384923	1,696972
Very high	1,512024	,0758756	8,24	0,000	1,37039	1,668296
Gender						
Female	1,055688	,0344125	1,66	0,096	,9903504	1,125337
Age group						
25-34	,730327	,0337184	-6,81	0,000	,6671421	,7994962
35-44	,6278687	,0331635	-8,81	0,000	,5661208	,6963516
45-54	,5519941	,0307501	-10,67	0,000	,4948987	,6156766
55-64	,4640098	,0274127	-13,00	0,000	,4132757	,5209719
65+	,4693783	,0293566	-12,09	0,000	,4152273	,5305913
Employment Status						
Unemployed_Discouraged	,5626863	,0831981	-3,89	0,000	,4211228	,7518373
Unemployed_Strict	1,133612	,0607417	2,34	0,019	1,020599	1,25914
Employed	1,514768	,0595884	10,56	0,000	1,402365	1,636179
Ever moved						
No	1,171134	,0392588	4,71	0,000	1,096661	1,250664
_cons	,5181215	,0292551	-11,65	0,000	,4638415	,5787536
Fearful	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Low	,8571638	,2175137	-0,61	0,544	,5212705	1,409498
Medium	1,54972	,3407623	1,99	0,046	1,00713	2,384629
High	2,238959	,4722977	3,82	0,000	1,480776	3,385346
Very high	1,637928	,3540367	2,28	0,022	1,072281	2,501965

Gender						
Female	1,206583	,1610178	1,41	0,159	,9288908	1,56729
Age group						
25-34	1,132674	,2253988	0,63	0,531	,766864	1,672983
35-44	1,576691	,3246845	2,21	0,027	1,053078	2,360655
45-54	1,491518	,3197782	1,86	0,062	,9797897	2,270515
55-64	1,423182	,3129758	1,60	0,109	,9248477	2,190032
65+	1,101531	,2738481	0,39	0,697	,6766785	1,793128
Employment Status						
Unemployed_Discouraged	1,500378	,6410708	0,95	0,342	,6493898	3,466539
Unemployed_Strict	,7955296	,1825828	-1,00	0,319	,5073367	1,247431
Employed	,9229048	,1422243	-0,52	0,603	,6823111	1,248336
Ever moved						
No	,8276011	,1067862	-1,47	0,143	,6426724	1,065743
_cons	,0085621	,0021295	-19,14	0,000	,0052586	,0139408
Restless	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Low	,5781271	,1021603	-3,10	0,002	,4088917	,817407
Medium	1,29808	,1852735	1,83	0,068	,9813196	1,717088
High	1,718193	,23799	3,91	0,000	1,309696	2,254101
Very high	1,38008	,1924974	2,31	0,021	1,049968	1,813979
Gender						
Female	1,166781	,1076928	1,67	0,095	,973698	1,398152
Age group						
25-34	1,423467	,2017729	2,49	0,013	1,078181	1,87933
35-44	1,496884	,2338577	2,58	0,010	1,10206	2,033158
45-54	1,896191	,2885872	4,20	0,000	1,407133	2,555225
55-64	2,137207	,3196186	5,08	0,000	1,594225	2,865124
65+	1,93202	,3073739	4,14	0,000	1,414458	2,638962

Employment Status						
Unemployed_Discouraged	1,139193	,3973888	0,37	0,709	,5750027	2,256966
Unemployed_Strict	,9750939	,1504214	-0,16	0,870	,7206712	1,319337
Employed	,9309068	,1002585	-0,66	0,506	,7537581	1,149689
Ever moved						
No	,7511559	,0665702	-3,23	0,001	,6313838	,8936485
_cons	,0198058	,0033316	-23,31	0,000	,0142433	,0275406
Happy	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Low	,7533355	,0392434	-5,44	0,000	,680216	,8343149
Medium	1,499509	,0739201	8,22	0,000	1,361407	1,65162
High	1,079143	,0553026	1,49	0,137	,9760173	1,193164
Very high	1,723907	,0842232	11,15	0,000	1,566489	1,897143
Gender						
Female	1,012821	,0325344	0,40	0,692	,9510201	1,078637
Age group						
25-34	,7463259	,0343597	-6,36	0,000	,6819311	,8168014
35-44	,6706178	,0352473	-7,60	0,000	,6049736	,7433848
45-54	,6237626	,0342848	-8,59	0,000	,5600586	,6947126
55-64	,6383633	,0361399	-7,93	0,000	,5713187	,7132756
65+	,6872345	,0405952	-6,35	0,000	,6121024	,7715886
Employment Status						
Unemployed_Discouraged	,640511	,0905022	-3,15	0,002	,4855729	,8448872
Unemployed_Strict	1,124284	,0598392	2,20	0,028	1,012911	1,247902
Employed	1,4045	,0544691	8,76	0,000	1,301699	1,51542
Ever moved						
No	,9762665	,0320346	-0,73	0,464	,9154562	1,041116
_cons	,6525627	,0360743	-7,72	0,000	,5855541	,7272395

Lonely	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Low	2,04684	,3625718	4,04	0,000	1,446453	2,896433
Medium	1,540209	,2824665	2,36	0,019	1,075162	2,206408
High	1,947284	,3498574	3,71	0,000	1,369301	2,769235
Very high	1,706301	,3053464	2,99	0,003	1,201521	2,423149
Gender						
Female	1,269764	,1348327	2,25	0,025	1,031184	1,563542
Age group						
25-34	1,395015	,2208393	2,10	0,035	1,022889	1,90252
35-44	1,63461	,2789108	2,88	0,004	1,169971	2,283775
45-54	1,484581	,2675747	2,19	0,028	1,042766	2,11359
55-64	1,837192	,319261	3,50	0,000	1,30688	2,582697
65+	1,964031	,3478182	3,81	0,000	1,388051	2,779016
Employment Status						
Unemployed_Discouraged	1,530114	,5364063	1,21	0,225	,7697	3,04177
Unemployed_Strict	1,029965	,1774551	0,17	0,864	,7347962	1,443703
Employed	,9691486	,1195549	-0,25	0,799	,7610015	1,234228
Ever moved						
No	,8938853	,0912771	-1,10	0,272	,731751	1,091944
_cons	,0094787	,0019588	-22,54	0,000	,0063219	,014212
Get going	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Low	,8334872	,1267261	-1,20	0,231	,6186991	1,122841
Medium	,8671321	,1276224	-0,97	0,333	,6498415	1,157079
High	1,062488	,1533711	0,42	0,675	,8006678	1,409924
Very high	1,461535	,1929389	2,87	0,004	1,128343	1,893116
Gender						

Female	,9000277	,0811885	-1,17	0,243	,7541745	1,074088
Age group						
25-34	1,369093	,1776957	2,42	0,016	1,061585	1,765677
35-44	1,299196	,1942893	1,75	0,080	,9691276	1,74168
45-54	1,491621	,2222411	2,68	0,007	1,113872	1,997476
55-64	1,094418	,1787126	0,55	0,581	,7946694	1,507231
65+	1,155854	,1869512	0,90	0,371	,8418358	1,587007
Employment Status						
Unemployed_Discouraged	,8650663	,3170099	-0,40	0,692	,4218133	1,774102
Unemployed_Strict	1,017842	,1413541	0,13	0,899	,7752978	1,336263
Employed	,6186859	,069619	-4,27	0,000	,4962345	,7713537
Ever moved						
No	,9224121	,084011	-0,89	0,375	,7716132	1,102682
_cons	,0324309	,0050879	-21,85	0,000	,0238461	,0441063

Appendix 4.7: Logistic Regression Results– Physical health

Tuberculosis	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,8535313	,0993157	-1,36	0,173	,6794771	1,072171
Medium	,5792513	,0729649	-4,33	0,000	,4525287	,7414603
High	,5934822	,0759062	-4,08	0,000	,4618908	,7625638
Very high	,6049522	,0731994	-4,15	0,000	,4772275	,7668611
Gender						
Female	,6366121	,0521295	-5,51	0,000	,5422176	,7474397
Age group						
25-34	3,311518	,5277506	7,51	0,000	2,423108	4,525657
35-44	6,383414	1,004802	11,78	0,000	4,688855	8,690388
45-54	6,437823	1,025977	11,68	0,000	4,710701	8,798175
55-64	5,379381	,8842569	10,24	0,000	3,897738	7,424238
65+	3,681009	,6610622	7,26	0,000	2,588821	5,233977
Employment Status						
Unemployed_Discouraged	2,266291	,5419035	3,42	0,001	1,418342	3,621183
Unemployed_Strict	1,106737	,151977	0,74	0,460	,8455852	1,448543
Employed	,7841488	,0771816	-2,47	0,013	,6465723	,9509986
Ever moved						
No	,9281604	,0766555	-0,90	0,367	,7894478	1,091246
_cons	,0221393	,0036708	-22,98	0,000	,0159968	,0306406

HBP	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,9867553	,078133	-0,17	0,866	,8449089	1,152415
Medium	,7980954	,0645724	-2,79	0,005	,6810606	,9352418

High	,96616	,0782341	-0,43	0,671	,8243727	1,132334
Very high	,8197558	,0640465	-2,54	0,011	,7033656	,9554058
Gender						
Female	2,005008	,1126791	12,38	0,000	1,79589	2,238477
Age group						
25-34	5,041905	,8127044	10,04	0,000	3,676119	6,915121
35-44	13,21236	2,060472	16,55	0,000	9,732739	17,93599
45-54	33,92467	5,12211	23,34	0,000	25,23464	45,60728
55-64	65,13443	9,719457	27,99	0,000	48,61755	87,26261
65+	97,50323	14,66398	30,45	0,000	72,61105	130,9288
Employment Status						
Unemployed_Discouraged	,9215204	,2146969	-0,35	0,726	,5837018	1,454852
Unemployed_Strict	,810144	,0891254	-1,91	0,056	,6530103	1,005089
Employed	,9094053	,0556265	-1,55	0,121	,8066612	1,025236
Ever moved						
No	,9044096	,0471503	-1,93	0,054	,8165614	1,001709
_cons	,0078918	,0012619	-30,28	0,000	,0057685	,0107965
Diabetes	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	1,112588	,1372703	0,86	0,387	,8736019	1,416951
Medium	,7542069	,099622	-2,14	0,033	,5821791	,9770672
High	,9698408	,1243295	-0,24	0,811	,7543624	1,246869
Very high	,7382446	,0959303	-2,34	0,020	,572258	,9523765
Gender						
Female	1,253835	,1136112	2,50	0,013	1,049814	1,497506
Age group						
25-34	3,80663	1,492926	3,41	0,001	1,764847	8,210587

35-44	15,92198	5,717544	7,71	0,000	7,876486	32,18559
45-54	35,51374	12,38476	10,24	0,000	17,92898	70,34565
55-64	72,81632	24,96436	12,51	0,000	37,18798	142,5788
65+	87,62178	30,03389	13,05	0,000	44,75565	171,5443
Employment Status						
Unemployed_Discouraged	,7813418	,3647479	-0,53	0,597	,3129544	1,950747
Unemployed_Strict	,8592298	,182776	-0,71	0,476	,5662929	1,3037
Employed	,9268437	,0955366	-0,74	0,461	,7572982	1,134347
Ever moved						
No	,8309488	,0697873	-2,20	0,027	,7048327	,979631
_cons	,0019214	,000682	-17,62	0,000	,0009583	,0038526

Stroke	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	1,091944	,2613518	0,37	0,713	,6830764	1,745547
Medium	,7683521	,1961077	-1,03	0,302	,4659151	1,267108
High	,680983	,18411	-1,42	0,155	,4008723	1,156822
Very high	,6088794	,160954	-1,88	0,061	,3626775	1,022214
Gender						
Female	,7498168	,1304671	-1,65	0,098	,5331474	1,05454
Age group						
25-34	8,542584	6,730255	2,72	0,006	1,823779	40,01349
35-44	38,24269	28,36632	4,91	0,000	8,936631	163,6526
45-54	37,97239	28,18358	4,90	0,000	8,865343	162,6448
55-64	66,69795	48,45156	5,78	0,000	16,06098	276,9829
65+	72,97594	52,85287	5,92	0,000	17,64803	301,7609
Employment Status						
Unemployed_Discouraged	,9192946	,6707396	-0,12	0,908	,2199873	3,841598

Unemployed_Strict	,6604149	,2486361	-1,10	0,270	,3157567	1,381278
Employed	,3860654	,0889307	-4,13	0,000	,245802	,6063679
Ever moved						
No	,7164985	,1208858	-1,98	0,048	,5147575	,9973047
_cons	,0007621	,0005648	-9,69	0,000	,0001783	,0032575
Asthma	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,7589231	,1111352	-1,88	0,060	,5695731	1,011221
Medium	,5747248	,0891117	-3,57	0,000	,4241117	,7788247
High	,8072644	,1173102	-1,47	0,141	,6071845	1,073275
Very high	,6674533	,0977229	-2,76	0,006	,5009508	,8892966
Gender						
Female	1,315078	,1385918	2,60	0,009	1,069661	1,616802
Age group						
25-34	1,361633	,2261054	1,86	0,063	,9833633	1,88541
35-44	1,104474	,2167906	0,51	0,613	,7517583	1,622679
45-54	2,424433	,3976922	5,40	0,000	1,757856	3,343775
55-64	2,667847	,4279819	6,12	0,000	1,948091	3,653529
65+	2,412248	,401677	5,29	0,000	1,740538	3,343184
Employment Status						
Unemployed_Discouraged	1,239413	,4343928	0,61	0,540	,6235694	2,463471
Unemployed_Strict	,6993022	,1372571	-1,82	0,068	,4759852	1,027393
Employed	,7985535	,0958433	-1,87	0,061	,6311634	1,010337
Ever moved						
No	,735746	,0725111	-3,11	0,002	,6065102	,8925195
_cons	,0242841	,00423	-21,34	0,000	,0172605	,0341658

Heart	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	,772596	,1541125	-1,29	0,196	,522589	1,142207
Medium	,8134662	,1570061	-1,07	0,285	,5572501	1,187487
High	1,126681	,2069696	0,65	0,516	,7860252	1,614974
Very high	1,029365	,1860455	0,16	0,873	,7223124	1,466946
Gender						
Female	1,611837	,2234392	3,44	0,001	1,228356	2,115037
Age group						
25-34	1,961078	,5533872	2,39	0,017	1,127972	3,409505
35-44	2,214622	,6739251	2,61	0,009	1,219756	4,020928
45-54	6,911311	1,729536	7,72	0,000	4,232039	11,28681
55-64	9,057359	2,163833	9,22	0,000	5,670831	14,46627
65+	9,747473	2,316186	9,58	0,000	6,118293	15,52937
Employment Status						
Unemployed_Discouraged	,4832505	,3481247	-1,01	0,313	,1177559	1,98318
Unemployed_Strict	,7860111	,2036022	-0,93	0,353	,473086	1,305922
Employed	,5648014	,089628	-3,60	0,000	,4138273	,7708546
Ever moved						
No	,8048139	,0982725	-1,78	0,075	,6335177	1,022427
_cons	,00466	,0012773	-19,59	0,000	,0027232	,0079744
Cancer	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Low	1,051958	,2651661	0,20	0,841	,6418553	1,724091
Medium	,9768686	,2463953	-0,09	0,926	,5958513	1,601528
High	,6592094	,1903387	-1,44	0,149	,3743254	1,160907
Very high	,9821765	,2451396	-0,07	0,943	,6021986	1,601915
Gender						

Female	1,194156	,2105795	1,01	0,314	,8451982	1,687188
Age group						
25-34	1,364023	,4012069	1,06	0,291	,7663967	2,427672
35-44	1,896213	,5753768	2,11	0,035	1,046172	3,436934
45-54	2,420666	,7058652	3,03	0,002	1,366863	4,286915
55-64	2,580223	,7452043	3,28	0,001	1,464936	4,544605
65+	3,233457	,9020911	4,21	0,000	1,871514	5,586514
Employment Status						
Unemployed_Discouraged	1,842495	,9663686	1,17	0,244	,6591139	5,150534
Unemployed_Strict	,7840805	,2565576	-0,74	0,457	,4128959	1,488952
Employed	,838717	,1724427	-0,86	0,392	,5605391	1,254946
Ever moved						
No	,8854941	,1497051	-0,72	0,472	,635738	1,233369
_cons	,0053455	,0016734	-16,71	0,000	,0028942	,0098731

Appendix 4.8: Correlation matrix: Creating an SDI

Percei~h	Bothered	Mind	Depres~d	Effort	Hope	Fearful	Restless	Happy	Lonely	Getgoing	Tuberc~s	HBP	Diabetes	Stroke	Ashtma	Heart	Cancer	Lostwa~s	Lostwa~n	Trust_~s	Trust_~l	Trust_o~	Trust_~e	~e_other	Migrat~n	Unempl~d	Burglary	Domest~e	Violence	Gangst~m	Murder	Drug_a~e	HH_inc~e
1.0000																																
0.0011	1.0000																															
-0.0626	0.3886	1.0000																														
-0.1400	0.4502	0.4742	1.0000																													
-0.0624	-0.2407	-0.0909	0.0289	1.0000																												
-0.4088	0.2390	0.0637	0.2789	0.2539	1.0000																											
-0.0529	-0.1207	-0.0517	0.0560	-0.0918	-0.0131	1.0000																										
-0.0646	0.3020	0.4837	0.6917	-0.0564	0.2695	0.1166	1.0000																									
-0.2702	0.2668	-0.0215	0.2412	-0.0425	0.7421	0.0341	0.3742	1.0000																								
0.0096	0.1645	0.5319	0.3097	0.0879	0.2683	0.0472	0.5265	0.2712	1.0000																							
-0.0731	-0.2528	-0.1529	-0.0241	0.0987	-0.2044	0.1216	-0.0722	-0.1922	-0.0094	1.0000																						
-0.0143	0.6246	-0.1523	0.2029	-0.1747	0.1868	-0.0612	0.0305	0.2911	-0.1540	-0.1212	1.0000																					
-0.2346	0.0159	-0.0813	-0.1053	-0.1717	0.4068	-0.0581	-0.0215	0.4001	0.0818	-0.1019	0.1192	1.0000																				
0.0480	-0.1082	0.0024	-0.0680	-0.0787	0.3120	-0.0575	0.0081	0.3333	0.2134	-0.1444	-0.0085	0.7403	1.0000																			
0.0557	0.0950	0.2038	0.0633	0.1115	-0.1132	-0.0747	0.1010	-0.1888	-0.0274	0.0237	0.2320	-0.0739	-0.0493	1.0000																		
-0.3984	-0.0432	-0.1366	-0.2379	-0.0621	0.1116	-0.0860	-0.2188	0.0899	-0.1260	-0.0238	-0.0198	0.5179	0.3540	-0.0252	1.0000																	
-0.4824	0.1401	0.2528	0.1433	0.0083	0.4671	0.0824	0.0027	0.2337	0.1785	-0.1055	0.0027	0.5240	0.3657	-0.0443	0.4252	1.0000																
-0.0454	-0.2116	-0.0019	-0.0998	-0.0399	0.0180	0.1334	0.0234	0.1477	0.0553	-0.0650	-0.1951	0.3240	0.2151	0.0187	-0.0324	-0.0126	1.0000															
0.2164	-0.2689	-0.2685	-0.1101	-0.0953	-0.5565	0.0701	-0.1125	-0.3175	-0.2890	0.1991	-0.0574	-0.3183	-0.1020	0.0097	-0.1041	-0.2570	-0.0625	1.0000														
-0.2462	-0.0083	0.1625	0.2087	0.0986	0.4368	0.0977	0.2549	0.3954	0.3599	-0.0134	-0.1174	-0.0177	-0.0796	-0.2131	-0.1295	0.0458	0.1150	-0.2508	1.0000													
0.2140	-0.1367	-0.1416	-0.3037	0.0064	-0.0161	0.0612	-0.3131	-0.0512	-0.0925	-0.1299	-0.1221	0.2058	0.1962	0.0779	-0.1171	0.1298	0.1193	-0.1325	-0.0533	1.0000												
0.2431	-0.0326	-0.2976	-0.5493	-0.3160	-0.3008	-0.0604	-0.4122	-0.1583	-0.4734	-0.0316	0.1393	0.1103	0.0898	0.1179	0.0472	-0.2261	0.0988	0.1690	-0.4295	0.1656	1.0000											
0.2929	-0.0967	-0.3637	-0.5199	-0.3019	-0.2803	-0.0059	-0.3767	-0.1392	-0.3663	0.1461	0.1820	0.0923	0.1228	0.1887	0.0221	-0.2799	0.0307	0.2590	-0.3855	0.1571	0.8751	1.0000										
0.1560	-0.1505	-0.2407	-0.5074	-0.2222	-0.1673	-0.0892	-0.2931	-0.0284	-0.1442	0.1350	0.0828	0.2832	0.2776	0.2534	0.1310	-0.1343	0.1505	0.0964	-0.3794	0.1795	0.6370	0.8193	1.0000									
0.1140	-0.1095	-0.2297	-0.4458	-0.2758	-0.0425	-0.0783	-0.2442	0.1004	-0.1722	0.1312	0.0688	0.4058	0.3563	0.1699	0.2306	-0.0262	0.2196	0.0813	-0.3494	0.1804	0.6523	0.7588	0.8589	1.0000								
0.1927	-0.0332	0.0180	0.0395	-0.2521	-0.2400	0.0872	0.2202	-0.0178	0.0084	-0.1482	-0.1048	-0.0060	-0.1235	0.0632	0.0246	-0.0448	0.0110	0.1872	0.0145	0.0694	0.0724	0.0460	-0.0047	0.0905	1.0000							
-0.0183	0.0453	-0.0337	-0.1504	-0.1109	-0.3871	-0.1012	-0.1972	-0.2462	-0.2117	0.2699	-0.1348	-0.3013	-0.3679	0.1098	-0.0353	-0.2409	-0.0134	0.2941	-0.2064	-0.0205	0.2381	0.2104	0.1451	0.0709	-0.1293	1.0000						
-0.2534	-0.2628	0.1159	0.1146	0.0648	-0.2008	0.1689	0.1178	-0.1710	0.0638	0.3626	-0.3026	-0.0659	-0.1326	0.0809	-0.0193	-0.0175	0.0050	0.0465	-0.1731	-0.1993	-0.0541	-0.0528	-0.0221	-0.1112	0.1703	0.2365	1.0000					
0.0869	-0.0361	0.1220	0.0636	-0.2562	-0.4445	-0.0371	0.0299	-0.3477	-0.1331	0.0518	-0.2042	-0.0693	-0.1456	-0.0228	-0.0309	-0.3881	0.0362	0.0260	-0.0897	0.0561	0.0349	-0.0226	-0.0027	-0.0040	0.1771	0.2314	0.3966	1.0000				
0.0043	0.1883	0.2850	0.2667	-0.2422	-0.1603	-0.0614	0.2960	-0.0991	-0.0265	-0.0172	-0.1414	0.0681	0.0379	-0.0095	0.0562	-0.2246	0.0842	-0.0167	-0.0133	-0.1448	-0.0876	-0.1393	-0.1248	-0.0134	0.1289	0.0898	0.2859	0.8258	1.0000			
-0.0955	-0.0842	0.3439	0.1314	-0.0617	-0.1337	0.1484	0.1945	-0.1306	0.1086	-0.1739	-0.3647	-0.2516	-0.1792	0.0213	-0.1153	-0.1114	-0.0693	0.0630	-0.0165	-0.1918	-0.2516	-0.3566	-0.2468	-0.3331	0.1023	0.1613	0.5087	0.4104	0.3822	1.0000		
-0.0453	-0.2086	0.1591	-0.1444	-0.1454	-0.3589	-0.0917	-0.1858	-0.4444	-0.1346	0.0427	-0.3338	-0.1785	-0.1828	0.0275	-0.0276	-0.2549	-0.0563	0.0726	-0.1790	-0.1100	0.1374	0.1033	0.0492	-0.0551	0.0031	0.3331	0.5818	0.6161	0.4602	0.6461	1.0000	
-0.5353	-0.2643	-0.0611	0.0589	0.0368	0.1051	0.1180	0.0666	0.1410	-0.0697	0.2593	-0.1658	-0.0570	-0.0248	-0.1264	0.2150	0.1292	-0.0994	-0.1216	-0.0650	-0.3511	-0.1042	-0.1703	-0.1514	-0.1821	-0.2990	0.1381	0.5619	0.0451	0.0533	0.2323	0.2784	1.0000
0.0212	-0.0461	0.0532	0.2718	-0.1130	0.3949	0.0823	0.2769	0.3535	0.1693	-0.2831	0.0879	0.3971	0.2501	0.0048	0.0049	0.1626	0.2019	-0.2193	0.3021	0.1184	-0.2754	-0.2084	-0.1239	0.0339	0.4190	-0.6418	-0.0791	0.0415	0.1153	0.0161	-0.1757	-0.2691	1.0000

Appendix 4.9 Rotated factor loadings

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Factor9	Factor10	Factor11	Uniqueness
N_Perceive~h				-0,5087								0,2409
N_Bothered		0,9385										0,0447
N_Mind						0,7527						0,1826
N_Depressed	-0,5086											0,2133
N_Effort	-0,3850											0,2507
N_Hope								0,6739				0,1681
N_Fearful									0,7734			0,3639
N_Restless						0,6279						0,2004
N_Happy		0,9385										0,0447
N_Lonely						0,8383						0,2144
N_Getgoing										0,6838		0,2614
N_Tubercul~s		0,7695										0,1791
N_HBP				0,7238								0,1194
N_Diabetes				0,5436								0,2334

N_Stroke											0,8498	0,2019
N_Ashtma						-0,2022						0,2602
N_Heart				0,7931								0,1249
N_Cancer										0,3025		0,5080
N_Lostwall~s								-0,7622				0,2883
N_Lostwall~n	-0,4160											0,3671
N_Trust_sans							-0,7794					0,2730
N_Trust_rel	0,8240											0,1675
N_Trust_ot~r	0,9057											0,0767
N_Trust_race	0,8991											0,1422
N_Trust_ra~r	0,8682											0,1505
N_Migration								-0,5451				0,3005
N_Unemployed					-0,7846							0,2546
N_Burglary							0,4672					0,1951

N_Domestic~e			0,9355									0,0924
N_Violence			0,8951									0,1168
N_Gangster~m										-0,5269		0,1994
N_Murder			0,6795									0,1552
N_Drug_abuse								0,2618				0,1816
N_HH_income					0,8840							0,1246
Variance (Rotated) Contribution	12,89%	10,02%	9,38%	7,89%	7,75%	7,33%	6,17%	6,14%	4,15%	4,04%	3,96%	

Appendix 4.10: Regression output SDI and GVA

Model summary					
Source	SS	df	MS	Number of obs	44
Model	0,0303	1	0,0303	F(1,42)	0,52
Residual	2,4302	42	0,0579	Prob > F	0,473
Total				R-squared	0,0123
				Adj R-squared	-0,0112
				Root MSE	0,24055

std_SDI_1	Coe.	Std.Err	t	P>|t|	[95% Conf. Interval]	
GVA	-0,00155	0,002146	-0,72	0,473	-0,00588	0,002776
cons		0,045646	12,63	0,0000	0,484362	0,668598

Appendix 5.1: Summary of Associations Between Place Attachment Indicators and Willingness to Relocate

Variable	Cramér's V	Strength of Association	Direction	Interpretation / Theoretical Implication
Length of Stay	–0,0894	Very Weak	Negative	Longer residence slightly reduces willingness to relocate; consistent with time-based attachment theory
Homeownership	–0,0688	Very Weak	Negative	Homeowners marginally less likely to relocate; weak attachment possibly due to economic instability
Age Group	–0,1318	Weak to Moderate	Negative	Older individuals less willing to relocate; aligns with life course and cumulative attachment theories
Preference to Stay	–0,2218	Moderate	Negative	Strong preference to stay closely linked to reduced relocation intent; reflects emotional attachment
Employment	–0,0411	Very Weak	Negative	Employed individuals slightly less willing to relocate; limited effect in unstable mining economies

Appendix 5.2: Summary results of logistic regression between Place Attachment Indicators and Willingness to Relocate

Willingness to relocate	Coefficient (Logit)	Odds Ratio (Logistic)	Marginal effects (Delta method)	p-value
Mining region	0,2345	1,2343	0,0257	0,000
Length of stay	-0,3091	0,7341	-0,0338	0,000
Preference to stay	-1,4545	0,2335	-0,1591	0,000
Homeownership	-0,3066	0,7360	-0,0335	0,000
Employment	-0,0562	0,9454	-0,0061	0,515
Age group	-0,1786	0,8364	-0,0195	0,000
_cons	-0,2803	0,7556		0,000

Appendix 5.3: Further analysis of the logistic regression results

Willing to relocate	Odds Ratio	Std. Err.	z	P>z	[95% Conf.Interval]	
Mining region						
Low	,9459353	,1435744	-0,37	0,714	,7025314	1,273671
Medium	1,341415	,1916521	2,06	0,040	1,013794	1,774913
High	1,103131	,1609355	0,67	0,501	,8287915	1,468279
Very high	2,034972	,2618751	5,52	0,000	1,581319	2,618769
Length of stay						
Longer	,8009222	,106951	-1,66	0,096	,6164889	1,040532
Preference to stay						
Yes	,229378	,0218754	-15,44	0,000	,1902716	,276522
Homeownership						
Yes	,6921596	,0614133	-4,15	0,000	,5816766	,8236277
Gender						
Female	,8931233	,0760206	-1,33	0,184	,7558909	1,05527
Age group						
2	,9629482	,1107587	-0,33	0,743	,7685947	1,206448
3	,6449632	,0885356	-3,19	0,001	,4928202	,8440757
4	,552469	,0865054	-3,79	0,000	,4064687	,7509114
5	,5147389	,0949315	-3,60	0,000	,3585939	,7388751
6	,5665001	,1125652	-2,86	0,004	,3837636	,83625
Employment status						
Unemployed_Discouraged	,7969922	,3000937	-0,60	0,547	,3810209	1,667091
Unemployed_Strict	1,04532	,1443213	0,32	0,748	,7974961	1,370155
Employed	1,059309	,1087202	0,56	0,575	,8662863	1,295341
Migration						
1.bornsa	1,734517	,604653	1,58	0,114	,8758898	3,434849

Income ladder						
Ladder Rung 2	1,196648	,1884854	1,14	0,254	,8788054	1,629447
Ladder Rung 3	1,923691	,2932855	4,29	0,000	1,426794	2,593638
Ladder Rung 4	1,743891	,3082766	3,15	0,002	1,233242	2,465986
Ladder Rung 5	4,062478	1,009233	5,64	0,000	2,496484	6,610787
Ladder Rung 6 (Richest)	2,524024	1,322198	1,77	0,077	,9040566	7,046792
Life satisfaction						
Satisfaction level 2	1,872553	,4462619	2,63	0,008	1,173757	2,987378
Satisfaction level 3	1,177361	,2782468	0,69	0,490	,740874	1,871005
Satisfaction level 4	1,056243	,2401543	0,24	0,810	,6764394	1,649295
Satisfaction level 5	1,175618	,2512188	0,76	0,449	,7733435	1,787147
Satisfaction level 6	,899807	,2033234	-0,47	0,640	,5778419	1,401167
Satisfaction level 7	1,303505	,2899374	1,19	0,233	,8429086	2,015787
Satisfaction level 8	1,27526	,295575	1,05	0,294	,8096745	2,00857
Satisfaction level 9	,6405789	,2024802	-1,41	0,159	,3447599	1,190223
Satisfaction level 10 (Very satisfied)	,5374257	,1285688	-2,60	0,009	,3362674	,8589188
_cons	,2801289	,1209828	-2,95	0,003	,1201541	,6530962

Appendix 5.4: Interaction effects of mining and immediate explanatory variables to place attachment

Willing_to_relocate	Odds Ratio	P>z
Length of stay # mining_region		
Base = Length of stay > 20 years # Very low		
Length of stay > 20 years # Low	1,3625	0,258
Length of stay > 20 years # Medium	1,3708	0,220
Length of stay > 20 years # High	1,3814	0,234
Length of stay > 20 years # Very high	2,0862**	0,002
Preference to stay # mining_region		
Base = Prefer to stay # Very low		
Prefer to stay # Low	0,3933**	0,003
Prefer to stay # Medium	0,7061	0,210
Prefer to stay # High	0,4837**	0,013
Prefer to stay # Very high	0,7991	0,408
Homeownership # mining_region		
Base = Homeowners # Very low		
Homeowners # Low	1,8170**	0,038
Homeowners # Medium	0,8663	0,586
Homeowners # High	0,8315	0,513
Homeowners # Very high	1,4653	0,121
Employment # mining_region		
Base = Employed # Very low		
Employed#Low	0,9098	0,771
Employed#Medium	0,8979	0,726
Employed#High	1,0883	0,980
Employed#Very high	0,8977	0,709
Age_group#mining_region		
Base = 25-34# Very low		

25-34#Low	0,6802	0,283
25-34#Medium	0,6870	0,287
25-34#High	0,6403	0,236
25-34#Very high	0,9767	0,944
Base = 35-44# Very low		
35-44#Low	0,3039**	0,007
35-44#Medium	0,5139	0,100
35-44#High	0,6446	0,295
35-44#Very high	0,8453	0,650
Base = 45-54# Very low		
45-54#Low	0,6262	0,345
45-54#Medium	0,7514	0,537
45-54#High	0,7889	0,645
45-54#Very high	0,9850	0,972
Base = 55-64# Very low		
55-64#Low	0,4307	0,255
55-64#Medium	1,3021	0,668
55-64#High	0,6462	0,531
55-64#Very high	1,2622	0,684
Base = 65+# Very low		
65+#Low	1,0000	
65+#Medium	1,0000	
65+#High	1,0000	
65+#Very high	0,6437	0,667
_cons	0,4377	0,012

Appendix 5.5: Structural Equation Model results

	Coefficient	Std. Err.	z	P>z	[95% Conf.	Interval]
Structural						
Willing_to_relocate <-						
mining_region	0,02	,0019036	11,25	0,000	,0176879	,0251498
preference_to_stay	-0,21	.	.	.	.	.
lengthofstay_final	-0,04	,005465	-7,04	0,000	-,0491927	-,0277703
homeownership	-0,04	,0066912	-6,04	0,000	-,0535076	-,0272786
_cons	0,02	,0078564	40,76	0,000	,3047984	,3355951
mean(mining_region)	2,06	,0114787	179,73	0,000	2,040602	2,085598
mean(preference_to_stay)	0,88	,0026547	329,96	0,000	,8707373	,8811434
mean(lengthofstay_final)	0,60	,0039367	153,68	0,000	,5972777	,6127094
mean(homeownership)	0,77	,0033739	229,08	0,000	,7662796	,7795051
var(e.Willing_to_relo~e)	0,10	.		.	.	
var(mining_region)	2,03	,013607		2,005256	2,058596	
var(preference_to_stay)	0,11	,0058708		,0977505	,1208067	
var(lengthofstay_final)	0,24	.		.	.	
var(homeownership)	0,18	.		.	.	

cov(mining_region. preference_to_stay)	-0,02	,0036834	-4,72	0,000	-,0246182	-,0101795
cov(mining_region. lengthofstay_final)	-0,03	,005601	-4,91	0,000	-,0384523	-,016497
cov(mining_region. homeownership)	0,02	,0048622	5,00	0,000	,0147878	,0338472
cov(preference_to_stay. lengthofstay_final)	0,01	,0013433	9,53	0,000	,0101656	,0154314
cov(preference_to_stay. homeownership)	0,01	,0012336	8,91	0,000	,0085772	,0134128
cov(lengthofstay_final. homeownership)	0,02	,0016897	13,38	0,000	,0193008	,0259245

Appendix 6.1: Regional variation of FTE in mining by district municipality

District	Annual Average mining FTE employment	District	GVA
Bojanala District	114037,1	John Taolo Gaetsewe District Municipality	57,00
West Rand District	46325,7	Waterberg District Municipality	56,00
Waterberg District	37817,8	Bojanala Platinum District Municipality	52,10
Nkangala District	33741,4	Sekhukhune District Municipality	48,00
Lejweleputswa District	23812,1	Nkangala District Municipality	38,70
Sekhukhune District	19894,7	Namakwa District Municipality	35,60
John Taolo Gaets District	14673,7	Mopani District Municipality	35,00
Gert Sibande District	14337,4	Lejweleputswa District Municipality	34,70
Dr Kenneth Kaunda District	10790	West Rand District Municipality	29,20
Ehlanzeni District	9407,5	Gert Sibande District Municipality	26,80
Fezile Dabi District	7897,8	ZF Mgcawu District Municipality	21,30
Mopani District	6517,3	Fezile Dabi District Municipality	18,20
ZF Mgcawu District	4999,2	Amajuba District Municipality	13,20
King Cetshwayo District	4692,3	Xhariep District Municipality	11,30
Frances Baard District	3754,7	King Cetshwayo District Municipality	10,73
Sedibeng District	3466,4	Dr Kenneth Kaunda District Municipality	10,00
Vhembe District	2696,9	Vhembe District Municipality	10,00
Namakwa District	2639,5	Capricorn District Municipality	9,00
West Coast District	2306,6	Dr Ruth Segomotsi Mompati District Municipality	8,00
Capricorn District	1859,9	Frances Baard District Municipality	7,00
Garden Route District	1858	Zululand District Municipality	7,00
Dr Ruth Segomotsi District	1273,3	Ngaka Modiri Molema District Municipality	6,60
Amajuba District	1148,1	Ehlanzeni District Municipality	4,00

Ngaka Modiri Mol District	1054,8	Pixley ka Seme District Municipality	3,70
Pixley Ka Seme District	991,9	uMzinyathi District Municipality	3,20
OR Tambo District	858,1	iLembe District Municipality	2,14
Xhariep District	843,5	Thabo Mofutsanyana District Municipality	2,00
Umzinyathi District	770,8	Sedibeng District Municipality	1,52
Cape Winelands District	750,1	uMkhanyakude District Municipality	1,40
Zululand District	740,2	Garden Route District Municipality	1,00
Umkhanyakude District	592,8	uThukela District Municipality	0,78
Thabo Mofutsanyane District	581,5	West Coast District Municipality	0,74
Ugu District	578,5	uMgungundlovu District Municipality	0,58
Umgungundlovu District	570	Ugu District Municipality	0,49
Amathole District	551,7	Harry Gwala District Municipality	0,30
Chris Hani District	430,4	Central Karoo District Municipality	0,28
Alfred Nzo District	407	Alfred Nzo District Municipality	0,22
Ilembe District	316,4	OR Tambo District Municipality	0,20
Overberg District	276,9	Joe Gqabi District Municipality	0,16
Joe Gqabi District	266,2	Chris Hani District Municipality	0,12
Sarah Baartman District	219,1	Overberg District Municipality	0,12
Uthukela District	169,5	Amathole District Municipality	0,10
Harry Gwala District	164,3	Cape Winelands District Municipality	0,00
Central Karoo District	83,3	Sarah Baartman District Municipality	0,00

Appendix 6.2: Results Hausman tests

Dependent variable	Chi-square	p-value	Model
Contact crimes			
Murder	62,47	0,000	FE
Attempted murder	17,91	0,003	FE
Assault GBH	24,67	0,000	FE
Common assault	16,97	0,005	FE
Common robbery	14,24	0,014	FE
RWAC	10,09	0,073	RE
Total contact crimes	18,82	0,002	FE
Sexual Offences			
Rape	18,31	0,003	FE
Sexual assault	39,51	0,000	FE
Attempted sexual assault	18,4	0,003	FE
Contact sexual offences	12,18	0,032	FE
Contact-related to property crimes			
Robbery of non-residential premises	19,54	0,002	FE
Robbery residential premises	13,24	0,021	FE
Carjacking	23,66	0,000	FE
Arson	14,48	0,013	FE
Malicious damage to property	34,96	0,000	FE
Property crimes			
Burglary of non-residential premises	17,41	0,004	FE
Burglary residential premises	28,66	0,000	FE
Theft of motor vehicle	28,31	0,000	FE
Theft out of motor vehicle	28,33	0,000	FE
Stock theft	7,89	0,162	RE
Shoplifting	16,88	0,005	FE
Crimes detected as a result of police action			
Drug-related crimes	33,51	0,000	FE
DUI	23,82	0,000	FE
Illegal possession of a firearm	94,11	0,000	FE
Kidnapping	29,47	0,000	FE

Appendix 6.3: Regional variation in Mining employment

Mining region	N	Mean	Standard deviation	min	max
Very low	90	426,9778	251,1041	41	1163
Low	70	891,3857	795,7072	107	2691
Medium	90	2342,689	2835,347	203	11826
High	91	4383,538	5080,301	720	36892
Very high	99	31323,99	31081,31	2453	125614
Total	440	8662,827	19339,51	41	125614