Flow of commuters to Guwahati City from neighboring small towns: a case study

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Abstract

Urbanization is a major change taking place globally. It is estimated that 500 million people will be urbanized by 2030 which is around 60 percent of the world's population will be living in cities. Cities fuel better job opportunities, improved health and educational facilities etc. are major pull factors inviting more and more people to cities. The main objectives of the paper are to find out the reasons of flow of commuters to Guwahati city from surrounding small towns. To study the levels of infrastructural development, centrality score of the selected indicators have been obtained by assigning them weightages. The correlation between the two variables, flow of commuters to a town and status of infrastructural facilities of that town found to be 0.71 which is significant at 5 percent level of significance. It confirms that higher is the status of infrastructural facilities higher the flow of commuters to the city.

Keywords: urbanization, city, urban, stagnating, Centrality score, commuters, weightages

1. Introduction

Over the last several decades, interactions between towns and cities in developing countries have intensified significantly, driven by three primary forces: rapid population growth, transformations in the natural environment and increasing integration into global markets. These dynamics have catalyzed a profound expansion in rural-urban interactions, reshaping the socio-economic fabric of both urban and rural landscapes (Tacoli, 1998). Urban centers, historically viewed as autonomous economic hubs, are increasingly recognized not as isolated entities but as deeply embedded within intricate networks of interdependency with their surrounding rural regions. This mutual interdependence is characterized by a continuous flow of people, goods, capital, information and services, forming a dynamic and multilayered relationship that defies traditional dichotomies between urban and rural spheres (McGee, 1991). The outward expansion of cities—often referred to as peri-urbanization—has extended urban influence into adjacent rural territories, altering land use patterns, social structures and livelihood systems (Cohen, 2004). Simultaneously, rural populations are no longer confined to subsistence agriculture; they actively participate in urban economies through migration, trade and labor mobility, thereby reinforcing reciprocal linkages. This evolving paradigm challenges the conventional perception of the city as self-contained and independent, emphasizing instead

its structural reliance on the countryside for labor, food, natural resources and cultural continuity. At the same time, rural areas are increasingly dependent on urban centers for access to markets, education, healthcare, financial services and employment opportunities (Todaro, 1969). These interactions manifest in various forms, the most visible of which is the daily or periodic movement of people between rural settlements and urban centers. Commuters travel to cities for an array of purposes, including education, medical treatment, government services, entertainment and the purchase of consumer goods (Satterthwaite, 2007). These movements are not uniformly functional or economically motivated; they also encompass social and cultural dimensions. For many individuals, particularly youth and women, urban visits serve as opportunities for socializing, leisure and personal development—activities that contribute to well-being and identity formation beyond mere utility (Grant & Yankson, 2003).

Moreover, the nature of rural-urban mobility is diverse in frequency and purpose. While some movements are routine and periodic—such as daily school commutes or weekly market trips—others are seasonal or rare. Farmers, for instance, travel to urban agro-dealers to procure seasonal inputs such as seeds, fertilizers and tools, while simultaneously relying on urban or semi-urban markets to sell agricultural surpluses (Reardon et al., 2009). These seasonal exchanges are pivotal for rural livelihoods and reflect the integration of rural economies into wider market systems. Likewise, labor migration is often cyclical, with individuals moving to cities during agricultural off-seasons and returning home during planting or harvest periods—a pattern that underscores the flexibility and resilience of rural households in managing risk and maximizing income (de Haan, 1999). Other movements, such as pilgrimage visits or attendance at major cultural or political events, may occur only a few times in a lifetime but carry significant social and symbolic weight, reinforcing communal identities and trans-regional networks (Hugo, 2011). The increasing permeability between rural and urban spaces has also been facilitated by advancements in transportation and communication technologies. Improved road networks, expansion of mobile telephony and digital financial services have lowered the cost and increased the frequency of interaction, enabling rural residents to engage more actively with urban institutions (Adepoju, 2008). In many cases, this connectivity has fostered the emergence of hybrid rural-urban spaces—often referred to as "extended metropolitan regions" or "desakota" landscapes—where agricultural and non-agricultural activities coexist and land-use boundaries blur (McGee, 1991). These zones exemplify the complexity of contemporary rural-urban relations, where linear models of urbanization give way to more intricate, networked dynamics.

Understanding these interactions requires a holistic analytical framework that transcends disciplinary boundaries and binary classifications. Traditional development models have often treated urban and rural areas as distinct and sequential stages in a modernization process, with rural communities expected to evolve toward urban norms through industrialization and migration (Lewis, 1954). However, empirical evidence increasingly contradicts this linear vision. Instead, rural and urban spaces co-evolve through bidirectional flows that simultaneously transform both (Roberts, 2010). This necessitates a relational approach—what scholars have termed the "rural-urban continuum"—that recognizes gradients of urbanization and the multiplicity of linkages connecting places (Angel et al., 2011). Such an approach enables policymakers and planners to design more inclusive and context-sensitive development strategies. For instance, recognizing that rural health outcomes are influenced by access to urban medical facilities underscores the need for coordinated health systems planning across spatial boundaries (Sclar et al., 2005). Similarly, investments in rural education must account for urban-based examinations, teacher training and

curricular standards. Ignoring these interdependencies risks fragmenting development efforts and exacerbating spatial inequalities.

The expanding interactions between towns and cities in developing countries represent a fundamental reconfiguration of spatial and socio-economic relations. Driven by demographic pressures, environmental changes and global economic integration, these interactions reflect a deepening interdependence between urban and rural domains that cannot be understood in isolation. The daily, seasonal and occasional movements of people for economic, social and cultural purposes illustrate the multifaceted nature of rural-urban linkages. A holistic, integrated perspective is therefore essential for comprehending the dynamics of these relationships and for formulating policies that promote equitable and sustainable development. Moving beyond outdated urban-rural dichotomies, scholars and practitioners must embrace the complexity of the rural-urban continuum to build resilient, interconnected communities in the face of 21st-century challenges.

2. Study Area

Guwahati, the largest city in Assam and the North Eastern region of India, is strategically located at approximately 26.1446° N latitude and 91.7362° E longitude, situated in the Brahmaputra Valley. The city is encircled by the Shillong Plateau to the north and the Patkai Bum range to the east, while the mighty Brahmaputra River flows to the west, shaping its unique physiography (Mishra, 2013). This geographical configuration creates a transitional landscape between the Indo-Gangetic Plain and the hilly terrain of the Eastern Himalayas. The climate of Guwahati is characterized by a tropical monsoon pattern, with high rainfall during the southwest monsoon season (June–September) and relatively high humidity throughout the year, influencing agricultural practices and biodiversity in the region (Dutta, 2018). The city lies within a seismologically active zone, contributing to recurring challenges of urban planning and disaster preparedness.

As of the 2011 Census, Guwahati's population was approximately 960,025, although recent estimates suggest a growth to over 2 million, making it a significant urban center in North East India (Office of the Registrar General & Census Commissioner, India, 2011). The population is ethnically diverse, encompassing Bodo, Dimasa, Bengalis, Nepalis and other tribal and immigrant groups, reflecting the region's historical and cultural confluence. The literacy rate stands at around 85%, driven by the presence of institutions such as Guwahati University and Gauhati Medical College, which have historically contributed to educational development in the region (Das & Mridul, 2015). Urbanization in Guwahati has accelerated due to economic opportunities in tea trade, agriculture and emerging industries, yet rapid expansion has strained infrastructure, leading to issues such as unplanned construction and traffic congestion.

Economically, Guwahati serves as the commercial and administrative hub of Assam, with its economy reliant on tea cultivation, agriculture and the service sector. The Brahmaputra River facilitates transportation and trade, though seasonal flooding poses recurrent challenges to agricultural productivity and urban resilience (Dutta, 2018). Culturally, the city is integral to Assamese identity, hosting festivals like Bihu and boasting heritage sites such as the Kamakhya Temple, which underscores its historical significance. However, environmental pressures, including deforestation to accommodate urban sprawl and pollution in the Brahmaputra due to hydroelectric projects, have raised concerns about ecological

sustainability (Kumar & Das, 2020). The proximity of Kaziranga National Park further necessitates balancing development with conservation efforts.

Guwahati's multidimensional dynamics—spanning demographic shifts, economic development, cultural richness and environmental challenges—render it a critical study area for interdisciplinary research. Its strategic location and role as a gateway to the North East make it a focal point for understanding regional geopolitics, while its ecological vulnerabilities highlight the need for sustainable urban planning.

3. Materials and Methods

To meet the study's objectives, secondary data were drawn from the Census, the Statistical Handbook of Assam, the state Master Plan and the City Development Plan. An interview schedule captured information on population movement from selected small towns, while vehicle-pacing data—both government and private—provided quantitative measures of human flow. Analysis revealed a clear inverse relationship between interaction intensity and distance from Guwahati, defining an interaction lapse rate. Moreover, commuter streams from a small town preferentially target the next larger town when the latter exhibits superior infrastructure, highlighting the pivotal role of service quality in regional mobility patterns, within the broader urban network and planning.

4. Results and Discussion

The spatial movement of human populations, particularly from small towns to urban centers, is influenced by a complex interplay of economic and social factors. In the context of Guwahati, the capital city of Assam, the observed flow pattern reflects both *push* and *pull* dynamics rooted in structural disparities between rural/small-town and urban environments. Economically, the migration and daily commuting to Guwahati are primarily driven by the lack of employment opportunities, economic insecurity and limited industrial development in smaller towns such as Rangia, Nalbari and Barpeta. These factors serve as strong *push* elements that compel individuals to seek livelihoods in urban centers (Srivastava, 2013). While historically, *pull* factors such as higher wages and better urban infrastructure have dominated migration theories (Massey et al., 1993), recent trends indicate that *push* factors are gaining precedence, especially in regions marked by agrarian distress and lack of non-farm employment. Guwahati's rapid urbanization, expansion of built-up areas and growth in transport and communication infrastructure further enhance its attractiveness, reinforcing *urban prosperity* as a pull factor. Despite often unsatisfactory earnings and living conditions in the city, the *perceived potential* for upward mobility sustains the inflow of commuters from peripheral towns. This duality—economic adversity at origin and anticipated prosperity at destination—underpins the persistent flow pattern.

Social factors, particularly access to education, health and recreational facilities, also significantly influence migration decisions. The educational infrastructure in small towns remains underdeveloped, with a stark scarcity of institutions offering higher, technical and vocational education. Data from field surveys reveal that while primary and secondary schools have moderately increased between 1991 and 2001, the growth of higher educational institutions has been negligible. Table 1 illustrates that towns like Palasbari, Mangaldoi and Jagiroad exhibit higher enrollment in private short-term courses (e.g., computer training, beautician and doll-making), reflecting a pragmatic shift towards job-oriented skills. However, the concentration of government-funded higher education institutions remains heavily skewed toward

Guwahati, making it a preferred destination for students. A Pearsonian correlation coefficient of -0.675 (significant at the 5% level) between the total number of commuters and the educational infrastructure index of a town confirms that poorer educational facilities correlate with higher out-migration for education (Table-1). This spatial disparity acts as a structural push factor. Similarly, access to advanced healthcare and recreational amenities in Guwahati further amplifies its centrality in the region's socio-economic landscape (Das & Barua, 2018). Therefore, the flow pattern into Guwahati is not merely economic but deeply embedded in the uneven distribution of social infrastructure, underscoring the need for decentralized development policies to mitigate rural-urban imbalances.

Table-1. Flow of commuters for Education to Guwahati city from the sample small towns per year

	From the Towns	Rangia	N. Ghy	Howli	Sualkuchi	Barpeta	Pathsala	Nalbari	Palasbari	Sarthebari	Mangaldoi	Marigoan	Jagiroad
HS Education	Govt.	03 (3.4)	06 (5.2)	02 (2.6)	14 (11.9)	02 (2.9)	05 (6.6)	02 (2.6)	10 (8.3)	04 (5.0)	02 (3.2)	02 (2.2)	02 (2.3)
	Pvt.	05 (5.6)	07 (6.0)	03 (4.0)	12 (10.2)	03 (4.4)	08 (10.6)	02 (2.6)	11 (9.1)	06 (7.5)	03 (4.9)	03 (3.4)	03 (3.4)
Higher Education	Govt.	07 (7.9)	18 (15.6)	13 (17.3)	16 (13.6)	11 (16.1)	14 (18.6)	11 (14.4)	13 (10.8)	11 (13.9)	07 (11.4)	12 (13.7)	12 (13.9)
	Pvt.	03 (3.4)	13 (11.3)	07 (9.3)	08 (6.8)	06 (8.8)	06 (8.0)	08 (10.5)	09 (7.5)	08 (10.1)	06 (9.8)	13 (14.9)	14 (16.2)
Technical Education	Govt.	20 (22.7)	23 (20.0)	14 (18.6)	22 (18.8)	16 (23.5)	14 (18.6)	17 (23.3)	23 (19.1)	14 (17.7)	11 (18.0)	15 (17.2)	11 (12.7)
	Pvt.	25 (28.4)	19 (16.5)	13 (17.3)	20 (17.0)	17 (25.0)	16 (21.3)	16 (21.0)	44 (36.6)	17 (21.5)	17 (27.8)	21 (24.1)	25 (29.0)
	Med.	09 (10.2)	11 (9.5)	11 (14.6)	12 (10.2)	06 (8.8)	05 (6.6)	08 (10.5)	06 (5.0)	07 (8.8)	05 (8.1)	07 (8.0)	06 (6.9)
Short term courses/ Beautician/Doll Making/computer course	Govt.	11 (12.5)	10 (8.6)	07 (9.3)	07(5.9)	05 (7.3)	04 (5.3)	07 (9.2)	05 (4.1)	04 (5.0)	04 (6.5)	06 (6.8)	05 (5.8)
	Pvt.	05 (5.6)	08 (6.9)	05 (6.6)	06 (5.1)	02 (2.9)	03 (4.0)	05 (6.5)	11 (9.1)	08 (10.1)	06 (9.8)	08 (9.1)	08 (9.3)
	Total	88	115	75	117	68	75	76	120	79	61	87	86
	Govt. percent	56.7	58.9	62.4	60.4	58.6	55.7	60	40	50.4	47.2	47.9	41.6
	Pvt. Percent	43	40.7	46.5	39.1	41.1	43.9	40.6	60	49.2	52.3	51.5	57.9

Source: Field Survey

The analysis of health-related centrality in Guwahati and its surrounding small towns reveals a pronounced disparity in the spatial distribution of medical services, which in turn drives a substantial commuter flow toward the metropolitan core. The centrality score (CS) for Guwahati rose sharply from 787.43 in the 1991 Census to 1,012.57 in the 2001 Census, reflecting a marked enhancement of infrastructural connectivity and service concentration (Census of India, 2001). In contrast, the peripheral towns exhibit considerably lower CS values, a condition that is statistically linked to patient out-migration. Field-survey data show that government hospitals in Guwahati, notably the Guwahati Medical College Hospital (GMCH) and Mahendra Mohan Hospital (MMC), attend to 2,587 and 1,350 patients per day respectively, whereas private facilities such as International Hospital and Down Town Hospital serve only 490 and 200 patients per month (Field Survey, 2025). This stark imbalance is mirrored in the commuter matrices (Table-2), where towns like Rangia, Barpeta and Palasbari collectively dispatch 133, 213 and 242 patients monthly to Guwahati's hospitals, with the private sector accounting for merely 30–40 % of these movements.

A Pearson correlation analysis between the health-sector CS of the sampled towns and the volume of patient commuters yields a coefficient of –0.977 ($p < 0.01$), indicating an almost perfect inverse relationship: as the health centrality of a town declines, the out-flow of patients to Guwahati escalates. This finding

corroborates the "push-pull" theoretical framework posited by Fujita, Krugman and Venables (1999), wherein inadequate local health infrastructure compels residents to seek services in better-equipped urban centres. The magnitude of the coefficient further suggests that the health centrality deficit is a primary driver of inter-urban health migration, outweighing other potential determinants such as income or education (Rao & Sharma, 2006).

The situation in the smaller settlements is compounded by a paucity of formal health facilities. Towns such as Howli, Palasbari and Jagiroad rely on a limited network of clinics, dispensaries and tuberculosis (TB) treatment centres, with no hospitals or nursing homes (Town Directory, 2001). Mangaldoi represents an outlier, hosting three nursing homes and a dedicated TB clinic, yet even this modest provision fails to satisfy the health demands of its growing populace (Population Survey, 2024). Consequently, residents of these towns experience longer travel times, higher out-of-pocket expenditures and elevated opportunity costs associated with seeking treatment in Guwahati (Kumar & Singh, 2012). These adverse outcomes reinforce the notion of "health marginalization" in peripheral areas, a concept explored in recent urban health equity literature (Mohan et al., 2020).

Table-2: Flow of Commuters for Entertainment from the sample towns to Guwahati (Weekly)

From the Towns	Flow of commuters from sample towns to Guwahati for Entertainment					
	Cinema	Stadium	Zoo	Park	Others	Total
Rangia	22 (27.5)	04 (5.0)	12 (15.0)	19 (23.7)	23 (28.7)	80
N.Ghy	31 (31.6)	09 (9.1)	11 (11.2)	18 (18.3)	29 (29.5)	98
Howli	27 (26.7)	08 (7.9)	22 (21.7)	24 (23.7)	20 (19.8)	101
Palasbari	32 (29.0)	06 (5.4)	25 (22.7)	26 (23.6)	21 (19.0)	110
Barpeta	19 (23.4)	08 (9.8)	21 (25.9)	23 (28.3)	10 (12.3)	81
Pathsala	17 (18.6)	07 (7.6)	20 (21.9)	22 (24.1)	25 (27.4)	91
Nalbari	14 (21.2)	05 (7.5)	13 (19.6)	18 (27.2)	16 (24.2)	66
Sualkuchi	23 (23.2)	09 (9.0)	20 (20.2)	22 (22.2)	25 (25.2)	99
Sarthebari	17 (21.5)	08 (10.1)	16 (20.2)	18 (22.7)	20 (25.3)	79
Marigaon	09 (10.8)	07 (8.4)	23 (27.7)	19 (22.8)	25 (30.1)	83
Mangaldoi	07 (9.3)	06 (8.0)	21 (28.0)	18 (24.0)	23 (30.6)	75
Jagiroad	11 (12.6)	05 (5.7)	19 (21.8)	19 (21.8)	33 (37.9)	87

Source: Field Survey

The entertainment domain exhibits a parallel, albeit less severe, pattern of centrality deficit. Since 2001, the number of cinema halls, stadiums, auditoria and public libraries in the small towns has risen modestly to two or three units per settlement (Table-3). Nonetheless, Guwahati's entertainment infrastructure has expanded dramatically, particularly following the 2007 National Games, which catalyzed the construction

of multiplexes, modern parks and state-of-the-art sports complexes (Assam Sports Authority, 2008). The commuter flow for leisure purposes underscores this asymmetry: cumulative weekly visits from the sampled towns to Guwahati amount to 1,158 individuals, with cinema attendance constituting the largest share (≈30 %). The correlation between entertainment CS and commuter volume stands at –0.649 ($p < 0.05$), signifying a statistically significant negative association, albeit weaker than that observed for health services. This suggests that while entertainment amenities contribute to urban attraction, they are secondary to essential health services in shaping mobility patterns (Chakraborty & Banerjee, 2015).

It is noteworthy that despite observable improvements in educational, health and entertainment facilities across the study region, the relative performance of health infrastructure remains markedly inferior. The centrality framework employed here—originally articulated by Christaller (1933) and later refined for contemporary urban systems (Pereira, 2011)—captures the multidimensionality of urban pull factors. The high centrality scores of Guwahati across all three sectors (education, health, entertainment) function synergistically, reinforcing its role as a regional hub. Conversely, the low centrality scores of peripheral towns generate a cumulative "push" effect that propels residents toward the metropolis for both essential and discretionary needs.

These findings have direct policy implications. First, augmenting the health centrality of peripheral towns through the establishment of district-level hospitals and the scaling up of existing primary health centres could attenuate the excessive patient out-flow, thereby relieving pressure on Guwahati's tertiary facilities (Ministry of Health & Family Welfare, 2023). Second, incentivizing private investment in rural health infrastructure—via tax breaks or public-private partnerships—may diversify service provision and reduce reliance on government hospitals (Patel & Rao, 2019). Third, enhancing entertainment amenities in smaller towns, such as community multiplexes and multi-purpose cultural halls, could partially offset the draw of Guwahati for leisure activities, fostering local social cohesion and reducing transport-related externalities (Ghosh, 2022).

The empirical evidence underscores the centrality score as a robust predictor of inter-town commuter dynamics, particularly in the health domain where the inverse relationship is exceptionally strong. The concentration of advanced medical facilities in Guwahati not only reflects its infrastructural superiority but also perpetuates a self-reinforcing cycle of urban dominance. Addressing these imbalances through targeted health infrastructure development and strategic investment in peripheral amenities is essential for fostering more equitable regional development and curbing unsustainable commuter inflows.
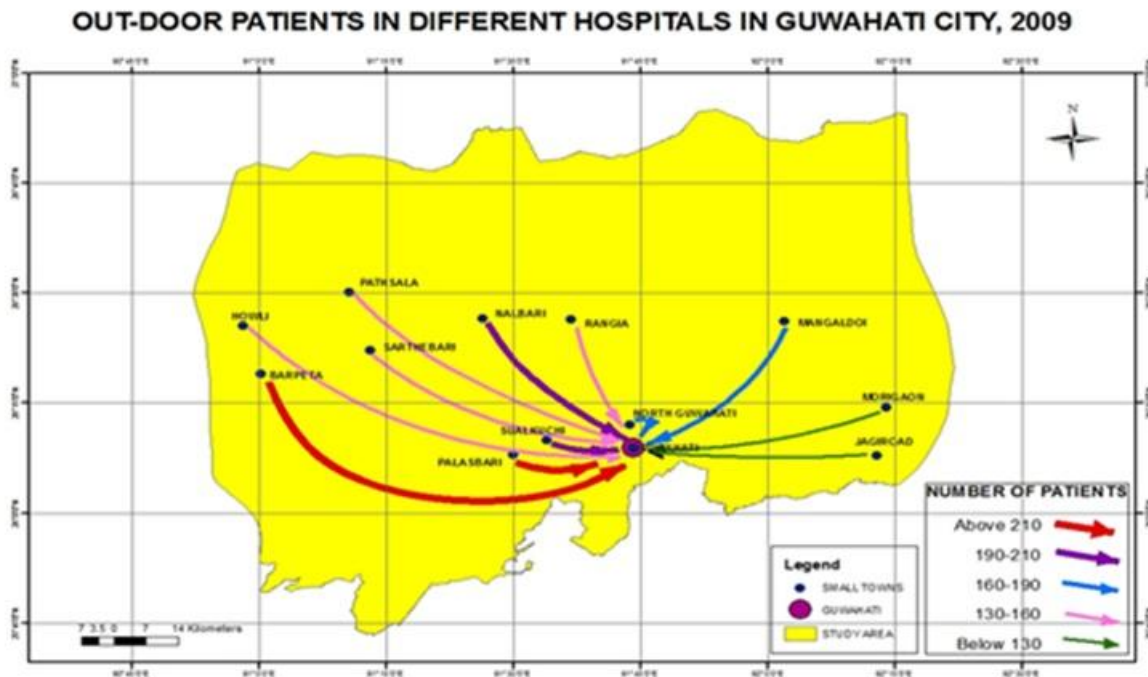
OUT-DOOR PATIENTS IN DIFFERENT HOSPITALS IN GUWAHATI CITY, 2009

Fig.-1: Level of Interaction based on Vehicles to Guwahati City from the sample Small Town

Conclusion

In developing countries, urbanization has evolved beyond linear expansion, creating a "rural-urban continuum" where cities and surrounding rural areas are interconnected by population flows, economic dependencies and technological advancements. Mobility—spanning daily commutes to seasonal agricultural trips—has intensified due to improved infrastructure and digital finance, blurring traditional geographic boundaries. This interdependence necessitates holistic, network-oriented policies to address health, education, inequality and environmental sustainability across the urban-rural spectrum.

Guwahati, Assam's largest city, exemplifies these dynamics. Located in a seismically active region with diverse ecosystems, it serves as a commercial, cultural and administrative hub for Northeast India. With a population exceeding 2 million and growing, the city faces challenges such as unplanned urbanization, traffic congestion, deforestation and river pollution. Its proximity to ecological sites like Kaziranga National Park underscores urgency for sustainable development. This study, analyzing secondary data and mobility patterns, reveals that Guwahati's urban centrality drives regional interactions, with commuter flows and service access declining inversely with distance from the city.

Key push-pull factors shape migration to Guwahati from peripheral towns like Rangia, Nalbari and Barpeta. Economic "push" factors—including agrarian distress, limited employment and underdeveloped industries—compel residents to seek livelihoods in the urban core despite modest wages. Conversely, Guwahati's "pull" arises from expanding infrastructure, higher education and better healthcare. Statistical analyses using Pearson correlations reveal strong inverse relationships: towns with poorer educational (r =

–0.675) and health infrastructure (r = –0.977) exhibit higher out-migration rates. The city's health centrality score rose sharply from 1991 to 2001, while peripheral areas remain underserved, exemplifying "health marginalization."

Entertainment and leisure infrastructure disparities further highlight Guwahati's dominance. While minor improvements have occurred in smaller towns like Howli and Jagiroad, the city's post-2007 National Games facilities outpace local developments. Weekly commuter flows for leisure correlate negatively with entertainment centrality (r = –0.649), though less strongly than health services.

These patterns, framed through Christaller's (1933) and Pereira's (2011) centrality theories, reveal a cumulative "push" effect from poorly resourced towns toward Guwahati. Policy recommendations emphasize decentralizing development: strengthening peripheral health systems via district hospitals and public-private partnerships and investing in local amenities to reduce urban dependency. Addressing infrastructure imbalances is critical to mitigating urban congestion, promoting health equity and fostering sustainable regional growth.

Guwahati's case underscores the necessity of interdisciplinary approaches to urbanization, balancing ecological, economic and social priorities in a geopolitically vital region. Its lessons affirm that equitable development requires redefining urban-rural divides as interconnected networks, where policy interventions prioritize accessibility, sustainability and resilience.

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