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THE USE OF PUBLIC TRANSPORT TO IMPLEMENT A POLYCENTRIC DEVELOPMENT MODEL IN SEKONDI-TAKORADI

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG, SOUTH AFRICA
THE FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT,
MASTER OF URBAN STUDIES IN URBAN MANAGEMENT.

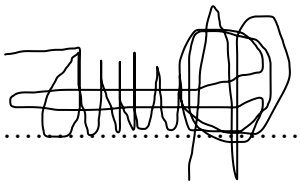
JULY 2025

JOACHIM GAAYUONI

STUDENT NO: 273476

DECLARATION

I, Joachim Gaayuoni, hereby declare that this research report is my original, unaided work. It is being submitted for the Master of Urban Studies degree in Urban Management at the University of the Witwatersrand, Johannesburg. This report has not been submitted for any other degree or examination at any other university.



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(Signature of Candidate)

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ABSTRACT

The 2021 population and housing census put the population of Ghana at 30.8 million people. At the Ghana Urban Forum 2024, it was revealed that this population is expected to rise to 50 million people by 2050, with 70% of the estimated population living in urban areas. However, urbanisation in the country continues to be haphazard, disorganised and characterised by disregard for laws. Using government policies and frameworks with a doctoral analysis, this research report investigates how efficient urban transport systems can address core urbanisation issues of sprawl and congestion in the twin city of Sekondi-Takoradi. The theoretical underpinnings of the polycentric spatial model are used to explore how urban planning policy, practice, and transportation systems work together to create activity centres that ease congestion in the mother city. Despite administrative and policy configurations to promote polycentricity, institutional capacity and lapses stand as challenges in achieving this balanced urban development. Also, access in urban design focuses on road-led infrastructure with few indications on how intermodal transport infrastructure will be achieved, which stands as a complex challenge to achieving polycentric development as observed in the global north, Latin America and China.

Key Words: Polycentric Development, Public Transport, Urban Sprawl, Transit-Oriented Development (TOD).

DEDICATION

This research is dedicated to the memory of Taki Sithagu. Although we never met in person, Taki's influence allowed me to study at this esteemed university. I also dedicate this work to Professor Marie Huchzermeyer, who provided me with the necessary support to meet my academic requirements despite my late registration, and to my supervisor, Dr. Mawabo Msingaphantsi, whose patience and guidance offered me valuable insights into urban planning and polycentric development

ACKNOWLEDGEMENTS

I want to thank the Wits-TUB-UNILAG Urban Lab for awarding me a scholarship to further my studies. My sincere thanks also go to my fellow scholars in the programme, whose support ensured that no one was left behind during our time at the university. I am deeply grateful to Tirivashe Jele and Harry Wilson Kapatika for sheltering me and helping me smoothly transition into life in Johannesburg. Additionally, I am thankful to the Management of Wassa East District Assembly in the Western Region of Ghana for making last-minute adjustments that allowed me to seize this opportunity to pursue my master's program. Lastly, I would like to express my gratitude to my family, friends, and research participants for their contributions and support throughout my studies in Johannesburg.

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List Of Acronyms

National Spatial Development Framework	**NSDF**
Sekondi-Takoradi Urban Network	**STUN**
Central Business District	**CBD**
Transit-Oriented Development	**TOD**
European Spatial Development Perspective Document	**ESDP**
Bus Rapid Systems	**BRT**
Light Rail Transit	**LRT**
Geographical Information Systems	**GIS**
Land use and Spatial Planning Authority	**LUSPA**
United States Geological Survey	**USGS**
Sekondi-Takoradi Metropolitan Assembly	**STMA**
Ghana Private Roads and Transport Union	**GPRTU**
Regional Coordinating Councils	**RCCs**
National Development Planning Commission	**NDPC**
Medium-term development plans	**MDTP**
Metropolitan, Municipal, and District Assemblies	**MMDAs**
The Ghana Private Roads Transport Union	**GPRTU**
Provisional National Defence Council	**PNDC**

CHAPTER ONE: INTRODUCTION

1.0 Introduction

The Ghana National Spatial Development Framework (2015-2035) identifies the biophysical, socio-economic, and built environment as the general themes of the anticipated challenges of the rapid urbanisation in the country (Government of Ghana, 2015a). Consequently, the policy document proposes a framework for government action with core tenets encapsulating the need for quick, continuous, and broad-based economic advancement through a balanced hierarchy of polycentric development. Furthermore, the National Spatial Development Framework (NSDF) emphasises the importance of ensuring that all citizens have access to essential services, regardless of location. Also, it highlights the necessity of steering development towards activity corridors, linking major economic centres (Government of Ghana, 2015b).

Sekondi–Takoradi, commonly referred to as the twin city of Ghana due to the proximity of the two urban centres of Sekondi and Takoradi, is experiencing some of the predicted negative impacts of rapid urbanisation on spatial transformation, as described in the NSDF. Driven by economic growth and trade, two once-separate fishing communities have transformed into a unified metropolitan area under a single local government authority (Yankson, Gough, Esson and Amankwaa, 2017). Since the discovery of oil in 2007, the metropolitan area has undergone rapid and largely unplanned urban growth at the expense of green spaces (Mensah, Kweku, Asamoah and Ofori, 2019). Empirical evidence of sprawling edges shows that up to 77% of the built-up area in the metropolis is now located outside the metropolitan core of Sekondi and Takoradi (Mensah, Gough and Simon, 2018; Acheampong, 2019).

The Land Use and Spatial Planning Act 936 (2016) and the Local Governance Act (925) 2016 mandate local governments as planning authorities under a three-tier planning structure that synchronises urban planning strategies among the three tiers of government for sustainable settlement development (Agyemang, Silva and Poku-Boansi, 2019). With urban congestion and sprawl identified as pressing challenges of urbanisation in the country (*Ibid*), the NSDF was developed in alignment with the new planning legislations and governance structure, as a comprehensive national spatial framework aimed at promoting balanced development, with a strong focus on polycentric growth supported by mass transit systems (Acheampong, 2019). Indeed, Ghana requires empirically grounded models in urban geography and sustainable development to guide settlement development and spatial transformation (Agyemang *et al*., 2019; Government of Ghana, 2015b; Acheampong, 2019).

1.1 Background

The future of humanity is increasingly urban, yet access to convenient public transportation in urban spaces remains limited worldwide. Currently, only around half of the world's urban residents have access to public transportation, with lower access in developing regions and higher access in Europe and North America (United Nations, 2023). As Africa becomes the fastest-urbanising region in the developing world, comprehensive land use planning is critical to managing growth and steering the transformation of rapidly expanding cities (Korah, Matthews and Tomerini, 2019). However, research on the spatial evolution of cities in sub-Saharan Africa continues to be limited (Gollnow, Nielsen, Lakes and Walker, 2019; Mawenda, Watanabe, and Avtar, 2020). Indeed, empirical evidence shows that built-up areas continue to outpace urban populations, leading to declining urban densities, particularly in developing countries (UN-Habitat, 2023).

Like many African cities, Ghanaian cities are not exempt but are at the centre of the challenges of rapid urbanisation happening on the continent. Challenges of urban sprawl, poor public transport systems and ineffective spatial planning hinder efforts to promote compact development and safeguard biodiversity and green spaces (Agyemang *et al*., 2019; Amponsah, Blija, Ayambire, Takyi, Mensah and Braimah, 2022). Besides, most cities in Africa have yet to sufficiently modernise their transportation systems and infrastructure to make public transport the preferred choice for daily commuters (Poku-Boansi, Asibey and Adom-Asamoah, 2024). In response to these challenges, the NSDF, inspired by the polycentric model, was developed to promote the development of interconnected urban networks made up of economically varied yet functionally independent nodes, linked by multi-modal transport infrastructure (Government of Ghana, 2015b).

Polycentric development safeguards ecological assets and ensures balanced growth among cities, as demonstrated empirically in other countries that have adopted this model (Natalia and Heinrichs, 2020; Zhu, Niu, and Wang, 2024; Davoudi, 2003; Liu, Derudder, and Wu, 2016). Therefore, grounded in polycentric development theory and empirical evidence, the NSDF advocates “a new urban settlement hierarchy based on the distance between settlements and the area of influence, or service coverage, of individual settlements.” Furthermore, the strategy emphasises an integrated and spatially balanced development that connects leading and lagging areas (Government of Ghana, 2015b:45). Figure 1.0 below highlights the Western Region, the primary focus area of this research report within the broader geographical context of Ghana, West Africa, and the African continent.

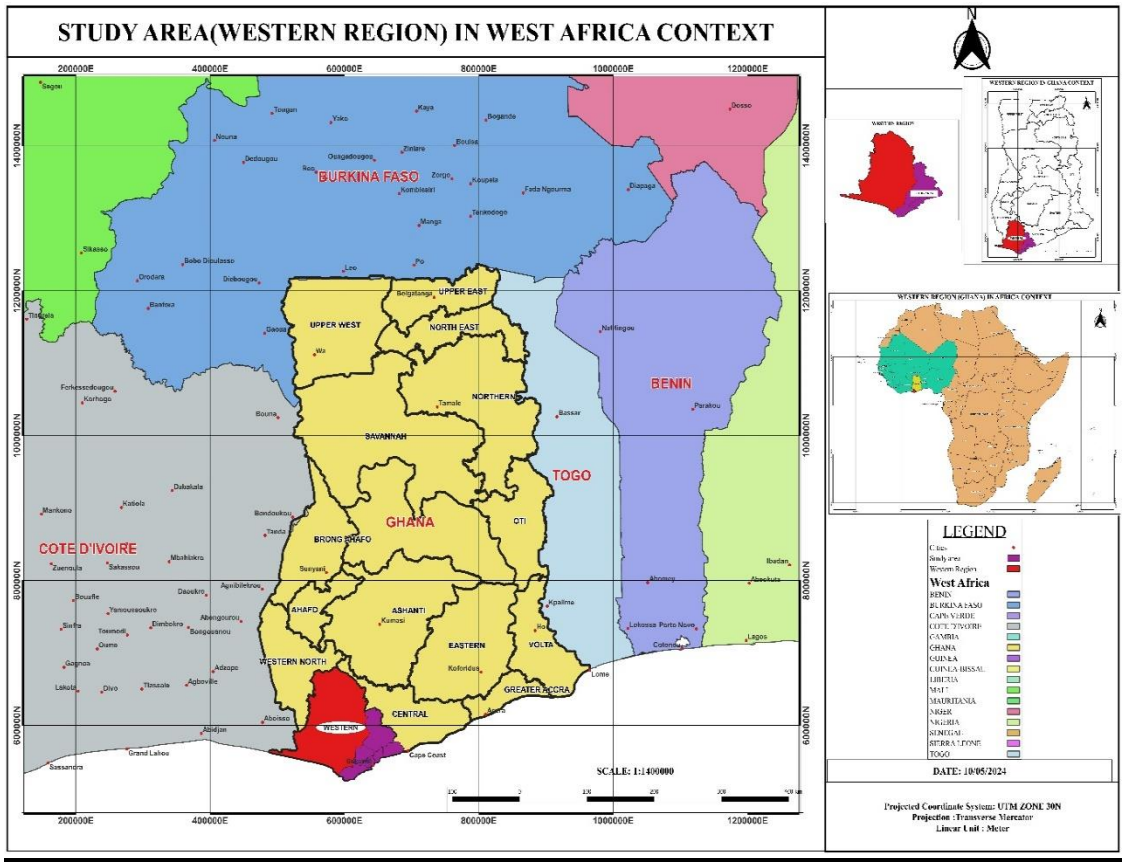

Figure 1.0: Map showing the proposed STUN in the Western Region of Ghana. Source: (Author, 2024).

1.2 Problem Statement and Rationale: Incorporating Polycentricity in Urban Planning

Contemporary planning models propose spatial strategies that integrate land use planning with transportation systems to create a comprehensive framework that addresses challenges of urban congestion, sprawl and accessibility (Abane, 2011; Mchome and Nzoya, 2023; Wu, Yuan, Gao, Zhang and Li, 2024). However, research into how transportation systems shape urban spatial structures across African cities remains strikingly underdeveloped (Poku-Boansi *et al*., 2024; Goodfellow and Huang, 2020; Okeke, Gyoh and Echendu, 2021). The disconnect between spatial and transportation planning is further highlighted in the Ghana National Transport Policy (2020), which links this gap to worsening congestion in metropolitan cores and unchecked urban sprawl on urban edges. Sekondi-Takoradi exemplifies these issues, as its status as the Western Region's primary economic hub has led to worsening traffic congestion and urban sprawl, both consequences of inadequate planning systems (Obeng-Odoom, 2015). The twin city continues to be one of Ghana's rapidly urbanising secondary cities, challenged by congestion, sprawl, and inadequate public transport services (Town and Country Planning Department, 2012; Mensah *et al*., 2019). With many scholars increasingly discussing the need to move from traditional centrality-based spatial models to more dispersed contemporary

models for sustainable urban change (Finn and Cobbinah, 2022; Jiang, Zhang, Ren, Wei, Xu and Liu, 2021). Public transport-oriented urban development deserves earnest policy attention in Ghana, with overwhelming evidence showing mobility systems influence spatial transformation (Poku-Boansi and Adarkwa, 2014; Agyemang *et al*., 2019). Advancing research on African urban transport systems is essential for achieving SDG 11 Target 2, as evidence-based insights are critical for driving meaningful urban mobility improvements (Poku-Boansi *et al*., 2024).

1.3 Research Aims and Objectives

This research investigates planning theory, policy, and practice in Ghana to understand how public transport networks can transform the polycentric urban area of the proposed Sekondi-Takoradi Urban Network (STUN) through functional connections. It examines urban planning strategies for creating a balanced polycentric urban region using the nodes proposed in the NSDF for STUN. Specifically, the study explores how public transport can address sprawl and congestion challenges within the metropolitan core while enhancing inter-urban commuting between nodes. It evaluates the effectiveness of urban design in promoting effective public transport systems that address urban sprawl and congestion. Through this comprehensive analysis, the study aims to contribute to developing a more resilient and sustainable city region in the Sekondi-Takoradi Urban Network and the Western Region.

1.4 Research Questions

Main Research Question

How can public transport be leveraged to implement a functional polycentric development model that mitigates urban sprawl, using the proposed Sekondi-Takoradi Urban Network (STUN) as a case study?

Sub-Research Questions

a) How can public transport improve access to Sekondi and Takoradi?
b) What polycentric public transport policies exist in the Sekondi-Takoradi Metropolitan area?
c) What policies address spatial transformation in the Sekondi-Takoradi Metropolitan area?

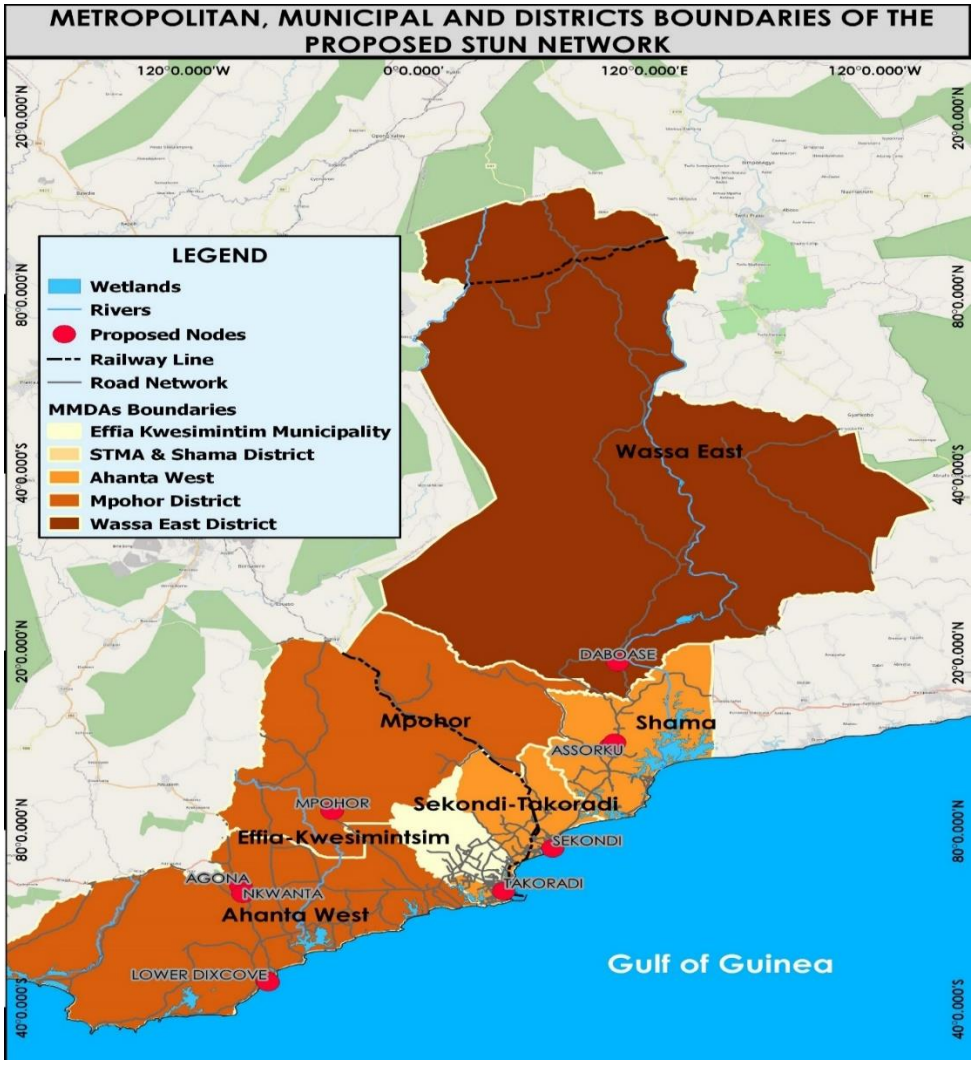

Figure 2.0: A Map Showing the Local Authority Boundaries for the Proposed STUN. Source: (Author, 2024).

1.5 Research Approach

This study uses a qualitative approach to develop a conceptual framework of the polycentric model using both analytical and empirical studies of the model in scholarly research. Also, a documentary review of national, regional, and local policy documents, frameworks, and plans was done to give a more localised understanding of what polycentric development means in the Ghanaian context. This report then examines urban development strategies aimed at mitigating urban sprawl and congestion through mass transportation systems in Sekondi-Takoradi Metropolis and its surrounding urban centres. Through juxtaposing empirical evidence and theoretical foundations of polycentricity, planning professionals and academics were selected for more insight into the local context. By conducting interviews with academics, urban planners, and other built environment professionals, deductive insights on morphological and functional polycentrism within the STUN region, using existing administrative

frameworks and policy contexts, were made, prioritising the role of mass transportation systems in fostering a balanced and functional polycentric region.

Additionally, the potential of the polycentric model to enhance land use efficiency and boost economic productivity is well-supported (Zhu, Niu, and Wang, 2024). In conclusion, this study utilises qualitative insights to deduce sustainable urbanisation strategies that integrate land use planning with mass transportation systems using the administrative framework for urban planning in Ghana. Figure 2.0 above shows the morphological structure of the proposed Sekondi-Takoradi Urban Network polycentric region. It shows the proposed centres in no hierarchy and also the local government boundaries around the centres.

1.6 Report Structure

This report is divided into six chapters. The first chapter briefly introduced the background, research aims, objectives, and expected findings. The second chapter reviews literature on polycentric development in Europe and China, incorporating normative and empirical discussions. Also, literature is used to develop a conceptual framework in the second chapter, which is used for discussing the findings in the fifth chapter. The third chapter outlines the research methodology, ethical considerations, and limitations. The fourth chapter discusses the context of urban change, sprawl and planning systems in Sekondi-Takoradi, the Western Region and Ghana. The fifth chapter is dedicated to findings, analysis and discussions of the research findings, followed by the sixth chapter, which presents the conclusions and recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter draws from literature to discuss the varied normative and analytical frameworks used to model and explain polycentricity in America, China and Europe. The review aims to understand the characteristics of the polycentric model in developing a conceptual framework that underscores the core ideas of polycentricity. First, I will briefly discuss the evolution of settlement distribution from the early 19th century and the decline in monocentric development in the global north. The review then discusses applications of the polycentric model in addressing urban sprawl and congestion while showing evidence of how transportation networks, public transportation, and the interconnected relationship between transportation and spatial organisation co-evolve into polycentricity. This will be followed by a conceptual framework demonstrating how urban governance, regional economies of scale and public transportation systems facilitate polycentric development in metropolitan regions.

2.1 Conceptual Evolution of Spatial Development Models

Spatial models that guided settlement planning in the global north in the early nineteenth century were modelled around centralised urban systems, creating the core-periphery divide associated with monocentric development (Agyemang *et al.,* 2019). Early 19th-century cities like London and New York in the global north historically centred around a single Central Business District (CBD) that agglomerated residential, commercial and mixed-use activities (Rodrigue, 2024). Thus, the observed monocentric spatial development patterns of the early 19th century, marked by the walking-horse car era, have today evolved into multiple agglomeration centres connected via advanced transport technologies. This change process has been complemented by transport corridor expansions alongside mobility technology, directly influencing the breakdown of the monocentric development and promoting the rise of multiple centres (*Ibid*). Besides, monocentric development models are losing relevance in light of the rapid urbanisation happening in the global south, where urban agglomeration expands beyond CBD limits and centrality models (Agyemang *et al*., 2019; Cats and Birch, 2021).

Monocentric spatial transformation models are increasingly becoming inefficient in modelling the current urban transformation process, mainly due to the rapid rate of urbanisation and decentralisation. This underscores the need to shift from centralised urbanisation in some old cities to polycentric agglomerations that can be distinguished from urban sprawl, extended urbanisation and suburban development (Davoudi, 2003). The shift from monocentric to

polycentric patterns dates back to the nineteenth century's spatial and functional decentralisation of activities. The "rapid decentralization of economic activities and the increase in mobility due to new transport technology, such as high-speed transport", means people can now commute efficiently over long distances within and between urban cities (Natalia and Heinrichs, 2020:714).

In recent decades, concerns have grown regarding the inefficiency of current urban designs in addressing congestion, environmental issues, and the efficiency of land use (Song, Chen and Pan, 2012). Despite the diverse models of sustainable urban transformation, spatial models of sustainable urban planning strategies have shifted into two main paradigms of monocentric and polycentric development. The call for polycentric urban development has been strongly advocated by the European Spatial Development Perspective (ESDP), various national and regional governments, and urban planners and academics (Davoudi, 2003). The complexities of modern cities and city regions require an urban morphology that can transform the more extensive geographical region using functional urban systems. The polycentric model is considered ideal because it swerves from the centrality principles of monocentric models and the core-periphery congestion associated with centralised development (Davoudi, 2003; Malý, 2016). The shift from spatial models of centrality to the more representative polycentric model of development is ensuing from not only the rapid decentralisation of economic activities but also the increase in commuting speed and efficiency due to advancements in transport technology that encourage cross-commuting (Natalia and Heinrichs, 2020).

Many scholars underscore the interconnectedness of spatial planning and transportation planning in shaping mobility patterns, improving access to services in metropolitan areas, and shaping urban morphology (Abane, 2011; Rodrigue, 2024; Cats and Birch, 2021). Urban planning can reimagine mass transportation systems as a tool for managing urban growth, as they have the potential to influence urban growth patterns more effectively than traditional planning systems (Agyemang *et al*., 2019). Nonetheless, it is important to note that early monocentric urban agglomeration models did account for transportation systems, which played a key role in shaping commuting patterns. These systems focus on movement between outlying areas and the central business district (CBD), which functions as the focal point of social and economic activity in monocentric models. This dynamic contributed to the emergence of a core-periphery structure and the predominantly one-directional commuting flows typical of monocentric cities (Rodrigue, 2024). However, David and Kilani (2022) argue that monocentric models fail to optimise transport networks, necessitating a more efficient urban

growth strategy that intertwines transportation and urban planning in an efficient urban system that aims to minimise external congestion and pollution costs. Despite the long co-evolutionary history of settlements and transport networks, extensive research has gone into the spatial transformation of geographic regions, with little attention given to the evolution of the corresponding transportation networks (Cats and Birch, 2021; Zhang, 2009). Moreover, suburban developments and daily commuting from suburbs to the CBD are associated with congestion and automobile dependency, compelling developing economies with rapid urbanisation rates to invest in mass transit systems (Rodrigue, 2024; Amedzro, Essien, Issah and Owusu, 2024). Accordingly, integrating transportation and land use planning is ideal in urban development to address contemporary urban challenges of congestion and sprawl (Agyemang *et al.*, 2019; Loo and du Verle, 2017).

The distribution of resources and the spatial differentiation of the economy influence the location and allocation of raw materials, capital, people, and information. Consequently, efficient transportation systems are essential for effectively balancing the distribution and accessibility of resources, as well as supporting activity centres through decentralised economic activities (Rodrigue, 2024). Integrating transportation and land use planning can promote high-density compact development through mixed-use planning. This is espoused to create activity centres that reduce the need for travel, promote non-motorised modes of commuting, and enhance accessibility to urban resources (Agyemang, Amoako-Sakyi, Antwi, Mensah and Abane, 2020). Figure 3.0 shows how urban settlements in the early 20th century were developed around monocentric models that centralised economic and social activities in the CBD, especially in the United States of America and Europe.

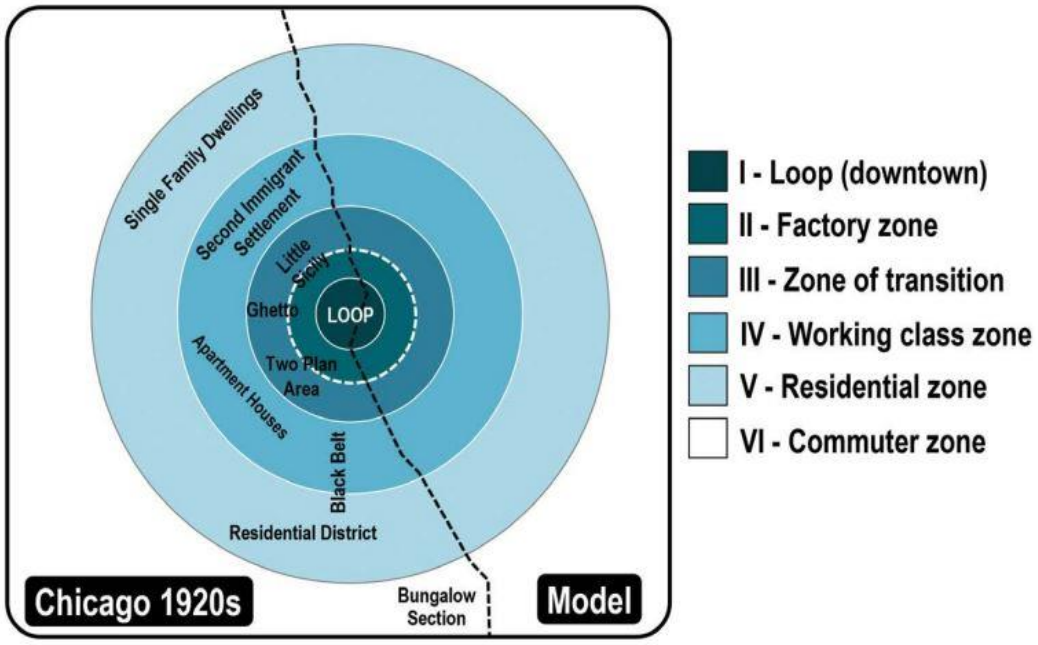

Figure 3.0: Ideal Concentric Model Source: (Rodrigue, 2024).

2.2 The Polycentric Development Model

Polycentric development is criticised due to a lack of accord in the definition of the concept among academics and practitioners (Davoudi, 2003; Agyemang *et al.,* 2019; Dadashpoor, Doorudinia and Meshkini, 2023). A common critique of the model is the lack of sufficient empirical evidence to support its superiority over monocentric models. When evaluated against theoretical claims related to alleviating congestion and improving accessibility, the model may not necessarily outperform monocentric models in all contexts (Dadashpoor *et al*., 2023). Nevertheless, the polycentric model is still being transformed into normative frameworks to guide and explain the spatial transformation of cities and regions through policy documents and spatial frameworks (Davoudi, 2003; Dadashpoor *et al*., 2023). Planners and politicians have transitioned the model into normative spatial strategies, adapting to local complexities to promote balanced and sustainable urban growth in the developed and developing world (Dadashpoor *et al*., 2023). Figure 4.0 below illustrates the proposed distribution of centres using the polycentric model, along with the connecting transport corridors

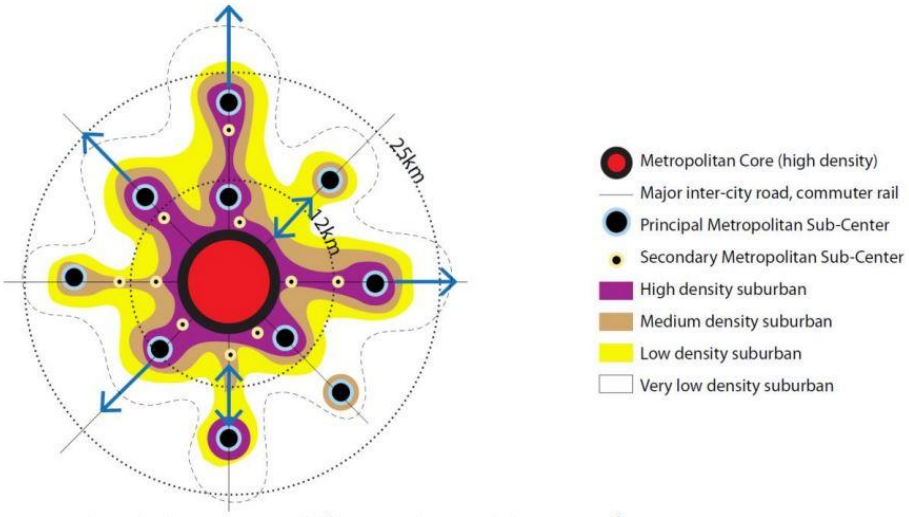

Figure 4.0: Ideal Polycentric Model, Source: (City of Johannesburg, 2021).

According to Kloosterman and Musterd (2001), the polycentricity development model has diverse definitions because of the diversity of backgrounds of participants present at the 1999 conference on polycentric development in Amsterdam. Nevertheless, polycentricity as a normative spatial strategy gained traction with the introduction of the European Spatial Development Perspective Document (ESDP) in the early 1990s to promote integration and access among European cities like London, Paris, Amsterdam and Milan (Malý, 2016; Natalia and Heinrichs, 2020; Davoudi, 2003; Dadashpoor *et al*., 2023). Since then, polycentric development has transitioned from scholarly research into normative spatial strategies that promote regional competitiveness and integration by connecting multiple economically complementary centres to foster balanced development across regions (Bartosiewicz and Marcińczak, 2020; Davoudi, 2003). Typically, the model includes a morphological dimension defined by spatial connections in a homogeneous geographical region or city with diverse yet complementary activity centres. Various factors, such as economic agglomeration principles, population densities, distances between centres, decentralisation of political power, and spatial development plans and policies, determine the node identification process (Dadashpoor *et al*., 2023).

Malý (2016) argues that a polycentric urban morphology, whether on a regional scale or city level, does not automatically transition into polycentric development. Thus, the urban morphology of polycentric regions requires individual centres with complementary economic profiles to be backed by functional regional connections that offer additional benefits to individual centres (Derudder *et al*., 2022). Therefore, a normative polycentric framework requires morphological and functional links within a broader polycentric framework (*Ibid*).

The morphology of a polycentric region is spatially epitomised by static spatial features encompassing transport networks and settlement distribution, requiring functional interactions to transform the static urban form into dynamic high-activity spaces (*Ibid*). Functionally, mixed land use planning is key to creating activity centres that promote multi-directional commuting patterns and interactions (*Ibid*). Polycentric development is expected to promote multidirectional commuting by balancing diverse activities across activity centres in urban regions or cities (Davoudi, 2003). Notwithstanding the late adoption of polycentricity in the developing world, empirical studies in Latin America, China, and the Global North affirm that cities have already transitioned from a monocentric to a polycentric spatial pattern (Agyemang *et al*., 2019).

Recognising the potential differences between government-designated polycentric regions and economically active areas, as well as the impact of city and regional planning on urban development, it is important not to simplify the concept of polycentricity to multiple centres located close to each other (Liu *et al*., 2016). In rapidly urbanising China, polycentricity is characterised by regions with dense cities connected through complementary economic profiles (Derudder *et al*., 2022). Mass transit systems facilitate the functional connections within polycentric regions, often characterised by "a multi-layer public transport network which compromises a range of public transport modes which vary in terms of their inter-station distances, speed, capacity, and cost characteristics" (Cats and Birch 2021:5). Also, land use planning plays a vital role in connecting centres by functionally distribution complementary activities and promoting economic specilisation. This is anticipated to encourage reverse commuting and interactions between and within centres, transforming urban nodes into vibrant activity centres (Dadashpoor *et al*., 2023).

While polycentric regions can sometimes develop naturally without deliberate efforts, as seen in parts of Europe with the Dutch Randstad and the Rhine-Ruhr regions as prime examples, empirical evidence shows that polycentric regions are typically created by integrating land use planning with transport policy. A common theme underpinning these polycentric regions is the collective branding to promote specialised regional economic activities. The Randstad region, for example, has two economic circles, one in the north wing anchored by Amsterdam and Rotterdam and the south wing anchored by The Hague and Utrecht (Goess *et al*., 2016). Together, the anchor cities represent the four largest urban agglomerations in the Netherlands, spanning four provinces and collectively accommodating around seven million people. Economically, the northern cities focus on tertiary activities like finance, culture,

entertainment, trade, and consultancy services. In contrast, the southern cities are centred around logistics and manufacturing, benefiting from their connection to a major regional seaport (*Ibid*). Similarly, the Rhine-Ruhr region is another prime example of a polycentric region that developed in the global north (*Ibid*). First conceptualised as a planning region in 1995, the Rhine-Ruhr is divided into the Rhine-axis in the south, encompassing service-oriented cities like Düsseldorf, Cologne, and Bonn (*Ibid*). In contrast, the northern part features cities like Dortmund, Bochum, Essen, and Duisburg, in the once highly industrialised rustbelt. The development of the Rhine-Ruhr is directly linked to the industrial boom of the nineteenth and twentieth centuries, which saw rural areas in the Rustbelt develop into cities, repositioning the region as one of the most industrialised regions in Europe (*Ibid*).

In China, polycentric development is described as a new form of urbanisation driven by the resurgence of regional projects and studies. The rise of polycentric development in China is closely influenced by global trends, with key policies focusing on regional governance and planning that encourage the specialisation of functions among different cities (Liu *et al.*, 2016). Polycentric development in China is backed by substantial investment in intermodal transport infrastructure that connects cities through various intercity public transportation systems built around the railways and highways (*Ibid*). For example, the Kowloon region in Hong Kong, China, consisting of 52 Tertiary Planning Units (TPUs) and grouped into seven growth clusters, is connected through a network of "auto link, rail link, and intra-zonal link" (Huai *et al*., 2021:100). Thus, when mapping activity centres with complementary economic profiles, polycentric designs should incorporate well-networked mass transit systems (Loo and du Verle, 2016). Figure 6.0 illustrates the polycentric development pattern in Koowon District, China, highlighting seven clustered nodes connected by a multi-modal transport network and encompassing 53 planning units.



Figure 5.0, A Map Showing the Polycentricity of Koowlon District in China, Source: (Huai et al., 2021)

2.2 Criticisms of The Polycentric Model

The theoretical and normative underpinnings of the polycentric spatial model remain insufficiently developed. While morphological polycentricity can be easily characterised by static spatial and demographic features of urban form, functional polycentricity lacks a precise conceptual definition (Vasanen, 2012). Moreover, empirical evidence substantiating the purported linkages between polycentricity and economic growth remains limited (Brezzi and Veneri, 2014). Urban policies targeting local-scale challenges should refrain from adopting top-down spatial models that, despite their broad social acceptance, are often designed without consideration of local contexts (Salvati, 2016)

2.3 Characteristics, Claims, Explanations, and Uses of the Polycentric Development Model

Polycentric development has emerged as cities and regions have expanded beyond their boundaries. As a model for achieving sustainable urban growth through efficient land use

management and governance, it necessitates broader cooperation between the mother city and the surrounding peripheral settlements. Initially, polycentric development occurred in Europe and North America due to city expansions, followed by a later transition in Latin American and Asian cities following similar patterns and principles. Contrary to what is observed in a monocentric urban structure, where a one-way flow pattern characterises daily commuting, multi-directional commuting patterns between the networked nodes characterise polycentric regions (Bartosiewicz and Marcińczak, 2020). Also, given that a polycentric region comprises historically distinct nodes at the inter-regional scale, they generally lack the radial hub and spoke-like monocentric road infrastructure, which means transportation routes developed at individual centres were primarily for intra-urban commuting (Kloosterman and Musterd, 2001). Figure 6.0 shows the polycentric region of Amsterdam and the supporting transport network.

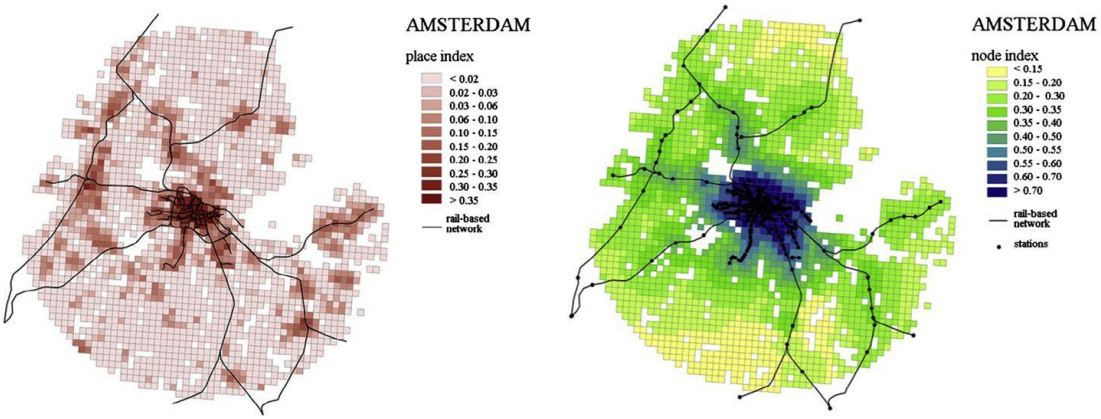

Figure 6.0 Polycentric development along transport routes in Amsterdam, Source: (Papa and Bertolini, 2015).

Hierarchical Structure and Measure of Polycentricity

The polycentric development model can be discussed at three distinct spatial scales in empirical and analytical research: the mega-scale, which refers to macro-regions or the national level, the macro-scale or inter-regional scale, and the meso-scale, which focuses on dynamics within cities (Natalia and Heinrichs, 2020). However, most empirical studies, most of which happen primarily in the global north, tend to focus on the inter-regional and intra-urban scales, where the focus is on urban regional systems (Bartosiewicz and Marcińczak, 2020). However, European cities have seen a saturation of empirical studies on polycentric development, especially at the intra-urban scale, calling for new studies in the developing world to focus on inter-regional and national scales (Natalia and Heinrichs, 2020).

The spatial scale at which polycentricity is examined directly influences the analytical depth of the study; the broader the scale, the less analytical it tends to be. Furthermore, in the study

of polycentric urban development, the importance of a node is determined not just by the size of the centre but primarily by the position of the centre within the broader polycentric region (Natalia and Heinrichs, 2020). Malý (2016), in the empirical study of micro-regional polycentricity across Europe at an inter-urban scale, outlined the need to identify centres using empirical data, emphasising the contribution of small and medium-sized settlements to local development. Although the local authority is the fundamental territorial unit for assessing polycentricity, local governments may or may not function as a central hub (*Ibid*), with the rank-size distribution method being the most common method for identifying centres in normative polycentric configurations (Zhu *et al*., 2024).

Polycentricity at the intra-urban scale primarily develops around traditional monocentric radial networks, with the densification of local grids (Cats and Birch, 2021). However, at the inter-urban scale, polycentric regions will primarily not be a hub-and-spoke radial network because the nodes will have historically developed their network infrastructure independently (Bartosiewicz and Marcińczak, 2020). Polycentric urban regions can be developed by guiding the urban transformation process through population and employment distribution. Also, it encompasses developing commuting routes that may be radial, linear, or corridor-based (Kloosterman and Musterd, 2001). The development of polycentric regions also involves making complex trade-off decisions between expanding network coverage, densifying local connections, enhancing inter-centre connections, and increasing the capacity of existing links (Cats and Birch, 2021).

Decentralisation of Activities Through Multiple Centres

Fundamentally, polycentric development encompasses the distribution of economic activities through an urban morphology that establishes multiple centres with a connected network (Davoudi, 2003). Despite the diverse discourse on the selection process of centres in polycentric development, critical elements in identifying centres and nodes in polycentric development should include agglomeration economies, the radius of individual centres, and the inter-distancing between the identified centres (Cats and Birch, 2021 citing Parr, 2004). Interestingly, due to the diversity in the definitions of polycentricity and the diversity of researchers and professionals on polycentricity, the nodes and/or centres of a polycentric region can also be reduced to mean the cluster of almost every human activity (Kloosterman and Musterd, 2001).

With decentralisation in the developing world continuing to occur in a widely unplanned pattern, empirical evidence points to the polycentric development model as an effective strategy for addressing issues associated with unplanned urban expansion. Moreover, polycentric development is espoused to address sprawl and congestion by "promoting efficient public transport services, reducing the need for commuting trips and traffic congestion, and minimising the distance between housing and job location" (Natalia and Heinrichs, 2020:716). Moreover, the new pattern of decentralising activity centres in a polycentric urban area has already happened in North America, Europe, Asia, and Latin America. In the developed world, iconic polycentric development-oriented cities include Los Angeles, Paris, and London at the intra-urban level and the Dutch Randstad at the inter-urban level (*Ibid*).

Land Use Development and Connectivity

It is argued that unique spatial patterns result in varying network structures, and the relationship between urban form and the associated transport network entails intricate feedback mechanisms (David and Kilani, 2022). Natalia and Heinrichs (2020) argue that the polycentric development model is the ideal urban spatial strategy for land use and transportation efficiency because it allows urban agglomerations to develop along public transport networks. Moreover, urban networks have grown to include intricate interactions beyond employment clusters, integrating aspects like land use zoning and employment networks (*Ibid)*. To exemplify these connections, Paris, initially designed as a monocentric city with a radial road network, now uses the Grand Paris Express circular rail systems to connect all sub-centres, enhancing efficient commuting (David and Kilani, 2022). Thus, the urban network necessary for developing polycentric centres should be done using land use planning as a proxy to influence the commuting habits of the people served by a network. Typically, the network should offer integrated multi-modal and non-motorised transportation choices that facilitate seamless transition between transport modes (Song *et al*., 2012).

Although the fundamental elements of urban form can be summarised as densities, design, and diversity, land use arrangements can purposely influence travel choices, which in turn influences transportation modelling (Song *et al*., 2012). This requires urban designs that promote mixed land use planning, diversity, and proximity of neighbourhoods to public transportation facilities (Natalia and Heinrichs, 2020). In addition to fostering individual economic centres, the polycentric model encourages mixed-use, high-density developments. This approach aims to create compact nodes, preserve open spaces, and protect biodiversity,

especially between urban centres (Bartosiewicz and Marcińczak, 2020). Polycentric networks are typically underpinned by mass transit systems that connect centres through direct commuting routes (David and Kilani, 2022). However, Cats and Birch (2021) argue that to justify providing the necessary infrastructure that connects polycentric regions, the population of the region in question must reach a critical mass that warrants such extensive infrastructure investments.

Nevertheless, David and Kilani (2022) argue that connecting sub-centres in a polycentric urban region with direct transit lines can potentially increase the attractiveness of sub-centres tenfold and significantly boost the appeal of sub-centres to the working class living in the CBD but employed in sub-centres. Further network expansions are expected to create a positive ripple effect on centres, enhancing their attractiveness to businesses, new investments, and residents, thereby creating labour pools. This is predicted to result in positive agglomeration outcomes, provided that mass transit services are adjusted to meet commuting demands with deliberate policy changes in transport pricing options implemented alongside the development of new transit lines (*Ibid).* Therefore, land-use planning is crucial in shaping travel behaviour and travel mode choices, highlighting the importance of integrating it with transportation modelling (Song *et al., 2012)*. The node identification and establishing process is crucial for planners in shaping polycentric development and housing patterns. By defining the nodes of a polycentric region, urban planners can strategically guide growth and development, ensuring that housing and infrastructure are optimally distributed through functional connections that promote balanced development across polycentric urban regions (Yang, Jin, Yan and Pei, 2019). Figure 7.0 below illustrates how direct transit routes should connect sub-centres in polycentric urban regions.

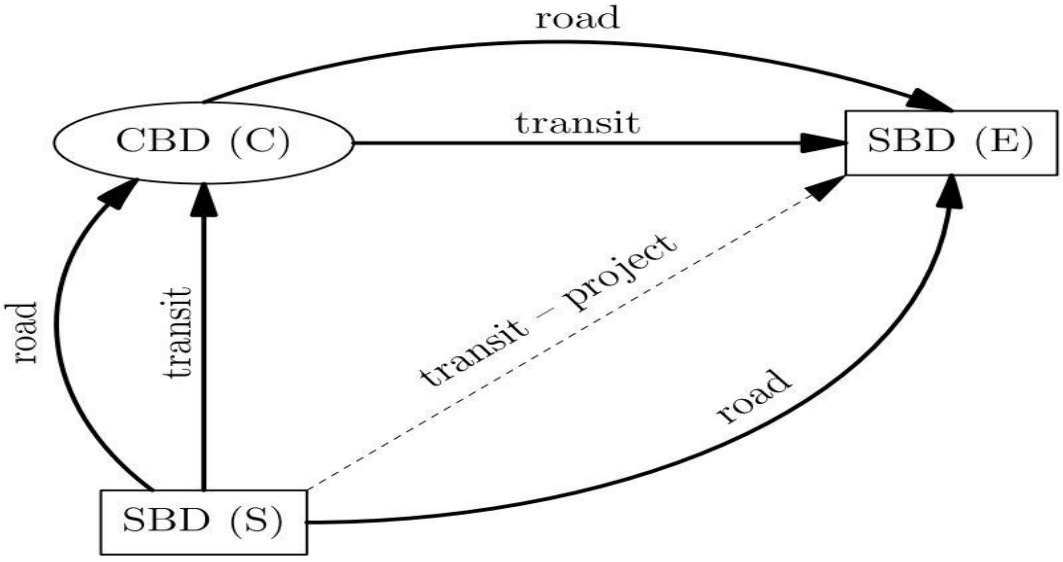

Figure 7.0: An illustration of direct transit routes in a polycentric development model. Source: (David and Kilani, 2022).

Flexibility and Adaptability to Sustainable Urban Transformation

Given that the polycentric model is still in its initial phase, with numerous conceptual interpretations, empirical studies have shown that social realities do not always fit into a theoretical framework (Kloosterman and Musterd, 2001). Typically, empirical studies on polycentricity use data on employment and travel behaviour. However, in the absence of this data, nighttime aerial images, land use footprints, and transport supply data, especially for informal public transport services, can be utilised to study polycentricity (Natalia and Heinrichs, 2020). Despite several empirical studies on the polycentric model, one can hardly find two studies by two different researchers using the same conceptual parameters (Bartosiewicz and Marcińczak, 2020). Additionally, the benefits of polycentric development go beyond economic, compact development, and transportation improvements, as outlined in theory (Natalia and Heinrichs, 2020).

Empirical evidence demonstrates that planners can subjectively create the morphology of polycentric urban regions through regional policies and spatial frameworks (Dadashpoor *et al*., 2023; Davoudi, 2003; Malý, 2016). However, due to the diverse arrangements required for polycentric development, early decisions can shape urban growth and the direction of spatial evolution, as exemplified by the Tokyo prototype (Cats and Birch, 2021). Empirical evidence shows that polycentric-driven urban transformations are flourishing in China at the inter-urban scale, aligning with the nation's new urbanisation goals (Liu *et al*., 2016). The potential

benefits of polycentricity will extend throughout a region if local connections within each centre are continuously developed (Cats and Birch, 2021).

Reduces Congestion, Urban Sprawl and Fragmentation

Studies on polycentricity have demonstrated the model's ability to check sprawling developments, enhance public transport efficiency, reduce the need for commuting, and alleviate congestion in city centres (Natalia and Heinrichs, 2020). The polycentric development model is actively being promoted in China, with the establishment of 110 new municipal-level centres. As a result, urban agglomerations in China are becoming less fragmented in their historic centres, expanding development into peri-urban areas, and reducing the need for transport-related activities (Yang *et al*., 2019). Furthermore, polycentricity mitigates congestion issues of monocentric urban form by decentralising employment and economic activities across multiple centres, thereby redistributing traffic to different activity centres (Huai, Lo and Ng, 2021).

Rising concerns associated with rapid urbanisation in China include congestion, environmental degradation, limited urban land resources, and inefficient urban form (Song *et al*., 2012). Besides, congestion and environmental degradation persistently challenge local authorities' capacity to manage urbanisation, prompting them to adopt improved public transport strategies (David and Kilani, 2022). Despite the inefficiencies associated with existing urban morphology and commuting patterns, current spatial models have not explicitly addressed traffic congestion, even though scholars acknowledge directing traffic as a key factor in the shift to polycentric urban regions (Louf and Barthelemy, 2013). Today, many metropolitan areas still face congestion and crowding issues in their public transport systems (David and Kilani, 2022).

Based on empirical research in China, polycentric regions maximise urban land use efficiency and address sprawl using agglomeration economy principles (Zhu *et al*., 2024). Accordingly, promoting environmentally friendly land use and transportation planning can be achieved using the polycentric development model as a spatial guide to urban change (Song *et al*., 2012). Additionally, Cats and Birch (2021) emphasise the importance of uniform mass transportation systems in mitigating fragmented polycentric development, noting that uneven demand for mass transportation services can cause fragmentation and disconnections within polycentric networks.

Enhancing Regional Connectivity and Balanced Development

Spatial policies and strategies should aim to develop an urban morphology that focuses on integrating, coordinating, and redistributing activities and housing within a polycentric framework to influence travel and mobility choices using urban design (Song *et al.,* 2012). The polycentric model is espoused to return substantial land use planning benefits while playing a crucial role in achieving more sustainable mobility outcomes (Alqhatani, Setunge and Mirodpour, 2014). In China, urban design is fostering polycentric urban regions along transportation corridors, supported by modern intermodal transport infrastructure (Natalia and Heinrichs, 2020). While different metropolitan centres are characterised by diverse transportation systems, polycentric development requires cohesive multimodal public transport networks. These networks should seamlessly integrate different transit modes like Bus Rapid Transit (BRT), Light Rail Transit (LRT), metro rail systems, and regional commuter rail to enhance connectivity and accessibility (Cats and Birch, 2021).

The complex urban structure of polycentric regions represents a transformation process where centres evolve into activity hubs, which also serve as transport nodes that attract transit trips, transforming them into centres of economic activities (Natalia and Heinrichs, 2020). Polycentric expansion strategies should prioritise densifying and increasing the capacity of existing transit lines. This approach allows for the creation of shortcuts and the development of entirely new direct transit links to connect centres at inter-urban and intra-urban scales (Alqhatani *et al.,* 2014). The role of urban planners in polycentric development is to build stakeholder trust by engaging various stakeholders in discussions about the urbanisation process, the need for open spaces, and the critical infrastructure needed to connect individual centres in a polycentric region (Kloosterman and Musterd, 2001). Therefore, urban planners in developing countries should develop local context indicators, taking essential lessons from the empirical evidence from the global north, Latin America, and China (Natalia and Heinrichs, 2020). Additionally, the importance of markets in decentralising metropolitan centres in a polycentric urban region, particularly in the developing world, should be foundational in developing centres as activity nodes (*Ibid*).

Homogeneous Inclusive Development

Although polycentric regions are characterised by networks of interconnected, competing, and collaborating nodes (Finka and Kluvánková, 2015), the proximity of multiple centres with complementary economic profiles fosters balanced development across the region (Derudder,

Meijers, Harrison, Hoyler and Liu, 2022). Additionally, polycentric urban regions are espoused to reduce disparities between centres while promoting balanced development that maintains the diversity of urban and rural areas (Natalia and Heinrichs, 2020). Although polycentricity shares the same spatial economic principles as monocentric models, polycentric regions exhibit distinct spatial characteristics compared to monocentric urban forms. These differences can be categorised into urban morphology, political entity, functional relationships, and cultural identity (*Ibid*). While economic agglomeration is a key principle for explaining the growth and resilience of cities, Louf and Barthelemy (2013) argue that congestion caused by the clustering of economic activities is a powerful force that creates the need for decentralised urban economies.

The essence of polycentric development, *vis-a-vis* economic agglomeration principles, is to balance the distribution of development among centres within a region (Li, Mou, Wang, Yin and He, 2018). Therefore, polycentric regions at the inter-urban scale consist of historically distinct centres close to each other and concentrated within a specific geographical area of a country with complementary economic profiles (Natalia and Heinrichs, 2020). Although independent markets characterise polycentric regions, they share labour markets and infrastructure that bind the centres. Thus, polycentricity fosters uniform and environmentally friendly growth of activity centres, facilitated by the free movement of people between and within centres (Kloosterman and Musterd, 2001).

2.4 Accessibility, Public Transport and Transport Policy

Transit Oriented Development (TOD) is an urban development strategy that integrates transportation and urban planning with a primary focus on accessibility (Papa and Bertolini, 2015; Deboosere, El-Geneidy and Levinson, 2018). Conceptually, TOD aims to curb urban sprawl and congestion by promoting strategies that minimise the need for travel and encourage the use of non-motorised transport. The key advantage of TOD lies in its ability to link underprivileged areas with city centres, guaranteeing fair access to essential services (Agyemang *et al.,* 2020). TOD designs prioritise providing attractive mobility options that supersede the need for private mobility while promoting densified mixed-use developments and non-motorised transport options for sustainable spatial expansion (Loo and du Verle, 2017).

TOD promotes polycentric development in cities and regions through urban planning by integrating transport infrastructure and land use planning. Moreover, TOD catalyses the

transformation process of homogeneous polycentric regions by fostering efficient mass transport systems with sustainable land use planning strategies (Papa and Bertolini, 2015). Empirical evidence shows that public transport facilities are highly patronised in TOD neighbourhoods compared to neighbourhoods outside these zones (Loo and du Verle, 2017). However, the concept has been criticised for focusing on city limits and not being fully integrated with the broader transportation systems of settlements of urban edges and/or peripheries (Deboosere *et al*., 2018). Moreover, sustainable urban design must go beyond the urban city edges to encourage cross-boundary commuting, thereby enabling the circulation of "ideas, capital, information, people, goods and services" (Loo and du Verle, 2017:56).

Nevertheless, the spatial distribution of the network varies based on urban morphology. However, a common characteristic of TODs is the provision of affordable high-density housing and employment opportunities for the population in a compact transit-oriented node (Papa and Bertolini, 2015). TOD improves accessibility by integrating land use planning with transport systems. Thus, implementing TODs on a regional scale should be backed by "functional connections between local and regional transport investments" (Deboosere *et al*., 2018:19).

> "The combined patterns of the railway network and land use differ significantly across the six urban systems, ranging from what could be termed a 'strong core structure' (i.e. Munich and Rome), to a 'networked city-region' (i.e. Amsterdam, Zurich and Naples), to a 'corridor structure' (Helsinki)" (Papa and Bertolini, 2015*:76*).

TOD is people-centred, focusing on access that offers diverse mobility options in densely populated areas to promote active urban environments through urban design. Thus, urban planning using the principles of TOD should promote non-motorised commuting, active open spaces, and green belts (Loo and du Verle, 2017). Additionally, as a concept of new urbanism, TOD requires supportive urban development policies that emphasise mixed-use design, densification, and diversity. These policies should focus on developing identified centres into transit nodes that support high-frequency commuting services that effectively meet commuting demands. Moreover, TOD requires supporting policies that discourage private automobile dependency and promote affordable housing (Knowles, Ferbrache and Nikitas, 2020).

In China, TODs have been marked by the swift expansion of a reliable rail network to foster sustainable urbanisation by ensuring easy mobility and high accessibility. This progress was achieved by establishing high-density mixed-use zones at various rail stations throughout the network, with support from government policies and land-use planning (Ma, Chen, Li, Ding

and Wang, 2018). Today, the urban regions of Beijing, Shanghai, and Shenzhen stand as empirical evidence of the success of polycentric urban areas developed using the principles of TOD in China (*Ibid*). However, the metropolitan centre remains the primary hub of activity, offering various transportation, commercial, and service options. Also, given its focus on people and accessibility, TOD's primary goal is to make public transportation attractive to individuals from all walks of life (Loo and du Verle, 2017).

2.5 Conceptual Framework

Figure 7.0 presents a conceptual framework that integrates the key principles of polycentric development, transit-oriented development (TOD), public transportation, and accessibility. It demonstrates how the interplay of these concepts can drive urban transformation by reducing congestion in central areas and addressing issues of sprawl and congestion. The figure outlines a cyclical and iterative process, where polycentric nodes simultaneously function as transport hubs within a regional corridor, with spatial planning embedded in the design process. The framework emphasises the foundational principles of spatial planning, polycentricity, and TOD as essential to fostering a balanced, hierarchical settlement structure.

Polycentric development is espoused to create economically and socially autonomous nodes that offer housing, employment, and recreational opportunities through the application of land use planning instruments and regulatory measures. TOD acts as the connective mechanism, linking these nodes, which also serve as public transport nodes with intermodal transport infrastructure for seamless intra- and inter-urban commuting. Through this iterative integration of polycentricity, TOD, and spatial planning, urban nodes will develop into economically resilient activity centres in an interconnected transport corridor characterised by compact high-density developments. Also, the corridor should feature affordable housing, mixed-use environments, and urban infrastructure designed with non-motorised commuting in mind, especially around public transport nodes.



Figure 8.0: Graphical Illustration of Conceptual Framework. Source: (Author, 2024)

Morphological Polycentricity and Spatial Transformations

Empirical studies by Cats and Birch (2021), inspired by the four distinct European polycentric urban regions, that is, London, Tokyo, the Flemish Diamond, and the Rhine-Ruhr area, have standard morphologically accurate maps that show the individual centres of various sizes situated nearby yet separated by defined distances. The Dutch Randstad is a typical example of polycentricity at the macro or inter-regional level, characterised by multiple centres. London is an example of intra-city polycentricity of a single city with multiple centres (Natalia and Heinrichs, 2020). The morphology of a polycentric region is mapped using the distribution of employment and residential densities across different identified nodes that make up the polycentric urban region. This distribution of identified activity centres outside the CBD may

not necessarily be cities but maintain economic connections with the mother city (Bartosiewicz and Marcińczak, 2020). Nevertheless, in the empirical study of Shenyang, the largest city in northeast China, morphological polycentricity was identified by the physical spatial structure created by material elements in the region (Yu, Yang, Li, Jin and Sun, 2022). This typically includes urban architecture, building footprints, and the network that connects individual centres. The mapped urban morphology must maintain the diversity of individual centres to ensure the spatial transformation process develops into diverse activity nodes in any given polycentric region (Song *et al*., 2012).

Functional Polycentricity

The second aspect of polycentricity emphasises the interactions within and between centres, driven by the concentration of employment and population in individual centres (Natalia and Heinrichs, 2020). Functional polycentricity creates functional links between settlements through mass transport systems (Cats and Birch, 2021). However, because polycentric urban regions are made up of politically and historically distinct nodes, there is a propensity to have tensions that affect collaboration between centres in the region due to political differences (Kloosterman and Musterd, 2001). Notwithstanding the differences in individual centre priorities, transportation links should prioritise further expansions that connect previously disconnected nodes to the existing urban network (David and Kilani, 2022).

Functional polycentricity is accelerated through multi-modal public transport networks that connect centres via direct transit routes (Cats and Birch, 2021). A typical public transport network in a polycentric model with a single CBD and two sub-centres distinguishes transit efficiency from the transport network by the ease of access from one sub-centre to another without a thoroughfare through the CDB (David and Kilani, 2022). Therefore, while transport networks might link all nodes to the CBD, direct public transit lines between centres can enhance the appeal of activity centres to investors and labour (*Ibid*).

It is essential to recognise the challenges in obtaining the necessary disaggregated census-based data on transportation, especially since public transport services in the developing world are primarily supplied by informal paratransit associations (Natalia and Heinrichs, 2020). Additionally, a functional polycentric urban region comprises complex interactions beyond employment agglomeration that can be induced by land use planning and zoning (*Ibid)*. Therefore, other functional variables such as land use type, diversity, and the distance to transportation facilities are essential factors in designing polycentric regions (*Ibid)*.

Consequently, functional polycentricity complements morphological polycentricity to facilitate a spatial transformation process that should result in reverse and multi-directional commuting within a network that offers a variety of economic and recreational activities (Bartosiewicz and Marcińczak, 2020).

Access-Oriented Development, Public Transport, Accessibility and Spatial Organisation

Urban planning has shifted from a mobility-centred approach towards access-oriented designs that prioritise diverse modes of commuting, especially non-motorised modes (Loo and du Verle, 2017). TOD has emerged as the ideal urban planning strategy that focuses on accessibility, aligning with the principles of the polycentric model to balance the distribution and accessibility of resources across cities and regions (Agyemang *et al.,* 2020). Moreover, TODs foster compact development by encouraging higher density and mixed-use development around transit stations outside the mother city, creating activity centres in an interconnected polycentric network of centres (*Ibid*). Additionally, intermodal and/or multimodal transport policies are crucial in rolling out TOD in urban planning (*Ibid*). TOD is advocated for as the ideal urban strategy that grasps the dynamic interplay between transportation and spatial organisation to shape commuting patterns for liveable, accessible, and well-connected urban agglomerations (Rodrigue, 2024).

Prioritising public transport systems in urban design is considered financially and environmentally wise for achieving sustainable urbanisation (Loo and du Verle, 2017). TODs address urban sprawl and traffic congestion challenges by reducing the need for travel, encouraging non-motorised transport through the concept of complete streets and development of compact nodes (Agyemang *et al*., 2020). Moreover, mobility, production, and distribution have become interconnected at local, regional, and global levels, highlighting the need for integrating inter- and intra-mobility options (Rodrigue, 2024). Therefore, TOD is vouched for as the ideal urban development strategy that addresses urbanisation challenges of congestion, pollution, and sprawl. Besides promoting liveable metropolitan areas, TOD benefits encompass:

> "Employment opportunities, education and job training centres, affordable housing schemes for the working force and open spaces to facilitate recreation. In other words, there is an emphasis on enhancing the sustainability of the metropolis as a system" (Agyemang *et al.*, 2020:412).

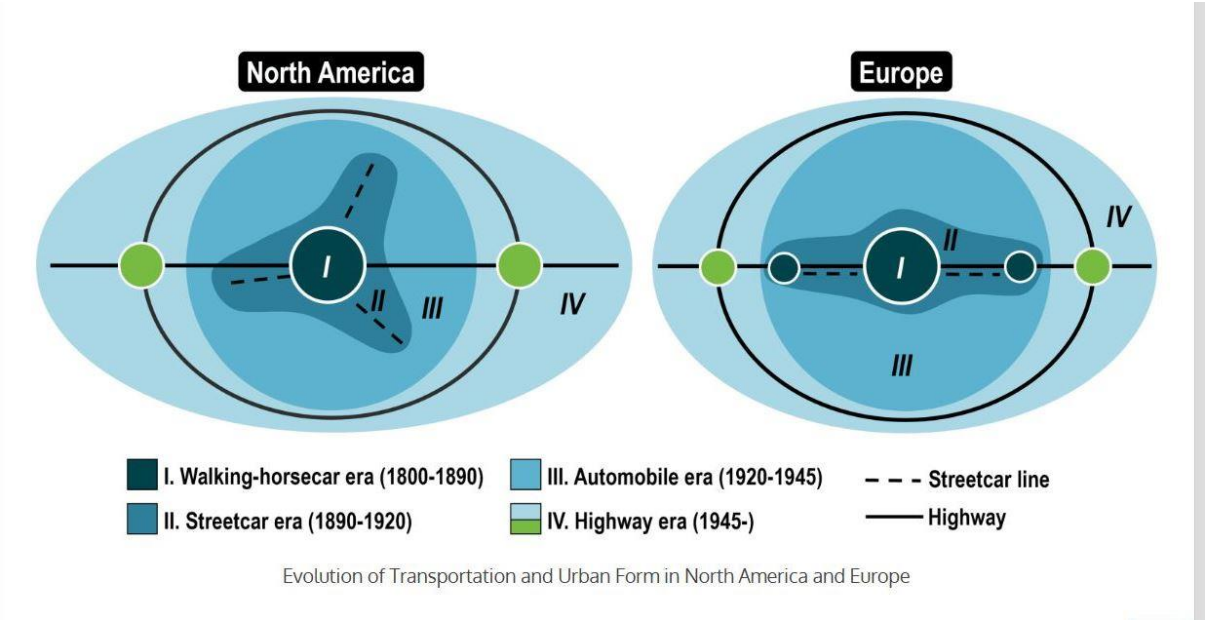

Figure 9.0: The Evolution of Settlements and Transport Corridors in North America and Europe. Source: (Rodrigue, 2024).

To exemplify an efficient urban public transportation system, Hong Kong's efficient rail and BRT systems have enabled it to become one the best non-car-dependent cities in the world, with housing units within a ten-minute walking distance or 500-metre radius of metro transit systems (Loo and du Verle, 2017, citing Loo, Chen and Chan, 2010). Therefore, spatial organisation can facilitate people-oriented accessibility through networked multi-modal transport infrastructure that enables seamless inter and intra-city commuting with provisions for non-motorised transport (Loo and du Verle, 2017). Pursuing intermodal transport systems is essential and incurs minimal transportation network construction and operational costs when one weighs the benefits of sustainable urbanisation (Wang, Yang, Yang and Gao, 2018). However, in trying to create a region characterised by high accessibility, Marchetti's constant serves as a good measure of mobility satisfaction as it holds that the average person will willingly travel in the same direction for thirty to forty minutes (Rodrigue, 2024).

CHAPTER THREE (3): RESEARCH METHODOLOGY

3.0 Introduction

This study employs a qualitative approach to investigate how public transport can promote a balanced polycentric urban region, focusing on Sekondi-Takoradi, the metropolitan core and its connections to the other nodes of the STUN network. Following the trends of empirical research on polycentric urban regions, the three most established routes to creating polycentric urban regions are:

> "(1) regressing the 'importance' of the different cities in a region onto a rank-size distribution; (2) comparing the observed polycentricity with expected levels as drawn from models expounding 'pure' polycentricity; and (3) using methods drawn from social network analysis" (Liu *et al*., 2016:1305).

This research uses a predetermined rank-size distribution of the STUN network per the NSDF to map the urban morphology of the polycentric urban region using Geographical Information Systems (GIS). Backing the map work are qualitative findings deduced from structured interviews conducted with spatial planners, academics and one feeder roads engineer. The questionnaires for the interviews were grounded in extensive desk review of empirical and theoretical literature, encompassing the polycentric urban model, Transit-Oriented Development (TOD), and key policy documents such as the National Spatial Development Framework (NSDF), the Western Regional Spatial Development Framework (WRSDF), the National Transport Policy, and relevant local spatial planning instruments. Spatial planning participants were purposively selected based on their professional expertise within the Land Use and Spatial Planning Authority (LUSPA), with emphasis on their involvement in drafting, supervising, or executing spatial planning initiatives across national, regional, and municipal scales.

To further explore the practical implications of the polycentric model within the STUN context, the interview guide enquired about local and regional urban planning strategies to assess their effectiveness in checking urban sprawl within the metropolis. Also, GIS techniques were employed to analyse urban change using aerial imagery sourced from Landsat via the USGS platform. The study mapped and analysed urban expansion patterns across four temporal benchmarks (1991, 2002, 2015, and 2022). GIS was further utilised to map the STUN transport corridor and the Central Business District (CBD) of Takoradi, to assess the degree of intramodality among various mass transit systems operating within the region. By integrating

these qualitative methods, I captured the complex nature of urban transformation in the STUN polycentric region. Thus, this study merges spatial data, expert perspectives, scholarly literature, and government policy documents to deliver a comprehensive understanding of how public transport facilitates the development of polycentric urban areas and addresses challenges of urban sprawl and congestion in the Sekondi-Takoradi metropolitan area.

3.1 Research Design

The research design for this study encompasses a comprehensive review of documentary and journal articles, supplemented by expert interviews and the analysis of urban land use change maps using GIS tools and data from the United States Geological Survey (USGS) servers. In this context, I conducted interviews with three spatial planners with the Land Use and Spatial Planning Authority (LUSPA). At the national level of LUSPA, I interviewed the Plan Preparation Officer and the Research, Monitoring, and Evaluation Officer, respectively, who are both stationed at the head office in Accra. The third spatial planner interviewed is the acting regional director of LUSPA Western Regional Directorate and is stationed in Sekondi. These officers together have over three decades of experience in the service and were actively involved in the development of the NSDF and WRSDF, and other important spatial planning policies and frameworks in the country. Also, two out of the three spatial planners interviewed have held urban planning positions in local government authorities in the STUN network during the period the WRSDF was developed, before their rise to the regional and national levels, respectively.

I also interviewed three academics specialising in urban planning, transportation and development planning, and transport and urban future, respectively. These academics were selected based on their knowledge in their respective fields in academia and also based on their knowledge of the urban planning paradigm in Ghana, and for some, their familiarity with the study area. Lastly, I interviewed the feeder roads engineer of the Wassa East District Assembly, one of the local authorities that the STUN networks envelopes. The overarching purpose of these interviews was to gain a deeper understanding of how urban and spatial planning policies, frameworks, and transport infrastructure—particularly road networks—are being coordinated to support polycentric development. The interviews also aimed to explore how these elements collectively address challenges such as urban sprawl and congestion, and to assess the relevance and effectiveness of policy proposals related to the STUN network in responding to the broader urbanisation pressures facing the region and the country. Table 1.0 below summarises the research approach

Table 1.0: Summary of Research Approach. Source: (Author, 2024).

Research Question: How can public transport be leveraged to implement a functional polycentric development model that mitigates urban sprawl, using the proposed Sekondi-Takoradi Urban Network (STUN) as a case study?				
Sub questions	***Data Type***	***Data source***	***Method***	***Limitation***
How can public transport improve access to city cores?	People's opinions, Maps of the transport network, and Policy documents describing government plans.	Planners. Academics, NSDF, Structure plans, Transport Policy Documents	Desk Review, Interviewed 3 spatial planners, interviewed 3 academics, and interviewed 1 roads engineer with GIS is used for mapping and spatial analysis	Travel time data, Ridership data, Housing, Data for making density maps
What polycentric public transport policies exist in the Sekondi-Takoradi Metropolitan area?	Policy Documents, Spatial Planners, Academics	NSDF, WRSDF, and Structure Plans, Spatial Planners	Interviewed planners, Desk Review of policy documents, Interviewed 3 Academics	Sekondi-Takoradi Metropolitan Assembly's Spatial Planner
What policies address spatial transformation in the Sekondi-Takoradi	Government Flagship programs and Projects, Spatial	NSDF, WRSDF, Structure plan, Local plans, GoG Planners	Interviewed 3 spatial Planners, Desk Reviews	The Metropolitan Spatial Planning Officer Interview could

Metropolitan area?	frameworks and Local Plans.			not be scheduled

3.2 Site Selection

The proposed nodes spread across five Metropolitan, Municipal, and District boundaries in the western region of Ghana, collectively forming the Sekondi-Takoradi Urban Network. Sekondi-Takoradi serves as the historic core of the study area, with Takoradi functioning as the CBD and Sekondi as the Administrative Capital. Ahanta West Municipal features two centres, Agona-Nkwanta and Dixcove. The remaining centres are Assorko-Essaman in the Shama District, Daboase in the Wassa East District, and Mpohor in the Mpohor District. Figure 10.0 below is a map showing the study area, highlighting the hierarchy of settlements in the network, and the commercial and administrative capitals of the region. This network was selected among the 11 proposed urban networks in the NSDF because I work as an urban planner at the Wassa East District Assembly, which is one of the local authorities in the proposed STUN network and thus my familiarity with the study area and the planning professionals and processes in the study area.

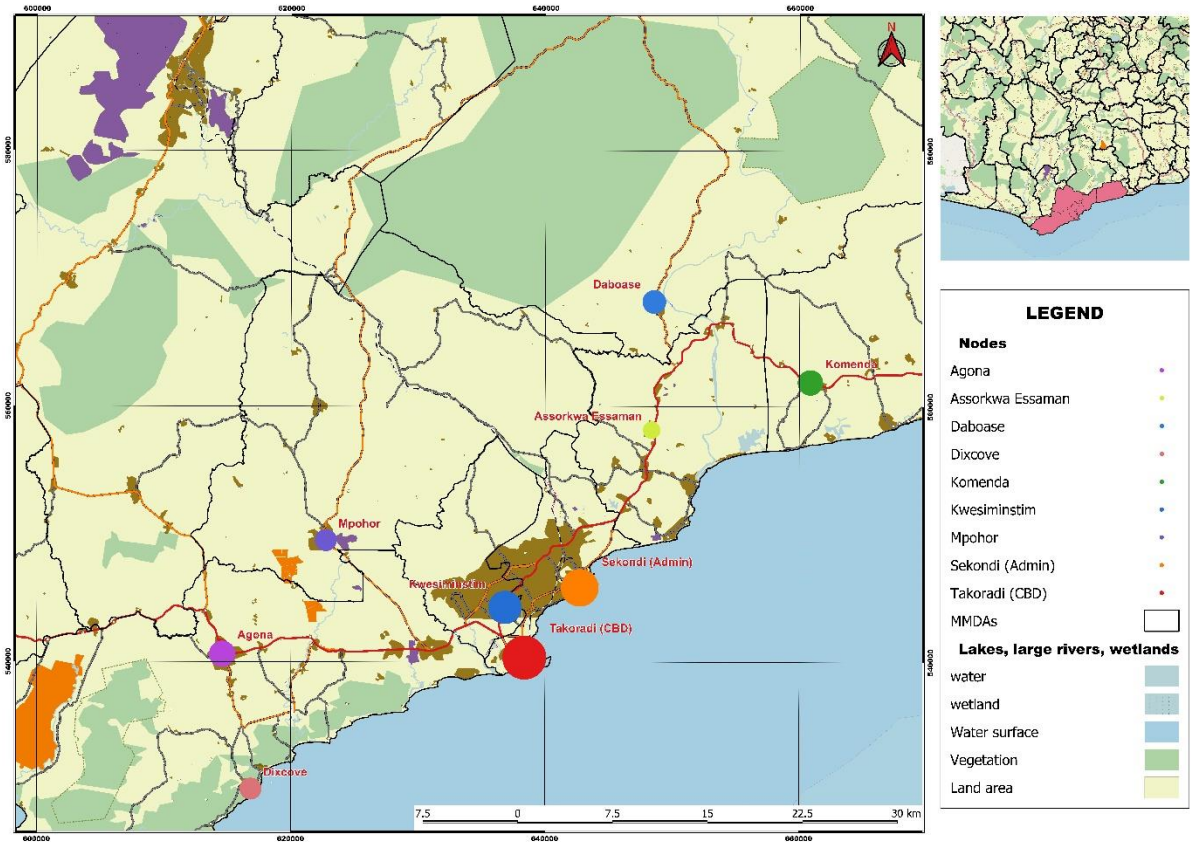

Figure 10.0: Map Showing Morphological Polycentric Structure of STUN Network Source: (Author, 2024).

3.3 Sampling

This study employed purposive sampling and initially proposed 10 participants at the proposal stage. The participants included government-designated spatial planners at the local, regional, and national levels, urban and transportation planning academics, participants from the leading public transport provider (GPRTU), and a state housing cooperation participant. During my literature review process, I sent emails inviting Ghanaian academics who had authored journal articles or books on urban and transportation planning to participate and provide qualitative insights on how integrating public transport and urban planning can address sprawling metropolitan centres. An invitation was also sent to GPRTU, the major provider of intra-urban public transport services that cut across local government boundaries, to participate in a structured interview due to the limitation of accessing disaggregated commuting data for the study area. Lastly, I reached out to the state housing corporation through email for a structured interview. In summary, at the proposal stage, the participants included four spatial planners from the three administrative tiers of spatial planning in Ghana, three academics specialising in urban and transportation planning, one participant from the Department of State Housing, one participant from the feeder roads department, and one participant from the GPRTU.

However, during my fieldwork, I was able to have interviews with three urban planners out of the four planners I planned to interview. The interview with the Director of Spatial Planning of the Sekondi-Takoradi metropolitan assembly did not materialise due to scheduling and time difference challenges. Also, I did not receive feedback from the GPRTU of Ghana and the State Housing Company for interviews for my research. As such, I was able to conduct interviews with 7 out of the planned 10 participants for my research. The seven people interviewed were three spatial planners, three academics, and one road engineer at the local government level.

3.4 Analysis

The analysis in this study operates under the assumption that feasibility studies identified the potential of the proposed STUN to develop into a polycentric urban region. Given that the NSDF acknowledged empirical insights on polycentric development from other countries, the STUN polycentric urban region can be argued to have been developed using local indicators but with theoretical and empirical foundations from around the world. Thus, the proposals for STUN in the NSDF are to balance development among the proposed activity centres through complementary economic activities that will alleviate congestion in Sekondi-Takoradi and check the ongoing sprawl at the urban edges through modern and intermodal transport systems, as observed in the developed world.

My analysis approach involved integrating GIS techniques, expert interviews, key document reviews, and extensive empirical evidence from the morphological and functional polycentricity literature. Following this approach, I discuss urban land use policy and the coordination with local land use and transportation planning using a conceptual framework developed around polycentric development, land use planning and TOD. In my analysis, I colour-coded my interview transcripts from each respondent with each colour code related to the research question. By doing this, I was able to manually assess the alignment of urban planning practice and policy in the study area to the core principles of polycentricity and public transport-oriented development. Also, I used GIS to map and analyse whether public transport hubs in the transport corridor that connects the nodes of the STUN polycentric urban region are multi-modal. I also analysed the expansion of the built environment in the metropolitan core from 1991 to 2024 to show the evidence of sprawling urban edges over time. Also, I discuss administrative lapses, inconsistencies, and the synchronisation of public transport supply and local-level land use planning activities using findings from my interviews and literature on the subject matter. The analysis and discussions focus on how public transport can

address urban sprawl on the edges of Sekondi and Takoradi and congestion at the core of the twin city. Figure 11.0 depicts a summary of all the tools and techniques used in this qualitative study.

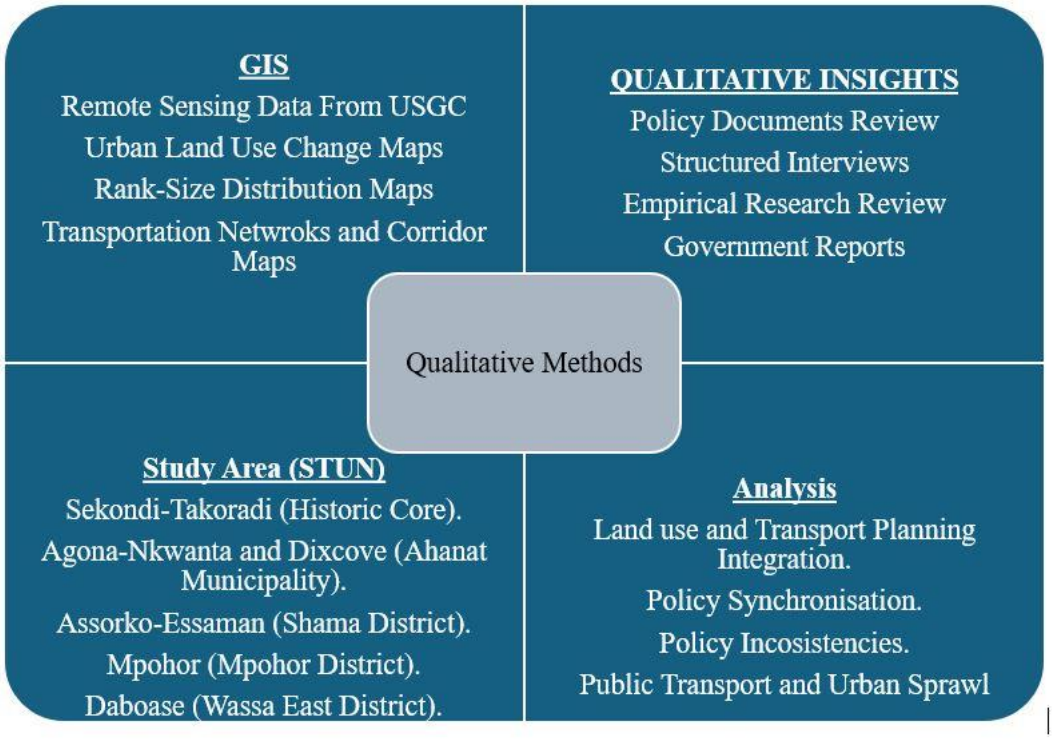

Figure 11.0: Graphical Representation of Research Approach and Analysis Source: (Author, 2024).

3.5 Ethical Considerations

This study adheres to the ethical guidelines established by the University of Witwatersrand, Johannesburg. Before the research commenced, ethical clearance was obtained to ensure compliance with the university's high academic standards. The security and confidentiality of the collected data are prioritised, with robust cloud protection for participants' responses in my secure university's OneDrive account. Thus, safeguarding the integrity of the research data and upholding the privacy rights of individuals are core principles of this study. Also, before each interview, each participant was reminded that they could opt out of the interview at any time and permission was then asked if the interview could be recorded.

3.6 Limitations

A significant limitation of this study was the inability to conduct field interviews with commuters due to financial constraints, academic commitments, and time restrictions. While

direct interactions with commuters could provide valuable insights into commuting patterns, this study relies on expert interviews. Although this approach is not a direct substitute for commuting data, it still enables a comprehensive analysis within the scope of the available resources and time frame. Furthermore, out of an initial proposal for 10 participants, three participants, including a physical planner for the Sekondi-Takoradi Metropolitan Assembly (STMA), A participant from the State Housing Department under the Ministry of Works and Housing, and also a participant from the Ghana Private Roads and Transport Union (GPRTU) were unable to participate in the study. Thus, I interviewed a participant from the roads department for insights into road development while drawing insights from other interviews for my findings and discussions on housing and transportation.

CHAPTER FOUR: URBAN PLANNING, TRANSPORTATION, AND SPATIAL ORGANIZATION IN GHANA AND THE SEKONDI-TAKORADI METROPOLITAN AREA

4.0 Introduction

By 2050, Africa is projected to account for 55% of the world's urban population. This forecast brings challenges and opportunities, emphasising the need to ensure equitable access to employment, housing, transportation, and social services to foster social justice and inclusivity (Acheampong, 2019). However, Ghana's history of a colonial-rooted urban-biased development agenda continues to focus on city infrastructure developments, widening the uneven access to socio-economic opportunities and contributing to the urban-rural divide (Gasu and Agbley, 2019). Therefore, the renewal of spatial planning for sustainable urbanisation in Ghana adopts a polycentric development model as the ideal spatial strategy to balance development by creating multiple activity centres using a distribution of settlements.

This chapter discusses the context of decentralised urban planning and local governance systems under which administrative urban planning systems operate. In this chapter, I also discuss the duplicity of planning systems and the unique role of the spatial planning administrative framework in urban policy, frameworks, and planning. Lastly, I discuss urban sprawl and spatial fragmentation in Sekondi-Takoradi, with an empirical emphasis on how sprawl has evolved from the historic core of the metropolitan area.

4.1 Decentralised Local Governance in Ghana

Ghana's decentralised local government structures' origins can be traced to a monocentric colonial era of development. Following the transition to democratic rule after decades of political destabilisation, the decentralised governance framework established by PNDC Law 287 (1988) aims to promote local-level decentralised development (Gasu and Agbley, 2019). Indeed, the return to constitutional rule and adoption of a decentralised local governance system brought a new structure and system that aims to achieve polycentric development (*Ibid*). Consequently, local governments adopt social networking sites nationwide as administrative hubs, leveraging the diversity in these locations as activity nodes (Biney, Forkuo, Poku-Boansi and Asare, 2024). Thus, local governments function semi-autonomously under the national government, with Regional Coordinating Councils (RCCs) acting as intermediaries between the national and local governments. The role of RCCs in the setup is to coordinate and oversee the activities of decentralised local government departments within their jurisdiction (*Ibid)*.

However, local governments remain agents of democratic decentralisation, participatory governance, and sustainable development, ensuring that development is evenly distributed (Adjei and Adu-Gyamfi, 2022).

Nevertheless, Gasu and Agbley (2019) argue that the existing governance system, which has lasted over thirty years, is a minimalist form of power decentralisation that strips local governments of the autonomy to make self-governed actions. This complicates the efforts of local governments to manage sprawl, housing, and congestion effectively in metropolitan areas or city regions, especially when these areas are governed by multiple independent local authorities (Owusu, 2015). Figure 12.0 below shows the three tiers of government in a system where "there is a shared national goal, but with peculiar local needs that require coordination between the various power centres" (Gasu and Agbley, 2019:259). This structure has the national level maintaining power over local governments, with RCCs in the middle as monitoring agents.

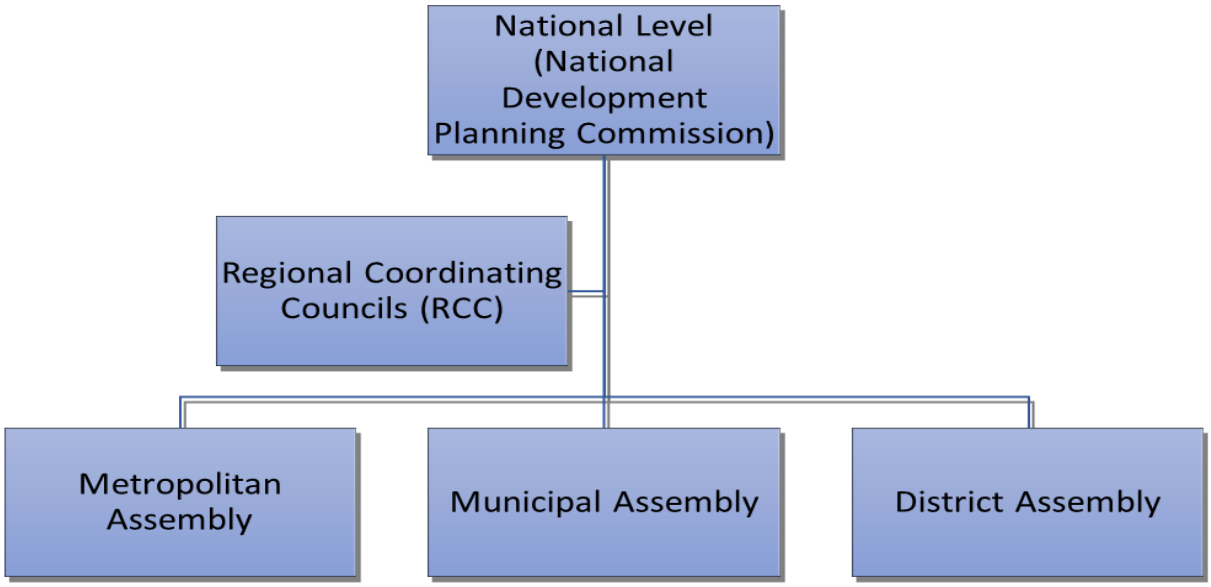

Figure 12.0: Decentralised Governance Framework. Source: (Author, 2024).

4.2 The Three-Tier Planning System in Ghana

The National Development Planning System Act 1994 (Act 480) established the National Development Planning Commission (NDPC) as the apex planning authority in Ghana. The mandate of NDPC encompasses directing local government planning activities through guidelines that shape local-level Medium-Term Development Plans (MDTP) (Gasu and

Agbely, 2019). The NDPC's mission is to align “human prosperity with ecological sustainability” using the three-tier governance framework (*Ibid*: 293). Acheampong (2019) argues that despite the NDPC's mandate to conduct socio-economic, environmental, and spatial planning activities as a unified, integrated task, the commission prioritises socio-economic development agendas that emphasise economic restructuring, macroeconomic stability, and poverty reduction over spatial planning policy. Moreover, Sarfo (2020) argues that integrating socio-economic and spatial planning into a unified task for human prosperity and socio-ecological sustainability is key to sustainable development. Nevertheless, the land reform project initiated in 2007 to revitalise spatial planning activities at all administrative levels of government was to bridge the spatial planning policy and practice gap. Thus, the reforms resulted in the development of spatial development frameworks and the enactment of the new Land Use and Spatial Planning Act in 2016, which declared the entire territory of Ghana a planning area. Ultimately, the reforms empowered local governments as the authorities with land use planning powers and local plan preparation responsibilities (Acheampong, 2019).

Sarfo (2021), however, contends that these reforms maintained, rather than unified, the existing division of local-level planning activities into two separate decentralised departments. These departments distinguish spatial planning from socio-economic planning, with minimal coordination. A new spatial planning authority, LUSPA, was created as part of the reforms at the national and regional levels to guide spatial planning activities in the country. Despite the duplication of roles in the planning system, Ghana remains one of the few African countries to have comprehensively developed a spatial framework with a national scope to guide spatial organisation (*Ibid*). Following lessons learnt from urban growth patterns in the global north, Ghana adopted the polycentric development model in its first NSDF. The core tenet of the new national spatial policy is to redistribute the population through networked growth clusters and to decongest the major cities with special emphasis on the city regions of Accra and Kumasi (Town and Country Planning Department, 2012). Figure 13.0 below demonstrates the split of Ghana's planning systems following the spatial planning reforms. This framework continues to guide the development of comprehensive planning policies, ensuring national development agendas align with regional development frameworks, local plans and MTDP planning activities.

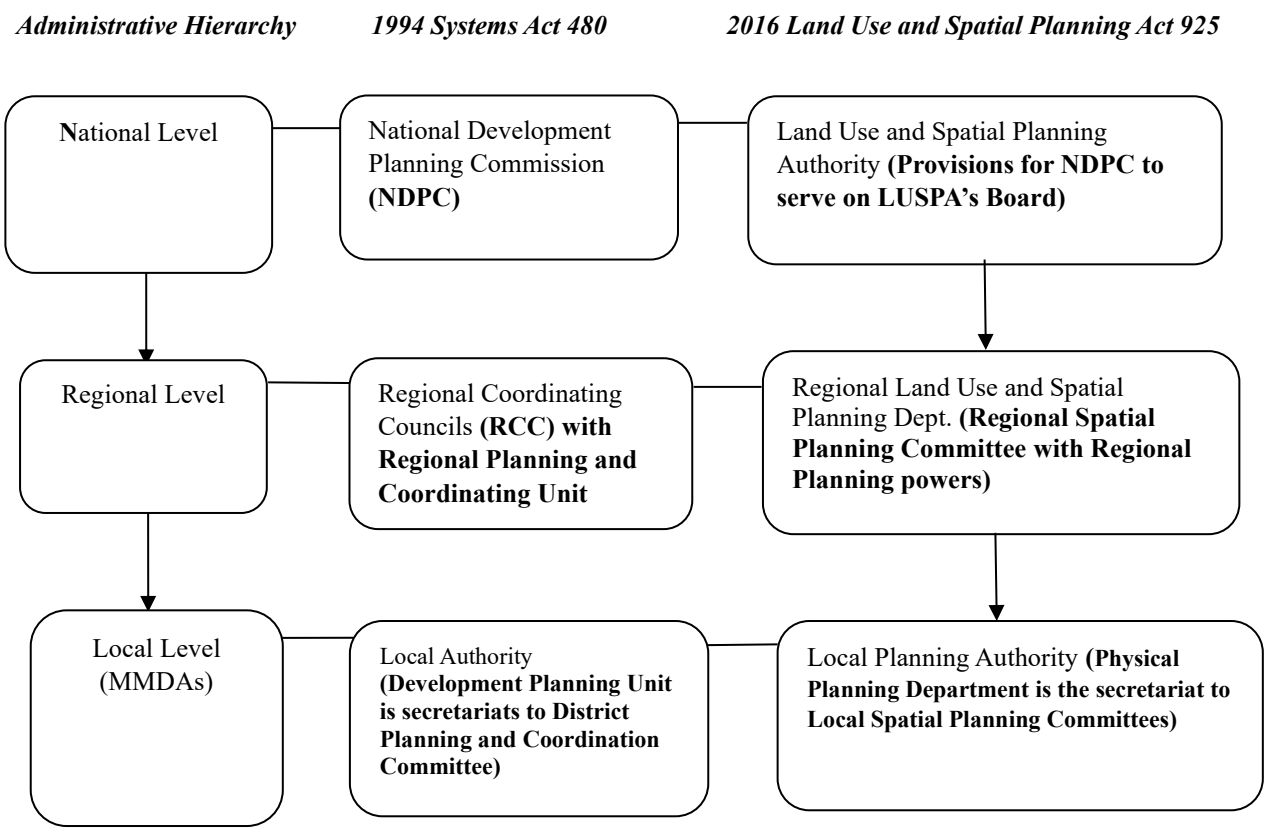

Figure 13.0: Administrative Decentralisation of Planning Functions Defined by the Development Planning System Act and New Spatial Planning Legislations. Source: Adapted from Acheampong (2019).

After over four decades of disconnect between national spatial planning policy and local-level spatial planning activities, the duplication of planning functions into two separate departments has exacerbated the challenges of coordinated regional and local government planning. However, the planning reforms through the NSDF offer a new comprehensive planning strategy that emphasises a unified spatial strategy across the three tiers, aiming to 'realise social, economic, and environmental development objectives over the next 20 years' (Agyemang, 2019: 77).

4.3 The Three-Tier Decentralised Administrative Structure and Planning in Ghana

The need for spatial organisation of settlements emerged during the nineteenth-century Industrial Revolution, a time characterised by rapid urbanisation in the global north, which necessitated the planning of settlements (Sarfo, 2021). However, in Ghana, it was only in 2016 that the New Land Use and Spatial Planning Act was enacted to repeal the colonial legislation CAP 84 (1945). Thus, for over seventy years, the colonial CAP 84 restricted land use planning to designated planning areas, coordinating investments in a centralised monocentric pattern and creating the rural-urban divide (Acheampong, 2019). Future projections of Africa's urban

population projections indicate the continent is the fastest urbanising continent globally, with population projections expected to exceed the capacity of existing urban infrastructure, reiterating the need for sustainable urban planning policy and practice (Korah *et al., 2019).*

The new planning paradigm aims to merge socio-economic development with land use planning for sustainable urbanisation (Sarfo, 2021). However, it is surprising that the reforms uphold the segregation of planning activities into two mutually exclusive institutional setups that work in parallel at the national, regional and local levels of government (*Ibid*). As a result, Metropolitan, Municipal, and District Assemblies (MMDAs) continue to develop MTDP every four years following national policy guidelines from the NDPC without spatial manifestation provisions (Acheampong, 2019). The planning system requires a reconfiguration that promotes regional planning and coordination between local governments, detailing essential strategies for effective metropolitan governance and regional development (Owusu, 2015). Acheampong (2019) emphasises the significance of regional planning based on systematic and rational spatial planning theories for achieving sustainable urban transformations. However, the inconsistencies in the planning system, laws, and policies continue to fragment development, weakening local planning authorities' response to the increasing pressures of urban sprawl, congestion and globalisation. This problem is epitomised at the local government level, where local plans and MTDP are prepared.

> "Consequently, land use plans were prepared that had no bearing on the prevailing socio-economic realities of the day, except for assisting landowners to sell their land. Similarly, MTDPs were and continuous to be prepared without adequate consideration for the spatial implications of proposals" (Acheampong, 2019:47).

Planners must recognise cities as complex, open systems with multiple interactions and vital relationships between government departments, developers, investors, citizens, and other stakeholders working together to achieve sustainable urban transformation (Korah *et al.*, 2019). However, Acheampong (2019) argues that the local governance system continues to be skewed towards promoting development planning activities despite the new reforms to facilitate regional planning and coordination. As a result, most MMDAs view the Physical Planning Department as an internal revenue-generating wing. The department's activities in local governments have been reduced to issuing development permits, which generate significant revenue for local planning authorities (*Ibid*). Figure 14.0 below illustrates the dual planning

system in Ghana, highlighting the levels and decentralisation of administrative planning units under the two main planning legislations in the country

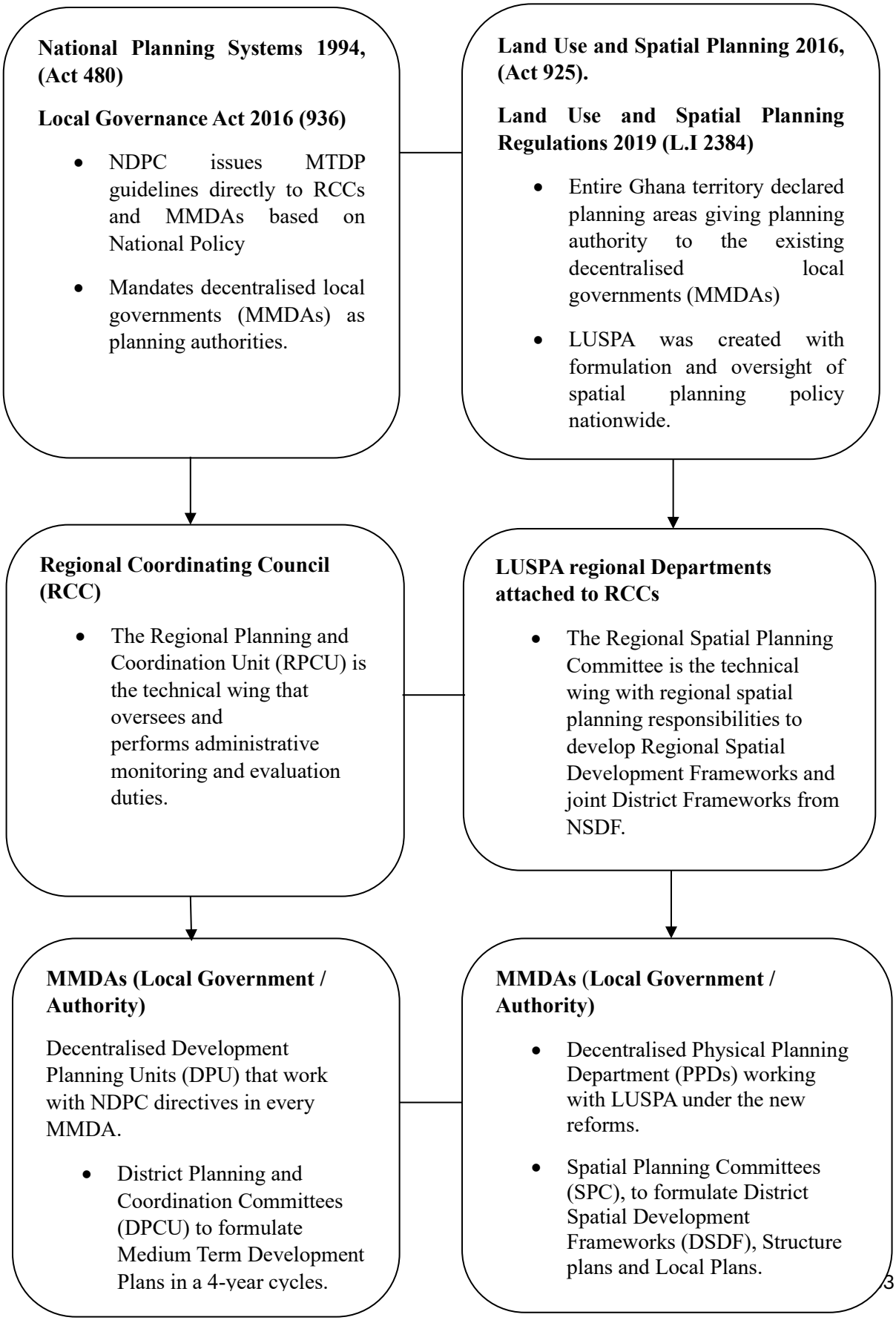

Figure 14.0 Decentralised Administrative Planning Structure in Ghana – Source: (Author, 2024)

4.4 Spatial Planning in Ghana

The Land Use Planning and Management Project 2007 was the genesis of the government's revival of spatial planning activities, leading to the new Land Use and Spatial Planning Act in 2016. Proposals of the new spatial planning system aim to ensure “comprehensive onuses for all the levels of planning that fosters the integration of concepts of spatial planning” (Sarfo 2021: 407). Thus, the three-tier spatial planning system was created to synchronise planning activities between the administrative tiers of planning with clearly stated responsibilities for all administrative actors. Also, the NSDF was developed as the new foundation for spatial organisation in Ghana (*Ibid*). Regional Spatial Development Frameworks and District Spatial Development Frameworks are to be teased out of the NSDF, with clearly stated administrative roles and responsibilities for preparing these frameworks. MMDAs hold the distinct role of planning authorities, tasked with creating legally binding structure plans and local plans under the newly established spatial planning system and legislation (Sarfo, 2021; Acheampong, 2019).

While the new reforms have contributed to the legal duplication of planning activities across the three levels of government in Ghana, they have also redefined the scope of spatial planning. National, regional, and local planning policies, strategies, and activities now use spatial plans as indicative tools for transformative development. However, the Physical Planning Department at the local level faces challenges in developing the mandated plans and frameworks under the new planning system to guide spatial organisation in the country. The effects of these challenges are accurately captured as:

> “The accumulated impacts of the arrangements that crippled town and country planning as is called locally are today reflected in the haphazard and uncoordinated development that characterises many towns and cities in the country” (Acheampong, 2019:112).

Figure 14.0 illustrates Ghana's spatial planning framework, highlighting the three levels at which planning takes place and the institutions responsible for coordinating frameworks, policies, and plans. This structure ensures alignment, with local plans at the lowest level reflecting the goals and aspirations set at the national level.

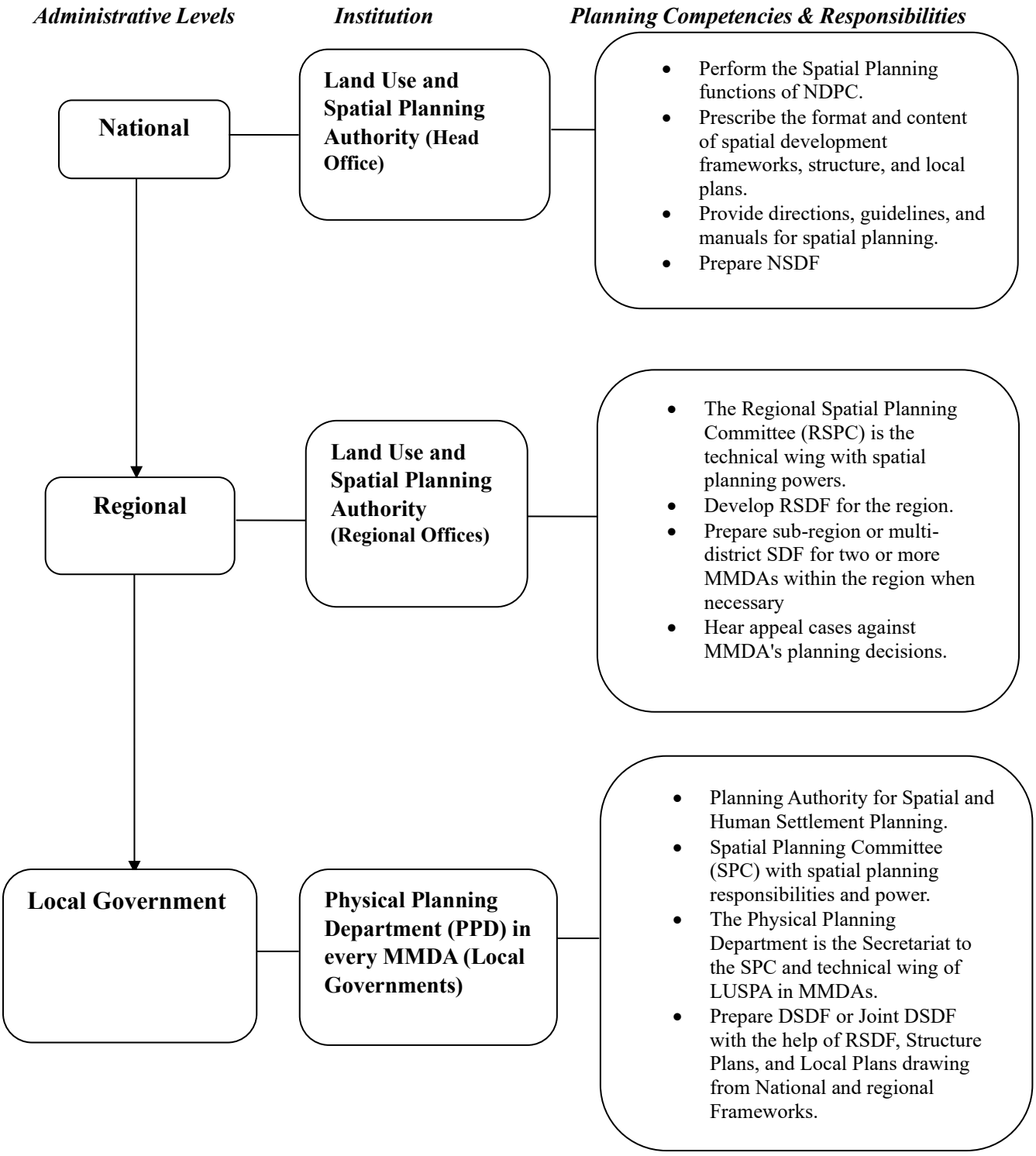

Figure 15.0: Administrative Decentralisation of Spatial Planning Responsibilities and Competencies under the New Land Use and Spatial Planning Act 925 (2016). Source: Adapted from Sarfo (2020).

4.5 Urban Sprawl and Fragmentation

Sub-Saharan African cities face difficulties with urban planning strategies that effectively address urban sprawl, the inefficient utilisation of land and the spread of informal settlements, with the continent also experiencing rapid urbanisation. The continuous growth in urban populations is straining urban infrastructure and fuelling the horizontal expansion of settlements and cities on the continent (Amponsah *et al*., 2022). Empirical research on urban sprawl and spatial transformations in the continent remains limited, with urban sprawl policy in the developing world, including Ghana, still highly underdeveloped (Cobbinah and Aboagye, 2017). The case study of the Sekondi-Takoradi metropolitan area is characterised by unregulated physical development within the city and its outskirts, which has led to significant changes in land use patterns between the early 1990s and today. This has resulted in a substantial loss of closed forest vegetation, encroachment into open forests and wetlands, and a steady rise in sprawling edges (Mensah *et al*., 2018). However, Sekondi-Takoradi remains the economic growth hub and the most prominent urban agglomeration in the Western region of Ghana, with a seaport, an airport, operational railway lines, and a highway network (Adjei Mensah, Kweku Mensah, Asamoah and Ofori, 2019).

The Sekondi-Takoradi Metropolitan Area

Sekondi-Takoradi, Ghana's sole twin city, is the largest urban centre in the resource-rich western region. Initially developed around its harbour and railway infrastructure to facilitate mineral extraction, it has now evolved into a modern, car-dependent society (Obeng-Odoom, 2015). The 2007 discovery of crude oil off the coast of the Twin Cities reinforced its status as a vital industrial and commercial hub for the region and the nation (Adjei Mensah *et al.,* 2019). However, spatial diseconomies persist at the regional level, especially at the subregional level, with Sekondi-Takoradi as the standout regional mega-centre (Town and Country Planning Department, 2012). The discovery of oil in 2007 spurred immigration into the Twin City, drawing in a pool of both local and international immigrants due to the promising economic opportunities of the oil industry and downstream economies of scale industries that accompany the oil industry (Adjei Mensah *et al.*, 2019).

Urbanisation in the metropolitan area is characterised by unplanned horizontal expansion, accompanied by a swift rise in socio-economic activities. This has led to significant land-use changes, with more than 1,697 hectares of farmland and open spaces in the metropolitan area and its surroundings being transformed into built-up areas (*Ibid*). Empirical evidence shows

that areas like Monkey Hill Nature Reserve, Butua Lagoon, Essei Lagoon, and the Whin Estuary have all faced significant encroachment by the built-up environments (Mensah *et al*., 2018). Rapid population growth in the metropolitan area has driven up the housing market due to the pressures of urbanisation and the modernity brought by the new oil and gas industry (*Ibid*). Therefore, it is unsurprising that STUN identifies six urban centres spaced an average of 26 km apart, with the furthest distance being 50 km, as a strategy to balance development between the core and its peripheral urban centres using the principles of polycentric development. STUN is a direct policy from the NSDF in response to urbanisation's pressures on the metropolitan core. The strategy outlined in the metropolitan structure plan for the spatial transformation process of the mother city is summarised below:

> "Preserve existing open space including wetlands, CBD strengthened with upscale offices and retail; upgraded historic core areas to include improved housing, sub-centres developed as activity nodes, mixed-use development along main radial corridors, public transport to reduce urban sprawl and reliance on private vehicles, land allocated for small and medium scale enterprise, redeveloped derelict and vacant land and properties" (Government of Ghana, 2015b:77).

Sustainable regional development strategies emphasise maximising the utility of urban land as a common goal for all urban agglomerations worldwide (Zhu *et al.,* 2022). However, Ghana's shifted focus to road infrastructure development, following advice from the World Bank in the mid-60s, has transformed urban centres in the country to automobile-dependent centres with sprawling peripheries (Obeng-Odoom, 2015). Unsurprisingly, most transport infrastructure in the country for commuting concentrates on road network development without adequate provisions for mass transit systems on these roads, consequently popularising the use of private vehicles for intra- and inter-urban mobility. The Ghana Private Roads Transport Union (GPRTU) has a long history as the leading provider of public transportation services in Ghana. It handles over 80% of intra-urban mobility through minibuses, commonly known as "*trotros*," offering informal public paratransit services in urban areas in Ghana (Abane, 2011).

Sekondi-Takoradi Urban Network (STUN)

STUN is an 80% urbanised network and one of the densest urban networks in the country, with 2010 estimates indicating an average of 8,400 people per square kilometre. As shown in Figure 16.0 below, it comprises six urban settlements, which are, on average, only 26 km apart, with populations ranging from about 6,000 to 590,000 inhabitants. Sekondi-Takoradi is the most

populous, housing 90% of the urban population. Agona-Nkwanta, the next settlement in the hierarchy, is 26 km away from the centre with a population of 14,000, followed by Mpohor, which is 17km away with a population of 11,000. Dixcove and Daboase are the furthest apart at 50 km, while Daboase and Assorkaw-Essaman are the closest at 10 km. Additionally, STUN has 227 rural communities with a total population of 120,000 (Government of Ghana, 2015b).

Except for Mpohor, connected via a feeder road, all other nodes are linked by well-engineered national and trunk roads. Sekondi and Takoradi form a two-centre anchor for the network and are considered the fastest-growing grade 1 settlements in the country. Proposals to connect individual nodes to the hub of the resource-rich western region were influenced by the Trans-Africa Highway, which traverses through the region, connecting the region and country to neighbouring Côte d'Ivoire. Thus, the proposals encompass constructing a new national-level expressway to facilitate mobility between centres, the mother city, and further agglomerations outside the network. Also, the proposals include building a new railway line to reduce travel time and complement the proposed expressway. However, the existing railway line that traverses the region primarily serves to transport freight to the port at Takoradi for export (*Ibid)*. Figure 16.0 below shows the urban settlement hierarchy of the proposed nodes of the STUN polycentric region based on their population.

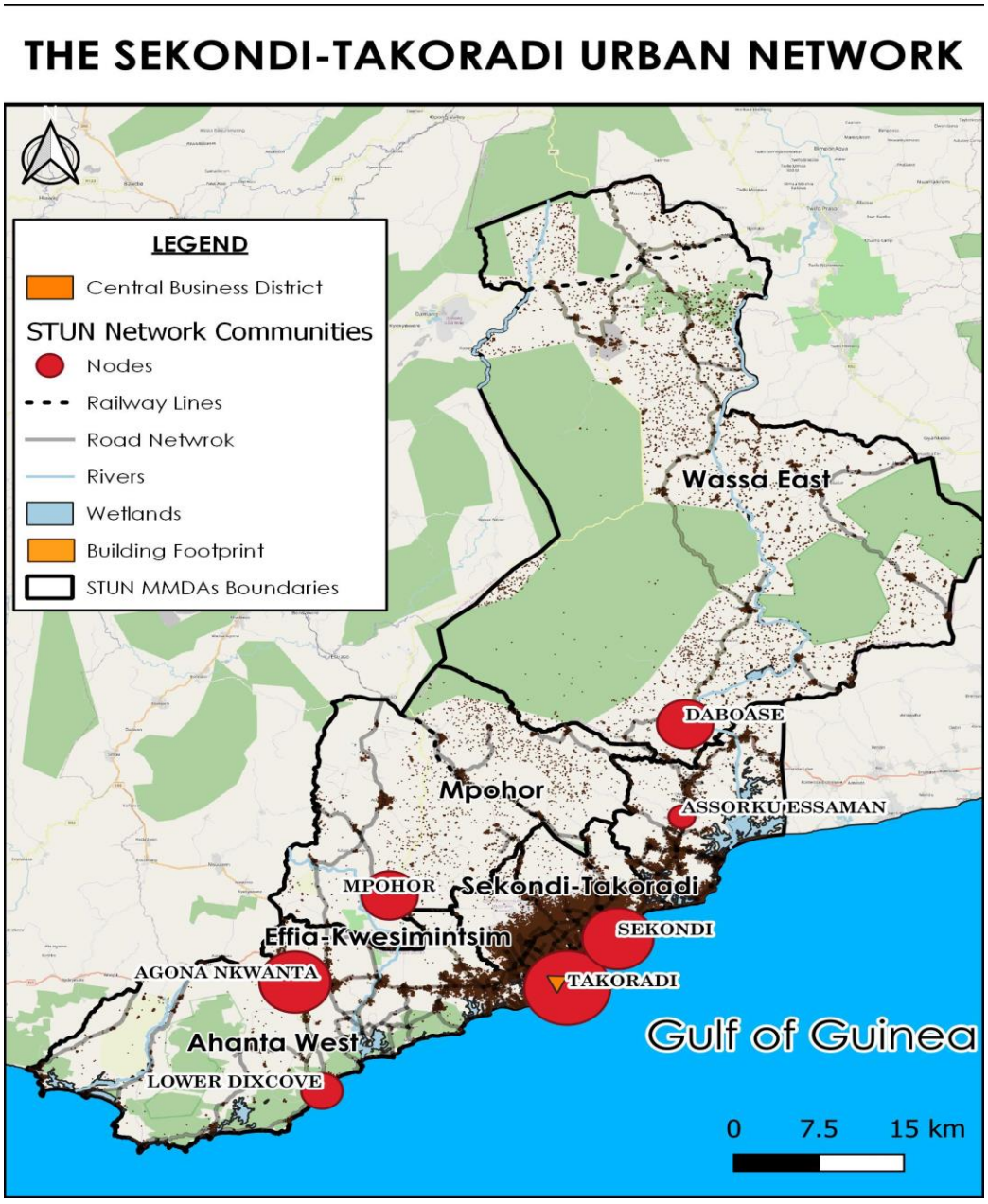

Figure 16.0: Rank Size Distribution of STUN Nodes in the Western Region of Ghana. Source: (Author, 2024).

4.6 Conclusion

This chapter explored the context of decentralised governance and planning systems in Ghana. It also examined the Sekondi-Takoradi metropolitan area, emphasising the evidence of sprawl and congestion beyond the metropolis. Furthermore, it introduced the STUN policy, outlining the nodes, strategies, and rank-size distribution of urban nodes within the proposed Sekondi-Takoradi Urban Network.

CHAPTER FIVE: FINDINGS AND DISCUSSIONS AROUND POLYCENTRIC URBAN REGIONS AND URBAN DEVELOPMENT IN STUN

5.0 Introduction

This chapter examines and analyses the findings of the uncontrolled horizontal expansion and urban transport systems in the Sekondi-Takoradi Metropolitan area. Following my seven interviews with three spatial planners with the LUSPA, three academics and one roads engineer, the findings from the interviews show no clear link between the theoretical integration of public transport networks with urban design and the urban planning practice. The foregoing discussion will unpack how spatial policy proposals have adopted the polycentric model to address the challenges of urbanisation in the country, using the planning administrative framework of spatial planning as the tool. This is discussed alongside the findings from my interviews on polycentricity development in the STUN polycentric urban network. Also, I discuss regional governance systems and their importance to promoting regional planning and regional development. The analysis also unpacks the connections between informal public transport service providers, the supporting infrastructure that connects STUN, and the local-level land use planning practice. I follow up to discuss how integrated spatial and transportation planning policies are and how they co-exist to promote sustainable urban transformation of the Sekondi-Takoradi urban region.

5.1 Regional Governance, Regional Planning and Regional Development

Implementing STUN based on inter-urban polycentricity principles requires a regional planning and governance component that is presently lacking “because, currently, we do not have the institutions and traditions in place to do that kind of planning” (Respondent 5, interview 19 September 2025). A parallel regional planning and governance system in pursuit of a regional vision is hindered by “the inconsistencies in the policy follow-through by various political parties of the existing political duopoly, which is in constant competition” (Respondent 2, interview 28 August 2024). I contend that an urban planning system that fails to align regional vision with coordinated planning and governance, particularly in developing integrated infrastructure networks, poses a significant challenge to achieving effective polycentric development and realising regional economies of scale. Besides, polycentric urban regions are characterised by multiple economic centres, each playing a distinct yet complementary economic role (Derudder *et al*., 2022).

Administrative officials from STUN local governments convene in joint meetings to synchronise regional planning activities. “I am a witness to the fact that they are doing it not in

isolation" (Respondent 3, interview 29 August 2024). The joint meetings held by planning actors in the region raise concerns about the argument raised by Dadashpoor *et al*. (2023) about the influence of land use planning in creating well-connected polycentric urban regions; that while regional planning may operate at an institutional level, a fundamental challenge persists: "How do you make regional spatial planning happen when you don't have the institutional capacity to be able to deliver?" (Respondent 5, interview, 19 September 2025). Polycentric development requires regional planning and governance confirmed by (Respondent 4, interview 28 August 2024): "there are some services that should be planned at the regional level, where we may need to declare a number of districts as a planning region." This shows another angle to the persistent disconnect between planning objectives and the institutional capabilities required to bring the visions to life.

Since the discovery of oil in 2007, the metropolis has seen significant immigration driven by new job opportunities in the industry and related offshore economic activities (Adjei Mensah *et al*., 2019). Perhaps the path to fostering economically diverse and self-sufficient urban nodes beyond Sekondi-Takoradi should begin by asking, "How do we get some centres to specialise?" (Respondent 4, interview 28 August 2024). The balanced hierarchy of settlements requires a framework for regional development that coordinates infrastructure connections between activity centres that transcend municipal boundaries. Indeed, "the foundation of policy and law is well laid; what is lacking is the institutional muscle to deliver the vision for urban development we want" (Respondent 2, interview 28 August 2024). Another interesting thing to consider is the establishment of a special fund that consolidates revenue from individual local government coffers to fund the development of regional infrastructure (confirmed by respondent 1, interview 28 August 2024).

STUN is a policy with the potential to balance development and ease congestion and sprawl in the metropolitan area of Sekondi and Takoradi. However, polycentric regions evolve through functional integration among all nodes, characterised by a balanced hierarchy in which no single centre dominates (Liu *et al.*, 2016). The inconsistencies of urban planning policy and practice in developing the polycentric region are summarised below.

> "I would say yes, there is a policy intent because LUSPA, NDPC, and, by extension, the Government of Ghana have all agreed that this is how we need to organise. But then there's always a gap between what is written in the policy and how that actually gets translated on the ground" (Respondent 5, interview 19 September 2024).

Inter-urban polycentric development involves a "complex ecosystem of different actors with different interests, and they have different spatial boundaries, which are sort of imaginary" (*Ibid*). Also, local authorities do not have mandates "to ensure that there is some form of coordination and integration in developing the network and the nodes that have been proposed in the plan" (Respondent 1, interview 28 August 2024). Additionally, with a housing market is primarily dominated by informal housing supply and is characterised by self-financed and self-built housing units (Owusu-Ansah, Soyeh and Asabere, 2019). I argue that housing, densification and mixed-use development through an already weakened urban planning system is another challenge to polycentric development.

Polycentric urban regions are not only developed by an institutionalised governance system; instead, they require coordinated development arrangements that include a mix of formal and informal agreements spanning inter-city collaborations (Harrison, 2024). Also, a common theme underpinning the development of polycentric urban regions is collective branding to promote specialised regional economies of scale (Goess, de Jong and Meijers, 2016). The lack of policy-practice alignment in Ghana perpetuates a pattern of rapid but disjointed urbanisation, where infrastructure concentrates in cities while outlying settlements become increasingly dependent on these urban cores for essential provisions (Owusu, 2015).

5.2 Transport Infrastructure, Informal Public Transport Services and Access

Acknowledging the crucial role of transportation in shaping urban societies, the National Transport Policy (2020) proposes a national multi-modal transport plan that integrates transport policy with land use planning, particularly in metropolitan areas suffering from excessive congestion and uncontrolled sprawl. In line with these visions, proposals for STUN to enhance accessibility between and within the proposed nodes encompass road and railway developments and expansions. "The objective is to enhance transportation networks in ways that are able to connect every part of this network" (Respondent 2, interview 28 August 2024). However, in the WRSDF and other indicative frameworks and spatial plans, key details on how mass transport systems will connect the urban nodes for daily commuting across the region remain absent. Currently, public transportation is supplied by GPRTU, a self-organised activity to meet public transport demand with little connection to the urban design process.

> "They have many stations in the major sub-metros, which are now three, excluding EKMA; we have transportation unions and major transportation stations in these three

> sub-metros that connect to the central business district, Market Circle" (Respondent 3, interview 29 August 2024).

Transportation details captured in existing frameworks and structure plans in the metropolitan area focus on road developments and expansion to ease congestion and improve accessibility; "with a first-class road in 30 minutes, you should be able to touch base with all the corners" (Respondent 2, interview 28 August 2024). However, inconsistencies of policies and planning activities exist in developing multi-modal transport infrastructure. The essence of intermodal transport policy is to ease accessibility between and within nodes through different transport options. Therefore, "fundamentally, first and foremost, we need to be practical and think about what already exists in the context" (Respondent 5, interview 19 September 2025). The evident shortcomings of urban planning systems hinder the vision of establishing high-density nodes linked by direct commuting lines, which aim to transform these nodes into activity centres through intermodal public transit systems. Moreover, "in terms of accessibility, I will say that most of the networks have poor surface conditions, which make it a problem for people to really move from one place to another" (Respondent 1, interview 28 August 2024).

Despite policy proposals for intermodal transport infrastructure with non-motorised provisions, the existing informal transport operators are non-existent in these provisions. This is a problematic approach, especially in an era where mobility is evolving into a continuous service. Inter-modality in advanced countries today adopts holistic systems, "where using one app or card, you can access all public transport facilities in a city without buying a ticket" (Respondent 4, interview 28 August 2024). Notwithstanding the inefficiencies of the informally supplied public transportation services, they remain the major supplier of intra- and inter-urban public transport services and have a role which should be explored and integrated.

> "it's perfectly possible that you have a transport system that combines BRT, whether by bus or by train or by tram, with the paratransit, with two Wheelers, *Pragya Aboboyaas*, etc, it all depends on how you configure the system because you have first and last mile accessibility challenges within such configuration" (Respondent 5, interview 19 September 2025).

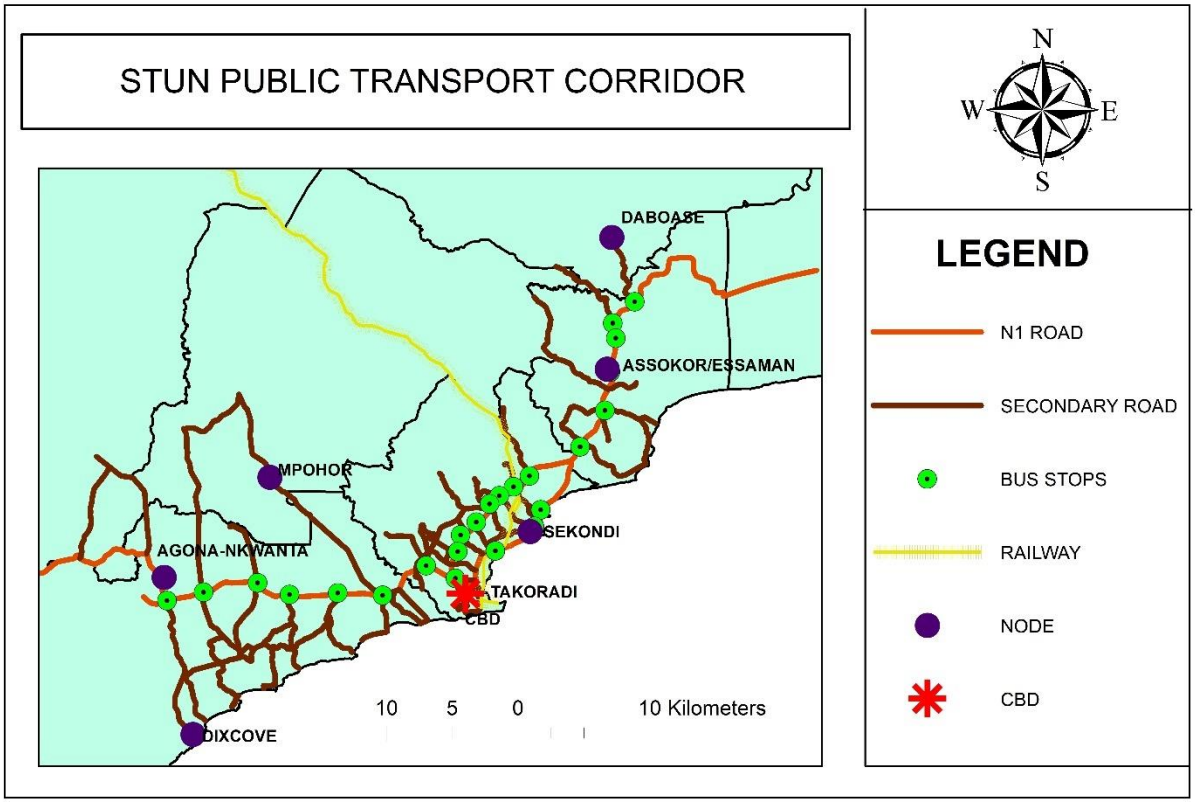

Figure 17.0: Map Showing GPRTU Transit Corridor along the N1 in the study area. Source (Author, 2024).

Figure 17.0 above shows the transport corridor of GPRTU *trotros* buses along the national highway traversing the region. These stops are self-organised informal stations where GPRTU operators pick up commuters between centres along the national highway. However, due to the absence of "optimal integration between transport and land use, we are unable to get the public transport systems to operate in a much more efficient manner" (Respondent 2, interview 28 August 2024). This is reflected in how "we design transport terminals and the way our public transport carriers operate" (*Ibid*). Regardless of the absence of integration of infrastructure with public transport systems, the existence of a highway network that links these nodes is a foundational framework that should be built on. However, "should it be a 5-Lane 6-Lane Expressway? Probably not" (Respondent 5, interview 19 September 2025).

Another observation that can be made from Figure 17.0 is that the existing railway line that runs through the region is not integrated into any of the nodes. This is because the active railway lines in the region, true to their colonial origins, are used for transporting freight from the inner lands of the region to the port for export. Moreover, current railway provisions adopted from the railway master plan aim "to help in connectivity in freight transport and the transportation of our natural resources, such as bauxite and gold" (Respondent 1, interview 28 August 2024). However, intermodal transport infrastructure, "should not be based on only a single transport

mode, but it should be multimodal and well-integrated such that you can move from one system to the other very smoothly" (Respondent 4, interview 28 August 2024). Proposals for railway development show a further detachment of new transport infrastructure from the existing public transport system. "Essentially, there seems to be some detachment when it comes to looking at the railway development and other modes of transportation within the city" (*Ibid*).

> "To emphasise public transport in the area we are talking about, moving from one place to another via public transport is difficult because of the road conditions and connections. It has become difficult for people to move from one place to another using public transport. Of course, those with private means can connect, and those people are in a minority percentage" (Respondent 1, interview 28 August 2024).

Urban design activities should recognise that "we can't ensure connectivity and accessibility for the entire area" (Respondent 1, interview 28 August 2024). Instead, accessibility should be incrementally developed, targeting areas where high access will contribute to productivity and economic growth. However, the stance that "in order to be able to develop a certain node or nodes within a particular geographical area, infrastructure in terms of roads and the transport sector is needed", as argued by (*Ibid*), is paradoxical. Since 2010, transportation planning has shifted from road infrastructure-led networks to inter-modal transport strategies geared towards accessibility-oriented development (Rodrigue, 2024). However, empirical evidence suggests road infrastructure in the country is prioritised over other transport network infrastructure and is a contributor to urban sprawl, especially in city regions.

The dominance of the central government over local authorities in development initiatives, coupled with a lack of institutional coordination, weak urban planning administration, and a focus on road infrastructure-driven expansion, is contributing to uncontrolled urban sprawl and increasing residential segregation, private automobile dependency and class-based divisions (Amedzro, Essien, Issah and Owusu, 2024). I argue that Ghana needs to consciously revise its transport infrastructure plans under the intermodal transport policy to promote efficient commuting and access within and between urban centres. For example, the Kowloon region in Hong Kong, China, consisting of 52 Tertiary Planning Units (TPUs) and grouped into seven growth clusters, is connected through a network of "auto link, rail link, and intra-zonal link" (Huai *et al*., 2021:100). There is no doubt that transport infrastructure forms the backbone for connections and commuting within the polycentric urban regions

5.3 Integration Between Land Use and Transport Planning

Urban planning policy and frameworks “at the national level and even the regional level, some regional spatial development frameworks adopt a polycentric model” (Respondent 1, interview 28 August 2024). The polycentric model adopted in the spatial plans of the western region integrates transportation networks; “transportation features prominently both in the western regional SDF and that of the national SDF” (Respondent 3, interview 29 August 2024). Transport systems are at the core of transforming morphological polycentric regions into functional activity centres. Thus, integrating transport systems into polycentric urban networks is ideal “because you want to be able to transport more people efficiently in a much more sustainable way between or among these nodes or centres"(Respondent 5, interview 19 September 2025).

However, in a three-tier urban planning administrative structure where local authorities are responsible for land-use planning, “most of the local authorities do not have these long-term spatial plans where they can integrate their transportation interventions or plans into them” (Respondent 1, interview 28 August 2024). Despite clear policy intent on establishing a hierarchy of settlements using the normative principles of polycentric development, relying on the administrative framework of mutually exclusive decentralised departments stands as a challenge to the vision. Moreover, “most places don't even have plans in the first place to even start to think about how you can enforce the plans. Places with plans, the plans are outdated” (Respondent 5, 19 September 2024). The challenges in translating policy into spatial plans that integrate land use and transportation provisions through the planning framework stem from “policymakers tend to think a lot in terms of administrative units” (*Ibid*).

In Figure 18.0 below, the proposed railway lines run parallel to the planned national expressway. While these transport corridors intersect at three points, the map fails to demonstrate their integration into functional intermodal public transport nodes. Notably, Tarkwa - an urban node outside the STUN corridor - appears as the only centre directly linked to Sekondi-Takoradi by rail. Additionally, the figure reveals a concerning alignment where the parallel expressway-railway corridor extends vertically into the forest reserve.

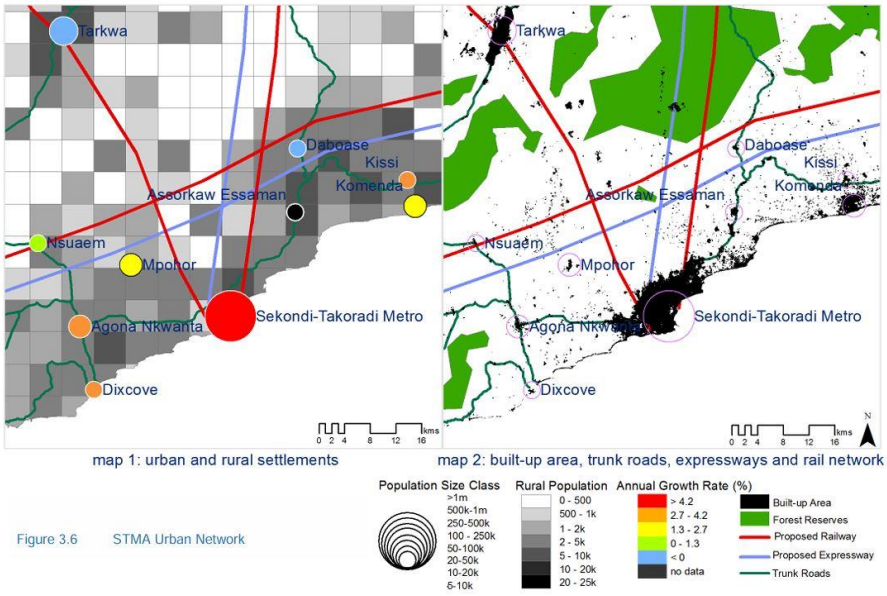

Figure 3.6 STMA Urban Network

Figure 18.0 Source: (Government of Ghana - Ghana National Spatial Development Framework (2015-2025) Volume II, The Overall Spatial Strategy, Ministry of Land and Natural Resources, Ministry of Environment, Science, Technology and Innovation, Town and Country Planning Dpartment, National Development Planning Commission, 2015: 37-8).

The gap in integration is "reflected in the way that we design transport terminals and the way our public transport carriers operate" (Respondent 2, interview 28 August 2024). To fully realise the benefits and development of polycentricity, the initial step in the required administrative changes is the integration of transport and urban planning. This integration requires modern urban planning methods that combine efficient transportation systems with complementary activities through mixed land-use planning and multi-modal transport systems.

> "The integration should be physical integrations, but we should also look at how they will be integrated by way of services and goods provision at the regional level. Also, cities are moving from the idea of zoning to specific form-based codes, which are quite specific" (Respondent 4, interview 28 August 2024).

In Ghanaian cities, road infrastructure serves as the primary mode of transportation but lacks integration into urban design to support mass commuting systems; "we don't look at integrating the railway system into the inter-modality and the multimodal concept of city planning when it comes to transportation." (Respondent 4, interview 28 August 2024). Also, capacity and inter-department gaps exist in local planning activities for integrated multi-modal infrastructure; "At the local level, where we do look at the local plans and all that, that integration is not really there in terms of integrating transportation planning and urban planning" (Respondent 1, interview 28 August 2024). Also, these spatial frameworks for Sekondi-Takoradi explicitly capture non-motorised transport infrastructure, especially walking and cycling (confirmed by

Respondent 3, interview 29 August 2024). The proposals in the SDF for Sekondi-Takoradi also address the surface conditions of the road network, infrastructure and connectivity as a whole (confirmed by Respondent 1, interview 28 August 2024). Despite policy proposals, transportation planning and land use planning activities are still mutually exclusive administrative functions, exemplified by failed attempts to roll out a BRT public transport system in Accra.

> "I think in terms of public transportation in Accra, they tried to do the BRT system, but it didn't work because they didn't have dedicated lanes for the public transport routes, and that failed. So, in planning our new cities, given that we have a road network as part of our plans, I think that our plans should specifically and consciously focus more on creating transportation routes for different levels of public transport modes" (Respondent 1, interview 28 August 2024).

Integrating accessibility into urban design should be against the backdrop of promoting easy "access to the city centre and other employment areas" (Respondent 2, interview 28 August 2024). Moreover, railway development should be reconsidered for passenger commuting as this "system can be very efficient in bringing people smoothly from one end of the city to the other" (Respondent 4, interview 28 August 2024). Therefore, integrating urban planning with public transport systems is necessary for multimodal transport systems because "there cannot be an efficient polycentric configuration without efficient and reliable public transport; they go hand in hand" (Respondent 5, interview 19 September 2024).

> "The former mayor of Bogota, who introduced the bus rapid transit in Bogota, said that a city is liveable where your 11-year-old boy can use his bicycle in the streets of the city without being disturbed, and that city is quite liveable. You can't tell me you will allow your 11-year-old boy to use a bicycle along the road from Takoradi to Sekondi; you will be very worried; it is not liveable" (Respondent 4, interview 28 August 2024).

The National Urban Policy (2012) highlights the lack of integration between land-use planning and transport policy, highlighting the focus on road development for human mobility. Recognising transportation's vital role in urban societies, the National Transport Policy (2020) proposes a multi-modal transport plan integrating transport policy with land use planning, especially in congested metropolitan areas. Despite the push for intermodal transport systems, there is little indication of how road infrastructure will be integrated into a multimodal transport system. Moreover, current road design standards favour private vehicle mobility, often

neglecting the right-of-way for non-motorised road users. Additionally, the informally provided public transport services across the country are not integrated into urban policies, transport policies, spatial frameworks and local plans.

5.4 Urban Planning Policy and Frameworks

The adopted strategy of a balanced hierarchy of settlements using the normative underpinnings of the polycentric development model encompasses: “The plan includes the construction of link roads and a national-level highway, known as the expressway, to enhance connectivity” (Respondent 1, interview 28 August 2024). The adopted polycentric spatial model as a national strategy to decongest city regions was primarily conceived in anticipation of the transformative effects of the growing oil and gas sector on Sekondi-Takoradi, while also acknowledging its wider implications for metropolitan areas and major urban clusters across the country.

> “What I can say about the NSDF is that we had the Western Regional SDF prepared in 2012, and it preceded the National Spatial Development framework, so a lot of information or details were pitched from the Western Regional Spatial Development Framework for the preparation of the NSDF it was a kind of the guide” (Respondent 3, interview 29 August 2024).

Policy provisions for average densities for urban centres are pegged at 90 to 120 persons per hectare, with an overall strategy to integrate urban transport systems into dense urban centres for large-scale transit systems to operate and schedule their operations for economic efficiency (confirmed by Respondent 2, interview 28 August 2024). In a polycentric configuration, “you have a main centre, and you have other sub-centres, once you're able to define these centres or nodes, then you can now link them by transportation networks” (Respondent 1, interview 28 August 2024). Apart from encouraging connections between centres in a polycentric urban network, urban policy and frameworks can reduce the need for commuting by adopting transport demand strategies into urban design. Thus, urban design should “encourage densification and mixed-use, especially active floor spaces, such that it will reduce the need for one to travel” (Respondent 4, interview 28 August 2024). This aligns with the core tenet of polycentric development to balance development across an urban region through a network of infrastructure that prioritises compact, high-density nodes integrated with an efficient intermodal transport system.

However, the inconsistencies in “investments and continuity in projects and programs that help us achieve the polycentricity, as well documented in policy” remain a stumbling block to the

polycentric urban policy vision (Respondent 2, interview 28 August 2024). The lack of integration of other government flagship policies that can enhance polycentricity in the urban region compounds the policy and practice gaps; "for instance, if you look at the one district, one factory model, we can have industrialisation not concentrating only in Sekondi-Takoradi, but other areas can also have some form of industrialisation" (Respondent 4, interview 28 August 2024).

"I know that at the regional level, there is the proposed SDF and we have tied it on the districts in an attempt to roll out some of these strategies" (Respondent 3, interview 29 August 2024). However, concerns about the effectiveness of "our planning system in the first place in helping us to realise this sort of balance" remain unanswered (Respondent 5, interview 19 September 2025). Table 2.0 below summarises spatial policies, frameworks, guidelines and legislations for spatial organisation and development at different tiers of government in the country. Even though, as shown in the Table below spatial framework makes provisions for long-term spatial plans with policies that recognise the need for inter-modal transport infrastructure. Without an efficient regional planning system with the capacity to coordinate the development of the proposed regional infrastructure, the current planning paradigms risk promoting sprawling urban edges and congestion at the core, just as much as they can address sprawl and congestion through efficient public transport.

Table 2.0: Summary of Urban Planning Policies and Frameworks. Source: (Author, 2024).

DOCUMENT TYPE	**STATUS**	**DESCRIPTION**	**SCALE**	**IMPACT/FOCUS**
National Urban Policy (2024)	Under Review	Policy	National	Sustainable Settlement Expansions
NSDF (2015 - 2035)	The last decade of the framework	Spatial Framework	National	Framework for National-Level Infrastructure
WRSDF (2012 - 2032)	The last decade of the framework	Regional Spatial Development Guide	Regional	Regional Development Guide

District Spatial Frameworks & Structure Plans (20-year validity period for DSDF and 15-year Validity period for SDF).	3 out of 6 MMDAs in the study area have structure plans	Statutory Local-level frameworks for spatial organisation and the brief for Local Plans	Local	Broad-based Local Development Direction
Local Plans	Neighbourhood land use plans	Legally binding land use planning and management document	Local	Specific Land Use Planning and Management Guide
Land Use and Spatial Planning Act (925) & L.I 2384	Outlines current laws and regulations for spatial planning	Legislation	National	Land Use Planning and Management
National Planning Guidelines (2026 -2029)	Synchronises all planning activities	Guidelines	National	Development and Spatial Planning Activities

Although the spatial development plans consistently emphasise the integration of land use and transport planning through long-term frameworks and structure plans, the implementation of polycentric development must be grounded in practical action, as outlined in these provisions. As Respondent 3 noted during the interview on 29 August 2024, “The polycentric model goes beyond STMA and looks more into the neighbouring or adjoining metro, municipal, and district assemblies.” This highlights the need for local planning authorities to enhance coordination of regional infrastructure development, not only to break monocentric commuting to Sekondi-Takoradi but also to empower surrounding areas to function as specialised and independent activity nodes with multimodal transport infrastructure.

5.5 Spatial Transformations in The Sekondi-Takoradi Metropolis

The discovery of oil led to major upheavals in both the housing and land markets, intensifying the "competition for land uses such as agriculture, residential development, and industrial development" (Respondent 1, interview 28 August 2024). Empirical evidence reinforces these mounting concerns about the urban consequences of the oil and gas industry, as unregulated development now extends beyond the core of Sekondi-Takoradi into once-protected forest reserves and agricultural zones (Adjei Mensah *et al*., 2019). Also, "the excess demand over supply is leading to a pricing regime in the land and housing market such that the poor and average income earners are unable to afford" (Respondent 2, interview 28 August 2024). "I know STMA's long-term transport strategy in response to this rapid urbanisation as a major economic hub focuses on creating the polycentric urban form that has been captured in the national SDF" (Respondent 3, interview 29 August 2024)

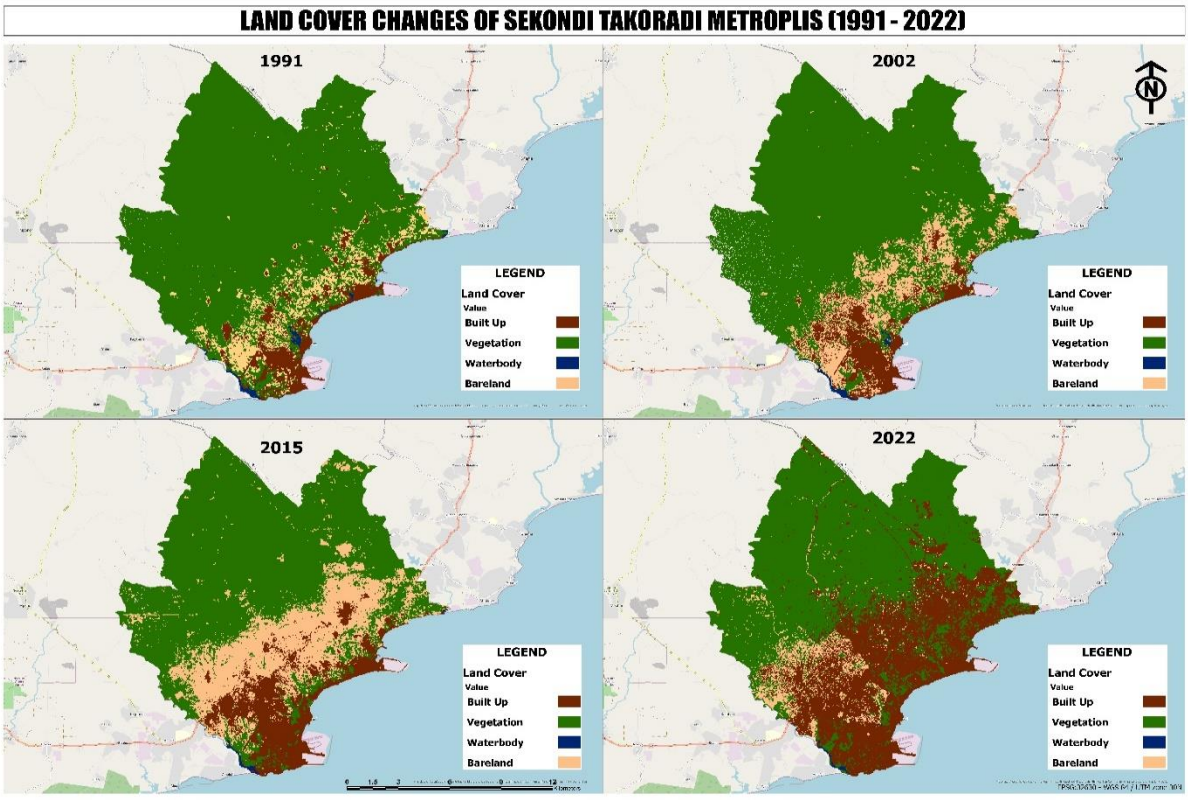

Figure 19.0: A map showing Urban Land Use Change in the Metropolitan Area Source: (Author, 2024).

Figure 19.0 illustrates the transformation of land use within the Sekondi-Takoradi Metropolitan Area. While the visual data requires additional sources for definitive conclusions, land cover change analysis indicates a rapid expansion of urban areas between 1991 and 2022. During this period, over 100 km² of green spaces and wetlands were converted into built-up zones, with significant encroachment observed along the peri-urban edges. The most intense phase of

change occurred between 2015 and 2022, marked by a 23% increase in fragmented urban growth, mirroring trends in economic and population expansion. This recent wave of development involving the conversion of agricultural and forested lands into residential, commercial, and industrial uses, closely aligns spatial changes associated with the growth of the oil and gas sector.

The idea of polycentricity sprang out of the pressures of the influx of people into the metropolitan area and the pressures this was exerting on the limited city infrastructure, especially the roads, due to the daily commuting from sprawling peripheries to the city core (confirmed by Respondent 3, interview 29 August 2024). Currently, ongoing projects in the metropolitan core are expanding the roads between the two urban nodes at the heart of the network. "The single-lane road space is not helping because of the pressures of the sprawl; there are a lot of vehicles on the road, yet transportation does not reach certain areas" (*Ibid*). Even though the urban transformation policy has linkages with other activity centres outside of the metropolitan core, a majority of the infrastructure provisions in the regional framework emphasise enhancing connections between Sekondi and Takoradi.

> "Based on the document, I foresee that the public transport infrastructure is basically to be improved between Sekondi and Takoradi in terms of the other network. Because of the economic activities and the level of infrastructure within Sekondi-Takoradi, that area is more prioritised or should be more prioritised" (Respondent 1, interview 28 August 2024).

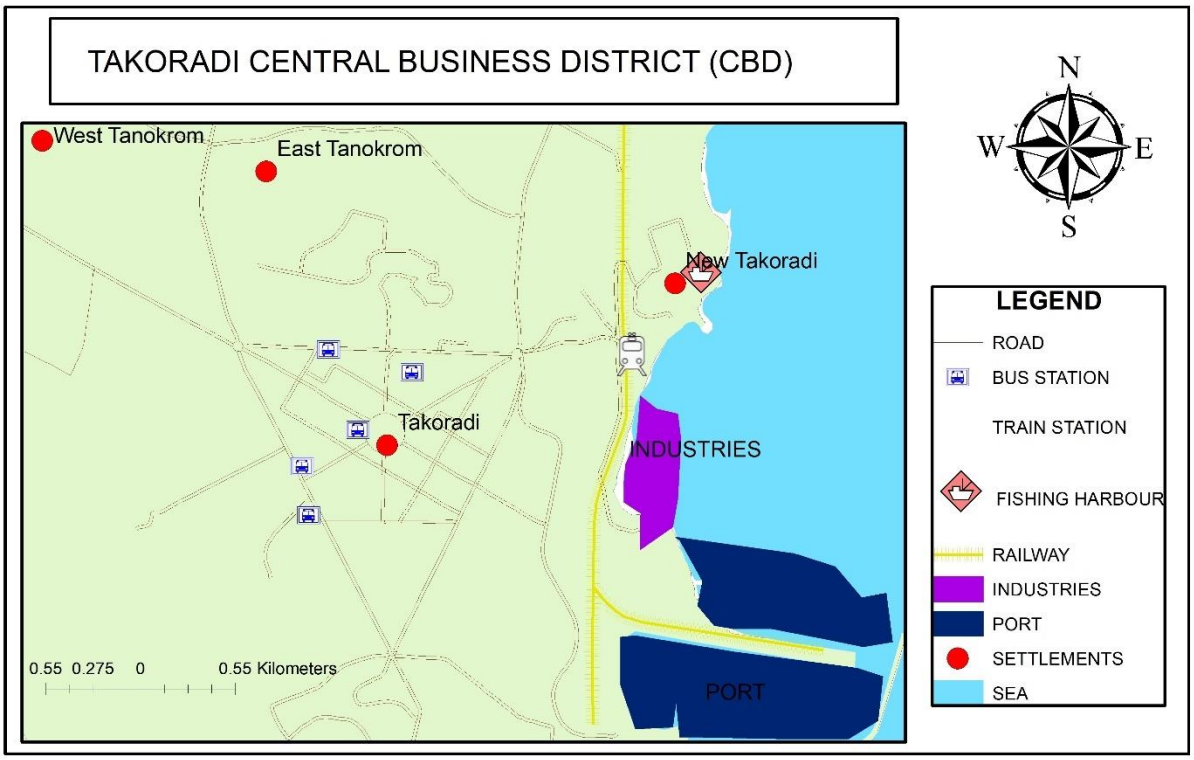

Figure 20.0: Map of Takoradi Central Business District. Source: (Author, 2024).

As shown in Figure 20.0, the Central Business District (CBD) follows a hub-and-spokes transport layout, with GPRTU bus stops evenly distributed throughout the area. Notably, the railway corridor intentionally bypasses the CBD, maintaining a direct and uninterrupted link to the Takoradi Port. This spatial arrangement reflects the railway's historical role in facilitating the export of raw materials rather than serving as a system for daily mass transit. This legacy may explain the limited intersection between railway lines and highways at key urban nodes, as well as the absence of a multi-modal transport hub, even within Takoradi's metropolitan CBD.

"Considering your study area of Sekondi-Takoradi and its environs, we may use decades to get there" (Respondent 5, interview 19 September 2025). Nevertheless, a practical use of the polycentric model to guide spatial transformations at the local scale is exemplified below. The examples describe the practical adoption of the model and concept of TOD by a spatial planner with LUSPA in drafting a spatial development framework for a local authority.

> "So what we did is we created 3 clusters along the N2 as transit-oriented urban clusters, and within every cluster, one cluster focused on intensive mixed-used and commercial development. Another cluster also focused much on recreational development, and we

had another class that also concentrate on purely residential development because there were a lot of activities on that N2" (Respondent 1, interview 28 August 2024).

5.8 Conclusion

This chapter explored the potential, challenges, and necessary changes for transforming the Sekondi Takoradi Urban Network into a polycentric urban region, drawing on empirical lessons from the polycentric areas worldwide. Although policies have been established to break the monocentric core-periphery relationship typical of Ghanaian cities, the current strategies are not ideal for addressing urban sprawl and congestion in Sekondi Takoradi and beyond. Given the limited infrastructure commitments towards these policies, there is a need to review the proposed transport systems, focusing on reviving and integrating railway lines into the intermodal transport systems in metropolitan areas. Also, urban planning systems and practices, especially at the local level where actual land use plans are prepared, lack the capacity to develop and implement plans that fulfil this vision.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

Following the findings and discussions on polycentric development in the study area, STUN remains a viable policy proposal to address contemporary urbanisation issues, mainly focusing on sprawl and transport systems. Moreover, empirical evidence highlights the importance of transport systems in enhancing access and maintaining functional balance among settlement hierarchies in PURs. However, the STUN case study reveals a network predominantly dominated by the twin cities, with limited functional connections to the surrounding peripheries. Consequently, this chapter will present my concluding thoughts on urban planning and polycentric development, along with recommendations and directions for future research.

6.1 Long-term Urban Planning Strategies

The findings indicate that despite concrete plans to establish a balanced polycentric hierarchy of settlements in the country, including the STUN network, the policy approach shows significant inconsistencies compared to empirical evidence from developed polycentric regions in Europe and Asia. Additionally, while existing proposals include provisions for developing inter-modal transport systems to facilitate mass commuting, there is little clarity on the implementation and the specific systems to be adopted for connecting the nodes. Furthermore, the core concept of connectivity in polycentric urban regions, as seen in the global north and Asia city regions, involves the functional connection of urban agglomerations through diverse transportation networks that support efficient inter-urban and intra-urban commuting. Therefore, creating polycentric regions requires integrating urban planning and transport systems to coordinate spatial developments along densified, walkable, and compact corridors.

However, urban change analysis reveals ongoing horizontal expansion of the metropolitan area, primarily beyond the core, contributing to urban congestion as the core remains the central hub for resources, housing, and employment opportunities. Developing polycentric urban regions requires horizontal and vertical coordination among various government agencies, potentially involving institutional arrangements and agreements to channel resources into developing regional connectivity infrastructure that strengthens the regional economy. Thus, the policy will require extensive coordination between agencies and competing local governments to foster a balanced region where Sekondi-Takoradi does not dominate as the central hub.

6.2 Recommendations

Adopting a balanced polycentric hierarchy of settlements for the Sekondi-Takoradi Urban network aims to improve access to the city core and mitigate urban sprawl and congestion in the metropolitan area and beyond. This viable policy should be reviewed, maintaining the core tenet of balancing regional urban development through intermodal transport systems and spatial planning. However, the central policy provision of an expressway to connect all nodes and reduce congestion and sprawl is problematic, as empirical evidence shows that road development contributes to sprawl and congestion. Additionally, the lack of integration of mass transit systems and dedicated bus lanes in existing road designs makes road development problematic in attracting public transport commuters, especially during rush hour, posing challenges to achieving balanced and reverse commuting in the network. Therefore, road infrastructure should be deliberately integrated with rail and non-motorised-friendly road designs. Furthermore, current proposals and existing rail infrastructure for freight transport need to be revised to include metro rail and LRT lines that promote fast inter-urban travel.

The proposed nodes' housing, land, and mortgage markets need to be developed to promote densification and compact development by providing the necessary infrastructure to support housing, create jobs, and stabilise land markets. Lastly, institutional arrangements that encourage regional planning and governance systems are needed to ensure systematic coordination of investment and infrastructure developments along transit corridors through regional spatial frameworks, district spatial frameworks, structure plans and local land use plans.

6.3 Future Directions for Research and Practice

This qualitative research uses expert opinions and empirical evidence for its design and analysis. However, due to previously mentioned limitations, commuting data—a crucial element for identifying Polycentric Urban Regions is absent from this study and should be included in future research. Also, with no state or local authority-based public transit systems, the Ghana Private Roads and Transport Union (GPRTU), the primary public transport service provider, has an unexamined role in promoting accessibility within and beyond the metropolis. Thus, it is recommended that members of the union be interviewed in future research. Lastly, input from the metropolitan spatial planner will be valuable in future research, as the policy aims to develop transit corridors along the radial routes from the CBD of Takoradi.

6.4 Conclusion

In the latter half of the 20th century, rapid urbanisation and increased economic activities significantly boosted the demand for individual passenger mobility services. This surge increased the need for work, leisure, and other commuting trips (Rodrigue, 2024). Locally, the discovery of oil in the twin city and the modern reliance on automobiles may push the city towards the social disruption theory (Mensah *et al*., 2018). As a result, urban planning must urgently incorporate modern urbanism concepts like TOD to enhance efficient inter-urban commuting and promote compact development. Moreover, achieving polycentric development requires a combination of institutional reforms and balanced investments from local governments and other regional stakeholders to foster the regional growth of a balanced polycentric region where Sekondi-Takoradi does not dominate in a monocentric pattern.

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6 August 2024

Gaayuoni,Joachim

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TO WHOM IT MAY CONCERN

RESEARCH ETHICS APPROVAL

The Use of Public Transport to Implement a Polycentric Development Model in Sekondi-Takoradi.

This letter serves to confirm that the Ethics application for the above titled study has been approved. The researcher has been granted clearance to proceed with the research study or project.

Protocol/clearance number is: **SOAP062/05/2024**

Yours sincerely

Motsei Choabi
Senior Administrative Manager | School of Architecture and Planning
E: motsei.choabi@wits.ac.za
T: +27 11 717 7727
W: www.wits.ac.za/soap/