

## CLIMATE-RESILIENT AGRICULTURE IN COASTAL KHULNA: UNVEILING THE SPATIAL DYNAMICS OF PERI-URBAN GROWTH CENTRES

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**Abstract:** This paper addresses the critical challenges posed by climate change to small-scale agriculture in coastal Bangladesh - a region highly susceptible to tidal surges, salinity, flooding, river erosion, and cyclones. The Bangladesh Delta Plan 2100 (BDP 2100), one of the most comprehensive policy documents on climate change, prescribes integrated spatial planning and production-based strategies for building agricultural resilience against climatic threats. This study advocates for a shift from production-based strategies to a market-enabling approach, emphasizing the role of peri-urban growth centres in sustaining smallholder farmers. Using Khulna as a case study, this qualitative and ethnographic research critically examines the morphology of peri-urban growth centres in Khulna. It employs spatial analysis, including mapping techniques, to explore the regenerative functions and spatial dynamics of organically developed growth centres. The research uses Rahul Mehrotra's Kinetic City theoretical framework to assess the complex interplay of spatial dynamics in informally developed peri-urban growth centres of the coastal cities. The findings reveal three overlapping layers of spatial dynamics that are essential for creating successful peri-urban growth centres for coastal cities. The lessons from the case study could contribute to developing climate-adaptive planning and policymaking for peri-urban growth centres that can support resilient coastal agriculture aligning with the Sustainable Development Goals (SDGs) for 2030.

**Keywords:** *Growth center, Spatial dynamics, Resilient agriculture, Climate change, Coastal spatial planning*

### 1. Introduction

In the global wave of recurrent climate change and its unprecedented impact, Bangladesh has been ranked the 7th most vulnerable country globally (UNDP, 2021). Its deltaic landscape faces persistent challenges such as tidal surges, salinity, flooding, river erosion, and cyclones, which significantly jeopardize coastal agriculture. Approximately 40% of Bangladesh's fertile land lies in these coastal regions, yet they are in a critically alarming state (BDP 2100, 2018). Over the past decades, the escalating frequency of natural disasters and economic losses has rendered smallholder farmers, who account for nearly two-thirds of coastal agriculture, the most vulnerable group (Huq et al., 2015). The potential eradication of these smallholders would jeopardize agricultural sustainability and severely threaten food security (BDP 2100, 2018). For instance, the August 2024 floods, labelled 'deadly' in the Global Climate Risk Index, affected over four million people, leaving the agricultural value chain in disarray (AlJazeera, 2024). As agriculture remains the economic lifeline of these regions, the need for revolutionary strategies to ensure climate resilience has become paramount.

To address these challenges, the Government of Bangladesh implemented the "Bangladesh Delta Plan 2100" (BDP 2100), influenced by the Dutch Delta Approach (DDA). This model emphasized macro-scale economic and techno-hydrological infrastructure, such as flood protection polders, to boost agricultural production (GED, 2020). However, evidence shows that climate change has reduced agricultural yields over the past 15 years (Chen & Mueller, 2018), revealing the limitations of production-focused resilience models (Kundu et al., 2020; Mojid, 2020). These approaches fail to address the socio-economic vulnerabilities of smallholder farmers, whose survival is central to sustaining coastal agriculture (Hasan & Kumar, 2022; Roy et al., 2019). Additionally, their dependence on peri-urban growth centers due to a lack of access to urban land highlights their (peri-urban growth centers') critical role as regional hubs connecting farmers to national and global markets.

Despite their significance, peri-urban growth centers remain under-researched in spatial planning, particularly in terms of their potential to empower smallholder farmers and enhance resilience. Farmers often face systemic challenges such as reliance on exploitative middlemen, reduced bargaining power, eviction by development authorities (referring to illegal occupation) and chronic poverty, which further marginalize them. Without strategic integration into peri-urban growth centers, these farmers are at risk of abandoning agriculture entirely, exacerbating food insecurity (Sarker et al., 2018; Deichmann et al., 2008). Existing research and planning models, predominantly focusing on large-scale infrastructure and economic growth (Ledo Espinoza, 2021; Li et al., 2018), neglect the critical socio-spatial dynamics and the regenerative spatial attributes of these centres, which have developed organically over the decades in response to the vulnerabilities of

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coastal agriculture. The crucial gap in these approaches, thus, often marginalizes vulnerable groups, perpetuates poverty, and fails to address the complexities of agricultural resilience (Escobar, 2011). The identification and mainstreaming of those spatial attributes are vital for sustaining the livelihoods of vulnerable farming communities.

The objective of this study is to explore the spatial dynamics and regenerative attributes of peri-urban growth centers, taking Khulna as a case, in supporting smallholder farmers. These spatial attributes—such as accessibility patterns, spatial configurations, and socio-economic networks—are integral to the resilience of smallholder farmers but remain under-identified, marked as ‘illegal’ and undervalued in formal planning approaches. This raises a key research question: What are the spatial dynamics and regenerative attributes of the organically grown peri-urban growth centers, which need to be harnessed and scaled up through formal spatial planning to foster coastal agricultural sustainability and climate resilience?

The study has used Rahul Mehrotra’s (2007) theoretical framework of static and kinetic urban spatial dynamics to analyze spatial zoning and socio-economic interactions within peri-urban growth centers, highlighting their dynamic role in supporting smallholder resilience. The findings provide actionable, climate-adaptive planning recommendations to update the Bangladesh Delta Plan 2100, aligning with the Sustainable Development Goals (SDGs)—particularly SDG 2 (Zero Hunger), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). By advancing a comprehensive understanding of peri-urban growth centers as regenerative spaces, this study seeks to contribute to more inclusive and sustainable planning frameworks for vulnerable agricultural communities.

## 2. Methodology

The research adopts an interdisciplinary and qualitative approach to conduct a comprehensive morphological analysis of the case city of Khulna. After a pilot survey, this study focuses on three selected peri-urban growth centres: Gollamari Bazaar, Harintana Bazaar, and Sachibunia Bazaar, based on their strategic geographical positioning within the Khulna region (Figure 1). Among them, Gollamari Bazaar has been focused on in this study, analysing the potential growth opportunities through a detailed examination of spatial dynamics at both scales: Macro scale (city scale) and Microscale (Bazaar/community scale). The qualitative data collection employs an ethnographic approach (Groat & Wang, 2013; Creswell & Poth, 2016) that includes in-depth interviews and extensive visual research data. The investigation utilizes the Random Purposeful Sampling method (Creswell & Poth, 2016) to carefully select the interviewees, conducting one-on-one interviews and facilitating focus group discussions using semi-structured questionnaires.

To complement the qualitative data, detailed mapping and drawing documentation of socio-economic spaces were undertaken, with sketches, photographs, and videos used for comprehensive data collection. In the specific case of Khulna, a parallel process was employed wherein analogous information was gathered and triangulated through a meticulous blend of secondary sources and a comprehensive physical survey. The theoretical framework for this study is grounded in Rahul Mehrotra’s (2008) arguments on city dynamics, which have been utilized to structure the analysis and produce mappings to understand the complex layers of spatial dynamics.

Mehrotra’s (2007) analytical framework is crucial for this study as it emphasizes the dynamic interplay between the “static city” (formal, planned structures) and the “kinetic city” (informal, adaptive spaces). This duality aligns with the fluid and evolving nature of peri-urban growth centers like Gollamari Bazaar in Khulna, where socio-economic activities and spatial configurations continuously adapt to the shifting demands of marginal rural farmers. Mehrotra’s (2007) focus on temporal and spatial transformations offers a critical lens to analyze how formal and informal urban systems coexist and evolve, providing insights into the socio-economic and morphological changes over time. Mehrotra’s approach aids in capturing the complexity of adaptability and resilience, making it integral for understanding and mapping the spatial dynamics of Khulna’s peri-urban areas. Finally, a comparative evaluation of morphological attributes is explored as a synthesis of the findings.





Figure 1, Mapping shows the locations of surveyed sites. (Source: Authors).

### 3. Findings: Spatial Dynamics of Growth Center

The study area, Khulna, holds a strategic location at the confluence of the Rupsha and Bhairab Rivers in southwestern Bangladesh, near the Bay of Bengal (Figure 1). This positioning makes the region particularly susceptible to climate change impacts, including rising sea levels, increasing salinity and intensified cyclones. In recent decades, the region has faced significant agricultural decline and growing threats to food security, as documented by UN Bangladesh (2024), Rabbani et al. (2015), Jalal et al. (2021), and Awal & Khan (2020).

Addressing these challenges requires Khulna to adopt a climate-responsive planning approach aimed at strengthening resilient agricultural practices in the region. The following sections will examine the spatial dynamics of peri-urban growth centres in Khulna, emphasizing their transformation into hubs for sustainable development and adaptive strategies to mitigate climate-induced risks. The spatial analysis explores the dynamic spatiality in two scalar layers: The Macro scale (city scale) and the Microscale (Bazaar/community scale).

#### 3.1. MACRO SCALE OF SPATIAL DYNAMICS

The growth pattern analysis reveals that the transformation of Khulna is closely tied to its development from a colonial market known as the *Boro-bazaar* area. As it expanded from its original growth centre (Figure 1), the city moved towards the northwest, finding solid ground on the higher lands along the western edge of the Bhairab-Rupsha River, near the lower end of the embankment (KDA, 2002). The city's spatial structure has been planned to evolve around the Khulna-Jessore Road and further transport infrastructure development. The economic surge facilitated by road development exemplifies the alignment of the city's planned growth with infrastructure-driven strategies (Roy et al., 2018). Analysing the formal and planned development grammar of the city center, this formal development appears to remain static, constrained by predefined land-use regulations and a lack of integration with the organic, emergent patterns of urbanization. This mirrors Mehrotra's (2007) observation that such static cities often fail to engage with the informal and fluid aspects of urban growth, limiting their capacity to adapt to evolving urban realities. Mehrotra (2007) highlights how cities in the Global South often exhibit a formalized, fixed grammar of spatial development tied to rigid land-use codes and planning frameworks, which resist adaptation to dynamic socioeconomic and cultural shifts. Similarly, Khulna's growth pattern showcases a continued reliance on static planning models that have predominantly governed the city's expansion.

On the other hand, the peri-urban development of Khulna is illustrated in the chronological map (Figure 2), which highlights an organic street pattern (Defacto Report, 2019). A comparative analysis of Google Earth images from 2001 and 2024 reveals a significant transformation in Khulna's peri-urban morphology, shifting from an agro-based periphery to a rapidly urbanizing zone. This transformation is marked by the rise of road-based commercial activities, which have increasingly been organized in unplanned open spaces. Such a development pattern reflects the evolving roles of unplanned urban spaces in a society confronting emerging challenges, as Mehrotra (2007) demonstrated elsewhere in the Indian context.

The spectacle of peri-urban growth in Khulna is characterized by complex, multi-layered lived spaces rather than the rigid, static images of a top-down standard. The open spaces in these growth centers generate a fluid urban peripheral zone, dynamic in its spatial characteristics. These co-created spatial dynamics align with Mehrotra's concept of a "bazaar-like" urban form, where streetscapes adapt to everyday activities, accommodating vendors, hawkers, and informal markets. This adaptive and inclusive spatiality is critical for fostering coastal climate resilience. In peri-urban Khulna, such open spaces have played a crucial role in supporting the local agrarian economy, facilitating the exchange of agricultural produce, and providing (nearly) rent-free access—offering significant economic benefits to marginal farmers.

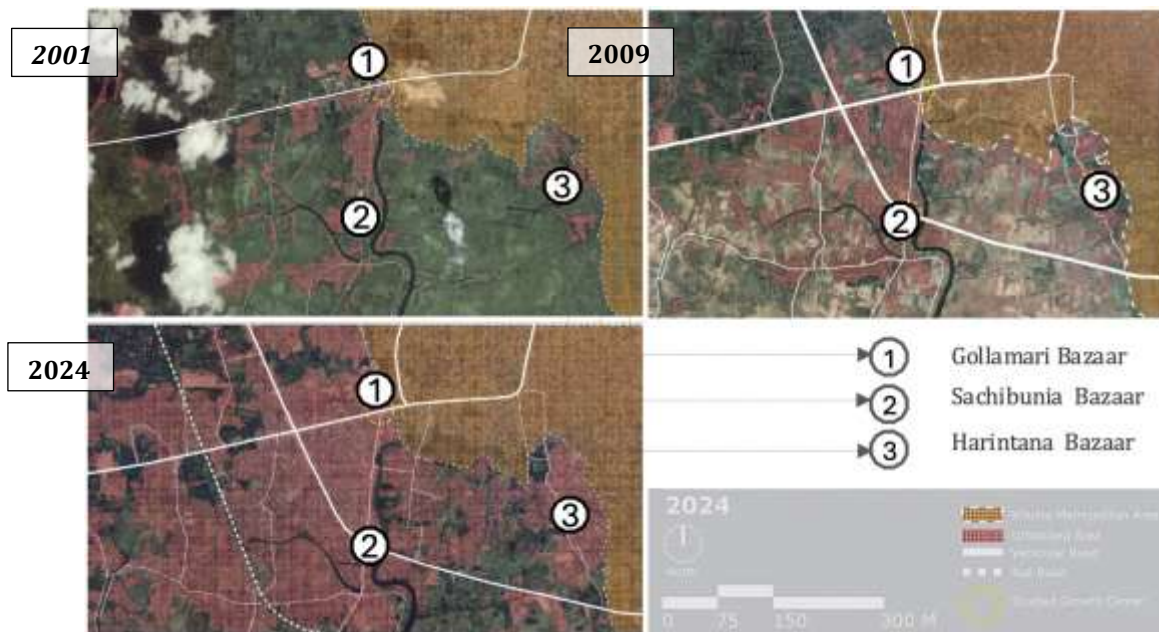


Figure 2, Chronological Map of Peri-urban Growth Pattern of Khulna. (Source: Authors).

As a transitional zone bridging rural and urban areas, the peri-urban dynamic is pivotal in shaping the socio-economic development, planning, and morphological growth of the city. It creates a platform to weave trans-local networks, which, as Greiner (2011) argues, influence urban economic systems and livelihoods by allowing households to leverage location-specific benefits. This comprehensive trans-local network facilitates the movement and exchange of people and resources, fostering the circulation of agricultural goods between urban and rural households.

In the case of low-income agriculture, the urban periphery and trans locality could provide a path to socio-economic upward mobility in the generated bazaar-like urban spaces. Yet, in reality, small income-based communities are often caught up in survivalist networks as their income is promptly allocated to meet fundamental necessities, and they do not have access to the planned markets of Khulna. Consequently, the peri-urban fringe could offer a route to socio-economic advancement and community growth for small agricultural communities by creating a kinetic community network. Among the emerging areas of peri-urban growth, Gollamari Bazaar (Figure 3) has been identified as the most potential to support marginalized groups.



Figure 3, Location of the Gollamari Bazaar. (Source: Google Satellite Image and Fieldwork, 2024)

Gollamari has developed into a thriving commercial hub, largely due to its strategic location. The Khulna–Batiaghata road has significantly improved the market’s accessibility, facilitating easier access for both buyers and sellers. The development of the Gollamari bazaar to become a growth centre can be understood through the lens of the location theory of the growth centre, which suggests that economic and market activities are influenced by spatial factors and resource accessibility. This accessibility is particularly beneficial for surrounding village growers, who can efficiently transport their agricultural products to the market using cost-effective modes of transportation such as vans and battery-driven vehicles. The proximity of Khulna University has further amplified the market’s economic activity, attracting a diverse population of students, faculty, and staff, thereby contributing to its vibrant social and economic environment. The linear park and Gollamari Bazaar serve as primary providers of infrastructure, reinforcing the market’s role as a key service centre.

The Gollamari bazaar's location on low-value land adjacent to the scenic Moyur River offers a significant geographical advantage (Figure 4). This positioning not only separates the inner city from the periphery but also provides an affordable and convenient site for market activities. The centrality within the transport network allows for the efficient delivery of goods, maintaining competitive prices and ensuring the market's popularity among urban consumers. This steady influx of buyers creates a dynamic and bustling marketplace, underscoring Gollamari Bazaar's role as a vital economic node.



Figure 4, Land use map of the Gollamari Bazaar. The black dotted line shows Hall Road Street Market (Source: Authors).

The Gollamari bazaar zone creates overlapped dynamics in the urban peripheral buffer area and makes an elastic urban condition, which could grip/capture the vibrancy and diversity of the space. Therefore, similar to Mehrotra's (2007) exploration in Bombay, the processions, faculty-student mobility, university programs, festivals, hawkers and street vendors all create an ever-transforming streetscape—an urban space in constant motion, where the very physical fabric of the bazaar is characterized by the kinetic. For such dynamics, the bazaar could function as a growth centre in the context of coastal city spatiality.

### 3.2. MICROSCALE OF SPATIAL DYNAMICS

The Gollamari Bridge area has emerged as a critical hub for local commerce, accommodating a vital agricultural market for small-scale farmers and urban consumers. This market, commonly known as Gollamari *Kacha-bazaar* due to its emphasis on fresh vegetables, has flourished as a growth centre owing to several interrelated factors, including its strategic location, socio-economic dynamics, and spatial organization. A respondent (2024), who is a regular buyer, claimed, *“Though there’s a bigger market near my home being a secondary market, vegetables are not as fresh as there. Here, the vegetables are either grown at home or collected freshly by women. Look at that vegetable. It’s old yet looks fresh. But this won’t be found in a bigger market...”*

The Gollamari market operates primarily in the early morning hours or after Fajr prayer, starting around 5-6 am. Sellers arrive before dawn to secure their spots and prepare their goods for sale, while buyers typically start arriving after the Fajr prayer, around 6:30 am. As a seller responded, *“I come here around 6 in the morning, though people start to come around 5 am.”* The market reaches its peak activity between 7 am and 8 am, with a significant influx of buyers, many of whom come after their morning walk on the university campus. By 10 am, the crowd begins to thin, and by noon, the market winds down. This temporal pattern reflects the market's adaptation to local consumers' activity patterns, ensuring that both buyers and sellers can operate effectively within a limited timeframe. Additionally, it ensures that regular activities in the bridge area are not disrupted by the market; instead, both can coexist harmoniously.

The Gollamari bazaar has developed in an axial way, whereas a growth line is directed in an east-west way and another line leads to the university boundary area, the hall road area. Observing the two lines, the hall road could accommodate a diverse range of sellers since it follows a branch road, where the traffic congestion is lower than the other bazaar axis. Analysing the spatial dynamics of the bazaar using Mehrotra's (2007) theoretical framework (which includes planning, spatial sequence, layout, material, growth pattern and spatial usage), this research identified the three layers of the Hall Road Street Market (Figure 5): (i) Part a: Static Zone, (ii) Part b: Semi Static Zone and (iii) Part c: Dynamic Zone.



Figure 5, Three zones of the Hall Road Street Market (a) Dynamic Zone (b) Semi Static Zone (c) Static Zone. (Source: Authors).

*(i) Part a: Static Zone*

The area is located at the turning of the node with fixed functional zoning and programming in a compact planning layout (Figure 6). In this planned part of the bazaar, the infrastructure has been built with durable concrete materials. The market forms of units are permanent in nature, and the sellers expand their shops, maintaining a stable order- such growth dynamics represent a static spatiality.





Figure 6, (Part a) The static zone of the Hall Road Street Market, in section, plan and Photograph. (Source: Authors)

(ii) Part b: Semi-Static Zone

The further layer of the linear bazaar sprawl is the semi-static zone, which is the intermediate zone between the static and kinetic zones (Figure 7). Adaptive functional zoning is generated, where the planning contains contemporary change and local wisdom. The shop unit has been designed with any residue of under-construction columns, walls, etc., which are semi-permanent and temporary in nature. A fish seller responded to her selection criteria of a wall as a semi-structured enclosure for her shop modality, *“This place is suitable for drainage; also, the wall backdrop can be used for both shading and storage.”* As a transitional dimension, the spaces are grown in an incremental manner with an aspiration to be more developed.



Figure 7, (Part b) The semi-static zone of the Hall Road Street Market in section, plan and Photograph. (Source: Authors)

(iii) Part c: Kinetic/Dynamic Zone

The mobile and fluid modality of the planning and functionality represents a dynamic bazaar form where the seller groups are mostly migrant small agricultural communities (Figure 8). They travel with their fresh goods from their village, and at the end of the day, they leave. A respondent (a woman seller from a neighbourhood village) asserted on their mobile market model, “We don’t have any fixed place. We have to come early in the morning to book our position... I sell my vegetables by 10/11 am, then return back to my village”. A kinetic network has been weaved from their spatial occupation pattern of the bazaar, and the idea of the market is centred on temporality and twitching organism- architecture in motion. The spaces are regenerative, constantly modified, recycled, and reinterpreted, and the priorities are regular activity and everyday landscape.



Figure 8, (Part c) The dynamic zone of the Hall Road Street Market, in section, plan and Photograph. (Source: Authors)

Summing up, the attributes of the growth centre spatial dynamics could be portrayed (Table 1), in both scales- Macro scale (city scale): Urban Space (established inaccessible growth centres), Peri-urban space (emerging growth centres), Rural space (smallholder farmers location) and Microscale (Bazaar/community scale): Static Zone, Semi-Static Zone and Kinetic/Dynamic Zone.

#### 4. Discussion

Historically, in planning, persistent concepts, models, and indicators of urban core-periphery models have been driven almost exclusively by distance cost and rent, despite a few stressing the importance of agglomerative aspects (Krugman, 1991). This explains why traditional rent-based infrastructure planning has been embraced in BDP 2100 to boost investment and economic growth and failed to extend support to smallholder farmers in an inclusive manner. In the Gollamari bazaar, the current informal setup and functionality allow for a dynamic and adaptable market environment where vendors can adjust their locations based on daily needs and market conditions, unlike BDP 2100. This elastic spatial condition is particularly important for small-scale farmers who rely on the ability to access and participate in the market without the burden of high rental costs and rigid stall assignments. The transient and temporal nature of the market also fosters a more inclusive and equitable space, accommodating a diverse range of vendors and ensuring that the market remains accessible to all, including the most economically vulnerable (Table 1).



Table 1: The attributes of the growth centre spatial dynamics. (Source: Authors).

Scale of Growth center	Parameter/attributes of Spatial dynamics					Spatial dynamics of the Growth center
	Infrastructure and Material	Spatial nature	Growth pattern	Planning and spatial layout	Pattern of occupation	
<b>(a) Macro Scale</b>	Durable material	Solid urban form	Planned transformation	Formal planning	Permanent grid	<b>(1a) Static City Core</b>
	Mixed material	Overlapped dynamics in buffer zone	Elastic urban condition	Contemporary transforming planning	Change responsive, Bazaar like grid	<b>(2a) Kinetic Peri-urban Area</b>
	Less durable material	Temporary form	Flexible	Indigenous planning	Organic grid	<b>(3a) Dynamic Rural zone</b>
<b>(b) Micro Scale</b>	Durable, concrete building material	Permanent, stable	Planned expansion	Compact plan layout	Stable functional zoning	<b>(1b) Static Bazaar Zone</b>
	Semi-permanent, recycled material	Transitional spatiality (semi-stable, temporary)	Incremental development	Local wisdom based transformative layout	Adaptive functional zoning	<b>(2b) Semi-Static bazaar zone</b>
	Recycled, moveable material	Mobile, Temporary	Regenerative development	Fluid, momentary layout	Kinetic functional zoning	<b>(3b) Kinetic/dynamic bazaar zone</b>

The spatial planning approaches in BDP 2100 conceive the cities and rural areas as two different spatial entities where the peri-urban zones of the cities are considered the destinations of rural migrants, which the city manages by either rejecting or rehabilitating. Evidence suggests that the most active urbanization processes in the modern world are found in the urban peripheries of the Global South (Follmann, 2022). Hence, little has been explored on the merit of the peri-urban morphology, spatial vocabulary, and emerging growth centres that have been produced organically by the engagement migrants, traders, and rural smallholder farmers. In contrast with the BDP 2100 limitation, the Gollamari market poses a supportive infrastructure for coastal smallholder farmers, extending the potentiality of the peri-urban planning model. The bazaar’s resilience and dynamic nature stem from its lack of formal infrastructure, fostering flexibility and adaptability among vendors. This unique operational model and dynamics not only support the livelihoods of small-scale farmers and vendors but also ensure that the market remains an integral part of the local economy, illustrating a successful instance of informal urban commerce.

Moreover, according to ESCAP (1979), the growth centre is the focal point with a specific level of facilities, a ‘growing point’ that includes its vicinity impacts the spread of development, and for Bangladesh, rural markets are considered as growth centres (LGED, 1995). By offering an unmediated link between farmers and consumers, the Gollamari market creates a platform for growing and sustaining coastal agricultural practices and promoting food security. This direct marketing model not only benefits small-scale farmers but also ensures that urban consumers have access to fresh, nutritious food. The autonomous established network and community relationship of their mobile market system deftly uses the static city and its infrastructure beyond its intended margins. As Mehrotra (2007) referred to, such networks create a synergy/interaction that relies on mutual integration rather than being fixated on formalized structures.

The Gollamari bazaar also contributes to the social fabric of Khulna by providing a space for community interaction and engagement, where the visual culture and everyday landscape act as a spectacle. This market serves as a meeting point for residents from different parts of the city. A response from a regular buyer was, *“I am waiting for this ‘boudi’... I regularly buy milk from her. I come to this market almost every day after a morning walk on the Khulna University campus around 7.30 am.”* Addressing a seller as ‘boudi’ (sister) implies a respectable interaction and exchange of mutual trust between buyer-seller, where such social relationship is embedded in simple regular activity such as his morning walk and shopping from Gollamari bazaar.

The findings from the paper make important recommendations for BDP 2100, the most significant policy document for coastal Bangladesh. The discussion suggests that the goal to “Increase climate change adaptation capacity for land management” in BDP 2100 should expand beyond technical advancements in agriculture and water systems. Policies need to emphasize spatial platforms that can leverage the adaptive capacities of informal and flexible infrastructures, as exemplified by the bazaar-like dynamics of the Gollamari growth center. This approach aligns with Mehrotra’s (2007) concept of transformative and transient spaces, emphasizing elasticity and adaptability in spatial planning to mitigate climate vulnerabilities effectively. BDP 2100’s emphasis on infrastructure as a driver of urbanization should incorporate the socio-economic embeddedness observed in informal markets. The temporal and informal spatiality of growth centers like

Gollamari demonstrates how the soft (social) infrastructure development by marginalized groups can support resilience by fostering embedded networks of trust and mutual support. This socio-spatial dimension, integral to sustainable development, must be reflected in land-use policies for coastal zones (Gehl, 2011).

Finally, the rigid zoning laws proposed for manufacturing and urban growth centers should allow for incremental and participatory development processes. Informal markets have demonstrated their ability to evolve incrementally, accommodating diverse vendors and fostering economic inclusivity. This approach should be a key strategy for managing land use in newly accreted or reclaimed coastal zones, as noted in the BDP 2100 objectives. The adaptive and resilient market model of peri-urban Khulna also provides valuable insights for other coastal cities in the Global South, including Bangkok, Thailand (BCF, 2024) and Hanoi, Vietnam (Dao, 2022), facing recurrent climate change challenges. By stressing on elastic and crisis-responsive spatial planning, the paper contributes to a broader trajectory of sustainable development, leveraging lessons from the organically developed growth centres at the city periphery to build resilient local economies.

## 5. Conclusion

This research highlights the complex negotiation between kinetic and static spatial dynamics within Gollamari Bazaar, illustrating its success as a peri-urban growth center for coastal agriculture. By applying Mehrotra's theoretical framework, the paper argues the need for tri-fold (static, semi-static and dynamic) spatial mediation for the growth centres to become climate-responsive in a climate-vulnerable region. As this paper has shown, the challenge of Gollamari Bazaar lies in adapting to the regional crisis of small-scale agriculture, which the growth center manages by reconciling opposing/contested conditions (i.e. formal vs informal, static vs dynamic) rather than polarizing them. The analysis of static, semi-static, and kinetic spaces stresses the importance of informal and impermanent zones in fostering a sustainable, regenerative system for small-scale producers to sustain in agriculture. The paper advocates for an integrated spatial planning approach, where it is crucial to recognize the importance of this dynamic spatiality and inclusiveness that can define a new vocabulary of 'growth center' through the acknowledgement of coexistence and co-creation.

The Khulna case presented in this paper also demonstrates through empirical evidence the need to shift from traditional infrastructure-heavy growth center design practices to more advanced, context-sensitive, and low-infrastructure strategies. The discussion section elaborates categorically on how the spatial attributes found in the Khulna case can contribute to achieving the goals of the Bangladesh Delta Plan 2100 and the Sustainable Development Goals for 2030. The lessons from Gollamari Bazaar also reveal that the resilient growth centres are those that embrace uncertainty, open-mindedness, and impermanence. This enables peri-urban growth centres to operate effectively, ensuring community engagement and the successful recovery of marginalized farmers struggling in a coastal environment against the diverse crises of climate change. The recognition and incorporation of such spatial modality of growth centres could embark on a visionary layout for future endeavors in city planning, as well as on the broader scale of the sustainability of the Global South against climate change.

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