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Peri-urban transformation in the Global South: a comparative socio-spatial analytics approach

q1 Alexander Follmann^a , Loraine Kennedy^b , Karin Pfeffer^{c,d}  and Fulong Wu^e 

ABSTRACT

This research advances our understanding of peri-urban dynamics in the Global South through an innovative comparative socio-spatial analytics approach combining geospatial and qualitative fieldwork-based methods. Drawing on three cases in China, Ghana and India, the comparison is operationalized through two pairs of conceptual lenses developed inductively. We argue that heterogeneous peri-urban morphologies in the Global South, which share several common features, notably fragmentation and bypass, albeit with differing degrees, are shaped by three key processes: (1) market- and speculation-driven property development; (2) state-led development strategies, often expressed through large-scale projects; and (3) fragmented planning and development practices.

KEYWORDS

peri-urban morphologies; urbanization; Global South; comparative urbanism; fragmentation; bypass

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1. INTRODUCTION

The world's most dynamic urbanization processes are occurring on the outer edges of existing cities in Africa and Asia (Angel et al., 2016). These spaces, which we refer to here as 'peri-urban', are experiencing unprecedented rates of expansion of built-up areas, fierce competition between social groups over land use and resources, and increasing risks of social exclusion and environmental degradation (e.g., McGregor et al., 2006; Vij & Narain, 2016). These processes generate critical challenges not only for people and governments in those places (Gaisie et al., 2019) but also for global sustainability, as much of future urban growth and associated land- and resource-use change will take place in the Global South (Allen, 2014; Simon, 2008).

Peri-urban areas present distinct challenges for urban research (Friedmann, 2016; Singh & Narain, 2020) and have captured attention from a range of disciplines and theoretical perspectives within the shifting geographies of global urbanization (Brenner & Schmid, 2015; Lawhon et al., 2016; Robinson & Roy, 2016; Roy, 2009). In this context, Caldeira's (2017) peripheral urbanization, Simone's (2019) extensive urbanization and the recent

work on planetary urbanization (e.g., Schmid et al., 2018) have offered new vocabularies to describe, analyse and theorize about peri-urban areas as the locus of distinct modes of production of space (see also Meth et al., 2021). Debates on global suburbanization (Wu & Keil, 2020) or peri-urbanization (Leaf, 2016; Simon, 2020) are other departure points for a retheorization of peripheral expansion. Additionally, a special issue in this journal explored current planning practices and spatial development strategies affecting peri-urban areas in the Global South.¹ Building on these debates, we approach the peri-urban as a historically situated and socially contested space that blurs the conventional urban-rural dichotomy in manifold ways (Allen, 2014; Follmann, 2022; Simon, 2020). We use the term 'peri-urban dynamics' to capture socio-spatial processes occurring on the outer edges of the metropolitan regions of Delhi (India), Accra (Ghana) and Shanghai (China).

Although the transformation of urban peripheries in the Global South has been extensively discussed, geographically wide-ranging comparative research on peri-urban dynamics remains underexplored (for exceptions, see Karaman et al., 2020; McGregor et al., 2006; Myers, 2018; and Sawyer et al., 2021, with case studies on more

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than one continent, and Shatkin, 2016, 2017, with cases in South and Southeast Asia). In this paper we draw on three cases: Delhi's satellite city Faridabad, the peri-urban town of Kasoa on the outskirts of Accra, and the new town development of Lingang at the fringe of Shanghai. In all three cases, we observed rapid land-use change and spatial transformations including state-led investments in large-scale infrastructure, private investments in housing and real estate, but also a range of bottom-up, often informal, land transactions and settlement processes (for Delhi, see also Follmann et al., 2018; Gururani, 2020; Singh & Narain, 2020; for Accra, see also Akubia & Bruns, 2019; Bartels, 2020; Gillespie, 2016; Møller-Jensen et al., 2020; and for Shanghai, see also Li & Chiu, 2020; Shen et al., 2020; Wang & Wu, 2020).

Our approach has been inspired by recent debates on comparative urbanism (McFarlane, 2010; Montero & Baiocchi, 2021; Parnell & Pieterse, 2016; Peck, 2015; Robinson, 2016; Sayin et al., 2022) and to an extent by the process-oriented perspective of planetary urbanization (Brenner & Schmid, 2015; Schmid et al., 2018). In particular, we use comparison as a tool for creating new conversations (McFarlane, 2010, p. 730) about peri-urban dynamics and to think about the peri-urban through elsewhere (Robinson, 2016, p. 5). Following Nijman (2007), our goal has been to better understand peri-urban dynamics in the individual cases through a comparison with other examples, and on that basis, analyse the production of peri-urban morphologies across diverse political-economic contexts to generate knowledge about peri-urban dynamics in the Global South more generally.

The contribution of this paper to current debates in urban and regional studies is threefold: conceptual, methodological and empirical. Conceptually, we introduce a set of analytical lenses – *fragmentation/integration and connectivity/bypass* – which guide systematic comparisons of peri-urban dynamics across our three cases. The conceptualization of these lenses is an outcome of extensive discussions bringing into conversation empirical findings from the peripheries of Delhi, Accra and Shanghai, generated in earlier research.² Thus, the lenses were developed inductively by comparing the observed large-scale spatial transformations and on the bases of our analyses of the processes that produced them. We then systematically apply the lenses in an iterative exchange to generate knowledge about the individual cases and compare the three cases with each other relationally to further generate knowledge on peri-urban dynamics. Thus, in contrast to the more common comparative approach of selecting a conceptual framework and cases to be compared before (a priori) the empirical research is conducted, we perform our comparison through a systematic and iterative re-analysis of already existing empirical materials. Recently, Montero and Baiocchi (2021) have termed this type of approach as *'a posteriori' comparisons*.³ Here, we focus on linking a posteriori comparisons to an integrated mixed-methods approach, pointing to our methodological innovation. We propose this approach, or what we call a *'socio-spatial analytics'*, combining findings derived from

qualitative methods that interrogate, deconstruct and explain peri-urban dynamics and evidence from geospatial science-based methods that classify, measure and spatially characterize peri-urban dynamics (see section 3). We argue that linking findings from different methodological approaches to the conceptual lenses fragmentation/integration and connectivity/bypass offers new avenues for comparative research on peri-urban dynamics as it helps overcome disciplinary boundaries within the diversity of urban disciplines (Acuto et al., 2018, p. 4). We share the belief that 'different epistemological perspectives can come together as complementary alternatives' (Sayin et al., 2022) to better explain peri-urban dynamics. The proposed socio-spatial analytics approach focuses here on methodological triangulations to allow for different perspectives on peri-urban dynamics. Applying the socio-spatial analytics with a posteriori comparison tactics, the article advances a conceptual and methodological framework for comparative research.

Empirically, the comparison of our cases has allowed us to identify three key processes critical in the production of peri-urban morphologies: (1) market- and speculation-driven property development; (2) state-led development strategies; and (3) fragmented planning and development practices.

We argue that the distinct interplay of these processes in each case explains the heterogeneous peri-urban morphologies we observe, with diverging degrees of bypass and fragmentation as well as social distributional implications.

The remainder of the paper is structured as follows. Section 2 introduces our inductive conceptual lenses and positions them in relation to existing scholarship. Section 3 outlines our methodological approach and its operationalization. The case studies Delhi, Accra and Shanghai are presented in sections 4–6, followed by a comparative analysis (section 7) and conclusion (section 8).

2. FRAGMENTATION/INTEGRATION AND CONNECTIVITY/BYPASS AS CONCEPTUAL LENSES

To capture and better understand the multifaceted peri-urban dynamics in the Global South, we introduce a set of conceptual lenses to compare patterns and trajectories. Although the terminology used – fragmentation/integration, connectivity/bypass – is not new in urban research, we propose to employ it as comparative analytical lenses. The value of this conceptual framework lies not only in describing different degrees of fragmentation, integration, connectivity or bypass, but also in its capacity to encompass multiple perspectives on socio-spatial transformations in peri-urban areas and to put into conversation and comparison cases from across the globe. In this section we briefly introduce and discuss each set of lenses.

2.1. Fragmentation and integration

Fragmentation, as a popular analytical idiom alongside the associated notions of segregation and polarization, has

been widely used to highlight the challenges of uneven urban development (e.g., McFarlane, 2018). The frontiers of fast-growing agglomerations in the Global South are characterized by both socio-spatial and institutional fragmentation; they typically straddle rural, municipal and metropolitan administrations, which produce ambiguity and regulatory vacuums (Dupont, 2007; Owusu, 2015). The coexistence of heterogeneous property regimes gives rise to a patchwork of settlement types (Caldeira, 2017; Shatkin, 2017).

Conversely, *integration* often designates an ideal planning objective embodying both social and spatial dimensions. Spatially, integration is apprehended through indicators and metrics for example, land-use mix, transport interconnectivity and infrastructure access, corresponding to standardized norms. Socially, integrated or mixed neighbourhoods form part of explicitly normative planning agenda; they are expressed, for instance, in housing policies that require new residential complexes to include some proportion of low-income housing. Much critical urban research has focused on the non-integrated, socially exclusionary features of peri-urbanization (Allen, 2014; Watson, 2014).

Interrogating peri-urban dynamics through the conceptual lenses of fragmentation/integration, we start with the assumption that highly fragmented peri-urban landscapes are the expression of distinct systems of land governance, mediated through historically embedded social institutions. Land-related issues, for example, expropriation, privatization, commodification, occupancy and speculation, have emerged as singularly significant issues in urban peripheries across the Global South (Akaateba, 2019; Benjamin, 2008). Land is at the heart of deeply political processes of dispossession and displacement (Gillespie, 2016; Goldman, 2020); but also everyday practices of compensation, capture, and rent (Gururani, 2020, p. 984), which sometimes offer opportunity for subaltern groups to become shareholders in urban production (Balakrishnan, 2019). To grasp this dynamically, it is generative to link the analysis of geospatially detectable processes of land-use change and fragmentation to the study of how agrarian property regimes are integrated into emerging real estate markets on the urban periphery. Additionally, contemporary land politics – whether land-centred accumulation in China (Shatkin, 2017; Shen et al., 2020), state-led acquisition of land for private investors in India (Chakravorty, 2016; Gururani, 2020) or incremental and uncoordinated privatization of land for real estate development in Ghana (Bartels, 2020; Gillespie, 2016, p. 2020) – drives urban expansion much faster than population growth alone would merit (Angel et al., 2016). Finally, the effects of large-scale land conversion and commodification are often at odds with broader social goals and, thus, spark contestation (Gillespie, 2016; Jenkins et al., 2014; Shatkin, 2016). The response from policymakers and planners often aims for both spatial and (global) socio-economic integration, which takes the form of state-driven land acquisition ‘in the public interest’ to publicly funded large-scale infrastructure developments

(Schindler & Kanai, 2021; Watson, 2014; Wiig & Silver, 2019).

2.2. Connectivity and bypass

Economic development policies are significant drivers of peri-urban dynamics. Rescaled states seeking to restructure their economies forge new geographies of accumulation on the urban frontier, for example, via large-scale infrastructure projects (Schindler & Kanai, 2021), export zones (Kennedy, 2014), real estate investments (Gillespie, 2016, p. 2020; Shatkin, 2016, 2017) and even entire new towns, which are being built essentially as mega-projects (Shen et al., 2020; Watson, 2014; Wu, 2020). As powerful drivers of peri-urban land-use change, these developments aim to create new accumulation nodes through global connectivity (Schindler & Kanai, 2021; Wiig & Silver, 2019), while perpetuating uneven development on multiple scales. Yet, the material infrastructure often bypasses local communities spatially with diverging degrees of (dis)connectivity and access (Kanai & Schindler, 2019, p. 303). Moreover, they are excluded from the decision-making as such projects often rely on ad hoc rules and regimes of exception that detach them from local economies and political territories (Kennedy & Sood, 2019).

In this context, the notion of *bypass* has been used to analyse large-scale urban developments on the urban periphery (e.g., see Shatkin’s, 2008, ‘bypass-implant urbanism’ for Manila and Bhattacharya and Sanyal’s, 2011, identification of the bypass approach to urbanization’ in India). More recently, the term ‘bypass urbanism’ was introduced to describe widescale transformation of urban peripheries in ways that produce extremely uneven urban developments that amount to socio-spatial segregation (Sawyer & Schmid, 2015, p. 213). As Sawyer et al. (2021, p. 680) further outline, ‘bypassing’ is a metaphor to describe the circumventing of existing planning regulations and/or institutions as well as local actors. Our understanding of ‘bypass’ embraces these metaphorical notions but goes further to also include materialized physical spaces, for example, highways connecting the centre to the periphery while bypassing in-between spaces.

Nevertheless, top-down large-scale projects almost always coexist alongside bottom-up strategies of individuals and households, including autoconstruction (Caldeira, 2017), plot-by-plot developments (Karaman et al., 2020), and refusal to relinquish occupational rights through negotiation and vote bank politics (Benjamin, 2008), and making claims for connectivity, for example, to water, energy and sewage networks, all of which influence outcomes on the ground.

In sum, multiple dimensions of connectivity and bypass emerge: the physical connectivity of spaces and places, affecting accessibility to resources and services, connectivity to information and knowledge, as well as access to decision-makers at different levels. Our socio-spatial approach aims to make visible and theorize from these multiple processes of fragmentation and integration resulting in new geographies of connectivity and bypass.

3. METHODOLOGY: A COMPARATIVE SOCIO-SPATIAL ANALYTICS

In this paper we apply an a posteriori comparison to generate new knowledge from existing case study materials from the metropolitan regions of Delhi, Accra and Shanghai. This entails that our research methods to generate the empirical evidence in the first place understandably differed across cases. Drawing on the empirical evidence of our three cases, we developed a 'socio-spatial analytics' approach to systematically compare them via our conceptual lenses. Using an iterative process, it combines findings from geospatial analysis and qualitative fieldwork-based research. In line with recent debates on comparative strategies (Montero & Baiocchi, 2021; Sayin et al., 2022), we make use of fragmentation/integration and connectivity/bypass as conceptual lenses not to compare cases but rather to focus on processes and associated mechanisms (Robinson, 2016) producing specific peri-urban morphologies.

Specifically, based on our existing knowledge of the three cases, we use evidence from different geospatial methods to analyse the spatial features and specific peri-urban morphologies. We draw on existing land-use classification based on remote sensing analysis. For Faridabad/Delhi we use multi-temporal land-use classifications based on Landsat (1991, 2000) and RapidEye (2010, 2017) satellite images (Mattner, 2017⁴) (see Figure A1 in Appendix A in the supplemental data online) as well as our own transect analysis derived from field mapping and visual interpretation of Google Earth images (see Figure A2 online). For Ksoa/Accra and Lingang/Shanghai, we rely on data from the Atlas of Urban Expansion⁵ (see Figures A3 and A5 online) as well as visual interpretation of Google Earth images (see Figures A4 and A6 online). The geospatial analysis allows us to make visible spatial patterns of connectivity/bypass as well as indicating processes of fragmentation/integration from a multi-temporal perspective. In doing so, it offers a bird's-eye view of peri-urban dynamics occurring in these three large urban agglomerations, which remain obscured when using on-the-ground empirical fieldwork only (e.g., see Sawyer et al., 2021, for a similar approach using mapping for comparison).

Qualitative data collected on the ground provide deeper insights into the drivers and consequences of the spatial patterns and processes, such as land governance or economic development strategies. The qualitative data mobilized for the comparative analysis in this paper are based on field observations and interviews with selected local stakeholders, including old and new residents, landowners, farmers as well as with urban and regional planners and elected officials.⁶ Research in Faridabad/Delhi was carried out during multiple weeks of fieldwork in 2016 and 2019; fieldwork in Accra/Ksoa was carried out in October 2018; and fieldwork in Lingang/Shanghai took place between 2015 and 2018.⁷

In the following sections we bring together the geospatial bird's-eye view and the on-the-ground perspective from qualitative data sources in an iterative exchange to

illustrate the capacity of our approach to generate knowledge on complex peri-urban dynamics.

4. FARIDABAD: TRANSFORMING DELHI'S INDUSTRIAL SATELLITE CITY INTO REAL ESTATE

In the 1950s, the Indian government's decision to locate a *new industrial township* in Faridabad transformed it from a small town largely dependent on agricultural activities to an industrialized city. For several decades its growth was facilitated by its connection to Delhi by roads and railway. More recently, with deindustrialization, the central parts of the city are marked by derelict compounds. In contrast, its peripheral areas are growing rapidly through planned, large-scale residential real estate developments and self-built, informal housing – which local residents generally distinguish as 'societies' and 'colonies' – as well as new industrial estates for light industries. Massive investments in road infrastructure catalysed private real estate investments in peri-urban areas. Overall, these dynamics resulted in a doubling of Faridabad's population between 1991 and 2011 (1.4 million in 2011).

To capture these large-scale transformations, we first used remote sensing data. Our analysis shows that Faridabad's built-up area increased by almost one fourth between 2010 (78 km²) and 2017 (96 km²) (see Figure A1 in Appendix A in the supplemental data online) and we identified three phases of urban development (Figure 1):

- *Linear integration* (1991–2000): three former urban cores are integrated into one urbanized zone along the highway
- *North/north-western expansion* (2000–10): development towards the west and to the north merging built-up areas of Faridabad and Delhi
- *South/south-eastern bypass expansion* (2010–17): urban growth in southern and eastern directions beyond the boundaries of the municipality bypassing central areas of Faridabad.⁸

The bird's-eye view suggests decreasing importance of the linear connectivity to Delhi as Faridabad is growing in various directions. However, research on the ground reveals that increasingly more people use the metro rail to travel to Delhi, and the extensively widened highway is still constantly congested between Delhi and Faridabad. Indeed, to ease traffic, an elevated road over the existing highway and a six-lane bypass road along the Agra Canal were erected in the last decade. Further, a six-lane Eastern Peripheral Expressway (135 km) opened in 2018 and another 59-km highway linking Faridabad to other booming satellite cities is under construction (Figure 1). These new developments highlight that regional connectivity is changing profoundly and that central parts of Faridabad are getting bypassed while (formerly) peripheral locations are emerging as better-connected locations.

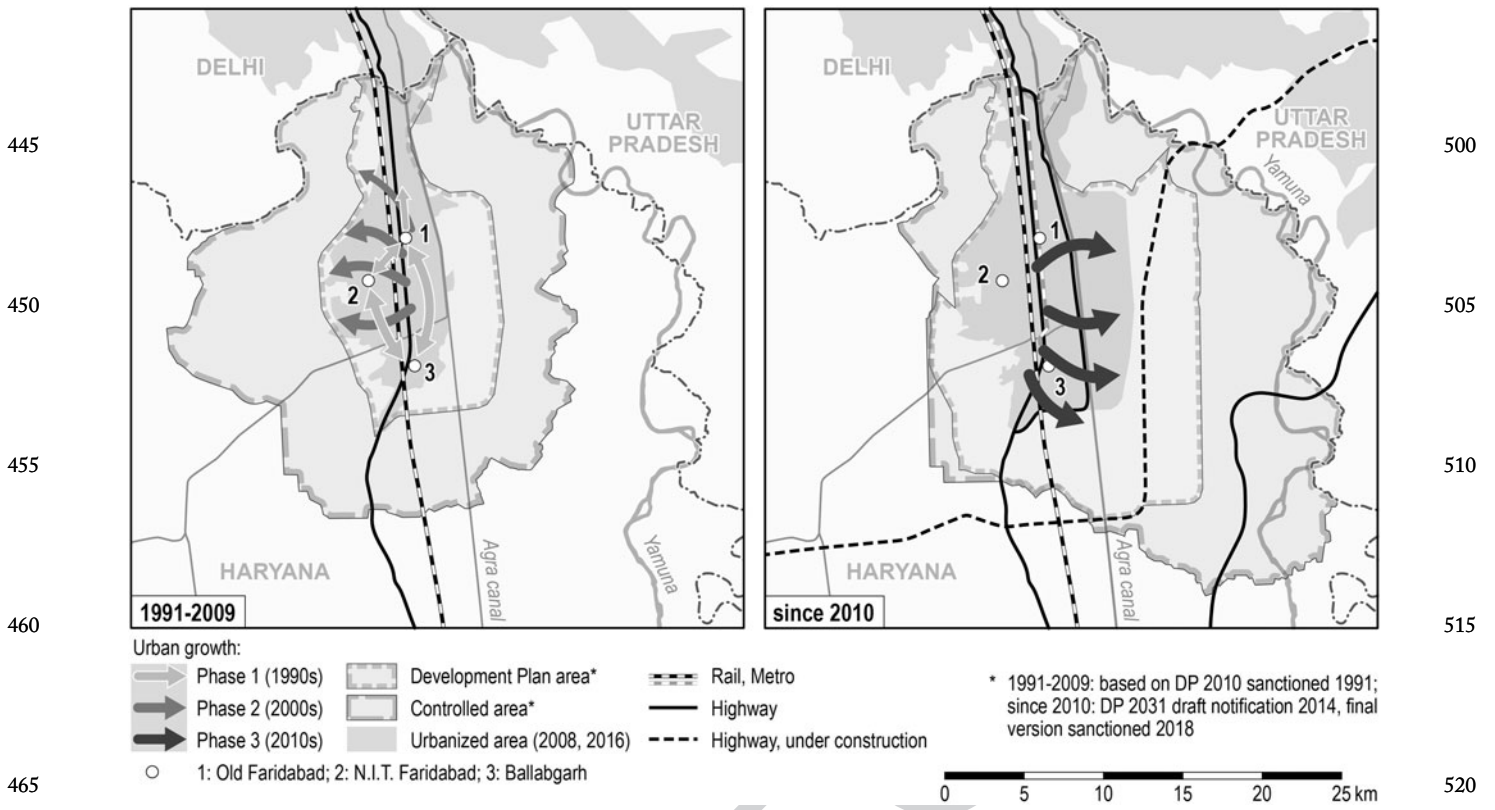


Figure 1. Urban growth patterns of Faridabad on the periphery of Delhi. Sources: GoH-DTCP (1991, 2014); Follmann et al. (2018); Mattner (2017). Layout: A. Follmann and G. Hartmann; Cartography: R. Spohner.

Infrastructure planning in and around Faridabad tends to be a technocratic, opaque process. Interviews and secondary sources indicate that information about the routing of new transportation lines is highly political and rarely made public. Instead, rumours circulate, generating both hope, for example, for better connectivity and jobs, and fear, for example, that legal action will be taken against informal activities or occupancy. Incidentally, it is not unusual for developers and land brokers to deliberately spread misinformation to persuade people to sell or buy land.⁹ Thus, the non-disclosure of official plans and fragmented power across state agencies feed land speculation and negotiation among stakeholders with vastly unequal power.

The regional (state) government of Haryana uses various spatial development instruments to achieve planned urban growth in and around Faridabad. These include the Development Plan 2031 (DP-2031), which provides detailed land-use zoning, and the so-called Controlled Area, which de jure controls subdivision and selling of land as well as construction activities beyond the area of the Development Plan. Whereas the stated aim of this plan is to ensure integrated development, in practice it is used to promote fast urban development by declaring large tracts of land ripe for planned development. Both state agencies and private developers acquire land from farmers, consolidate it into larger plots, and then sell these to private developers to build mainly high-rise gated enclaves for the middle classes. Depending on the

level of demand from private developers, budgetary resources and potential obstacles to acquisition (e.g., ambiguous land tenure status and/or litigation), this market-oriented land and property development model is rolled out sector by sector.¹⁰ In the process, a fragmented pattern of peri-urban morphologies emerges, with fully developed sectors, sectors under development and sectors flagged for future actions (Follmann et al., 2018).

It is significant that urban development does not fall within the authority of the municipality of Faridabad. Rather, it is within the remit of the Haryana state government and municipal actors are bypassed. And whereas residential development comes under the Haryana Urban Development Authority, the construction of the above-mentioned expressways rests with the national government (National Highways Authority of India). This is an important reminder that peri-urban dynamics are always nested within the political economies of other scales, which contribute to shaping these dynamics (Kennedy, 2014; Schindler & Kanai, 2021).

Fieldwork research and the visual interpretation of multi-temporal high-resolution Google Earth satellite images (see Figure A2 in Appendix A in the supplemental data online) indicate that two distinct peri-urban morphologies are emerging. First, we find an increasing number of formally planned large-scale real-estate projects, locally known as 'societies'. Developed mainly by private actors, these often take the form of gated, multi-story, condominium-style housing projects targeting the

middle-classes. Second, and in sharp morphological contrast, we find ‘colonies’, that are sprawling, incrementally built housing. This type of housing is non-compliant as per the DP-2031, but is widely tolerated by the authorities. Spatially, these colonies are located either beyond the DP-2031 or within sectors that for whatever reasons have not yet been developed. The informal settlements generally show poor housing conditions and lack basic infrastructures. In sum, these two distinct settlement types produce highly fragmented peri-urban morphologies. Their territorial extents, spatial dynamics and concentrations are detectable through geospatial analysis using satellite images. However, the underlying logics and the reasons for the juxtaposition of both settlements become legible only through qualitative fieldwork. As indicated above, planned urban expansion in Faridabad targets the upwardly mobile middle classes, while low-cost housing is non-existent in the plans. As this suggests, social integration is absent from plan-making, yet (informal) colonies fill a crucial need, helping to fulfil the demand for affordable housing. The plots are often developed on land of former brick kilns. They are sold by local agents and construction starts without obtaining any prior approval. Nevertheless, demolition of these colonies hardly ever occurs as local vote bank politics act as a protective force.

Furthermore, comparatively cheaper land is available further out on the periphery and the state government seeks to apply its real estate-driven urban development model beyond current urban boundaries through the extension of the area of the Development Plan (see shifting boundaries of the planning boundary in Figure 1). While these dynamics produce spatially fragmented peri-urban morphologies, we know from interviews with residents¹¹ that people buying and living on informally plotted peri-urban land are often deeply invested in state-led development processes and stake their futures in the expanding city.

In sum, the Faridabad case has shown the connections between the highly fragmented peri-urban morphologies and underlying urban development processes, reflecting planning practices, multi-scalar governance, land politics and housing markets: the non-integration of low-cost housing in development plans despite large-scale unmet demand from low-income groups resulting in simultaneous creation of developer-built high-rise housing ‘societies’ and largely self-built low-rise ‘colonies’; the construction of large-scale road infrastructure by the national government spatially bypassing central areas and creating new connectivity at the outer edges of the city; and the institutional bypassing of the municipality by the regional state.

5. KASOA: DORMITORY URBANIZATION HOTSPOTS IN ACCRA’S PERIPHERY

Until a couple of decades ago, the peri-urban areas of Accra, including Kasoa, were characterized by dispersed rural settlements, with a dominance of subsistence farming

(Gough & Yankson, 2000, 2011; Yankson & Gough, 1999). However, today, new housing developed by individuals and real estate developers within and around indigenous rural settlements is replacing forest and agricultural land uses and attracting newcomers, often from nearby Accra (Bartels, 2020). The land market in the area has become increasingly complex, with customary land tenure and statutory land-management procedures existing side by side. Customary landowners, which include families, clans and traditional authorities (chiefs), are key players in local property markets, as they are empowered to sell land for residential development both to individuals of indigenous communities and developers (Gough & Yankson, 2000; Miller et al., 2020). The sale of plots of land from customary landowners and small-scale development on these plots by both the poor and the middle classes contribute to the piecemeal processes of peri-urbanization in Greater Accra (Bartels, 2020).

Although regional planning aimed to direct future development towards the east of Accra within existing built-up structures (Owusu, 2013), the Greater Accra Metropolitan Area (GAMA) has shown outward sprawl in all directions (see Figure A3 in Appendix A in the supplemental data online; see also Akubia & Bruns, 2019; Møller-Jensen et al., 2020), even beyond its administrative regional boundary – as we outline for the case of Kasoa. Although in principle different planning instruments are in place at the central, regional and local levels to guide spatial and land-use planning, urban development has happened and continues to happen in an uncoordinated and institutionally fragmented manner. This is in part because of a lack of human resources and enforcement powers at the local level (Gaisie et al., 2019; Gough & Yankson, 2000; Owusu, 2015). In the context of decentralization, there is also limited coordination between various administrative units with regard to urban development activities (Agyemang et al., 2017).

In analysing the spatial evidence, we note that GAMA experienced a considerable increase in urban extension, with annual averages of spatial extensions of 12.4% in 1991–2000 and 5.3% in 2000–14 (Angel et al., 2016, pp. 34–35);¹² infilling growth is comparably low. In the latter period, most of the changes were in the peri-urban areas, which became increasingly attractive for people seeking affordable housing (Adugbila, 2019), due to the scarcity of land and extremely high land and property values in Accra (Gillespie, 2020). Doan and Oduro (2012) remind us that the concentric growth of Accra combines with urban development in targeted nodes such as the port, or along highways and in villages.

The spatial evidence also shows that the satellite town Kasoa, administered under the Central Region, and situated to the west of GAMA, is spatially and functionally integrating with Accra (see Figure A3 in Appendix A in the supplemental data online). This process is producing a larger but spatially more fragmented and less compact contiguous patch, that is, more open spaces between an increasing number of contiguous land-use patches. The spatial incorporation of peri-urban built-up areas

engenders a low-density urban sprawl, a pattern partly explained by improved transportation and infrastructure networks between Greater Accra and adjacent regions. This is also reflected in lower population densities in both the overall urban extent as well as in the built-up area. More than 60% of the built-up area changes are due to extensions, fragmenting, and reducing forest and agricultural land, and, as also shown by Akubia and Bruns (2019), reducing open space and encroaching on wetlands and water bodies. Infill developments are also occurring.

Urban development in Kasoa was impacted by the toll road built in 2008 joining Accra and the Cape Coast (the CBD–Mallam–Kasoa corridor; Adugbila, 2019). As indicated by Doan and Oduro (2012), for GAMA, the corridor acted as a powerful catalyst spurring residential developments in localities along the highway. Kasoa's population nearly doubled between 2000 and 2010 (from 34,719 to 69,384),¹³ and reached 131,543 in 2018 (Miller et al., 2020). The satellite imagery analysis by Addae and Oppelt (2019) predicts further urban expansion and identifies peri-urban towns such as Kasoa as 'hotspots'.

To explore in further detail the impact of the toll road on Kasoa, Adugbila (2019) combined visual image interpretation of Google Earth images (2008, 2018), household surveys and key informant interviews. Findings from that study indicate that the road expansion and associated development served to both connect residents and fragment local communities. As road connectivity with Greater Accra improved, it fuelled residential development and attracted mainly middle-class commuters engaged in trade or employed in the manufacturing or service sectors in Accra. The key factors driving residential development in Kasoa are the higher cost of living in Accra city, the availability of vacant plots (see Figure A4 in Appendix A in the supplemental data online) and improved connectivity. The increase of upscale gated communities such as Red Roof, Iron city, Blue Gate and Adom estates in the Tuba community, in particular, contributed to effectively excluding lower income groups from this type of housing and led them to relocate, often to areas closer to the main road.

Expansion of road infrastructure and associated urbanization processes affect various dimensions of integration. From a more fine-grained analysis of two residential communities in Kasoa, Mataheko and Tuba (see Figure A4 in Appendix A in the supplemental data online), it appears that community integration between these two residential areas decreased. Although overall the residents benefited from greater access to employment opportunities (e.g., domestic help) and business activities (e.g., selling food along the road), the emergence of gated residential compounds, which permit more secluded lifestyles, contributed to decreased social interactions among the two communities. Moreover, the relative improvement of income levels decreased the need to solicit others for help. Lastly, functional integration improved due to increased access to basic services such as water. The analysis of these two communities illustrates that outcomes in

terms of integration/fragmentation and connectivity/bypass can even vary at the very local level.

In sum, the piecemeal, unplanned conversion of agricultural land into residential and commercial areas changed the socio-spatial fabric, connections between local communities and spatial fragmentation at the local level. Vacant plots and improved transport connectivity to Accra attracted new groups into Kasoa, functionally integrating Kasoa with Accra beyond administrative boundaries. The new residential developments also brought improved access to urban amenities, physical infrastructure and jobs. While we see spatial and political fragmentation at the regional scale and a decrease in agricultural land use, we see that the regional connectivity promotes increased functional integration at the local scale, and social diversification, a process that may lead to a decrease in social interactions between different social groups. Improved connectivity and access thus come with social and environmental costs.

6. LINGANG: STATE-INITIATED NEW TOWN DEVELOPMENT IN SHANGHAI

To understand peri-urban dynamics in Shanghai, we also first adopt a bird's-eye view. After urban sprawl in the 1990s, in the early 2000s Shanghai envisioned a polycentric spatial structure of the metropolitan area. The master plan initiated the development of nine new towns, which changed the peri-urban dynamics into state-initiated new town development. One of the new towns, Lingang, examined in more detail below, is the furthest new town, located 75 km from central Shanghai. Existing research has investigated the case mostly from the perspective of governance and state rescaling (Li & Chiu, 2020; Robinson et al., 2021; Shen et al., 2020; Wang & Wu, 2019). Here we go beyond the development of new towns and reflect on peri-urban dynamics by examining the peri-urban morphologies and the processes that produce them. Occupying an area of 315 km², the development of the new town was initiated in conjunction with the construction of the Yangshshan deep-water container port in 2001. Shanghai detected an opportunity to develop advanced manufacturing industries and hence wished to develop a new town to support port-driven industrial development. The development has been driven by Shanghai's overall municipal and industrial upgrading strategy. From multi-temporal land-use data (see Figure A5 in Appendix A in the supplemental data online) we learn that land development occurred not only in the areas close to central Shanghai but also jumped over agricultural fields into peripheral areas. While Shanghai is comparably compact, the development of new towns has significantly extended the scope of spatial expansion into peri-urban areas.

We then zoom into the new town and its environs (Figure 2; see also Figure A6 in Appendix A in the supplemental data online). The area reveals significant land developments, and the new town is literally a municipal mega-urban project. The most striking spatial feature is

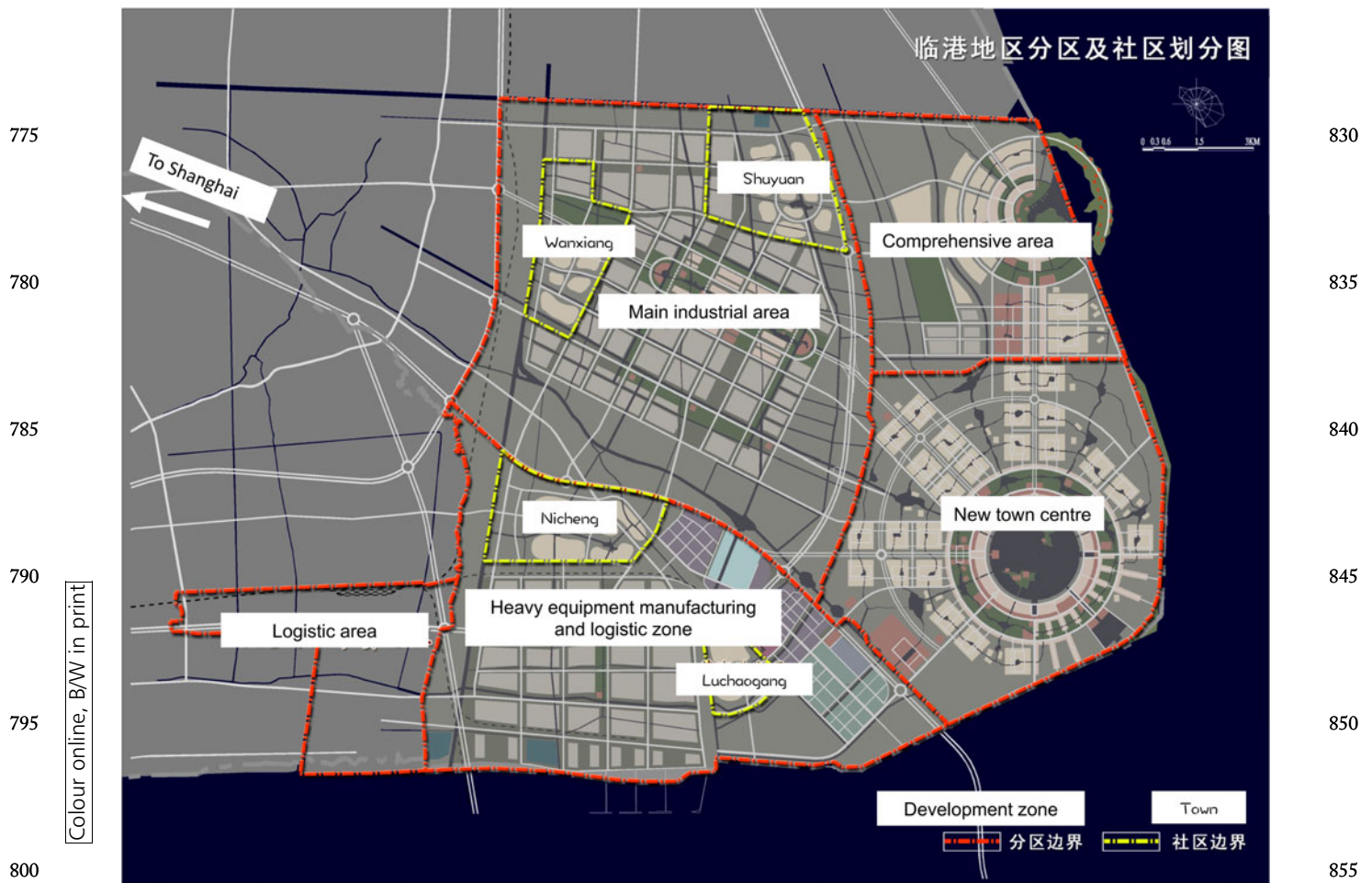


Figure 2. Planned development of Lingang and existing towns in peri-urban Shanghai.
Source and design: F. Wu, adopted from the Shanghai Pudong Planning and Design Institute.

the strong planning input (see the bottom image in [Figure A6 online](#)). The core new town is called Nanhui New City, which has been comprehensively designed (see the top left image in [Figure A6 online](#)). In addition, the heavy equipment manufacturing zone is also carefully planned (see the middle image in [Figure A6 online](#)). These large land plots and street blocks, and well-aligned avenues, reflect their formal development approaches. Indeed, the municipal government designated the Lingang Economic Group to develop the industrial zone, while the Harbour-City Development Corporation under the district government led the new town development. Clearly, the planning here is influenced by norms that separate industrial, commercial and residential areas. Morphologically, this area seems to be well integrated. However, beneath this neatly designed new town is spatial and institutional fragmentation. The fragmentation is caused by the so-called 'separation between industries and cities' (*chan cheng fengli*). Separated by a distance of 15 km without convenient connections, industrial workers, unlikely to commute between these two 'functional areas', actually live in nearby villages.

Spatial fragmentation is also caused by institutional division because these two areas have been developed by different development corporations. Moreover, spatial

fragmentation is created between planned development and remaining informal rural settlements. Four rural towns in the area remain. One prosperous former rural town is Nicheng ([Figure 2](#); and see the top right image in [Figure A6 in Appendix A in the supplemental data online](#)). Its morphologies are more irregular and informal, adjacent to the formal industrial zone. Simply reading the spatial morphologies we can identify two salient features: (1) the new town is a well-designed and planned area, presenting some spatial unity; and (2) despite its formal appearance, the peri-urban area shows evidence of spatial and institutional fragmentation between formal and informal components and different functional areas (industrial versus residential functions).

We have demonstrated so far the usefulness of reading the spatial morphologies to understanding peri-urban dynamics, which is characterized by state-initiated new town development. Although the formal development presents quite different features from 'plot urbanism' in Accra or larger scale sector-wise development in Faridabad, peri-urban Shanghai is both spatially and institutionally fragmented. The municipal government of Shanghai is aware of spatial fragmentation between industrial and residential areas and drives state planning and governance adjustment towards peri-urban integration. In 2012, the

industrial and new town management committees were merged into one in the Lingang region. A new institutional adjustment has been made to integrate urban and rural areas. In 2015, the government launched a pilot policy to coordinate the roles of social provision and business promotion. The function of economic governance, that is, attracting investment, in the rural towns has been transferred from town governments to the Lingang management committee. The rural towns now receive fiscal redistribution rather than draw income from local businesses. Through these operations of institutional unification, the peri-urban area of Lingang is increasingly integrated into the new city.

Besides assessing spatial fragmentation and integration, it is also important to examine connectivity and bypass. Lingang is a comprehensively planned new town and, therefore, it is well connected through road and metro rail with central Shanghai. However, its internal connectivity is still weak, although we observe an evolution towards better connectivity, for instance, with new roads and mass-transit stations beginning to connect different areas. Interestingly, Nicheng enjoys the development of its town centre. New shopping malls began to attract business because of the growing population. The connectivity between industrial, residential and commercial development has been strengthened. In contrast to the 'grand' new town of Lingang, the rural town is growing organically in response to local demand and thus is better connected to the industrial area. The satellite image shows that rather informal development in rural towns is occurring adjacent to well-planned large parcels of formal development. However, connectivity does not exist evenly across the whole new town area. Although the government aims to integrate rural towns into its mega-urban project through the transfer of government functions mentioned above, not all rural towns are well connected to the new town. Currently, the connectivity of some rural towns is not strong. In this sense, they are not in a situation of total bypass. Again, this is due to the fact that the new town is a strategic development of Shanghai. Although bypass and fragmentation seem inevitable in such a large-scale development, the overall peri-urban dynamics tend towards integration and connection.

So far, the strong state intervention seems to suggest well-connected and integrated peri-urban transformation, in contrast to the dominant pattern in the Global South. However, a careful investigation using socio-spatial analytics reveals a quite complex picture. For rural villages inside the area of strategic development, to speed up the development of the new town, the government compensated farmers quite generously. For other areas outside the main new town, integration is much slower. Some existing communities in the region are not very well connected to the development of new town and hence have been 'bypassed'. The main developer of the new town, the Lingang Economic Group, has taken a more strategic view about the direction and priority area of development and has shifted its attention to attracting highly skilled workers and developing high-tech industries. The feature

of bypass we observe has resulted from the weak relationship between these communities and the development strategy. On the other hand, spatial proximity matters. Beyond state intervention to integrate and connect rural areas into the new town, market forces strengthen, through spatial spillover effects, the linkages between urban and rural areas (e.g., development of a new shopping centre in Nicheng).

In short, peri-urban dynamics in Shanghai are characterized by planned new town development with larger development sites and land tracts. We see a stronger tendency of integration and connectivity. But also due to this state-centred development, fragmentation occurs because of internal fragmentation of development organization by multiscale states. Depending upon their spatial proximity to state mega-urban projects, rural towns show varying degrees of connectivity. Residual rural settlements remain. However, these 'informal' developments have been gradually absorbed into or connected with the formal economy, especially at the location adjacent to industrial development, near mass-transit stations, or connected with road infrastructure. We stress the state-centred integration but also residual spaces outside the formal mega-urban projects, which are still struggling with their difficult situation of fragmentation or bypass.

7. DISCUSSION: A COMPARATIVE ANALYSIS OF PERI-URBAN DYNAMICS

Our comparative analysis underscores that there are no uniform morphologies in peri-urban areas in the Global South. Both inter- and intra-case findings clearly highlight heterogeneous patterns. Some peri-urban features demonstrate a 'neater' pattern (state-led, planned), and others more irregular, arising from 'plot-by-plot' development. In this respect, our findings corroborate other recent comparative research on peri-urban dynamics in Asia and Africa (Karaman et al., 2020; Meth et al., 2021; Myers, 2018; Sawyer et al., 2021). Whether they are the result of deliberate policies/planning or transpire more indirectly from a combination of endogenous and exogenous stimuli, peri-urban dynamics always give expression to broader political economic context, socio-political processes and distributional politics (Robinson & Roy, 2016). China has a strong central government, and the Lingang mega-project reflects transcalar interactions (Robinson et al., 2021). India sees the strong influence from the regional (state) government and global aspiration, while at the local level there is a significant property right informality. Comparatively, both the central and local states are weak in Ghana, while real estate developers operate in the context of customary land tenures. Yet, across these varying broader political-economic contexts, our analysis has identified three key processes that are particularly significant in producing the peri-urban morphologies we observe in the three cases.

First, market- and speculation-driven property development processes. In all three cases, they trend in favour of upper and middle-class residential spaces while

neglecting low-income housing. However, this trend – which is corroborated in other peri-urban areas in the Global South (e.g., Sawyer et al., 2021; Watson, 2014; Wu & Keil, 2020) – is produced by distinct historically grounded land politics with varying social distributional implications, as we summarize here for each case.

In Faridabad, state and private actors are committed to an agenda focused on constructing commercial and residential property for the market and connectivity to Delhi through public investments in multi-modal transport. These shifts are reconfiguring the social profile of the city as planned development caters to upper segments of the market. Lower income households rely largely on autoconstructed settlements of various types dispersed throughout the city. Additionally, across the city, the demolition of decades-old, informal settlements to widen highways or erect other infrastructure are radically diminishing housing opportunities for underprivileged groups.

In contrast, planners and politicians are more committed to providing low-income housing in peri-urban Shanghai, which forms part of the mandate of local governments. Nonetheless, like elsewhere in China, peri-urban areas experience housing shortages, especially for migrant workers (Shen et al., 2020). Village collectives operate as small-scale developers to fill this gap, whereas large-scale property developers tend to cater to the middle classes, offering alternative living experiences in the form of gated compounds or entire new towns (Robinson et al., 2021; Wu, 2020).

In Kasa/Accra, housing is built largely through private initiatives of individuals and developers. With improved road connectivity, middle-class groups have settled in Kasa and commute into Accra. As such dormitory communities are built, including upscale gated residences, lower income groups are effectively excluded from these spaces and struggle to find affordable housing. As existing scholarship argues, the privatization of communal land in Accra is complex: while members of land-owning groups can access land to some extent through traditional authorities (chiefs), non-members of the communities (called ‘strangers’) must have higher purchasing power as they need to pay more – if they get access at all (Bartels, 2020; Gough & Yankson, 2000).

In sum, the three cases show that the degree to which lower income groups are excluded from the formal housing market as well as get bypassed by information, services and infrastructure depends on a range of factors, including, but not limited to, the principles underlying urban development planning (e.g., polycentric spatial structure, linear transport development). To a varied extent, social contestation and political management imperatives mitigate against fragmentation and bypass, and work in favour of integration and connectivity.

Second, state-led development strategies, notably large-scale projects (new towns, industrial zones, road/transport infrastructure) emerge as major drivers of socio-spatial fragmentation/integration and diverging degrees of connectivity/bypass. They exist alongside, but

also induce, more incremental, bottom-up/subaltern actions, emblematic of peripheral urbanization, which are also impacted by mega-projects. For example, informal colonies in Faridabad proliferate because of increasing demand for low-skilled labour (e.g., construction workers, domestic help) in formal/planned developments.

Large-scale projects in peri-urban areas often aim for regional connectivity – and in the case of Lingang and Faridabad also global connections, influenced by transcalar actors, as shown in existing literature (Halbert & Rouanet, 2014; Robinson et al., 2021; Shen et al., 2020). Government agencies on various levels pursue this goal. Yet, outcomes differ due to varying local/national capabilities and political will to achieve ‘planned’ development, and to differences in planning norms. At the local and regional levels, increased connectivity through infrastructure investments triggered processes of land speculation and the unplanned growth of self-built settlements: dynamic growth of autoconstructed ‘colonies’ in Faridabad; irregular growth of rural town and villages around Lingang; and different forms of incremental, piecemeal urban growth in Kasa. Thus, our analysis highlights multiple connections between large-scale planned development and more incremental urban growth at the urban periphery of these three Southern metropolises, thereby contributing to debates on the infrastructure turn (Schindler & Kanai, 2021; Wiig & Silver, 2019) and the real estate frontiers (Gillespie, 2016; 2020; Gururani, 2020). To unveil and explain these induced changes in the peri-urban morphologies, the socio-spatial analytics proved its generative potential: the geospatial analysis revealed the fragmented patterns of urban expansion and sharp morphological contrasts in all three cases; the qualitative research generated insights into how key social and political processes combine and interact to produce these socio-spatial fragmentations and bypass.

Third, fragmented planning and development practices rooted within complex, multi-scalar governance arrangements result in non-integrated spatial planning and the bypassing of local actors in decision-making processes. Our cases show strong correlation between institutional fragmentation and spatial fragmentation, while social contestation can mitigate against processes of fragmentation and bypass. Likewise, the scope for social contestation to mitigate against processes of fragmentation and bypass is contingent on political space afforded by different governance regimes. Whereas planning and enforcement of building guidelines were limited in Kasa beyond the highway, the Indian and Chinese cases underscore the preeminent role of state actors located at varying spatial scales. In Lingang/Shanghai and Faridabad/Delhi, state actors drive urban development not only through urban and regional planning but also by participating directly in constructing the built environment, via public agencies or delegating to other actors. These patterns reflect the willingness of governments to use state machinery to acquire and convert agricultural land to urban uses, and to ‘monetize’ it (cf. Shatkin, 2016). However, there emerge also clear differences between the

Chinese and Indian cases. In China, peri-urban municipalities play an important role in urban development through the consolidation of village land (see also Hsing, 2010). In contrast, in India it is well-established that urban governments are bypassed by state governments' urban development corporations (Kennedy, 2014). In Ghana, the state is largely absent in land development, and land privatization is largely based on the customary land system with local chiefs playing an important role; formal land policies are bypassed in this process (Akaateba, 2019; Bartels, 2020). While state spaces and governance arrangements differ, dismantling of collectively held user rights at the expense of vulnerable groups is a common feature (Gillespie, 2016; Vij & Narain, 2016). However, the degree to which this creates socio-spatial fragmentation (e.g., exclusion, segregation, gating) varies across contexts depending on property regimes, types of political management and social contestation.

Property regimes shape the degree to which the state can manage land conversion processes and foster integrated development. Whereas the Chinese state retains control over successive phases of urban development, these processes are more decentralized and market-driven in India and Ghana, where private players from customary family groupings to small property-owners to large real estate firms participate alongside state actors. Unsurprisingly, this gives rise to a more incremental, uncoordinated development process and produces a less ordered, more fragmented spatial outcome, which is visible from satellite images and measurable through geospatial analysis.

This last point highlights that none of these three processes operates independently, but rather multiple linkages exist. Thus, we argue that peri-urban dynamics are produced by the interplay of these three processes; revealing these differences through comparative socio-spatial analytics helps to explain the existing heterogeneous peri-urban morphologies across the Global South.

Beyond the identification of these three key processes, the value of the proposed comparative approach is exemplified by our finding that spatial and social patterns need not coincide: peri-urban morphologies that suggest a high degree of spatial integration can contain fragmentation and bypass at more fine-grained scales of analysis. Whereas a polycentric spatial structure such as that planned for metropolitan Shanghai puts greater emphasis on spatial integration, corridor development, which currently enjoys renewed popularity as a tool for economic development (Balakrishnan, 2019; Kanai & Schindler, 2019), accentuates linear transport connectivity. For example, Faridabad and Lingang originated as planned satellite cities, albeit at different points in time, and in both cases, linear transport infrastructure is a key component ensuring connectivity to the core city.

In Faridabad, the dependence on Delhi is visible in a linear spatial structure of the city. The development of mass-rapid transport reinforced this spatial linearity and added high degrees of nodal connectivity around the stations in central Faridabad. In contrast, massive investments in bypass expressways produced new connectivity

and new centralities at the outer edge, kickstarting dynamic residential development and land speculation beyond the existing 'planned' urban expansion. Similar, in Kasa, residential developments were spurred by the expansion of a highway improving connectivity to metropolitan Accra, and have taken place largely outside any formal plan. Although Lingang is connected to Shanghai through metro and roads, various places within this vast region (e.g., rural towns) are less well integrated and experience bypass. Spatial fragmentation here is a clear outcome of institutional fragmentation, that is, different development areas managed by different agencies and administrative levels.

The cases highlight that bypass and connectivity are not always visible spatially; indeed inferences drawn from satellite images can be misleading as the Faridabad case showed. Research at more fine-grained scales, notably through qualitative fieldwork, can help detect these processes. Thus, only through methodological triangulation are we able to make visible and explain this dissonance within peri-urban morphologies, which appears to be common across the three cases.

8. CONCLUSIONS

In this paper we applied an integrated socio-spatial analytics approach that combines geospatial and qualitative fieldwork methodologies to study and compare peri-urban dynamics in three urban agglomerations in the Global South. To operationalize the comparison, we used two pairs of conceptual lenses – *fragmentation/integration* and *connectivity/bypass* – which allowed us to investigate concrete processes and outcomes of peri-urban dynamics in relation to uneven development, as well as institutional discontinuities and ambiguities. Distinct spatial patterns emerge in different contexts, which can be detected from above using geospatial methods; for example, a sharp contrast between formally planned new town and informal urban villages in Shanghai; planned, high-rise societies and autoconstructed 'colonies' in a satellite city of Delhi; or the incremental urban growth at the outskirts of Accra. Through qualitative social science enquiry, we interpret these patterns as manifestations of historically grounded socio-political processes. We argue that peri-urban morphologies express broader political-economic contexts and local/national planning norms with regard to connectivity and integration (e.g., zoning and functional segregation). The nature and degree of state involvement also strongly conditions peri-urban morphologies. Institutional fragmentation and bypass tend to produce spatial fragmentation and bypass, whereas institutional integration fosters spatial integration and connectivity. Additionally, political management and social contestation can mitigate against processes of dis-possession, fragmentation and bypass, and solicit for integration and connectivity.

Connecting back to current debates on peri-urbanization and the challenges these highly dynamic spaces pose for urban and regional research, we have

demonstrated that a comparative research framework that combines rigorous spatial analysis with critical social science methods can generate new insights into the production of heterogeneous peri-urban morphologies and contribute to theory-building.

The contribution of the paper is threefold. Conceptually, we have introduced a set of analytical lenses which we argue are generative to structure the comparative study of peri-urban dynamics. Methodologically, our iterative socio-spatial analytics advances existing methods of comparative urbanism by combining different methodological approaches. In particular, our social-spatial analytics linked a posteriori comparisons with an integrated mixed-methods approach. Although here the comparative approach was applied a posteriori to three study sites, we postulate that our approach can serve to conceptualize larger, multi-sited, a priori comparative research. By combining both theoretical perspectives and methods from geospatial sciences and urban studies, the approach offers a way forward to overcome compartmentalization in urban research, identified as a key obstacle to responding to complex urban challenges (Acuto et al., 2018; Sayın et al., 2022).

Empirically, we have identified three key processes (market- and speculation-driven property development; state-led development strategies; and fragmented planning and development practices) that contribute significantly to shaping peri-urban dynamics across varying political-economic contexts. We have argued that an investigation of these three processes and their interlinkages can explain heterogeneous peri-urban morphologies in the Global South, which share several common features, for example, fragmentation and bypass, albeit with differing degrees. Future research may analyse critically to what extent these findings are corroborated across other cases, and also the extent to which the comparative socio-spatial approach presented here is generative for building further theoretical insights about urbanization from the Global South.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

NOTES

1. *Regional Studies*, 55(1) (2021).
2. This conceptualization was first elaborated within the research collective COMPASS (for details, see the Acknowledgements).
3. Our approach shares many similarities with that outlined by Montero and Baiocchi (2021). Although we developed our approach independently, we have adopted here their terminology, that is, a posteriori comparison, as it aptly describes our comparative approach.
4. The remote sensing analysis by Mattner (2017) has been supervised by one of the authors.
5. See <http://www.atlasofurbanexpansion.org/data/>.
6. We draw here on 12 interviews from Faridabad/Delhi, seven interviews from Kasoa/Accra and 51 interviews from Lingang/Shanghai.
7. The fieldwork in Kasoa was carried out by Adugbila (2019) and supervised by one of the authors.
8. See Sen and Yadav (2017, p. 100) for a similar description of urban growth in Faridabad and Kumar et al. (2021) for a zonal assessment of the urban growth in Faridabad using spatial metrics.
9. For example, developers produce their own development plans by making maps and figures based on the official plans, but showing changes and additions that reflect their interests. In this sense, their plans can be performative.
10. Interview with a senior town planner, Haryana Urban Development Authority, October 2016.
11. Interviews with residents of colonies in Faridabad, October 2016 and September 2019.
12. Spatial evidence derived from different remote sensing images with different spatial resolutions and

classification methods show a similar trend for Accra, but precise numbers may deviate (Møller-Jensen et al., 2020).
 13. Ghana Statistical Service, 2010, Population and Housing Census.

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