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Barriers to the implementation of Ghana's spatial planning agenda: An assessment of the Sekondi-Takoradi Urban Network (STUN)

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Research article

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Abstract

This article investigates the extent to which the policy vision of polycentric urban development, articulated in Ghana's *National Spatial Development Framework* (NSDF), has been realised in practice within the Sekondi-Takoradi Urban Network (STUN). Employing a qualitative research design, the study integrates GIS-based land-use analysis with structured interviews to evaluate the implementation of Ghana's polycentric development strategy and to identify barriers to STUN's functional transformation. Spatial analysis of land-use change is complemented by thematic analysis of interview data, organised around two analytical dimensions: spatial coordination and transport integration. The findings highlight four interrelated themes shaping the assessment of STUN: its conceptualisation as a normative polycentric urban region; the translation of this vision into a functional polycentric system; the role of urban governance in advancing polycentricity; and the relationship between spatial planning, transport systems, and polycentric development. Despite policy commitments to balanced regional growth, STUN remains predominantly monocentric in practice. Weak spatial-transport integration, limited inclusion of informal mobility providers, and poor inter-institutional coordination undermine the framework's implementation. The article contributes to debates on urban planning in the Global South by demonstrating that policy designation alone is insufficient to achieve functional polycentricity. It argues for strengthening regional planning institutions, improving transport-land-use integration, and formally incorporating informal mobility systems to advance polycentric development beyond symbolic policy intentions.

Keywords: polycentric urban development; spatial planning; transit-oriented development; urban governance; Ghana; Sekondi-Takoradi; national spatial development framework (NSDF)

HINDERNISSE VIR DIE IMPLEMENTERING VAN GHANA SE RUIMTELIKE BEPLANNINGSAGENDA: 'N EVALUERING VAN DIE SEKONDI-TAKORADI STEDELIKE NETWERK (STUN)

Hierdie artikel ondersoek die mate waarin die beleidsvisie van polisentriese stedelike ontwikkeling, soos uiteengesit in Ghana se *Nasionale Ruimtelike*

Ontwikkelingsraamwerk (NSDF), in die praktyk binne die Sekondi-Takoradi Stedelike Netwerk (STUN) verwesenlik is. Deur 'n kwalitatiewe navorsingsontwerp te gebruik, kombineer die studie GIS-gebaseerde grondgebruiksanalise met gestruktureerde onderhoude om die implementering van Ghana se polisentriese ontwikkelingsstrategie te evalueer en hindernisse vir STUN se funksionele transformasie te identifiseer. Die analise is georganiseer rondom twee sleutel-dimensies: ruimtelike koördinering en vervoerintegrasie. Die bevindinge toon vier onderling verwante temas wat die evaluering van STUN vorm: die konseptualisering daarvan as 'n normatiewe polisentriese stedelike streek; die vertaling van hierdie visie na 'n funksionele polisentriese stelsel; die rol van stedelike bestuur in die nastrewing van polisentrisme; en die verhouding tussen ruimtelike beplanning, vervoerstelsels en polisentriese ontwikkeling. Ten spyte van beleidsverbintenisse tot gebalanseerde streeksontwikkeling, bly STUN in praktyk hoofsaaklik monosentriese. Die implementering van die raamwerk word ondermyn deur swak integrasie van ruimte en vervoer, beperkte insluiting van informele mobiliteitsverskaffers en gebrekkige inter-institusionele koördinering. Die artikel dra by tot debatte oor stedelike beplanning in die Globale Suide deur te wys dat beleidsaanwysing alleen onvoldoende is sonder effektiewe bestuursreëlings, infrastruktuurbelegging en geïntegreerde mobiliteitstelsels. Dit bepleit die versterking van streekbeplanningsinstellings, verbeterde vervoer-grondgebruikintegrasie en die formele inkorporering van informele mobiliteitstelsels om polisentriese ontwikkeling verder as simboliese beleidsvoornemens te bevorder.

LITŠITISO TSA HO KENYA TŠEBETSONG MERERO EA SEBAKA SA GHANA: TLHAHLOBO EA STUN

Sengolola sena se hlahloba hore na leano la Ghana la nts'etsopele ea litoropo tse nang le libaka tse ngata, le hlalositsong ho Moralo oa Naha oa Nts'etsopele ea Sebaka (NSDF), le kentsoe tšebetsong hakae ka har'a Marang-rang a Metse a Sekondi-Takoradi (STUN). Ho sebelisitsoe mokhoa oa lipatlisiso tsa boleng o kopanyang tlhahlobo ea phetoho ea tšebeliso ea mobu e thehiloeng ho GIS le lipuisano tse hlophisitsoeng ho lekola

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ts'ebetso ea leano lena le ho khetholla litšitiso tse amang phetoho ea STUN. Tlhahlobo e shebane le litekanyo tse peli tsa bohlokoa: khokahano ea sebaka le kopanyo ea lipalangoang. Liphuputso li bontša lihlooho tse 'ne tsa bohlokoa: kutloisiso ea STUN e le sebaka sa litoropo se nang le libaka tse ngata; phetolelo ea pono ena ts'ebetso; karolo ea puso ea litoropo ho nts'etsopela ea libaka tse ngata; le kamano pakeng tsa moralo oa sebaka, lipalangoang le nts'etsopela ea libaka. Leha ho na le boitlamo ba leano ba kholo e leka-lekaneng ea libaka, STUN e ntse e laoloa haholo ke setsi se le seng. Ho fokola ha kopanyo ea sebaka le lipalangoang, ho se kenyeletsoe ka ho lekaneng ha bafani ba tsamaiso e seng molaong, le tšebeliso e fokolang pakeng tsa mekhatlo li sitisa ts'ebetso ea leano. Sengolola se pheha khang ea hore ho matlafatsoe litsi tsa moralo oa libaka, ho ntlafatsoe kopanyo ea lipalangoang le tšebeliso ea mobu, le ho kenyelletsoa ha litsamaiso tse seng molaong ho khothaletsa nts'etsopela ea polycentricity.

1. INTRODUCTION

Polycentric development has emerged as a central planning paradigm in response to the challenges of rapid urbanisation, spatial inequality, and congestion associated with monocentric urban models. Defined by the spatial distribution of multiple, relatively autonomous yet functionally connected urban centres, the polycentric model promises to support more balanced territorial development, reduce the dominance of primate cities, and support integrated urban systems (Derudder, 2022). Internationally, this model has been integrated into spatial planning frameworks such as the European Spatial Development Perspective (ESDP) (Richardson & Jensen, 2000; Dadashpoor, Doorudinia & Meshkini, 2023; Malý, 2016) and China's national urbanisation strategy (Liu, Derudder & Wu, 2016), and it is increasingly influential in shaping urban policy across the Global South (Prieto-Curiel, Patino & Anderson, 2023). While polycentric regions can sometimes develop naturally without deliberate efforts, as seen in parts of Europe, empirical research shows that the process can be facilitated through normative spatial and transport policies (Goess, De Jong & Meijers, 2016).

Following years of dormancy and obsolete colonial legislation that guided spatial planning in Ghana for roughly 70 years, the National Spatial Development Framework (NSDF) (2015-2035) (Government of Ghana, 2015) was developed as part of the Land Reforms Project, which started in 2007, to revitalise spatial governance in Ghana (Acheampong, 2019). Ghana introduced its first National Urban Policy (NUP) in 2012, prompted by the reality that over half its population was already urban. The policy was a direct response to mounting pressures in Accra and Kumasi, where rapid, unregulated growth was pushing residents farther from essential services, increasing travel times, and worsening traffic congestion within their predominantly monocentric layouts. Consequently, the NSDF represents a crucial national document, the first of its kind to articulate a comprehensive spatial vision for the country, positioning Ghana among the few African nations that have developed a national spatial framework (Sarfo, 2021). The NSDF adopts the polycentric model to strategise 11 urban networks anchored by metropolitan centres and towns to address the monocentric path dependency paradigm.

The Sekondi-Takoradi Urban Network (STUN) is one of the 11 urban networks proposed in the NSDF. Although STUN was formally designated as a polycentric urban region in 2015, its subsequent urban development has not followed the typical patterns associated with functional polycentric regions observed in parts of the Global North, Latin America, or China. Instead, its transformation has been more uneven, with economic activity still concentrated in core urban areas and weaker integration of peripheral centres. Structural shortcomings in the public transport system further limit the emergence of a more connected, multi-nodal urban form. While the NSDF provides a spatial vision that categorises nodes according to a hierarchical role in the network, questions persist concerning institutional coordination, the role of transport systems, institutional capacity, and the inclusion of informal

systems that dominate everyday mobility in Ghanaian cities. These gaps between policy intentions and actual urban dynamics underscore the need to assess how spatial planning and mobility systems support, or hinder, the transition toward polycentric development.

This article examines how Ghana's polycentric urban development agenda is being applied in practice through the case of STUN. It investigates two central questions: the extent to which the NSDF's vision of polycentric development has been realised in the region, and the degree to which the public transport system supports, or limits, the emergence of a more balanced urban structure. Using STUN as an example, this study looks at how well Ghana's NSDF has worked in practice. It examines whether the plan has helped move development away from a single dominant city centre toward several active urban centres across the region. The article also identifies key challenges that have slowed or limited this shift since the strategy was introduced in 2015, including the role of public transport in supporting a more balanced pattern of development.

2. LITERATURE REVIEW

2.1 The rise of polycentric urban regions

Polycentric development has gained increasing prominence as an urban planning model that addresses the environmental, economic, and social limitations of monocentric urban growth. Defined by the spatial distribution of multiple centres that are both autonomous and functionally integrated, polycentric urban regions offer a conceptual and policy framework for promoting spatial equity, reducing congestion, and supporting balanced regional development (Bartosiewicz & Marcińczak, 2020). In contrast to the traditional concentric city model, polycentric urban regions are characterised by decentralised economic activity, multi-directional commuting flows, and inter-nodal connectivity via efficient transport

systems (Liu *et al.*, 2016). While originally rooted in European spatial planning discourse, particularly through the European Spatial Development Perspective (ESDP), polycentricity has since been embraced by countries across Asia and Africa (Kwon & Seo, 2018; Domingo *et al.*, 2024), albeit with some questions about its contextual relevance (Sinclair-Smith, 2015) and its economic impact (Wang, Derudder & Liu, 2019). Its promise of efficiency is “premised on the assumption that the agglomeration economies of primate cities offer unrivalled advantages and that the major issue of national urban policy is to avert the diseconomies of urban growth” (Parnell & Pieterse, 2014: 248). Its normative appeal lies in its potential to promote territorial cohesion, reduce the dominance of primate cities, and accommodate urban growth through more sustainable patterns of development (David & Kilani, 2022). However, scholars have warned that its application often outpaces the institutional capacity required for meaningful implementation, especially in developing countries (Parnell & Pieterse, 2014; Zambrano-Monserrate, 2025).

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 (Natalia & Heinrichs, 2020). In addition, new urbanism movements advocate for polycentricity, Transit-Oriented Development (TOD), and a multi-nodal urban structure as ideal to address the challenges of rapid urbanisation (Waters, 2016). Typically, polycentric urban regions are characterised by multi-modal transport systems that facilitate seamless transition between transport modes. However, the development of polycentric regions requires complex trade-offs between expanding network coverage, densifying local connections, and enhancing inter-centre linkages (Cats & Birch, 2021). Functionally,

variables such as land-use type, diversity, and the distance to transportation facilities are essential factors in planning polycentric regions (Natalia & Heinrichs, 2020). In addition, polycentric urban regions are usually characterised by mass and intermodal transit systems that efficiently connect centres through direct transit routes (David & Kilani, 2022). Scholars also acknowledge that a key factor in the shift to polycentric development is directing traffic (Louf & Barthelemy, 2013; Li, Xiong & Wang, 2019) and mitigating emissions (Jiang *et al.*, 2022). This is because people generally move through urban space to engage in a variety of activities that meet their social, economic, and personal needs (Saddier, 2025). Through spatial policies and planning frameworks, urban planners can facilitate the development of polycentric urban regions (Dadashpoor *et al.*, 2023; Davoudi, 2003; Malý, 2016).

The essence of polycentric development, in relation to economic agglomeration principles, is to balance the distribution of development among centres within a region (Li *et al.*, 2018). This means that nodes in a polycentric region should evolve into hubs with complementary economic activities with reverse commuting characteristics (Natalia & Heinrichs, 2020). The metropolitan centre remains the primary hub of activity, offering various transportation, commercial, and service options (Loo & Du Verle, 2017).

2.2 The role of transit-oriented development in polycentric urban regions

Burger and Meijers (2012) distinguish between morphological polycentricity, where multiple urban centres exist in spatial proximity, and functional polycentricity, which depends on the flow of people, goods, and services between nodes. A region may appear polycentric on a map but lack the functional characteristics such as labour market integration or public transit connectivity that make the model operational. The transition from morphological to functional polycentricity is typically mediated

by cohesive multimodal public transport networks characterised by BRTs, Light Rail Transit, metro rail systems, and regional commuter rail, thereby enhancing connectivity and accessibility (Cats & Birch, 2021). Successful polycentric regions exhibit multi-directional commuting patterns, land-use clustering, and institutional coordination to promote compact, high-density growth nodes. This transformation has already happened in the Global North, with prime examples such as the Randstad in The Netherlands and the Rhine-Ruhr region in Germany (Goess *et al.*, 2016).

In this context, TOD has gained traction as a policy tool for realising functional polycentricity. TOD encourages high-density, mixed-use development clustered around transit nodes, aiming to reduce car dependency and promote compact, connected urban growth (Cervero, 2007). By aligning land-use planning with transport infrastructure, TOD serves as a spatial strategy that can reinforce the functional links between centres in a polycentric region. It is, therefore, viewed not only as a sustainability tool, but also as an enabler of regional integration (Papa & Bertolini, 2015). The effective implementation of TOD in support of polycentricity hinges on institutional coherence across scales. Planning frameworks must be synchronised across national, regional, and local levels to guide land development, target transport investments, and regulate urban form (Waters, 2016).

In much of the Global South, including Ghana, this remains a persistent challenge. As Harrison and Todes (2015) note, planning in these contexts is often under-resourced, politically driven, and fragmented between sectors and jurisdictions. Where institutional misalignment prevails, even well-articulated spatial strategies risk being isolated or symbolic, rather than transformative. TOD is a key strategy that facilitates polycentric development, because it ensures resources are distributed and accessed more evenly. Its most significant benefit is that it connects disadvantaged areas to city centres, providing guaranteed

access to vital services (Agyemang *et al.*, 2020). While TOD offers significant potential to support the transition from morphological to functional polycentricity, its prospects in secondary cities in the Global South depend less on the adoption of global best practices and more on the ability to navigate local constraints – from informal mobility and institutional fragmentation to limited fiscal and technical capacity. Su, Wang and Kang (2022) note that effective TOD implementation relies on adapting generative principles to local circumstances. Understanding these contextual dynamics is key to evaluating how polycentric visions can become operational realities.

African cities face common challenges of inclusive and sustainable urban transport futures, which will be impossible to address without a deeper understanding of the unique spatial, sociocultural, political, and economic contexts that generate and reproduce these challenges (Acheampong *et al.*, 2022). For instance, in Asia, the TOD theory has been localised into the Integrated Station-City Development (ISCD) framework, which has been proven to be successful in addressing sustainable regional economic growth and development (Liang, Song & Dong, 2021). Another example is the development of BRT systems in Curitiba and Bogota, which still serves as the blueprint for developing BRT systems (Chetty & Venter, 2025). In Curitiba, strategic land-use planning, specifically linear zoning along BRT corridors, was instrumental in shaping transit ridership (Domingo *et al.*, 2024). BRT systems have been introduced in various African cities in diverse formats, with Johannesburg's Rea Vaya standing out as the most advanced and comprehensive example (Matubatuba & De Meyer-Heydenrych, 2022).

2.3 Polycentric planning in Africa

Empirical research on polycentric development in Africa remains limited. Some studies document the rise of informal polycentricity – decentralised economic and

residential development driven by market forces rather than planning (Obeng-Odoom, 2011). While cities in Asia and Latin America have seen spatial transformation into polycentric regions, sub-Saharan African cities are expanding spatially in ways that do not seem to fit neatly into existing urban models. For instance, an empirical study of the Kumasi city region by Agyemang, Silva and Poku-Boansi (2019) characterises the urbanisation process not as a coherent shift toward polycentricity, but as inefficient, spontaneous, and unsustainable. An understanding of the uniqueness of the spatial, cultural, political, and economic contexts of African cities is necessary to address the challenges of urbanisation on the continent. The literature stresses that commuter data, informal transport systems, and urban governance dynamics must be accounted for when assessing urban mobility solutions in African cities (Acheampong *et al.*, 2022). While the literature establishes the conceptual foundations of

polycentricity and its dependence on transport integration, few empirical studies explore how these ideas are implemented in secondary cities in sub-Saharan Africa. Following the introduction of normative polycentricism in the early 1990s through the ESDP, there has been widespread adoption of the strategy normatively in other jurisdictions such as Latin America, China, and now Africa. However, Natalia and Heinrichs (2019) argue that Europe has seen a saturation of empirical studies on polycentric development, calling for new studies in Africa.

The concept of a polycentric spatial vision in Ghana was first introduced in 2012 through the National Urban Policy Framework and was further strengthened in 2015 with the adoption of a polycentric development model under the NSDF (2015-2035) (Government of Ghana, 2015). Since then, national spatial policy has placed strong emphasis on decentralising growth away from the major metropolitan centres of Accra and Kumasi.

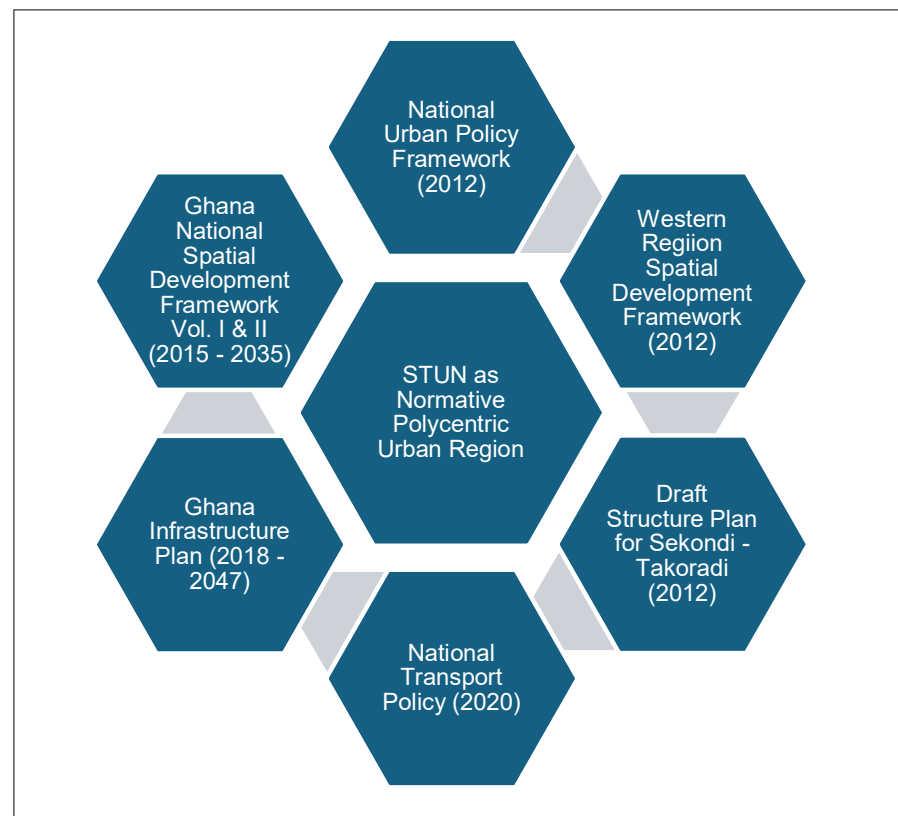


Figure 1: Summary of the conceptual framework

Source: Authors, 2026

Within this framework, STUN, one of 11 urban networks identified in the NSDF, applies a place-based approach to establish a hierarchy of six interconnected nodes. These nodes are linked through functional and morphological relationships supported by modern transport infrastructure. Sekondi-Takoradi is classified as a Grade 1 node, a distinction reserved for only four metropolitan areas nationwide, reflecting its status as a large city with advanced, high-level functions (Government of Ghana, 2015). As such, its strategic importance within the NSDF positions it as a key anchor for promoting balanced regional development.

The spatial vision outlined in the NSDF is reinforced by subsequent legislative instruments, including the Land Use and Spatial Planning Act 925 (2016) and the Land Use and Spatial Planning Regulations L.I. 2384 (2019). In addition, the National Transport Policy (2020) provides critical direction on the role of transport in supporting polycentric development. The Ghana Infrastructure Plan (2018-2047), a long-term strategy for national infrastructure and transport corridors, also plays a central role in shaping the country's spatial development trajectory (see Figure 1).

into a modern, car-dependent society (Obeng-Odoom, 2015).

STUN is characterised by rapid population growth, high levels of urbanisation, and continuous spatial expansion. Its coastal location, strong national and regional highway connections, and position as an industrial and commercial centre have accelerated extensive urban sprawl into former farmlands and forested zones previously situated at the urban fringe (Adjei Mensah *et al.*, 2019). With an estimated 80% urbanisation rate, STUN ranks among the densest urban networks in Ghana, recording an average of 8,400 people per square kilometre in 2010. Sekondi-Takoradi accommodates a significant share of the network's urban population, with the 2021 Population and Housing Census reporting a total of 245,382 residents, of whom 85% live in urban areas (Ghana Districts, 2025). Broader metropolitan and peri-urban estimates indicate substantial growth, rising from roughly 559,548 in 2010 to more than 1.1 million in 2021, due to continued in-migration driven by economic opportunities (Eduful & Hooper, 2019).

At the network scale, STUN grew from 0.4 million inhabitants in 2000 to 0.7 million in 2010, and projections

indicate a rise to approximately 1.9 million by 2035, with an urbanisation level of about 84% (Ghana Districts, 2025). The settlement structure within STUN reflects a clear hierarchy. Agona-Nkwanta, the second-largest settlement, is located approximately 26 km from the urban core and has a population of roughly 14,000, followed by Mpothor, 17 km away with a population of 11,000. Dixcove and Dabose represent the most spatially distant settlements (approximately 50 km apart), while Dabose and Assorkaw-Essaman are the closest (roughly 10 km apart). Beyond the main urban centres, STUN also includes approximately 227 rural communities with a combined population of roughly 120,000 (Government of Ghana, 2015).

Economically, STUN is one of Ghana's most dynamic regions. The discovery of offshore oil in 2007 transformed Sekondi-Takoradi into the country's 'Oil City', catalysing domestic and foreign investment. The local economy is dominated by the service sector (59.9%), followed by agriculture (21%) and industry (19.1%) (Obeng-Odoom, 2012). Oil and gas activities, petrochemical industries, fishing, port-related commerce, and cash crop production, particularly rubber and oil palm,

3. STUDY AREA

STUN is one of Ghana's most significant emerging urban systems, spanning five metropolitan, municipal, and district assemblies in the western region along the Gulf of Guinea (Biney *et al.*, 2024) (see Figure 2). Anchored by the twin city of Sekondi-Takoradi, the network functions as a strategic economic and infrastructural hub linking coastal and inland settlements. It comprises a cluster of approximately six urban settlements and forms part of Ghana's NSDF. 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 by the colonial government, the twin city has evolved

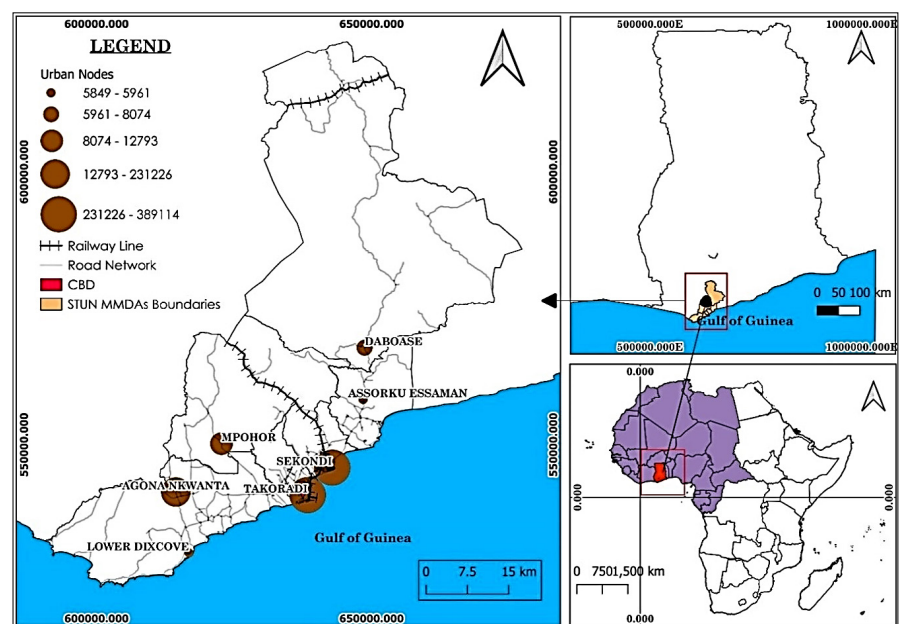


Figure 2: Map showing proposed STUN polycentric urban region

Source: Authors, 2026

continue to support the regional economy (Ackah *et al.*, 2019).

Spatially, STUN exhibits strong internal connectivity, with over 80% of its trunk road network classified as national-level infrastructure (Eduful & Hooper, 2019). This enhances mobility between settlements and strengthens regional integration. However, rapid expansion has introduced challenges, including increasing urban sprawl, infrastructure strain, environmental pressures, climate change impacts, and urban heat island effects.

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). This accelerated growth highlighted the need for a spatial vision to guide future development, prompting the formulation of both regional and national spatial frameworks. Despite these efforts, spatial diseconomies persist at the subregional scale, with Sekondi-Takoradi functioning as the dominant regional growth pole (Fiave, 2017).

4. METHODOLOGY

4.1 Research design

This study adopts a qualitative research design to assess the Ghanaian policy vision of polycentric urban development (polycentric strategy) and to identify the barriers that have hindered the functional transformation of STUN. A qualitative approach is appropriate, as it enables the integration of GIS mapping and expert interviews as complementary data-collection methods (Tomaszewski, Zarestky & Gonzalez, 2020). Satellite imagery and geospatial data, including population figures from the Ghana Statistical Service, were obtained to assess patterns of urban sprawl and land-use change (Jensen, 2016). GIS mapping was employed to develop a rank-size morphological map of the STUN, illustrating the settlement

hierarchy and the existing transport infrastructure connecting the urban nodes (Bartosiewicz & Marcińczak, 2020; Zhu, Niu & Wang, 2024). The study uses semi-structured interviews to support the GIS-based analysis. Thematic analysis was applied to interview data, structured around two analytical categories, namely spatial coordination and transport integration. Mapping and analysing geospatial data are essential for evaluating the NSDF's polycentric urban development vision for STUN against empirically observed spatial transformations in the region and against idealised characteristics of polycentric regions identified in the literature, thereby enabling the identification of key barriers to polycentric development.

4.2 Participants

Table 1 shows the profile of seven interviewees who participated in semi-structured interviews. Participants were selected using purposive sampling based on their professional experience and institutional involvement in spatial planning in the region. Purposive sampling is widely used in qualitative

research to identify information-rich cases with direct relevance to the research objectives, particularly where expert knowledge is required (Ahmad & Wilkins, 2024). The sample included senior officials from national, regional, and district planning authorities, academics specialising in urban planning and transport, and an engineer. Their diverse yet complementary backgrounds, spanning policy formulation, academic research, and technical implementation, provided a foundation for exploring the dynamics of polycentric development in Sekondi-Takoradi.

4.3 Data-collection methods

4.3.1 GIS data collection

An Area of Interest (AoI) shapefile was digitised in ArcGIS, using the administrative boundaries of the Sekondi-Takoradi Metropolitan Assembly and Effia-Kwesimintim Municipal Assembly. This polygon shapefile served as a spatial mask and was applied in ERDAS Imagine to subset the multispectral satellite imagery, ensuring that

Table 1: Participants interviewed

No	Institution	Experience
1	Land Use and Spatial Planning Authority (Headquarters)	Head of plan preparation
2	Land Use and Spatial Planning Authority (Headquarters)	Director of research monitoring and evaluation
3	Land Use and Spatial Planning Authority (Western Regional Directorate)	Regional director
4	Academic	Transport and Urban Futures
5	Academic	Urban Transportation and Mobilities Planning
6	Academic	Urban Resilience Specialist
7	Local Government Service	District Feeder Roads engineer

Table 2: Interview schedule summary

Theme	Section number	Total questions	Nature of question(s) Open-ended/Closed-ended
Official position and experience	1-2	2	Q1: Open; Q2: Closed
NSDF	3	1	Open
Metropolitan spatial development framework or structure plan	4	1	Open
Urbanisation issues in the metropolis and/or region	5	1	Open
Long-term spatial strategy	6	1	Open
Aims of the spatial strategy	7	1	Open
Polycentric development model	8-9	2	Q8: Closed (Yes/No confirmation) followed by Open; Q9: Open (conditional on Q8 response)
STUN policy	10	1	Closed (Yes/No confirmation) followed by Open
Public transportation integration	11-12	2	Open (both)
Additional information or opinions	13	1	Open

all raster datasets were clipped precisely to the study extent.

Multi-temporal satellite imagery from the LANDSAT 4-9 missions (1991-2022) was acquired from the USGS Earth Explorer platform as Level 1 terrain-corrected (L1T) products (USGS, 2020). Pre-processing steps included radiometric correction to minimise sensor and atmospheric distortions and to ensure inter-temporal comparability.

Supervised classification was conducted using a signature-based approach in ENVI and ERDAS Imagine. Training samples (spectral signatures) were collected for four primary land-use/land-cover classes, built-up areas, vegetation, water bodies, and bare land, based on the USGS Land-Use/Land-Cover Classification System (Adjei Mensah *et al.*, 2019). These signatures were used to classify each epoch image, producing thematic raster outputs. The classified maps were then symbolised using standardised colour schemes defined within the attribute tables to ensure cartographic consistency across all time periods.

4.3.2 Interviews

Following an extensive desk review of literature on polycentric urbanism, TOD and key spatial policies, a semi-structured interview guide (see Table 2), were developed to cover the following four themes: polycentric development as a normative concept, polycentric development as observed in STUN, institutional arrangements in the roll-out of the vision, and the role of public transport in supporting polycentric development in STUN. Participation was voluntary, and informed consent was obtained prior to each interview.

4.4 Data analysis and interpretation

4.4.1 GIS mapping and spatial analysis

GIS were used to analyse spatial and temporal patterns of land-use and land-cover change across four benchmark years (1991, 2002, 2015, and 2022),

following established remote sensing-based change detection approaches (Lu *et al.*, 2004). A post-classification comparison technique was employed to quantify land-use and land-cover changes between time periods (Jensen, 2015). Independently classified raster datasets for 1991, 2002, 2015, and 2022 were compared across three intervals: 1991-2002, 2002-2015, and 2015-2022.

The classified outputs from the remote sensing process were integrated into GIS for further spatial analysis and visualisation. The Matrix Union tool in the ERDAS Imagine GIS Analysis module was used to overlay classified images from consecutive years. This process produced both a thematic change map and a transition matrix, which quantified class-to-class conversions and their corresponding spatial extent (km²). The transition matrix enabled identification of dominant land-cover trajectories, such as vegetation-to-built-up and bare land-to-built-up transformations.

Final cartographic outputs, including change maps and classified land-use maps, were refined in ArcMap, where map elements such as legends, scale bars, and north arrows were standardised before exporting the layouts as JPEG images.

In addition, the STUN transport corridor and the Central Business District (CBD) of Takoradi were mapped to assess spatial connectivity and infrastructure development patterns (Rodrigue, Comtois & Slack, 2020).

To further examine the spatial structure of the metropolis, QGIS was used to generate a rank-size morphological map, illustrating settlement hierarchy and the connectivity of transport networks between urban nodes. This analysis supported the assessment of morphological polycentricity within the region (Bartosiewicz & Marcińczak, 2020).

4.4.2 Interviews

Interview transcripts were thematically analysed to assess the alignment between urban planning practice and policy and the core principles of polycentricity and public transport-oriented development, following established qualitative analysis approaches (Braun & Clarke, 2021). Using direct *verbatim* quotations from participants, responses were examined across four analytical categories: STUN as a normative polycentric urban region; the operationalisation of STUN as a functional polycentric urban system; urban governance and the pursuit of polycentricity, and the relationship between spatial planning, transport, and polycentric development in STUN. This approach enabled an examination of STUN as both a policy construct and a lived urban reality, reflecting the distinction between normative and functional polycentricity highlighted in the literature (Burger & Meijers, 2012). The analysis further acknowledges that polycentric development manifests differently across contexts, particularly in cities of the Global South (Harrison & Todes, 2015).

4.5 Limitations of the study

While the study design included perspectives from the informal transport union (GPRTU), an urban planner from the Sekondi-Takoradi Metropolitan Assembly, and a representative from the State Housing Company (SHC), access constraints ultimately prevented their participation. The absence of commuter-level travel data constitutes a limitation, precluding a detailed analysis of the functional integration between urban nodes. 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. Nevertheless, the triangulation of spatial, documentary, and interview data provides a grounded and multidimensional understanding of how the STUN model is materialising in practice.

5. FINDINGS AND DISCUSSION

5.1 Land-use change

The years 1991-2022 have been characterised by extensive urban expansion that has morphologically altered the Sekondi-Takoradi metropolis. Driven by economic growth, population growth, and the oil and gas industry, the built environment has expanded significantly (see Table 3), recording a net increase of 27.49% over the study period, with the most rapid growth (21.23%) occurring between 2015 and 2022. This sporadic wave of horizontal expansion has come at the expense of agricultural and forested lands, as reflected in the substantial decline in vegetation cover by 24.98%, alongside a smaller reduction in water bodies of 0.44%. Bare land initially increased during earlier periods but ultimately recorded a slight net decrease of 2.08%, suggesting its transitional role in the conversion process from natural land to built-up areas. This rapid process of land conversions is closely linked to the oil and gas industry, which brought about an increase in demand for urban infrastructure, thereby creating “competition for land uses such as agriculture, residential development, and industrial development” (Respondent 1, interview 28 August 2024). From Figure 3, it can be observed that 23% of all land-use changes in the metropolis occurred within the five-year period (2015-2022) of the three-decade interval.

5.2 STUN as a normative polycentric urban region

The findings indicate that polycentricity within STUN has emerged predominantly as a normative planning response to rapid, poorly regulated urban expansion rather than as an outcome of endogenous spatial or economic restructuring. This aligns with the literature that frames polycentric development in the Global South as a policy-driven model adopted to counteract the negative externalities of monocentric growth, including congestion, land speculation, and

spatial inequality (Parnell & Pieterse, 2014; David & Kilani, 2022).

Interview data situate the introduction of polycentric planning squarely within this regulatory rationale. “The government came in because there was a lot of land grabbing. People and investors were moving into the city, so the government thought it wise to develop a regional spatial development framework to guide the spatial development” (Respondent 1, interview 28 August 2024). This framing resonates with Davoudi’s (2003) argument that polycentricity often first appears as a planning doctrine, intended to impose spatial order retroactively on already fragmented urbanisation trajectories.

The normative character of STUN’s polycentric vision is further reinforced by its formal embedding within statutory planning instruments. As one respondent noted, “I know that the structure plan features the polycentric model. Their SDF also features the polycentric proposal” (Respondent 3, interview

29 August 2024). This confirms that polycentricity is institutionally recognised and codified, even if its functional realisation remains limited. Similar patterns have been documented in African urban planning contexts, where spatial strategies are frequently well articulated on paper but struggle to transition into operational practice (Harrison & Todes, 2015).

Transport infrastructure is positioned as the principal mechanism through which this vision is expected to materialise. The objective is to create efficient transportation networks and systems for efficient mobility within the network. According to Respondent 1, the strategy emphasises “the construction of link roads and a national-level highway, known as the expressway, to enhance connectivity” (Respondent 1, interview 28 August 2024). This reliance on infrastructure-led integration reflects early-stage polycentric strategies identified in the literature, where investments

Table 3: Land-use changes (1991-2002)

Category	1991-2002 Change (km ² & %)	2002-2015 Change (km ² & %)	2015-2022 Change (km ² & %)	Net Change 1991-2022 (km ² & %)
Built up	+3.94 / +1.81%	+9.68 / +4.45%	+46.19 / +21.23%	+59.81 / +27.49%
Bare land	+7.69 / +3.53%	+25.13 / +11.55%	-37.34 / -17.16%	-4.52 / -2.08%
Vegetation	-11.39 / -5.24%	-34.24 / -15.74%	-8.71 / -4.00%	-54.34 / -24.98%
Waterbody	-0.22 / -0.10%	-0.57 / -0.26%	-0.16 / -0.07%	-0.95 / -0.44%

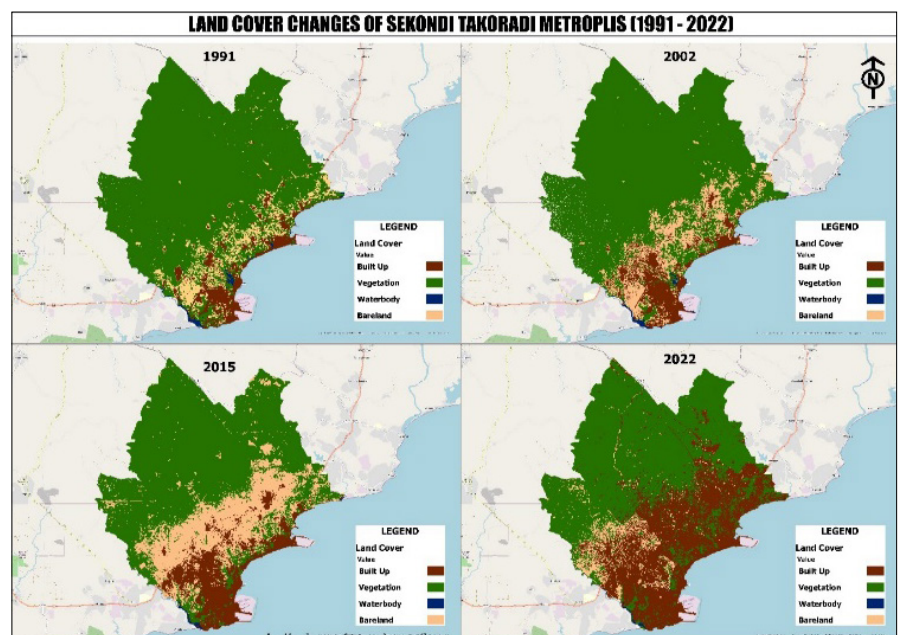


Figure 3: Land-cover changes in Sekondi Takoradi Metropolis (1991-2022)

prioritise inter-nodal accessibility without necessarily generating functional interdependence (Cats & Birch, 2021).

The normative expectations attached to mobility are further revealed in explicit assumptions about travel time thresholds. “In 30 minutes, optimally, we expect one to be able to reach every corner of a network” (Respondent 2, interview 28 August 2024). Such expectations mirror the time-space compression logic commonly associated with polycentric urban regions, where efficient circulation is viewed as a prerequisite for territorial cohesion (Burger & Meijers, 2012). However, as the literature cautions, reduced travel times alone do not guarantee functional polycentricity in the absence of economic complementarities or integrated governance arrangements.

Land-use densification targets further demonstrate the alignment between policy intent and contemporary TOD principles. As articulated by one respondent, “the land use policy goal ... is to have average densities of 90 to 120 persons per hectare” (Respondent 2, interview 28 August 2024). These density thresholds correspond with Cervero’s (2007) and Papa and Bertolini’s (2015) arguments that compact, high-density development is essential for sustaining economically viable mass transit in polycentric regions. Collectively, the evidence suggests that STUN’s polycentric vision is theoretically informed and normatively strong, yet primarily aspirational. “I think the polycentric model is a better option to help in the distribution or decentralisation of certain social and economic services within a particular area” (Respondent 1, interview 28 August 2024).

5.3 Operationalising STUN as a functional polycentric urban region

Despite the clarity of the normative spatial vision articulated in planning frameworks, the findings reveal a pronounced gap between morphological polycentricity and functional integration. This disjuncture reflects the distinction

drawn by Burger and Meijers (2012), where the presence of multiple centres does not automatically translate into interconnected labour markets, economic flows, or commuting patterns.

Respondents consistently questioned the effectiveness of implementation across both metropolitan and peripheral nodes. “I’m not saying it’s well executed in STMA or well executed in Ahanta West or any key district in the region” (Respondent 3, interview 29 August 2024). Such reflections indicate that, while the spatial form of polycentricity is envisioned, its operationalisation remains uneven and incomplete.

A central explanation lies in the absence of continuous and coordinated investment. As one respondent stated, “we are unable to experience consistent investments and continuity in projects and programs that help us achieve the polycentricity as well documented in policy” (Respondent 2, interview 28 August 2024). This finding aligns with Harrison and Todes (2015), who argue that polycentric initiatives in the Global South frequently falter, due to fragmented financing, changing political priorities, and weak institutional capacity.

Vertical misalignment within the planning system further constrains implementation. The lack of awareness and uptake at the local government level was explicitly acknowledged: “have you been to the MMDAs to ask if they are aware of that development?” (Respondent 5, interview 19 September 2024). This reflects the institutional fragmentation highlighted in African planning literature, where national visions are insufficiently translated into local planning practice (Acheampong *et al.*, 2022).

Horizontal coordination challenges compound these issues. “It’s about duplications and competition and nothing getting done” (Respondent 4, interview 19 September 2024). Infrastructure development often follows political incentives rather than spatial logic, with interviewees noting that investments tend to reinforce existing urban primacy

rather than catalyse secondary nodes. To exemplify this, “even though the plan preparation looked at integrating these nodes” (Respondent 3, interview 29 August 2024), “how do you make regional spatial planning happen when you don’t have the institutional capacity to be able to deliver?” (Respondent 4, interview 19 September 2024).

Such dynamics echo Acheampong’s (2019) critique of parallel and competing planning systems in Ghana, where overlapping mandates undermine the coherence required to operationalise regional spatial strategies. As a result, STUN remains spatially designated but functionally constrained.

5.4 Urban governance and the pursuit of polycentricity

Governance emerges as a fundamental structural barrier to the realisation of polycentric development in STUN. While national and regional policies formally endorse integrated and networked urban development, respondents emphasised the absence of institutional arrangements capable of delivering planning at the required regional scale. “We do not have the institutions and traditions in place to do that kind of planning” (Respondent 4, interview 19 September 2024). This reinforces Davoudi’s (2003) assertion that polycentric development is governance-intensive and requires institutional capacities that are often lacking in developing contexts.

Importantly, the challenge is not framed as a deficiency of policy frameworks, but of implementation capacity. “The foundation of policy and law is well laid; what is lacking is the institutional muscle” (Respondent 2, interview 28 August 2024). This policy-implementation gap is well documented in African urban governance literature, where reforms frequently outpace the administrative resources needed for execution (Acheampong *et al.*, 2022).

The continued localisation of planning authority further undermines the regional logic of polycentricity. As noted by Respondent 5, “planning is still done by local authorities, I’m

talking about MMDAs" (Respondent 5, interview 19 September 2024). Polycentric development requires regional planning where "some services should be planned at the regional level. We may need to declare a number of districts as a planning region" (Respondent 5, interview 19 September 2024). Literature on polycentric urban regions stresses that effective implementation requires planning beyond administrative boundaries, supported by regional coordination mechanisms (Natalia & Heinrichs, 2020). In their absence, spatial fragmentation persists, and inter-nodal integration remains unlikely. "The practical challenge is that, even though the NSDF and the new planning legislation see the importance of regional spatial planning, we don't really have the sort of experience and the institutional setup to be able to deliver that mandate" (Respondent 4, interview 19 September 2024).

5.5 Spatial planning, transportation, and polycentric development in STUN

Respondents widely recognise that transport systems are central to achieving polycentric integration, echoing the literature that positions mobility as the functional backbone of polycentric urban regions (Cats & Birch, 2021). As one respondent stated, "there cannot be an efficient polycentric configuration without efficient, reliable public transport" (Respondent 4, interview 19 September 2024). This aligns with Burger and Meijers' (2012) emphasis on transport flows as defining functional polycentricity.

However, the empirical reality departs sharply from this normative ideal. "Our cities ... are not planned to have a multimodal system" (Respondent 6, interview 25 September 2024). Instead, transport planning remains heavily road-oriented, reinforcing patterns of sprawl and automobile dependence. This is explicitly acknowledged in the observation that "almost always, people end up driving, it promotes car use" (Respondent 5, interview

19 September 2024), reflecting critiques by Cervero (2007) and Acheampong *et al.* (2022).

Road expansion is, therefore, perceived not as an enabler of accessibility, but as deepening socio-spatial inequality. As noted by Respondent 1, "it has become difficult for people to move from one place to another using public transport" (Respondent 1, interview 28 August 2024). In contrast, informal paratransit systems remain indispensable despite their inefficiencies. "You cannot do away completely with the existing informal modes of transport" (Respondent 4, interview 19 September 2024). This reflects Obeng-Odoom's (2012) argument that informal mobility systems are central to African urban functionality yet systematically marginalised in formal planning frameworks.

The lack of integration between land-use and transport planning further constrains STUN's transition toward functional polycentricity. "We are unable to get the public transport systems to operate in a much more efficient manner" (Respondent 2, interview 28 August 2024). "Integration is not really there in terms of integrating transportation planning and urban planning" (Respondent 1, interview 28 August 2024). As in many Global South contexts, transport and

spatial planning proceed in parallel rather than being strategically aligned through TOD or corridor-based densification (Cervero *et al.*, 2004; Papa & Bertolini, 2015).

Figure 4 shows the corridor used by the Ghana Private Roads Transport Union (GPRTU) to transport citizens within STUN. While the road networks remain the dominant mode of mobility in the region, "there seems to be some detachment when it comes to looking at the railway development and other modes of transportation within the city" (Respondent 5, interview 19 September 2024). This detachment is reflected in the fact that, while informal transport operators dominate the road-centred urban network, there are no provisions in policy or practice for integrating them into the multi-modal transport policies for polycentric development. "It's perfectly possible that you have a transport system that combines BRT, whether by bus, by train or by tram, with the paratransit with two Wheelers, Pragma Aboboyas, etc." (Respondent 4, interview 19 September 2024). "An efficient public transportation system 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 5, interview 19 September 2024).

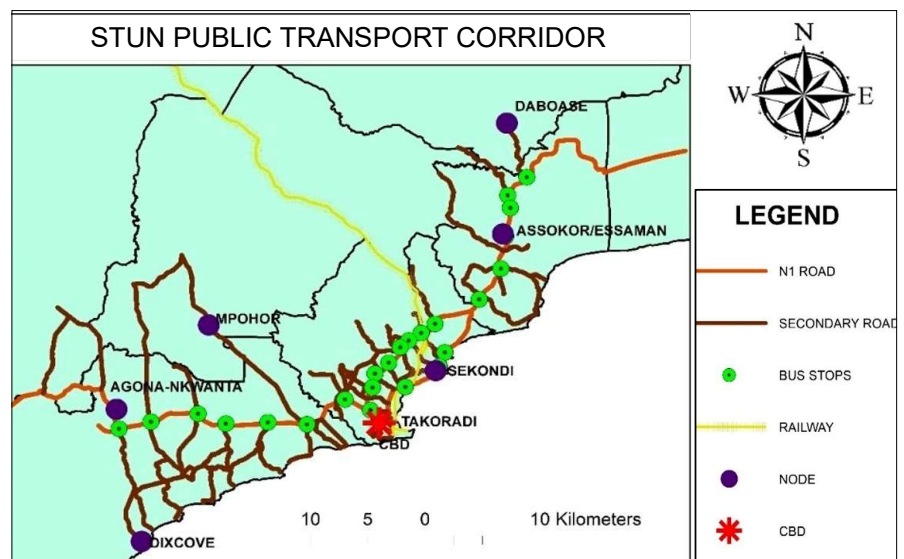


Figure 4: The PUR's public transport corridor

Source: Authors, 2025

These findings affirm Acheampong's (2019) critique of Ghana's spatial planning landscape, where parallel systems – one under the National Development Planning Commission (NDPC) and another under the Land Use and Spatial Planning Authority (LUSPA) – create competing mandates and implementation gaps.

The broader implication of these findings is that STUN remains a largely normative construct – symbolically important within national spatial policy, but materially unsupported by institutional arrangements or transport systems. This mirrors concerns in the literature that polycentric development strategies, while conceptually appealing, require more than morphological designation to succeed (Davoudi, 2003; Harrison & Todes, 2015). Without institutional capacity, dedicated funding, integrated governance, and recognition of informal systems, the polycentric vision is unlikely to be realised.

Overall, the findings demonstrate that STUN remains a largely normative and policy-driven polycentric construct. While the spatial vision is theoretically informed and institutionally articulated, its translation into functional urban practice is constrained by governance fragmentation, investment discontinuity, transport system mismatch, and limited recognition of informal urban realities. Consistent with the literature, these findings suggest that polycentricity in Ghana remains aspirational – symbolically powerful, yet operationally constrained.

6. POLICY IMPLICATIONS

To effectively implement a polycentric urban development model in Ghana, it is essential to enhance the capacity of spatial planners, especially practitioners at the local and regional levels, to address the systemic challenges limiting the realisation of polycentric development in the region. Key policy actions must include capacity building to equip local professionals with modern tools and techniques; institutional reform to streamline mandates,

potentially through a unified Department of Urban Management; and support for regional planning initiatives to support inter-urban collaboration. Ultimately, these efforts must be directed towards translating normative concepts into actionable plans, providing planners with the technical support needed to convert theoretical frameworks such as polycentricity into indicative plans that can effectively guide infrastructure and land-use decisions.

In contemporary urban design, polycentric development and TOD require aligning railway corridors with land-use strategies; as such, policy should focus on integrating land-use planning, particularly around railway stations and corridors. Policy must prioritise an integrated approach to any future railway renewal projects. This encompasses evaluating the accessibility of station locations in relation to the origins and destinations in the metropolitan area and the complementary land uses around station areas, affordable housing policies and pedestrian-friendly urban environments. This integration is essential not only for generating ridership, but also for transforming station areas into vibrant hubs that attract, generate and reduce the need for commuting.

First, national and regional policy must mandate a shift beyond road-centric planning, by strategically integrating modern transit systems such as BRT or Light Rail with the existing, vital ecosystem of informal transport (trotros, pragaas, aboboyaas, and legalised okada). A key action is the formal integration of these informal operators, assigning them defined and complementary roles within a unified, multi-modal system. Secondly, policy should champion the development of context-specific TOD corridors. These corridors would function as the backbone of a multimodal system polycentric region, governed by a comprehensive regulatory framework that seamlessly combines all commuting modes. Crucially, this entire network must be designed around people, not vehicles. This requires a dedicated policy focus on creating and protecting

safe, high-quality spaces for non-motorised transport, especially within and around all transport hubs. This physical integration must be coupled with capacity-building programmes for informal operators to enhance service quality and safety. By implementing this integrated approach, Ghana can forge a more inclusive, efficient, and sustainable urban transport system that serves all social classes.

7. CONCLUSION

The polycentric model is recommended by major agendas such as the New Urban Agenda, NSDF, and ESDP as the ideal strategy to manage rapid urbanisation and mitigate associated issues such as sprawl and congestion. Nevertheless, with an expected 2.5 billion new urban dwellers by 2050, Agyeman *et al.* (2019) contend that urban scholars have to transcend the frontiers of existing urban structure models to better depict the spatial evolutions of sub-Saharan African cities. This article set out to examine the implementation of Ghana's national spatial development agenda through a case study of STUN. Drawing on spatial analysis, policy review, and expert interviews, it explored whether the region exhibits the functional characteristics of a polycentric urban system, and what role public transport and institutional arrangements play in supporting or constraining that vision.

The findings reveal a significant policy-practice gap. Although national and regional planning frameworks clearly articulate the ambition to decentralise urban growth and promote balanced regional development, this ambition has not materialised in the case of STUN. Instead, the urban system remains dominated by Takoradi, with limited functional integration between surrounding nodes. The spatial form may appear polycentric, but the absence of coordinated transport systems, land-use planning, and institutional governance prevents this morphology from translating into a functional network.

The article confirms key arguments in the contemporary literature: polycentric development requires more than spatial designation – it depends on transport connectivity, land-use integration, and, critically, effective governance. Ghana's planning context, shaped by the coexistence of parallel institutional systems (under Acts 480 and 925), lacks the coordination mechanisms necessary to implement its spatial vision. Moreover, the persistent exclusion of informal transport systems further undermines the potential for integrated, inclusive urban development.

In contributing empirical evidence from a second-tier city, this article adds to the limited body of work on how polycentric policy frameworks unfold in practice in the Global South. It highlights the urgent need for stronger regional coordination bodies, improved integration between planning and transport sectors, and more inclusive recognition of informal actors who shape urban mobility. Future research should expand on these insights, by incorporating commuter-level data and examining similar cases across other designated urban networks in Ghana. There is also an opportunity to explore institutional reform pathways that could support the operationalisation of national spatial development goals in contexts marked by fragmentation, informality, and rapid urban change.

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