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

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Abstract: The research presented here advances 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 a number of 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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60   and India, the comparison is operationalized through two pairs of conceptual lenses developed

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1. Introduction

The world's most dynamic urbanisation 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 and Narain 2016). These processes generate critical challenges not only for people and governments in those places (Gaisie et al. 2019) but 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 and Narain 2021) and have captured attention from a range of disciplines and theoretical perspectives within the shifting geographies of global urbanisation (Roy 2009; Brenner and Schmid, 2015; Lawhon et al. 2016; Robinson and Roy, 2016). In this context, Caldeira's (2017) peripheral urbanization, Simone's (2019) extensive urbanization and the recent work on planetary urbanization (see 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 and Keil 2020) or periurbanization (Leaf 2016; Simon 2020) are other departure points for a retheorization of peripheral expansion. Additionally, a special issue in this journal (Volume 55, Issue 1, 2021) explored current planning practices and spatial development strategies affecting peri-urban areas in the global South. 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 forthcoming; 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, Accra and Shanghai.

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 than one continent, and Shatkin 2016; 2017 with cases in South and South-East Asia). In this paper, we draw on three cases: Delhi's satellite city Faridabad (India), the peri-urban town of Kasoa on the outskirts of Accra (Ghana), and the new town development of Lingang at the fringe of Shanghai (China). 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,

102 often informal, land transactions and settlement processes (see also for Delhi: Follmann et al.

103 2018, Gururani 2020, Singh and Narain 2020; for Accra: Akubia and Bruns 2019, Bartels 2020,

104 Gillespie 2016, Møller-Jensen et al. 2020; and for Shanghai: Li and Chiu 2020, Shen et al. 2020,

105 Wang and Wu 2020).

106 Our approach has been inspired by recent debates on comparative urbanism (McFarlane 2010;

107 Parnell and Pieterse 2016; Peck 2015; Robinson 2016; Montero and Baiocchi 2021;; Sayin et

108 al. 2022) and to an extent, by the process-oriented perspective of planetary urbanization

109 (Brenner and Schmid, 2015, Schmid et al., 2018). In particular, we use comparison as "a tool

110 for creating new conversations" (McFarlane 2010: p. 730) about peri-urban dynamics and to

111 think about the peri-urban "through elsewhere" (Robinson 2016: p. 5). Following Nijman

112 (2007), our goal has been to better understand peri-urban dynamics in the individual cases

113 through a comparison with other examples, and on that basis, analyse the production of peri-

114 urban morphologies across diverse political-economic contexts to generate knowledge about

115 peri-urban dynamics in the global South more generally.

116 The contribution of this paper to current debates in urban and regional studies is threefold:

117 conceptual, methodological and empirical. Conceptually, we introduce a set of analytical lenses

118 – *fragmentation/integration and connectivity/bypass* – which guide systematic comparisons of

119 peri-urban dynamics across our three cases. The conceptualization of these lenses is an outcome

120 of extensive discussions bringing into conversation empirical findings from the peripheries of

121 Delhi, Accra and Shanghai, generated in earlier research.[1] Thus, the lenses were developed

122 inductively by comparing the observed large-scale spatial transformations and on the bases of

123 our analyses of the processes that produced them. We then systematically apply the lenses in

124 an iterative exchange to generate knowledge about the individual cases and compare the three

125 cases with each other relationally to further generate knowledge on peri-urban dynamics. Thus,

126 in contrast to the more common comparative approach of selecting a conceptual framework and

127 cases to be compared before (*a priori*) the empirical research is conducted, we perform our

128 comparison through a systematic and iterative re-analysis of already existing empirical

129 materials. Recently, Montero and Baiocchi (2021) have termed this type of approach as "*a*

130 *posteriori* comparisons".[2] Here, we focus on linking *a posteriori* comparisons to an integrated

131 mixed-methods approach, pointing to our methodological innovation. We propose this

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[1] This conceptualization was first elaborated within the research collective COMPASS (for details see acknowledgements).

[2] 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, i.e., *a posteriori* comparison, as it aptly describes our comparative approach.

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 characterise 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, Parnell and Seto 2018: 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; 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 paper is organized 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 operationalisation. The case studies are presented in the following sections: Delhi (4), Accra (5), Shanghai (6), followed by a comparative analysis (section 7) and conclusion (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 them as comparative analytical lenses. The value of this conceptual framework lies not only in describing different degrees of fragmentation, integration, connectivity or bypass, but in its capacity to encompass multiple perspectives on

165 socio-spatial transformations in peri-urban areas and to put into conversation and comparison
166 cases from across the globe. In this section, we briefly introduce and discuss each set of lenses.

167 *Fragmentation and integration*

168   *Fragmentation*, as a popular analytical idiom alongside the associated notions of
169 segregation and polarisation, has been widely used to highlight the challenges of uneven urban
170 development (e.g., McFarlane 2018). The frontiers of fast-growing agglomerations in the global
171 South are characterized by both socio-spatial and institutional fragmentation; they typically
172 straddle rural, municipal and metropolitan administrations, which produce ambiguity and
173 regulatory vacuums (Dupont 2007; Owusu 2015). The co-existence of heterogeneous property
174 regimes gives rise to a patchwork of settlement types (Caldeira 2017, Shatkin 2017).

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

183   Interrogating peri-urban dynamics through the conceptual lenses of
184 fragmentation/integration, we start with the assumption that highly fragmented peri-urban
185 landscapes are the expression of distinct systems of land governance, mediated through
186 historically embedded social institutions. Land-related issues, e.g., expropriation, privatization,
187 commodification, occupancy, speculation, have emerged as singularly significant issues in
188 urban peripheries across the global South (Akaateba 2019; Benjamin 2008). Land is at the heart
189 of deeply political processes of dispossession and displacement (Gillespie 2016; Goldman
190 2020); but also "everyday practices of compensation, capture, and rent" (Gururani 2020: 984),
191 which sometimes offer opportunity for subaltern groups to become "shareholders" in urban
192 production (Balakrishnan 2019). To grasp this dynamically, it is generative to link the analysis
193 of geospatially detectable processes of land use change and fragmentation to the study of how
194 agrarian property regimes are integrated into emerging real estate markets on the urban
195 periphery. Additionally, contemporary land politics – whether land-centred accumulation in
196 China (Shatkin 2017; Shen et al. 2020), state-led acquisition of land for private investors in
197 India (Chakravorty 2016; Gururani 2020) or incremental and uncoordinated privatization of

198 land for real estate development in Ghana (Bartels 2020; Gillespie 2016, 2020) – drives urban
199 expansion much faster than population growth alone would merit (Angel et al. 2016). Finally,
200 the effects of large-scale land conversion and commodification are often at odds with broader
201 social goals and, thus, spark contestation (Jenkins, Kennedy and Mukhopadhyay 2014; Shatkin
202 2016; Gillespie 2016). The response from policy-makers and planners often aims for both
203 spatial and (global) socio-economic integration, which takes the form of state-driven land
204 acquisition 'in the public interest' to publicly-funded large-scale infrastructure developments
205 (Schindler and Kanai 2021, Watson 2014, Wiig and Silver 2019).

206

207 *Connectivity and bypass*

208   Economic development policies are significant drivers of peri-urban dynamics.
209 Rescaled states seeking to restructure their economies forge new geographies of accumulation
210 on the urban frontier e.g., via large-scale infrastructure projects (Schindler and Kanai 2019),
211 export zones (Kennedy 2014), real estate investments (Shatkin 2016; 2017; Gillespie 2016,
212 2020) and even entire new towns, which are being built essentially as mega-projects (Shen et
213 al. 2020; Watson 2014; Wu 2020). As powerful drivers of peri-urban land use change, these
214 developments aim to create new accumulation nodes through global connectivity (Wigg and
215 Silver 2019; Schindler and Kanai 2021), while perpetuating uneven development on multiple
216 scales. Yet, the material infrastructure often bypasses local communities spatially with
217 "diverging degrees of (dis)connectivity and access" (Kanai and Schindler 2019: p. 303).
218 Moreover, they are excluded from the decision-making as such projects often rely on ad hoc
219 rules and regimes of exception that detach them from local economies and political territories
220 (Kennedy and Sood 2019).

221   In this context, the notion of *bypass* has been utilised to analyse large-scale urban
222 developments at the urban periphery (see, e.g., Shatkin's (2008) "bypass-implant urbanism" for
223 Manila, and Bhattacharya and Sanyal's (2011) identification of "the bypass approach to
224 urbanisation" in India). More recently, the term "bypass urbanism" was introduced to describe
225 widescale transformation of urban peripheries in ways that produce "extremely uneven urban
226 developments that amount to socio-spatial segregation" (Sawyer and Schmid 2015, p.213). As
227 Sawyer et al. (2021, p. 680) further outline, 'bypassing' is a metaphor to describe the
228 circumventing of existing planning regulations and/or institutions as well as local actors. Our
229 understanding of 'bypass' embraces these metaphorical notions but goes further to also include

230 materialized physical spaces, e.g., highways connecting the centre to the periphery while
231 bypassing in-between spaces.

232 Nevertheless, "top-down" large-scale projects almost always co-exist alongside
233 "bottom-up" strategies of individuals and households, including "autoconstruction" (Caldeira
234 2017), plot by plot developments (Karaman et al. 2020), and refusal to relinquish occupational
235 rights, through negotiation and vote bank politics (Benjamin 2008) and making claims for
236 connectivity e.g., to water, energy and sewage networks, all of which influence outcomes on
237 the ground.

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

243

244 **3. Methodology – a comparative socio-spatial analytics**

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

255 Specifically, based on our existing knowledge of the three cases, we use evidence from
256 different geospatial methods to analyse the spatial features and specific peri-urban
257 morphologies. We draw on existing land-use classification based on remote sensing analysis.
258 For Faridabad/Delhi we use multi-temporal land-use classifications based upon Landsat (1991,
259 2000) and RapidEye (2010, 2017) satellite images (Mattner 2017[3], see Appendix 1) as well as
260 our own transect analysis derived from field mapping and visual interpretation of Google Earth

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[3] The remote sensing analysis by Mattner (2017) has been supervised by one of the authors.

261 images (see Appendix 2). For Kasoa/Accra and Lingang/Shanghai, we rely on data of the atlas
262 of Urban Expansion[4] (see Appendix 3 and 5) as well as visual interpretation of Google Earth
263 images (see Appendix 4 and 6). The geospatial analysis allows us to make visible spatial
264 patterns of connectivity/bypass as well as indicating processes of fragmentation/integration
265 from a multi-temporal perspective. In doing so, it offers a bird's-eye view of peri-urban
266 dynamics occurring in these three large urban agglomerations, which remain obscured when
267 using on-the-ground empirical fieldwork only (see, e.g., Sawyer et al. 2021 for a similar
268 approach using mapping for comparison).

269   Qualitative data collected on the ground provides deeper insights into the drivers and
270 consequences of the spatial patterns and processes, such as land governance or economic
271 development strategies. The qualitative data mobilized for the comparative analysis in this
272 paper is based on field observations and interviews with selected local stakeholders, including
273 old and new residents, landowners, farmers as well as with urban and regional planners and
274 elected officials.[5] Research in Faridabad/Delhi was carried out during multiple weeks of
275 fieldwork in 2016 and 2019, fieldwork in Accra/Kasoa was carried out in October 2018, and
276 fieldwork in Lingang/Shanghai took place between 2015 and 2018.[6]

277   In the following sections, we bring together the geospatial bird's-eye view and the on-
278 the-ground perspective from qualitative data sources in an iterative exchange to illustrate the
279 capacity of our approach to generate knowledge on complex peri-urban dynamics.

280

281 **4. Faridabad: Transforming Delhi's industrial satellite city into real estate**

282 In the 1950s, the Indian government's decision to locate a *New Industrial Township* in
283 Faridabad transformed it from a small town largely dependent on agricultural activities to an
284 industrialised city. For several decades its growth was facilitated by its connection to Delhi by
285 roads and railway. More recently, with deindustrialization, the central parts of the city are
286 marked by derelict compounds. In contrast, its peripheral areas are growing rapidly through
287 planned, large-scale residential real estate developments and self-built, informal housing –
288 which local residents generally distinguish as 'societies' and 'colonies' – as well as new
289 industrial estates for light industries. Massive investments in road infrastructure catalysed

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[4] http://www.atlasofurbanexpansion.org/data
[5] We draw here on 12 interviews from Faridabad/Delhi, 7 interviews from Kasoa/Accra, and 51 interviews from Lingang/Shanghai.
[6] The fieldwork in Kasoa was carried out by Adugbila (2019) supervised by one of the authors.

290 private real estate investments in peri-urban areas. Overall, these dynamics resulted in a
291 doubling of Faridabad's population between 1991 to 2011 (1.4 million in 2011).

292 To capture these large-scale transformations, we first used remote sensing data. Our analysis
293 shows that Faridabad's built up area increased by almost one fourth between 2010 (78 km^2) and
294 2017 (96 km^2) (see Appendix 1) and we identified three phases of urban development (see
295 Figure 1):

296 1) *linear integration* (1991 to 2000): three former urban cores are integrated into one
297 urbanized zone along the highway;
298 2) *north/north-western expansion* (2000 to 2010): development towards the west and to the
299 north merging built-up areas of Faridabad and Delhi;
300 3) *south/ south-eastern bypass expansion* (2010 to 2017): urban growth in southern and
301 eastern directions beyond the boundaries of the municipality bypassing central areas of
302 Faridabad.[7]

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

313 Infrastructure planning in and around Faridabad tends to be a technocratic, opaque process.
314 Interviews and secondary sources indicate that information about the routing of new
315 transportation lines is highly political and rarely made public. Instead, rumours circulate,
316 generating both hope, e.g., for better connectivity and jobs, and fear, e.g., that legal action will
317 be taken against informal activities or occupancy. Incidentally, it is not unusual for developers
318 and land brokers to deliberately spread misinformation to persuade people to sell or buy land.[8]

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[7] See Sen & Yadav 2017: p. 100 for similar description of urban growth of Faridabad and Kumar et al. 2021 for
a zonal assessment of the urban growth in Faridabad using spatial metrics.
[8] 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.

319 Thus, the non-disclosure of official plans and fragmented power across state agencies feed land
320 speculation and negotiation among stakeholders with vastly unequal power.

321   The regional (state) government of Haryana uses various spatial development
322 instruments to achieve planned urban growth in and around Faridabad. These include the
323 Development Plan 2031 (DP-2031), which provides detailed land-use zoning, and the so-called
324 Controlled Area, which de jure controls subdivision and selling of land as well as construction
325 activities beyond the area of the Development Plan. Whereas the stated aim of this plan is to
326 ensure integrated development, in practice it is used to promote fast urban development by
327 declaring large tracts of land ripe for planned development. Both state agencies and private
328 developers acquire land from farmers, consolidate it into larger plots, and then sell these to
329 private developers to build mainly high-rise gated enclaves for the middle classes. Depending
330 on the level of demand from private developers, budgetary resources and potential obstacles to
331 acquisition (e.g. ambiguous land tenure status and/or litigation), this market-oriented land and
332 property development model is rolled out sector by sector.[9] In the process, a fragmented pattern
333 of peri-urban morphologies emerges, with fully developed sectors, sectors under development
334 and sectors flagged for future actions (Follmann et al. 2018).

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

342 Fieldwork research and the visual interpretation of multi-temporal high-resolution Google
343 Earth satellite images (see Appendix 2) indicate that two distinct peri-urban morphologies are
344 emerging. First, we find an increasing number of formally-planned large-scale real-estate
345 projects, locally known as 'societies'. Developed mainly by private actors, these often take the
346 form of gated, multi-story, condominium-style housing projects targeting the middle-classes.
347 Second, and in sharp morphological contrast, we find 'colonies', which are sprawling,
348 incrementally-built housing. This type of housing is non-compliant as per the DP-2031, but is
349 widely tolerated by the authorities. Spatially, these colonies are located either beyond the DP-
350 2031 or within sectors that for whatever reasons have not yet been developed. The informal

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[9] Interview Senior Town Planner, Haryana Urban Development Authority, October 2016.

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 residents[10] 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 urbanisation hotspots in Accra's periphery

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

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[10] Interviews with residents of colonies in Faridabad, October 2016 and September 2019.

(Yankson and Gough, 1999, Gough and Yankson 2000, 2011). However, today, new housing developed by individuals and real estate developers within and around indigenous rural settlements are 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 and 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-urbanisation 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), Greater Accra Metropolitan Area (GAMA) has shown outward sprawl in all directions (see Appendix 3, see also Akubia and 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 and Yankson, 2000; Owusu 2015). In the context of decentralisation, 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 2000-2014 (Angel et al. 2016: 34-35)[11]; 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 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.

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[11] 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).

412   The spatial evidence also shows that the satellite town Kasoa, administered under the

413   Central Region, and situated to the west of GAMA, is spatially and functionally integrating

414   with Accra (see Appendix 3). This process is producing a larger, but spatially more fragmented

415   and less compact contiguous patch, i.e., more open spaces between an increasing number of

416   contiguous land-use patches. The spatial incorporation of peri-urban built-up areas engenders a

417   low-density urban sprawl, a pattern partly explained by improved transportation and

418   infrastructure networks between Greater Accra and adjacent regions. This is also reflected in

419   lower population densities in both the overall urban extent as well as in the built-up area. More

420   than 60 percent of the built-up area changes are due to extensions, fragmenting and reducing

421   forest and agricultural land, and, also as shown by Akubia and Bruns (2019), reducing open

422   space and encroaching on wetlands and water bodies. Infill developments are also occurring.

423   Urban development in Kasoa was impacted by the toll road built in 2008 joining Accra

424   and the Cape Coast (the CBD-Mallam-Kasoa corridor; see Adugbila 2019). As indicated by

425   Doan and Oduru (2012) for GAMA, the corridor acted as a powerful catalyst spurring

426   residential developments in localities along the highway. Kasoa's population nearly doubled

427   between 2000 and 2010 (from 34,719 to 69,384)[12], and reached 131,543 in 2018 (Miller et al.

428   2020). The satellite imagery analysis by Addae and Oppelt (2019) predicts further urban

429   expansion, and identifies peri-urban towns like Kasoa as "hotspots".

430   To explore in further detail the impact of the toll road on Kasoa, Adugbila (2019)

431   combined visual image interpretation of Google Earth images (2008, 2018), household surveys

432   and key informant interviews. Findings from that study indicate that the road expansion and

433   associated development served to both connect residents and fragment local communities. As

434   road connectivity with Greater Accra improved, it fuelled residential development and attracted

435   mainly middle-class commuters engaged in trade or employed in the manufacturing or service

436   sector in Accra. The key factors driving residential development in Kasoa are the higher cost

437   of living in Accra city, the availability of vacant plots (see Appendix 4), and improved

438   connectivity. The increase of upscale gated communities such as Red Roof, Iron city, Blue gate,

439   Adom estates in the Tuba community, in particular, contributed to effectively excluding lower-

440   income groups from this type of housing and, led them to relocate, often to areas closer to the

441   main road.

442   Expansion of road infrastructure and associated urbanisation processes affect various

443   dimensions of integration. From a more fine-grained analysis of two residential communities

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[12] Ghana Statistical Service, 2010 - Population and Housing Census.

444   in Kasoa, Mataheko and Tuba (see Appendix 4), it appears that community integration between

445   these two residential areas decreased. Although overall the residents benefited from greater

446   access to employment opportunities (e.g., domestic help) and business activities (e.g., selling

447   food along the road), the emergence of gated residential compounds, which permit more

448   secluded lifestyles, contributed to decreased social interactions among the two communities.

449   Moreover, the relative improvement of income levels decreased the need to solicit others for

450   help. Lastly, functional integration improved due to increased access to basic services such as

451   water. The analysis of these two communities illustrates that outcomes in terms of

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

453   In sum, the piecemeal, unplanned conversion of agricultural land into residential and

454   commercial areas changed the socio-spatial fabric, connections between local communities, and

455   spatial fragmentation at the local level. Vacant plots and improved transport connectivity to

456   Accra attracted new groups into Kasoa, functionally integrating Kasoa with Accra beyond

457   administrative boundaries. The new residential developments also brought improved access to

458   urban amenities, physical infrastructure and jobs. While we see spatial and political

459   fragmentation at the regional scale and a decrease in agricultural land use, we see that the

460   regional connectivity promotes increased functional integration at the local scale, and social

461   diversification, a process that may lead to a decrease in social interactions between different

462   social groups. Improved connectivity and access come thus with social and environmental

463   costs.

464

465   **6. Lingang: State-initiated new town development in Shanghai**

466   To understand peri-urban dynamics in Shanghai, we also first adopt a bird's eye view.

467   After urban sprawl in the 1990s, in the early 2000s, Shanghai envisioned a polycentric spatial

468   structure of the metropolitan area. The master plan initiated the development of nine new towns,

469   which changed the peri-urban dynamics into state-initiated new town development. One of the

470   new towns, Lingang, examined in more detail here, is the furthest new town, located 75 km

471   from central Shanghai. Existing research has investigated the case mostly from the perspective

472   of governance and state rescaling (Robinson et al 2021, Shen et al. 2020, Wang and Wu 2019,

473   Li and Chiu 2020). Here we go beyond the development of new town and reflect on peri-urban

474   dynamics through examining the peri-urban morphologies and the processes that produce them.

475   Occupying an area of 315 km^2, the development of the new town was initiated in conjunction

476   with the construction of the Yanghshan deep-water container port in 2001. Shanghai detected

477 an opportunity to develop advanced manufacturing industries and hence wished to develop a
478 new town to support port-driven industrial development. The development has been driven by
479 Shanghai's overall municipal and industrial upgrading strategy. From multi-temporal land-use
480 data (see Appendix 5), we learn that land development occurred not only in the areas close to
481 central Shanghai but also jumped over agricultural fields into peripheral areas. While Shanghai
482 is comparably compact, the development of new towns has significantly extended the scope of
483 spatial expansion into peri-urban areas.

484   We then zoom into the new town and its environs (Figure 2 and Appendix 6). The area
485 reveals significant land developments, and the new town is literally a municipal mega-urban
486 project. The most striking spatial feature is the strong planning input (see the bottom image in
487 Appendix 6). The core new town is called Nanhui New City, which has been comprehensively
488 designed (see the top left image, Appendix 6). In addition, the heavy equipment manufacturing
489 zone is also carefully planned (see the middle image). These large land plots and street blocks,
490 and well-aligned avenues reflect their formal development approaches. Indeed, the municipal
491 government designated the Lingang Economic Group to develop the industrial zone, while the
492 Harbour-city Development Corporation under the district government led the new town
493 development. Clearly, the planning here is influenced by norms that separate industrial,
494 commercial and residential areas. Morphologically, this area seems to be well integrated.
495 However, beneath this neatly designed new town is spatial and institutional fragmentation. The
496 fragmentation is caused by the so-called "separation between industries and cities" (*chan cheng*
497 *fengli*). Separated by a distance of 15 km without convenient connections, industrial workers,
498 unlikely to commute between these two "functional areas", actually live in nearby villages.

499   Spatial fragmentation is also caused by institutional division, because these two areas
500 have been developed by different development corporations. Moreover, spatial fragmentation
501 is created between planned development and remaining informal rural settlements. Four rural
502 towns in the area remain. One prosperous former rural town is Nicheng (see Figure 2, Appendix
503 6 top right image). Its morphologies are more irregular and informal, adjacent to the formal
504 industrial zone. Simply reading the spatial morphologies, we can identify two salient features:
505 1) the new town is a well-designed and planned area, presenting some spatial unity; 2) despite
506 its formal appearance, the peri-urban area shows evidence of spatial and institutional
507 fragmentation between formal and informal components and different functional areas
508 (industrial versus residential functions).

509   We have demonstrated so far the usefulness of reading the spatial morphologies to
510   understanding peri-urban dynamics, which is characterized by state-initiated new town
511   development. Although the formal development presents quite different features from 'plot
512   urbanism' in Accra or larger-scale sector-wise development in Faridabad, peri-urban Shanghai
513   is both spatially and institutionally fragmented. The municipal government of Shanghai is
514   aware of spatial fragmentation between industrial and residential areas and drives state planning
515   and governance adjustment towards peri-urban integration. In 2012, the industrial and new town
516   management committees were merged into one in the Lingang region. A new institutional
517   adjustment has been made to integrate urban and rural areas. In 2015, the government launched
518   a pilot policy to coordinate the roles of social provision and business promotion. The function
519   of economic governance, i.e., attracting investment, in the rural towns has been transferred from
520   town governments to the Lingang management committee. The rural towns now receive fiscal
521   redistribution rather than draw income from local businesses. Through these operations of
522   institutional unification, the peri-urban area of Lingang is increasingly integrated into the new
523   city.

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

543   So far, the strong state intervention seems to suggest well-connected and integrated peri-
544   urban transformation, in contrast to the dominant pattern in the global South. However, a careful
545   investigation using socio-spatial analytics reveals a quite complex picture. For rural villages
546   inside the area of strategic development, to speed up the development of the new town, the
547   government compensated farmers quite generously. For other areas outside the main new town,
548   integration is much slower. Some existing communities in the region are not very well
549   connected to the development of new town and hence have been "bypassed". The main
550   developer of the new town, the Lingang Economic Group, has taken a more strategic view about
551   the direction and priority area of development and has shifted its attention to attracting highly-
552   skilled workers and developing high-tech industries. The feature of bypass we observe has
553   resulted from the weak relationship between these communities and the development strategy.
554   On the other hand, spatial proximity matters. Beyond state intervention to integrate and connect
555   rural areas into the new town, market forces strengthen, through spatial spill-over effects, the
556   linkages between urban and rural areas (e.g., development of a new shopping centre in
557   Nicheng).

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

569

570   **7. Discussion: a comparative analysis of peri-urban dynamics**

571   Our comparative analysis underscores that there are no uniform morphologies in peri-
572   urban areas in the global South. Both inter- and intra-case findings clearly highlight
573   heterogenous patterns. Some peri-urban features demonstrate a 'neater' pattern (state-led,
574   planned), and others more irregular, arising from 'plot-by-plot' development. In this respect,
575   our findings corroborate other recent comparative research on peri-urban dynamics in Asia and

Africa (see 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 and 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 (see, e.g., Watson 2014; Sawyer et al. 2021, Wu and 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).

609   In Kasoa/Accra, housing is built largely through private initiatives of individuals and

610   developers. With improved road connectivity, middle-class groups have settled in Kasoa and

611   commute into Accra. As such dormitory communities are built, including upscale gated

612   residences, lower-income groups are effectively excluded from these spaces and struggle to

613   find affordable housing. As existing scholarship argues, the privatisation of communal land in

614   Accra is complex: while members of landowning groups can access land to some extent through

615   traditional authorities (chiefs), non-members of the communities (called "strangers") must have

616   higher purchasing power as they need to pay more – if they get access at all (Gough and

617   Yankson 2000; Bartels 2020).

618   In sum, the three cases show that the degree to which lower-income groups are excluded

619   from the formal housing market as well as get bypassed by information, services and

620   infrastructure depends on a range of factors, including but not limited to the principles

621   underlying urban development planning (e.g., polycentric spatial structure, linear transport

622   development). To a varied extent, social contestation and political management imperatives

623   mitigate against fragmentation and bypass, and work in favour of integration and connectivity.

624   **Second**, state-led development strategies, notably large-scale projects (new towns,

625   industrial zones, road/transport infrastructure) emerge as major drivers of socio-spatial

626   fragmentation/integration and diverging degrees of connectivity/bypass. They exist alongside,

627   but also induce, more incremental, bottom-up/subaltern actions, emblematic of peripheral

628   urbanization, that are also impacted by mega-projects. For example, informal colonies in

629   Faridabad proliferate because of increasing demand for low-skilled labor (e.g. construction

630   workers, domestic help) in formal/planned developments.

631   Large-scale projects in peri-urban areas often aim for regional connectivity – and in the

632   case of Lingang and Faridabad also global connections, influenced by transcalar actors, as

633   shown in existing literature (Halbert and Rouanet 2014, Robinson et al. 2021, Shen et al. 2020).

634   Government agencies on various levels pursue this goal. Yet, outcomes differ due to varying

635   local/national capabilities and political will to achieve 'planned' development, and to

636   differences in planning norms. On the local and regional level, increased connectivity through

637   infrastructure investments triggered processes of land speculation and the unplanned growth of

638   self-built settlements: dynamic growth of autoconstructed 'colonies' in Faridabad; irregular

639   growth of rural town and villages around Lingang, and different forms of incremental,

640   piecemeal urban growth in Kasoa. Thus, our analysis highlights multiple connections between

641   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 and Kanai 2021, Wiig and 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 about how key social and political processes combine and interact to produce these socio-spatial fragmentations and by-pass.

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 was limited in Kasoa 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 case. 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 (Vij and Narain 2016, Gillespie 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

676 successive phases of urban development, these processes are more decentralised and market-
677 driven in India and Ghana, where private players —from customary family groupings to small
678 property-owners to large real estate firms— participate alongside state actors. Not surprisingly,
679 this gives rise to a more incremental, uncoordinated development process and produces a less
680 ordered, more fragmented spatial outcome, which is visible from satellite images and
681 measurable through geospatial analysis.

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

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

696 In Faridabad, the dependence on Delhi is visible in a linear spatial structure of the city.
697 The development of mass-rapid transport reinforced this spatial linearity and added high
698 degrees of nodal connectivity around the stations in central Faridabad. In contrast, massive
699 investments in bypass expressways produced new connectivity and new centralities at the outer
700 edge, kickstarting dynamic residential development and land speculation beyond the existing
701 'planned' urban expansion. Similar, in Kasoa, residential developments were spurred by the
702 expansion of a highway improving connectivity to metropolitan Accra, and have taken place
703 largely outside any formal plan. Although Lingang is connected with Shanghai through metro
704 and roads, various places within this vast region (e.g., rural towns) are less well integrated and
705 experience bypass. Spatial fragmentation here is a clear outcome of institutional fragmentation,
706 i.e., different development areas managed by different agencies and administrative levels.

707 The cases highlight that bypass and connectivity are not always visible spatially, indeed
708 inferences drawn from satellite images can be misleading as the Faridabad case showed.

709 Research at more fine-grained scales, notably through qualitative fieldwork, can help detect
710 these processes. Thus, only through methodological triangulation are we able to make visible
711 and explain this dissonance within peri-urban morphologies, which appears to be common
712 across the three cases.

713 **8. Conclusion**

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

733 Connecting back to current debates on peri-urbanisation and the challenges these highly
734 dynamic spaces pose for urban and regional research, we have demonstrated that a comparative
735 research framework that combines rigorous spatial analysis with critical social science methods
736 can generate new insights into the production of heterogenous peri-urban morphologies and
737 contribute to theory-building.

738 The contribution of the paper is threefold: Conceptually, we have introduced a set of analytical
739 lenses which we argue are generative to structure the comparative study of peri-urban dynamics.
740 Methodologically, our iterative socio-spatial analytics advances existing methods of
741 comparative urbanism by combining different methodological approaches. In particular, our

742   social-spatial analytics linked *a posteriori* comparisons with an integrated mixed-methods

743   approach. Although here the comparative approach was applied *a posteriori* to three study sites,

744   we postulate that our approach can serve to conceptualize larger, multi-sited, *a priori*

745   comparative research. By combining both theoretical perspectives and methods from geospatial

746   sciences and urban studies, the approach offers a way forward to overcome

747   compartmentalization in urban research, identified as a key obstacle to responding to complex

748   urban challenges (Acuto, Parnell and Seto 2018; Sayin et al. 2022).

749   Empirically, we have identified three key processes (market- and speculation-driven property

750   development; state-led development strategies; fragmented planning and development

751   practices) that contribute significantly to shaping peri-urban dynamics across varying political-

752   economic contexts. We have argued that an investigation of these three processes and their

753   interlinkages can explain heterogeneous peri-urban morphologies in the global South, which

754   share a number of common features, e.g., fragmentation and bypass, albeit with differing

755   degrees. Future research may analyse critically to what extent these findings are corroborated

756   across other cases, and also the extent to which the comparative socio-spatial approach

757   presented here is generative for building further theoretical insights about urbanisation from the

758   global South.

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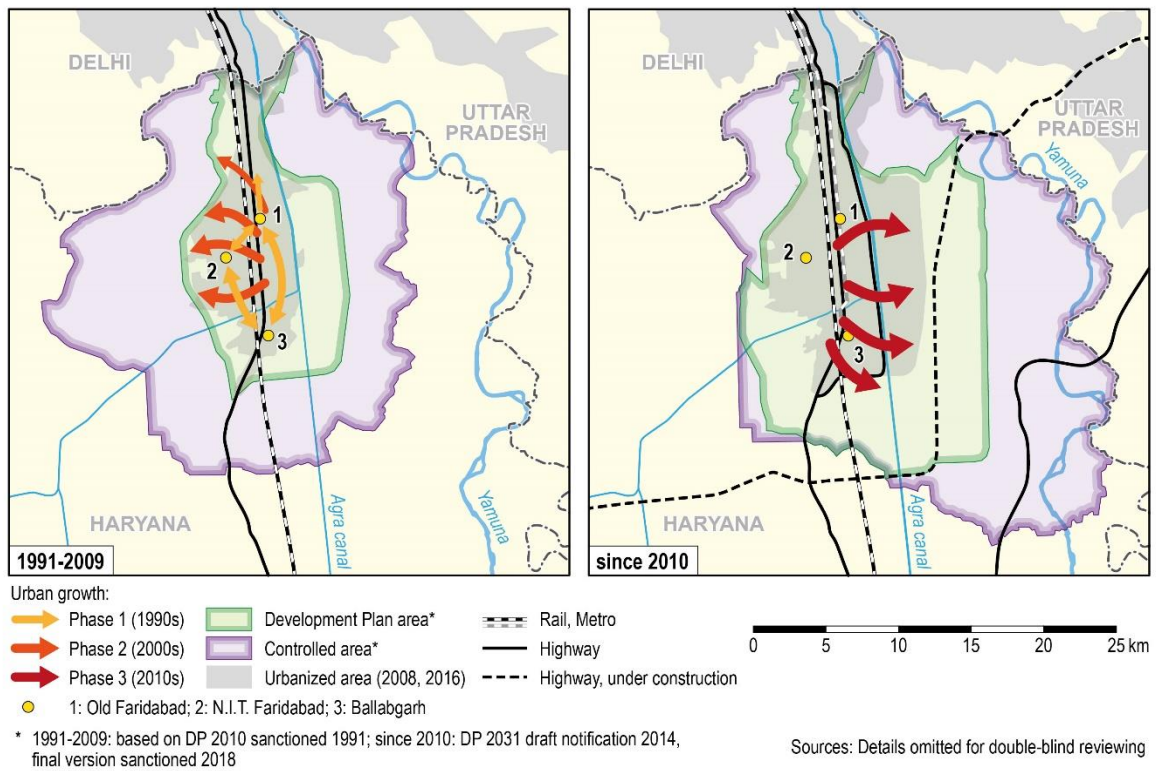841   doi:https://doi.org/10.1111/anti.12626

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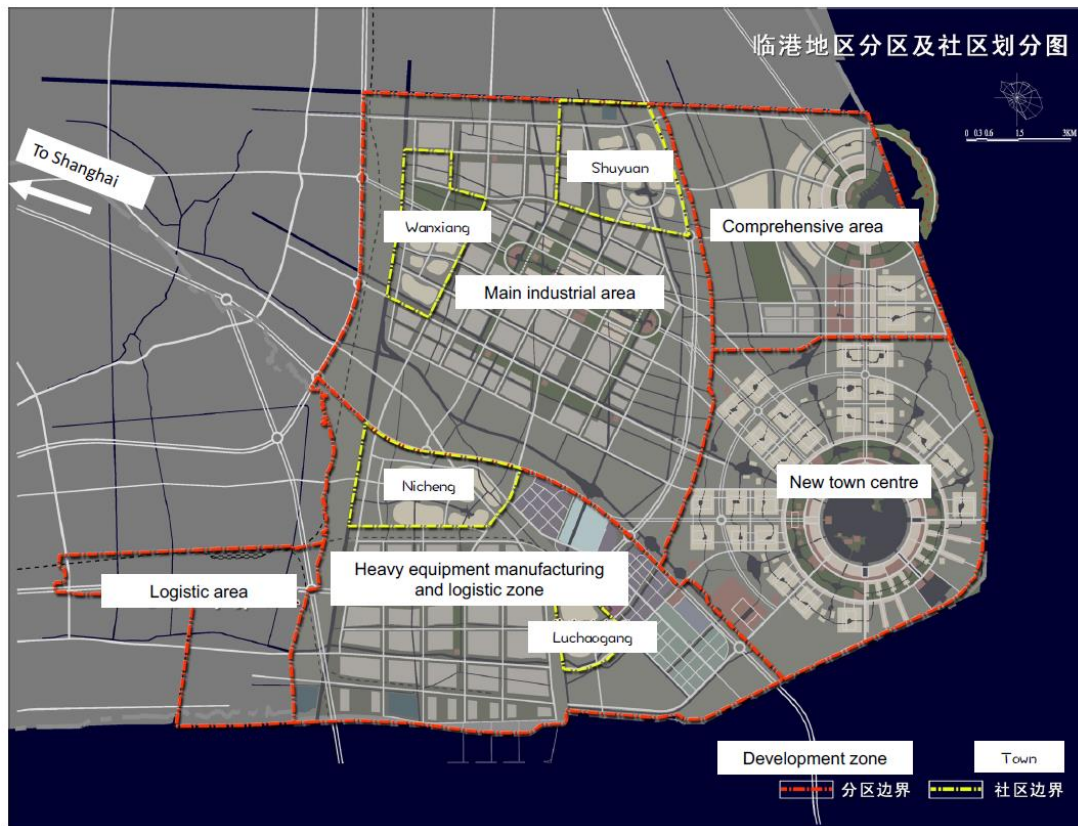889 40(1), 236-246. doi:https://doi.org/10.1111/1468-2427.12278

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951

Urban growth:

- Phase 1 (1990s) — (yellow arrow)
- Phase 2 (2000s) — (orange arrow)
- Phase 3 (2010s) — (dark red arrow)
- Development Plan area* — (green)
- Controlled area* — (purple)
- Urbanized area (2008, 2016) — (grey)
- Rail, Metro
- Highway
- Highway, under construction
- 1: Old Faridabad; 2: N.I.T. Faridabad; 3: Ballabgarh

* 1991-2009: based on DP 2010 sanctioned 1991; since 2010: DP 2031 draft notification 2014, final version sanctioned 2018

Sources: Details omitted for double-blind reviewing

952
953   Figure 1: Urban Growth Patterns of Faridabad at the periphery of Delhi
954

临港地区分区及社区划分图

To Shanghai

Shuyuan

Wanxiang

Comprehensive area

Main industrial area

Nicheng

New town centre

Logistic area

Heavy equipment manufacturing
and logistic zone

Luchaogang

Development zone   Town

分区边界   社区边界

955

956   Figure 2: Planned development of Lingang and existing towns in peri-urban Shanghai
957   (Source and Design: adopted from Shanghai Pudong Planning and Design Institute)
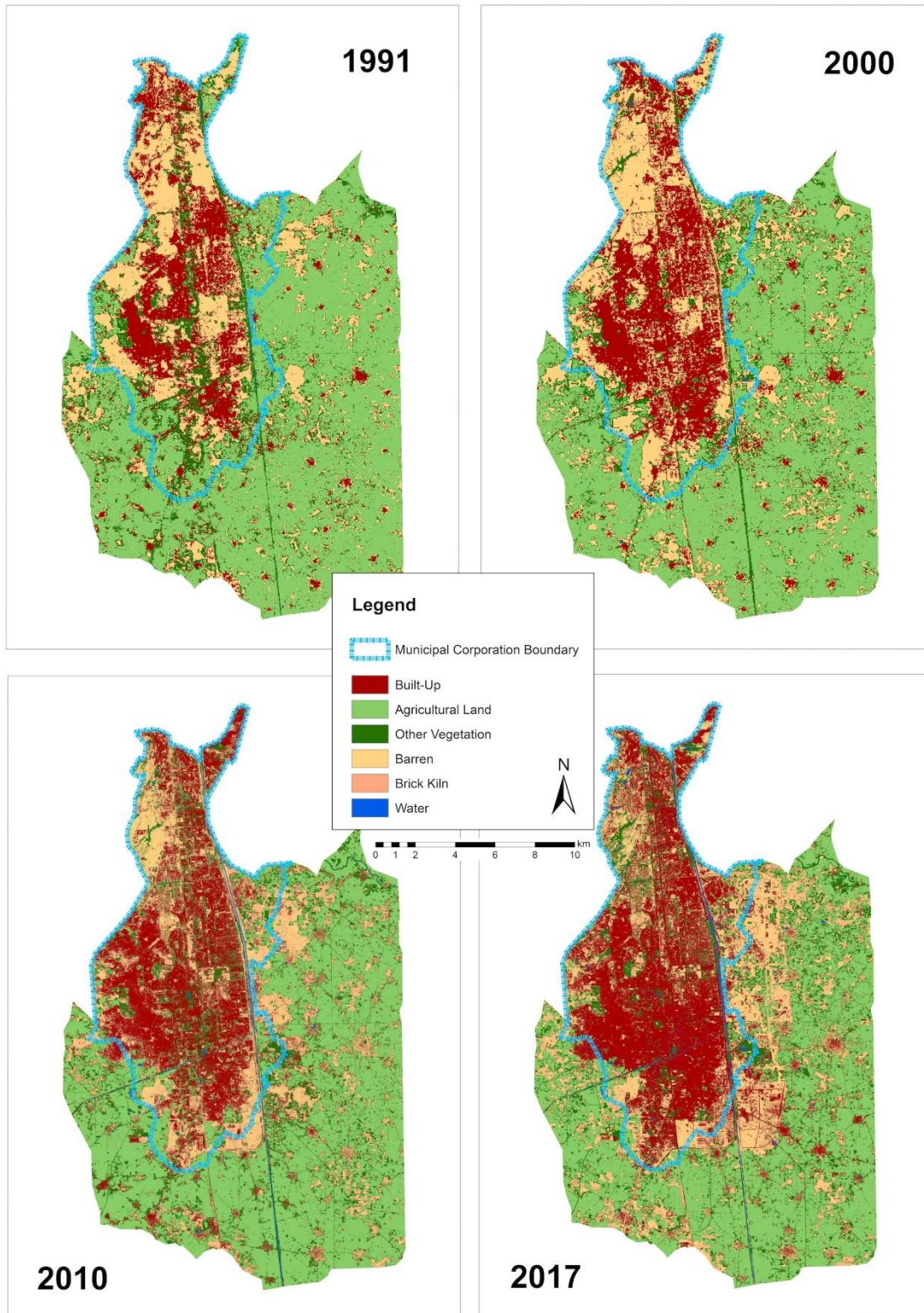
958   **Figure Captions (List)**

959   Figure 1: Urban Growth Patterns of Faridabad at the periphery of Delhi

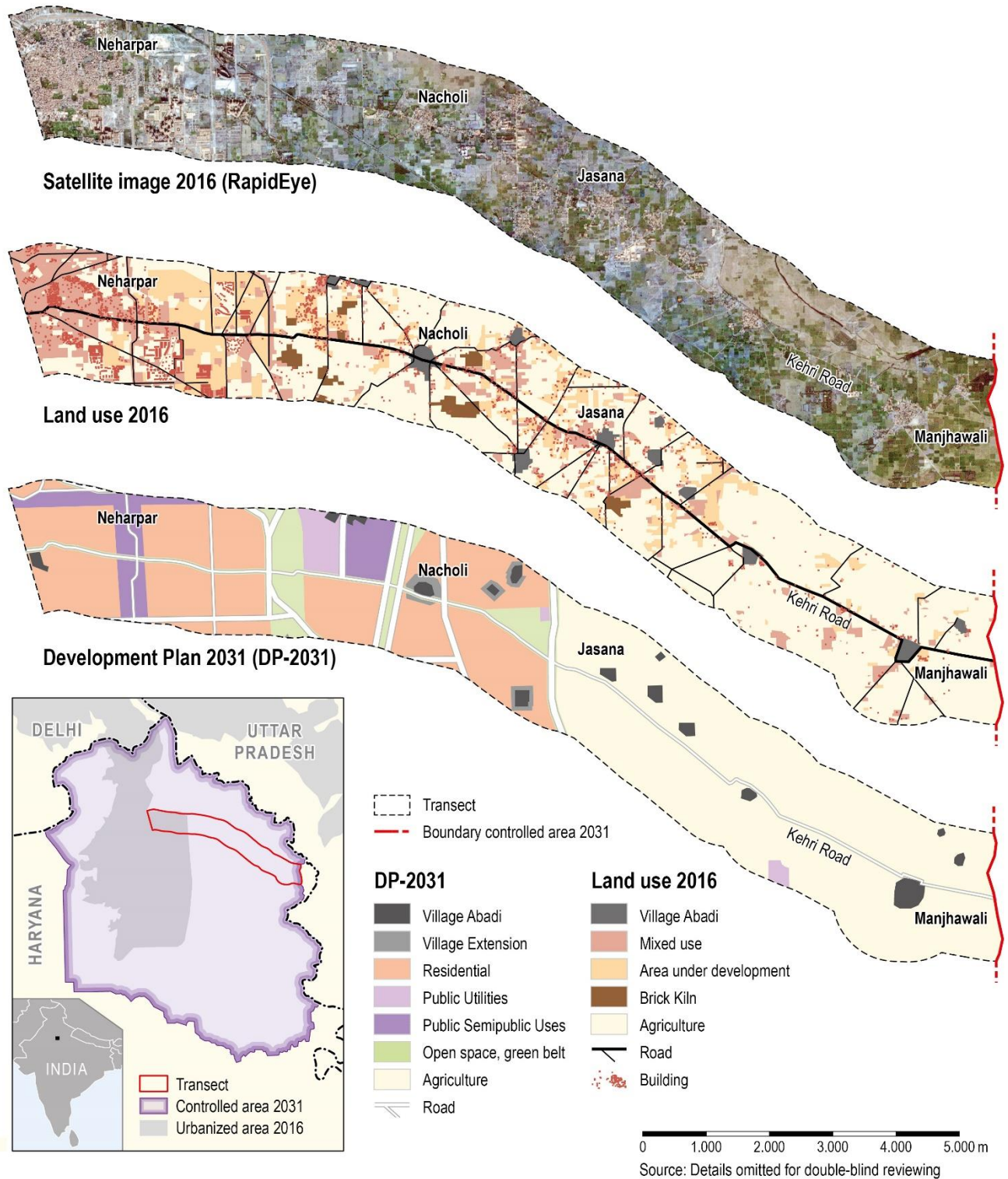960   Figure 2: Planned development of Lingang and existing towns in peri-urban Shanghai

961

Appendix 1:
963 **Land Use Change and Urban Growth of Faridabad 1991-2017**

964
965 Source for the data: Landsat (1991, 2000) and RapidEye ©Planet Labs (2010, 2017).
966 Analysis and Design: omitted for blind review

967

Appendix 2:
969 **Transect Analysis of Faridabad**

970

971 Source and Design: omitted for blind review

972

973

Appendix 3:
Urban Growth Analysis of Accra with the communities Mataheko and Tuba in Kasoa
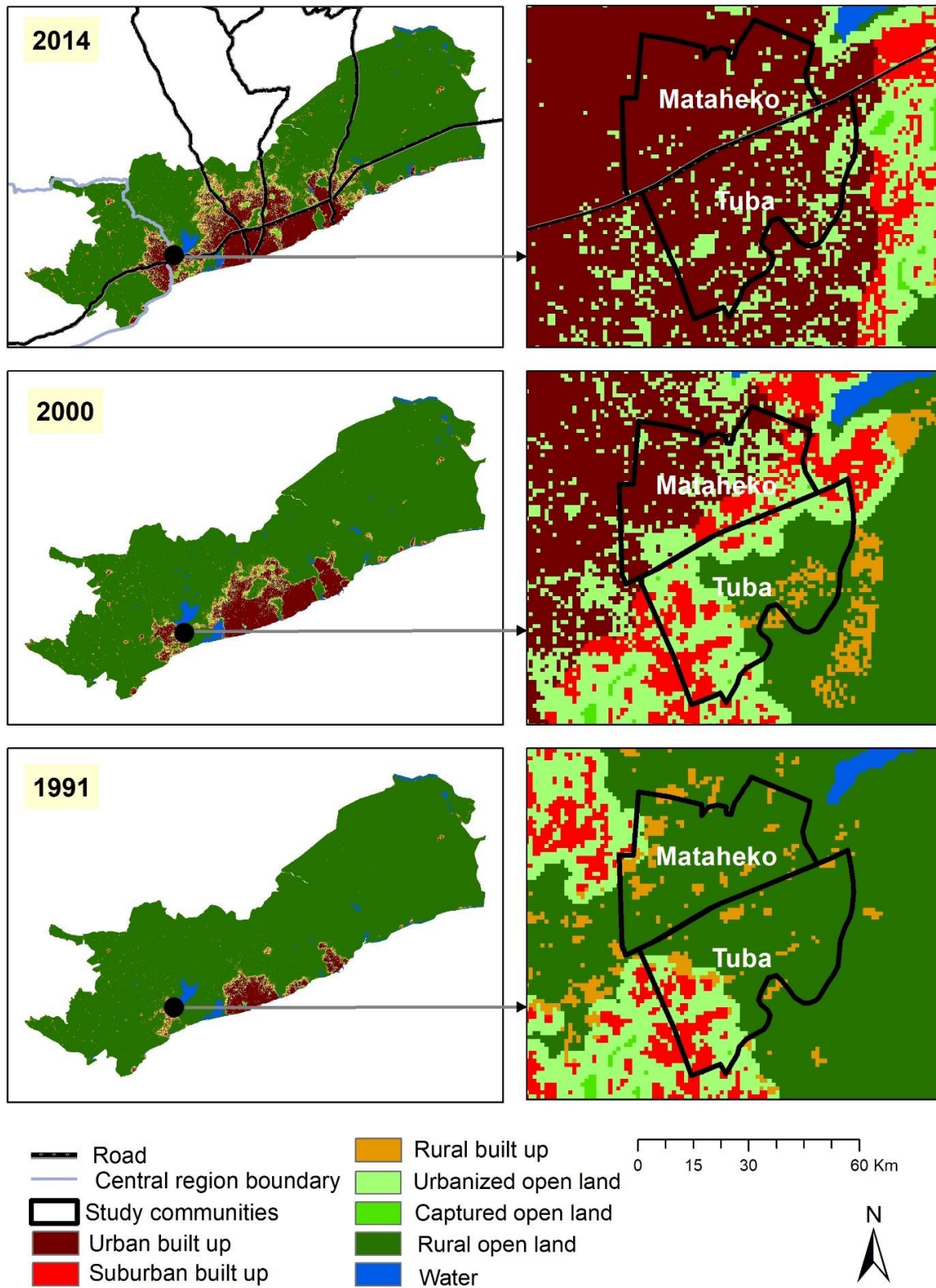
976

977 Design: Adugbila (2019), Source for the data: http://www.atlasofurbanexpansion.org/data

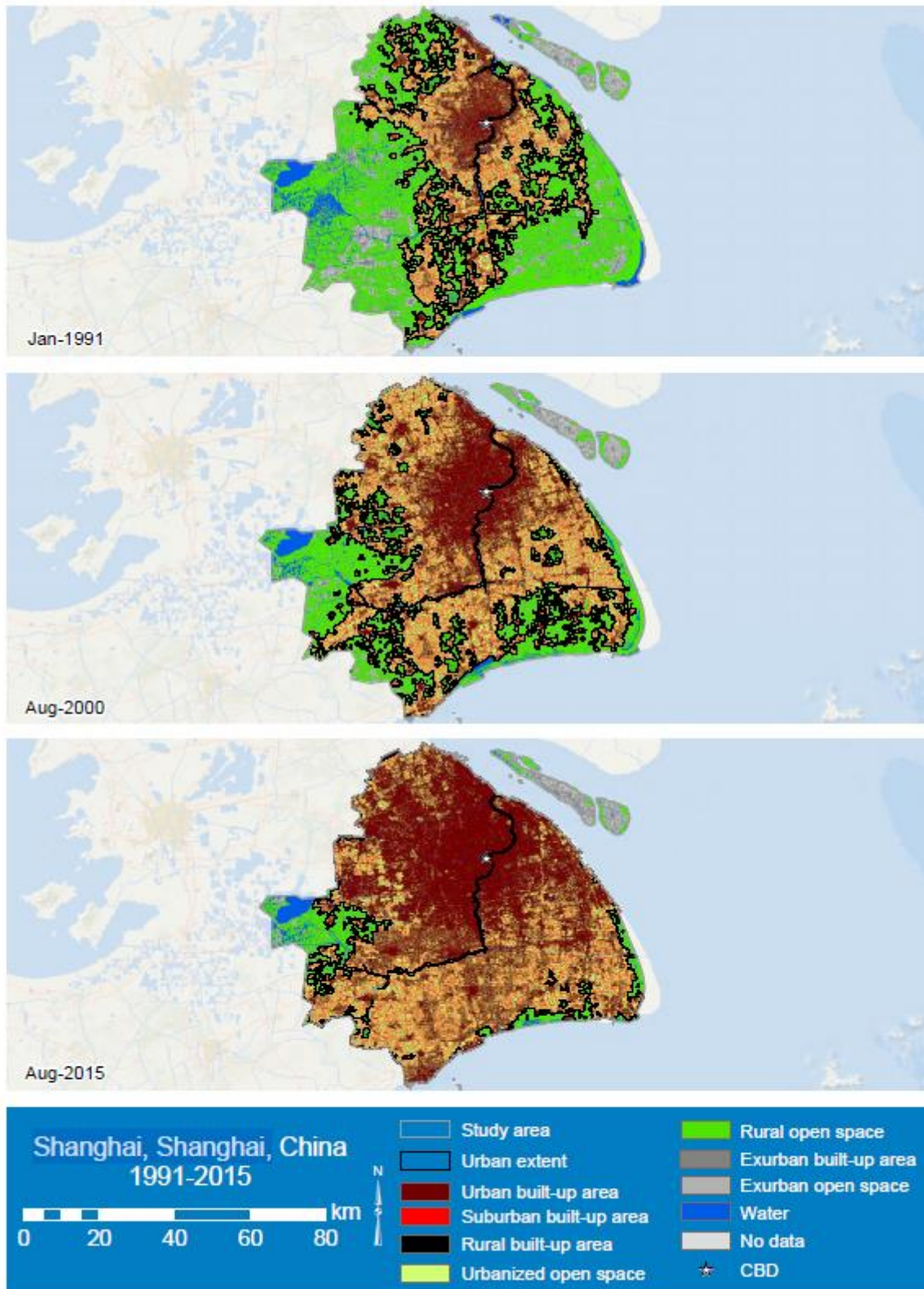**Appendix 4: Transformation of Mataheko and Tuba in Kasoa, Ghana (2009-2019)**

981   Source: Google Earth 2021

982 **Appendix 5: Land-use change Shanghai 1991-2015**

983
984 Source: Angel et al. 2016: p. 348
985

986   **Appendix 6: Bird's-Eye view of Lingang, Shanghai**

987
988   Source: Google Earth (2021)