

Title:

Rurbanity: A concept for the interdisciplinary study of rural-urban transformation

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1 **Abstract**

2 Along with climate change, population growth, and over-exploitation of natural resources,
3 urbanisation is among the major global challenges of our time. It is a nexus where many of the world's
4 grand challenges intersect, and thus key to sustainable development. The widespread understanding
5 of urbanisation as a successive and unidirectional transformation of landscapes and societies from a
6 rural to an urban state is increasingly questioned. Examples from around the globe show that 'the
7 rural' and 'the urban' are not only highly interdependent, but actually coexist and often merge in the
8 same space or livelihood strategy. Our concept of *rurbanity* provides an integrated theoretical
9 foundation which overcomes the rural-urban divide and can be operationalised for empirical research.
10 *Rurbanity* is the next stringent step following the gradual widening of previous concepts from urban-
11 centered approaches through the emphasis on urban peripheries to attempts of abolishing any
12 distinction of a rural environment and acknowledging the highly dynamic nature of globalising
13 urbanisation. Building on complex systems theory and assemblage thinking, our concept explores
14 complementary aspects of the distinct epistemic worldviews dominating the natural and social
15 sciences. Within this theoretical frame we derive four analytical dimensions as entry points for
16 empirical research: *Endowments and Place*, *Flows and Connectivity*, *Institutions and Behaviour*, and
17 *Lifestyles and Livelihoods*. Two examples illustrate how these dimensions apply and interact and
18 together lead to a comprehensive, insightful understanding of *rurban* phenomena. Such understanding
19 can be an effective starting point for assessing potential contributions of *rurbanity* to long-term global
20 sustainability.

21 **Keywords:**

22 Assemblage
23 Interdisciplinarity
24 Rural-urban transformation
25 Social-ecological system
26 Sustainability
27 Urbanisation

28 **Introduction**

29 Urbanisation is accelerating globally. Today, 56% of the world's population lives in urban areas, and by
30 2050 the proportion of urban population is expected to reach 67% (World Bank 2020). Between 2018
31 and 2050, the total urban population will grow by an estimated 2.5 to 3 billion people. This world-scale
32 urban transformation has been addressed by various UN reports (UN Habitat 1996; UN 2019) and has

33 led to the declaration of an Urban Age, or a Planetary Urbanisation, which exemplifies the
34 Anthropocene in its geographical form (Swyngedouw 2014). Currently, nearly 90% of the urban growth
35 is taking place in Africa and Asia (UN 2018). Cities, particularly those in the Global South, will be
36 increasingly important agents for humanity to thrive on earth, but at the same time among the areas
37 most affected by losses in ecosystem services, depending on how global urbanisation is shaped.

38 Urbanisation, with its effects on the environment, is certainly one of the major global challenges of our
39 time (WBGU 2016), along with climate change (IPCC 2021), population growth (UN 2017), and over-
40 exploitation of natural resources that approach planetary boundaries (Rockstrom et al. 2009; Steffen
41 et al. 2015). It is a nexus where all of these grand challenges intersect, and often a driver of future
42 trends in development (While and Whitehead 2013). This makes rural-urban transformations a key
43 arena for achieving the Sustainable Development Goals on which the global community has agreed
44 (UN 2015; Elmquist et al. 2021). Particularly in low-income and lower middle-income countries, cities
45 are facing political, social, economic, and ecological challenges, and are struggling to meet the needs
46 of their growing populations, including housing, transportation, energy systems, and other
47 infrastructure, as well as employment and basic services such as education and health care (Zhang
48 2016).

49 As their populations grow, cities also grow spatially, by combinations of building densification, high-
50 rise, and lateral sprawl (Angel et al. 2021, Marconcini et al. 2021). Surface sealing for urban
51 infrastructure occurs mostly, and with increasing speed, at the expense of prime agricultural land (Bren
52 d'Amour et al. 2016). On the other hand, according to FAO statistics on land use, urban areas still
53 comprise less than 3% of the total land area, whereas agriculture, including croplands and pasture,
54 accounts for 36% (47 million km² of 130 million km²; FAO 2022). Similar shares were estimated for the
55 year 2000 in an earlier study based on remote sensing data (Ramankutty et al. 2008), and in the analysis
56 of the spatial history of human land use by Ellis et al. (2021). World Bank statistics (2022) classified
57 86% of the total land area (112 million km²) as rural in 2010, where the classification of a given area as
58 rural or urban certainly has serious ambiguities. To urbanists 'the rural' often constitutes just the stage
59 on which urbanisation unfolds, especially as the research and policy community addressing rural
60 development is largely divorced from the urban arena and operates within other scientific disciplines
61 and policy domains (van Vliet et al. 2020).

62 The physical dimension of urbanisation and the social-ecological and political challenges that arise
63 from it have reignited the scientific discussion about the relationship between the rural and the urban.
64 Concepts based on the rural-urban dichotomy are increasingly questioned as to whether they are still
65 suitable to adequately explain the highly intertwined rural-urban settlements, social-ecological

systems, and societal arrangements that emerge in the outskirts of cities and in metropolitan regions (McGee 1991; Marshall et al. 2009; Brenner and Schmid 2014; Brenner and Katsikis 2020). Likewise, the presumption that transition proceeds one-directionally towards the urban, and that it ceases or stops once a completely urbanised stage is reached, is increasingly refuted (Gutierrez-Velez et al. 2022). Since the turn of the 20th century, when scholars in Europe began to formally study the spatial planning of cities, research focused strongly on metropolises and megacities, whereas rural areas were neglected. Even more, the in-between remained an entirely blind spot in the discourse. Koolhaas (2014) pointed to the urban bias by stating that “our current obsession with only the city is highly irresponsible, because you cannot understand the city without understanding the countryside”, or even stronger: There is “no [rural] outside left to conquer” (Tzanninis et al. 2021: p.229), and: “rural and urban livelihoods and lifestyles can blend together to the point where ‘the rural’ and ‘the urban’ become indiscernible.” (Gutierrez-Velez et al. 2022: p.3). In order to describe the new configurations and relationships between the urban and the rural under globalising conditions, including its spatial structures and social, political, and cultural articulations, we elaborate a concept termed '*rurbanity*', with its underlying process of '*rurbanisation*'. We argue that it is far better suited than concepts of rural-urban gradients, peri-urban fringes, or rural-urban interfaces to capture the being and becoming of entangled rural and urban spatial structures, material flows, institutions, forms of social practice, and lifestyles.

The development of this concept has to engage the natural and social sciences in a way that is suitable for analysing the heterogeneous structure and the dynamic transformation of *rurban* space and the *rurban* phenomena contained therein. We suggest two theoretical frameworks as particularly helpful to this end: that of social-ecological systems and that of assemblages. The first is well established in interdisciplinary research; the latter is used in the social sciences, and here particularly in research focussing on the link between society and technology and environment (Lowenhaupt Tsing 2015). Using examples from previous and ongoing research, we propose our concept as an innovative analytical framework to integrate different domains of scientific knowledge, and outline a general roadmap for its empirical applicability. We conclude with a brief outlook on implications of *rurbanity* for sustainability.

94 **Analysis of existing conceptual framings for rural-urban relationships**

95 Global urbanisation cannot be spatially delineated and has an impact far beyond urban centres and
96 agglomeration areas. As the example of the megacity of Bengaluru in southern India shows (**Figure 1**),
97 cities are increasingly diffusing at their edges and the rural-urban interface is characterised by a
98 mosaic-like structure of spatial units of different functions, agricultural, and non-agrarian activities

99 (Hoffmann et al. 2021). It is criss-crossed by a closely-knit network of infrastructures and flows of
100 people, resources and goods, energy, information, knowledge, and innovation. New geographies of
101 'citylands' are emerging, everyday routines, values and rationalities are subject to profound changes
102 (Roy 2009). This new dialectic between the urban and the rural requires a redefinition of the
103 relationship between both realms that goes well beyond dualistic urban-rural notions. In the following
104 we briefly review a number of concepts that seek to capture socio-spatial reconfigurations beyond the
105 traditional urban-rural dichotomy.

106 **Gradients and indices**

107 Nearly 200 years ago, von Thünen (1826) proposed a model of concentric rings of different agricultural
108 land use around an urban centre determined by economic functions. His concept lay the foundation
109 for many attempts to describe and define the impact of a city on its rural surroundings by mathematical
110 models. Most recently, Chang et al. (2022) presented a linear mechanistic model based on gravity
111 forces related to functional requirements for satisfying urban demands. Earth observation and land
112 use science (van Vliet et al. 2020) have also been applied to develop quantitative indices for the degree
113 of urbanity in relation to the distance from a central city (Schlesinger and Drescher 2013; Hoffmann et
114 al. 2017). This approach is useful as a descriptive tool for temporary phenomena, but it has little
115 explanatory power for drivers of transformation.

116 **Peripheries and interfaces**

117 In the early 1990s, McGee pointed to spaces in the extended environments of major Asian cities, where
118 non-agricultural and agricultural forms of land use and settlement coexist and are highly linked to each
119 other. He referred to these spaces as 'desakota', a term he derived from the Indonesian words 'desa'
120 (village) and 'kota' (city; McGee 1991). He distinguished three types of desakota, based on differential
121 combinations of land use patterns, economic development, and population dynamics. Indovina (1990)
122 referred to the urbanised landscape of the city and its immediate hinterland as 'città diffusa', Sieverts
123 (1997/2001) as 'Zwischenstadt'. The widely used concept of 'peri-urban' refers to the urban fringe and
124 the geographic edge of cities: "as a place, it refers to the movement of goods and services between
125 physical spaces and to the transition from rural to urban contexts, as a process, it refers to an interface
126 between rural and urban activities, and finally, as a concept, to institutions and perspectives" (Marshall
127 et al. 2009: p.3). Many of those ideas are also subsumed under the term 'suburbanization' (Tzaninis et
128 al. 2021). There are different approaches of conceptualising the peri-urban. Place-based approaches,
129 understanding the peri-urban as a heterogeneous conglomeration of rural-urban features lying
130 between cities and countries (Cadéne 2005) have to be distinguished from flow-based
131 conceptualisations which emphasise the "flows of produce, finance, labour, and services" and the

132 influence of “processes of rapid economic, sociological, institutional, and environmental change”
133 (Halkatti et al. 2003: p.149). The dynamism of change inherent in peri-urban spaces is evident in the
134 use of the term ‘zone’ or ‘rural-urban interface’. Finally, Allen et al. (2006) provide a working definition
135 of the peri-urban as instances where rural and urban features co-exist, in environmental, socio-
136 economic, and institutional terms.

137 **Continuous rural-urban landscapes**

138 The worldwide rural-to-urban transition encompasses a vast spectrum of settlement conditions, from
139 sprawling megacities with their peri-urban satellite towns, to regional centres and small towns, no
140 matter whether classified as urban or not (Brenner and Schmid 2014). “Increasingly, the urbanisation
141 process has become a global condition rather than simply a ‘way of life’ that is confined to certain
142 types of settlement space as compared to others” (Brenner and Schmid 2014: p.747). Taking these
143 ideas further, the authors call for a decentering perspective that redirects attention from the cities to
144 what was formerly perceived as ‘rural hinterlands’, as those are nowadays an integral part of
145 continuous, rural-urban ‘operational landscapes’ (Schmid 2018; Brenner and Katsikis 2020). The
146 urbanisation patterns observed in different case studies have proven to be highly variegated, complex,
147 and context dependent (Schmid et al. 2017). In a comparative analysis, Schmid et al. (2017) derived a
148 typology of different urbanisation processes described as ‘popular urbanisation, plotting urbanism,
149 multilayered patchwork urbanisation, or laminar urbanisation’, among others. Their proposed
150 terminology aimed at taking account of the spatial characteristics as well as the socio-political drivers
151 that shaped the case studies.

152 From the perspective of urban political ecology, Tzanninis et al. (2021) identified four major challenges
153 in gaining a comprehensive understanding of rural-urban transitions: the methodological city-ism, a
154 neglect of Southern contexts, the rift between academia and the policy arena, and the inclusion of
155 non-human elements (primarily nature and ecology) in urbanisation concepts. Overcoming these
156 constraints would reveal rural-urban landscapes worldwide as a ‘more-than-urban continuum’ to
157 which there is no longer any outside. They also emphasise that “nowadays some of the most dynamic
158 socio-political changes happen in the periphery”, and “it is in the sprawl where sustainability,
159 community, and the urban have to be found” (Tzanninis et al. 2021: p.243). So far lacking in their
160 approach, however, is an operational and empirical approach to their insightful claims.

161 **Temporary urbanism and alternative-substitute place-making**

162 With a strong focus on the Global South, on the interplay between formal and informal governance,
163 and on the dynamics of transformation processes, Andres et al. (2021) addressed some of the above-
164 mentioned challenges: “African cities and Global South cities should be conceptualised as the outcome

165 of layers of planned interventions combined with alternative substitute place-making that represents
166 different forms of ‘permanent impermanence’’ (Andres et al. 2021: p.30). The authors described urban
167 planning as a macro-scale intervention, and place-making as a micro-scale practice of neighbourhood
168 residents, that interact and mingle in the peri-urban space. In contrast to urban planning paradigms,
169 the informal practices of place-making stand out due to flexibility combined with short-term and
170 everyday adaptability. In theoretical terms the authors pointed out that “a system of systems approach
171 is required to account holistically for the different connected components underpinning social,
172 economic, and environmental well-being” (Andres et al. 2021: p.30). Their conclusions, however, were
173 limited to practical recommendations for improving urban planning.

174 **Critique**

175 While by no means complete, all of the alternative concepts highlighted above acknowledge that the
176 established categories of the urban and the rural are insufficient to describe contemporary lived
177 realities which feature multiple elements of diversity, uncertainty, and self-organisation. The examples
178 were also selected to show how concepts have progressively widened over time, from urban-centred
179 approaches, through emphasis on urban peripheries, toward attempts to abolish any distinction of a
180 rural environment and to acknowledge the highly dynamic nature of urbanisation. All of these
181 approaches, however, argue from a specific disciplinary perspective, such as economics, land use
182 science and agricultural science, political ecology, or urban planning. Though most of them aim at
183 integrating different dimensions of urbanisation, they still lack a coherent framework from which entry
184 points for empirical research could be derived. One reason for this may be the differing, but often tacit
185 epistemological worldviews that guide research traditions in natural compared with social sciences.

186 **The concept of “rurbanity”**

187 Fifty years ago, the French sociologist Henri Lefebvre already described urbanisation as a ‘total’
188 phenomenon that has suspended the rural-urban divide and thus the historical categories of urban
189 and rural (Lefebvre 1972). While we accept that the rural and the urban continue to (co-)exist, we
190 argue that they are organised in specific entanglements that we call ‘rurban’. We understand *rurban*
191 as the continuous reconfiguration of material flows, practices, contexts of meaning, and spatial
192 structures. Accordingly, our analysis of ‘rurbanisation’ requires, first, the simultaneous and equal
193 attention to rural and urban practices, spatial structures, and imaginaries. Secondly, the *rurban*
194 substantiates the ambiguity of the categories rural and urban and critically re-evaluates their
195 associated attributions. The analysis of ‘rurbanity’ therefore implies a permanent (re-)positioning
196 within complex and highly dynamic relationships between the rural and the urban. By defining this
197 state as an independent object of study, constituted in the dialectical gap between the categories of

198 rural and urban but in itself an object, our concept makes an ontological contribution to that field
199 which can be operationalized for interdisciplinary research.

200 The fusion of the words ‘urban’ and ‘rural’ has been previously reported. The terms *rurban* and
201 *rurbanisation* can be tracked back to the sociologist Sorokin, who referred to them in 1929 as a
202 terminological invention of C.P. Galpin in 1918 (Dymitrow 2017). Urbain (2002) took up the desakota
203 concept when analysing the changing relationship between the rural and the urban under conditions
204 of globalisation. He described a process of ‘ruralisation of the urban’ and the result of this development
205 as a state of ‘*rurbanity*’.

206 The term *rurban* was revived and used more coherently when several Indian scholars adopted it to
207 describe urbanisation processes in India, albeit with slight differences in their specific definitions (Revi
208 et al. 2006; Gupta 2015; Kolhe and Dhote 2016). Revi et al. (2006: p.58) defined ‘*rurbanism*’ as “a
209 process integrating the urban with the rural, so that there is a co-evolution of the countryside and the
210 city that is embedded within it.” In 2016, the term even lent its name to a nation-wide rural
211 development program in India, ‘India’s National *Rurban* Mission’ (<https://rurban.gov.in>; Singh and
212 Rahman 2018). By means of concerted policy directives, this program envisions developing clusters of
213 settlements that preserve and nurture the essence of rural community life with a focus on equity and
214 inclusiveness, without compromising with facilities perceived to be essentially urban in nature, thus
215 creating ‘*rurban* villages’. While this prominently illustrates how a novel term can promote a new vision
216 that finally manifests itself in a real-world policy, it is also an example of a purely top-down state
217 agency. Accordingly, this strand of literature talks about *rurbanism*, whereas in our concept we prefer
218 the noun *rurbanity*. The suffix –ism, derived from the Latin –ismus, denotes a doctrine, a principle or a
219 faith system. The suffix –ity, on the other hand, forms abstract nouns from adjectives, referring to a
220 quality, a state, measure, or distribution of something, thus meaning a ‘condition or quality of being’
221 (<http://www.uefap.com>).

222 Our focus, thus, is the environmentally, socially and culturally productive co-presence of urban and
223 rural elements and practices – in the widest sense of the term, including matter, relations, and ideas –
224 within a shared space that is being structured by that very co-presence. Our elaborated concept of
225 *rurbanity* points to the fact that, when rural and urban elements come together, intermingle, and
226 assemble, they give rise to characteristic spatial, social and environmental phenomena that share a
227 number of similarities, irrespective of the local context. This is illustrated in Figures 2 and 3 by the
228 comparison of aerial images (Figure 2) as well as photographs on the ground (Figure 3), showing
229 different locations in the Greater Bengaluru region (India) and the Rabat-Kenitra region (Morocco).
230 The mix of residential and commercial building structures, parks, roads, street-lining trees, and

231 agricultural fields in both locations demonstrates that similar *rurban* patterns are emerging in
232 geographically, socially, and politically unrelated regions. Our concept makes it possible to lay out a
233 roadmap how the emergence and development of these phenomena can be analysed when taken up
234 as an object of interdisciplinary research.

235 **Linking the concept of *rurbanity* with social-ecological system analysis and assemblage
236 thinking**

237 By using the concept of *rurbanity*, we emphasise the connection between heterogeneous elements in
238 a shared space. Moreover, the connection between these elements and the patterns within which they
239 are arranged, appear stable in the sense that stability is achieved through the constant persistent
240 creation of the emergent (Deleuze and Guattari 1987; Protevi 2006). In physics and chemistry such
241 scenarios are theoretically described as ‘dissipative structures’ (Prigogine 1978) that persist far from
242 thermodynamic equilibrium by constantly absorbing energy ‘from the outside world’ to maintain their
243 order. This is a basic principle that actually applies to all living systems and enables them to grow in
244 size and complexity, to adapt, and to evolve (Holling 2001; Kurakin 2010). Therefore, we consider the
245 concept of *rurbanity* as a contribution towards, not a critique of general system theory (Bertalanffy
246 1950). More specifically, to usefully conceptualise *rurbanity*, we draw on two theoretical approaches
247 that share a number of commonalities but also have important differences: social-ecological systems
248 (a specification of complex adaptive systems), and assemblage thinking (Spies and Alff 2020).

249 The merit of both is that they invite researchers to seek connections between items situated within
250 different ontologies. For example, there is a straightforward language to describe how agricultural soil
251 reacts to the addition of water, but there is no such language to describe how water reacts to an
252 institution or a cultural value and *vice versa*. However, by looking at a space of formation and
253 transformation that is sourced from two broad directions – the urban and the rural – with an enormous
254 number of heterogeneous elements of completely different ontological status, we conceptualise
255 *rurbanity* as a constellation and process of being and becoming. *Rurbanity* associates elements that so
256 far have not been studied as being part of one encompassing system, but still become part of a process
257 of arranging and rearranging of items that, at first sight, would not go together. *Rurbanity* thus points
258 to a phenomenon that defies modernist ideas of planning from above as well as scientific routines of
259 knowing and predicting through established system modelling and extrapolation. In this regard, it fits
260 the assemblage concept that emphasises heterogeneity (multiplicity), practice (events), emergence,
261 creativity, and openness over boundedness, unity, and equilibrium.

262 The term ‘assemblage’, derived from the French term ‘agencement’ (Deleuze and Guattari 1987, Law
263 2004), is different from hybridisation. Hybridisation refers to the process of mixing two things to
264 produce new forms, for example ‘creole’ forms of culture (Pieterse 1993). An assemblage is “some
265 form of provisional socio-spatial formation [...] composed of heterogeneous elements that may be
266 human and non-human, organic and inorganic, technical, and natural” (Anderson and McFarlane 2011:
267 p.24). The elements of an assemblage thereby maintain their individual identities. The assemblage is
268 constantly creating, recreating, and transforming the arrangements of the relations connecting its
269 empirically perceptible items (De Landa 2006). It is important to add that in the complex reality of
270 social assemblages they are permeated with multiple asymmetries concerning power and access to all
271 kinds of resources.

272 *Rurbanity*, viewed through the framework of social-ecological systems, highlights the connectedness
273 of the material with the social, of the social with the symbolic, and of the social-material with the
274 spatial, forming habitats that are marked by a high degree of direct and planned human, socially, and
275 culturally constituted intervention. At the same time, *rurbanity* is also usefully studied as an
276 assemblage at work in order to explore why some connections are enabled while others become
277 dysfunctional. This question, though, cannot be answered once and for all because, following the
278 notion of assemblage and knowledge built from prior empirical research, we have to understand
279 *rurbanity* as an arrangement that is the spatio-temporally specific condition for its own re-
280 arrangement. If we understand *rurbanity* as a state of being and becoming, its study requires a
281 conceptual language that is capable of grasping phenomena that are not fixed, that are transient, that
282 have no clear-cut boundary between an inside and an outside, that are more than one thing at a time,
283 and that do not only follow linear causalities.

284 One of the processes that characterise *rurbanity* and would be highlighted by an assemblage approach
285 is ‘bricolage’, as described by Claude Lévi-Strauss (1966). An engineer would carefully procure the raw
286 materials and the most appropriate tools needed for a specific purpose or project, and thus depend
287 on the availability of those. A ‘bricoleur’, by contrast, would take whatever is available and use it in the
288 best possible manner. His “set of tools and materials (...) is always finite and is also heterogeneous (...).
289 They each represent a set of actual and possible relations; they are 'operators' but they can be used
290 for any operations of the same type” (Lévi-Strauss 1966: p.18). This idea of bricolage implies a high
291 motivation for the local recycling of resources, whereas engineering might rather rely on external
292 inputs. The application of such principles in urban development has been termed ‘urban tinkering’
293 (Elmqvist et al 2018), or ‘jugaad’ in the Global South (Radjou et al. 2012). The description of several
294 examples showed that the actual implications, however, remain to be assessed in each specific
295 context.

296 Our concept of *rurbanity* goes beyond bricolage, because we understand that depending on the
297 circumstances also other forms of ordering heterogeneous items are at work. The concept highlights
298 the contingency in the formation and transformation of rural-urban spaces that do not follow a
299 preconceived plan, but emerge in a generalised way from multiple creative quests to gain utility by
300 combining things one has not asked for but found. It also highlights the fact that in this process
301 normative orders of what can be combined with or used for what are easily and elegantly transcended.
302 Thus, a balcony can become a barn, a sewage conduit an irrigation system, and a kinsman a salaried
303 employee.

304 The theory of complex adaptive systems is applicable in the natural sciences (Prigogine and Stengers
305 1984; Dooley 1996; Holling 2001), as well as in social sciences such as economics and governance
306 research, emphasising that social and environmental dimensions are intertwined and inseparable (Liu
307 et al. 2007; Ostrom 2009; Preiser et al. 2018). With its holistic aspiration, this kind of systems thinking
308 is well suited to analyse *rurbanity*, particularly as the concept strives to make systems-oriented
309 ecological analysis a fundamental component of the study of the profound societal and historical
310 processes upon which the creation of urban space is based. Since both approaches, complex adaptive
311 systems and assemblage, share the interest in human-environmental research, combining them bears
312 a high potential for meaningful syntheses, and utilisation in integrative, interdisciplinary research
313 (Spies and Alff 2020). The entanglement of society and nature, relations and dynamics as constitutional
314 factors, path dependency, emergence, and self-organisation are important guiding principles in both
315 schools of thinking. Our concept of *rurbanity* applies this approach to the research field of rural-urban
316 transformations, and exemplifies an attempt to realise the synthesis potential pointed out by Spies
317 and Alff (2020).

318 **Operational entry points for analysing *rurbanity***

319 In order to translate this highly abstract theoretical conception of *rurbanity* into empirically based
320 interdisciplinary knowledge production an operational framework is needed. This operational
321 framework has to integrate the material, the social, and the cultural dimensions of *rurbanity*; it also
322 has to allow for both a system-oriented and a process-oriented analysis of the phenomenon. We
323 suggest to build this operational framework by defining four analytical dimensions or perspectives as
324 entry points (Boone et al. 2014; Schmid et al. 2017) that, in combination, elucidate the structure (the
325 being) and the transformational dynamics (the becoming) of *rurban* phenomena: (1) *Endowments and*
326 *Place*, (2) *Flows and Connectivity*, (3) *Livelihoods and Lifestyles*, and (4) *Institutions and Behaviour*.

327 The perspective of *Endowments and Place* picks out the place-based properties of a *rurban*
328 phenomenon, narrowing down the scope from the global scale of urban footprints to specific regions

329 of highly dynamic rural-urban transformation, and determines their characteristic material and
330 immaterial resources and assets at a given moment in time. It allows us to ask which features these
331 regions share to make them focal points of *rurbanity*. Endowments may comprise natural resources
332 such as raw materials, water and fertile soils, or ecosystem services, but also human-made
333 infrastructures such as housing, transport and communication networks, or human and social
334 capacities such as a well-educated labour force or cultural achievements of a population.

335 *Flows and Connectivity* addresses the regional to global networks through which these material and
336 immaterial resources flow in multiple forms of exchange that operate at different spatial and temporal
337 scales (Karg et al. 2019). Such flows, that rely on the connectivity within and between multiple
338 networks at different scales, offer choices to *rurban* actors and thus confer high flexibility towards
339 them, either to adapt and enhance resilience or to find innovative solutions and effect transformation.
340 Spotswood et al. (2021) show that a number of non-human species make use of such opportunities,
341 too. However, such networks of resource flows may also increase the vulnerability of certain groups
342 from a local to the global level, for example through the use and accumulation of contaminated
343 resources in food production.

344 *Livelihoods* describe the means of securing necessities for life, such as occupation, access to resources
345 and information, reliance on social networks, and supporting institutions (Stienstra and Lee 2019). The
346 perspective of *Livelihood* is particularly suitable to capture the dynamics of *rurbanity* and to
347 meaningfully integrate our interdisciplinary research on these dynamics. While originally devised for
348 the study of rural economies that goes beyond the local and accounts for their wider, indeed global
349 connections (Ellis 2000; Jones and Craswell 2004), the concept highlights exactly those properties of
350 socio-ecological processes that we deem crucial to studying the dynamic and multi-dimensional
351 processes of the making of *rurbanity*. *Lifestyles* depict the way of life that defines and reinforces self-
352 identity. Following Adler ([1933] 2008) we understand *lifestyle* as a creative force with which people
353 try to overcome their shortcomings, express themselves, and value what they need. *Lifestyles* are
354 expressed by and associated with occupation, socio-economic status, consumption levels. The
355 perspective of *Lifestyles* also highlights the role of cultural systems for particular forms of sociality,
356 identity, and practices of social distinction (Walters 2006). Taking particular interest in processes of
357 transformation, we are also aware that *lifestyles* may exhibit enormous inertia that affects socio-
358 ecological dynamics in *rurbanity*.

359 The perspective of *Institutions and Behaviour* is drawn from two sources: a) the economic school of
360 New Institutionalism (North 1990) which builds on earlier institutional thinking in economics (e.g.
361 Veblen 1919); b) the anthropology of politics as practice (Bailey 1969). Institutions are socially devised

362 instruments of regulation and governance that exist in various forms including laws, norms, rules of
363 conduct, or moral values. They are established and maintained by a collective that can be the state,
364 but also a local community as Ostrom (1990) argued against Hardin (1969); they can be formal as well
365 as informal. While institutions award roles and identity to individual and collective agents (March and
366 Olsen 1989), the perceptions, preferences, and risk attitudes of individual actors, their expectations,
367 decision-making, and daily routines are described by *Behaviour* (Simon 1959; Gächter and Herrmann
368 2009). This perspective thus helps to qualify the notions of individual choice on the one hand and utility
369 maximization on the other and thereby assess their impact on the sustainability of resource use. While
370 New Institutional Economics interprets institutions to be a result of rational actors' collaborative
371 efforts to minimize transaction costs (North 1990), social anthropology has emphasised two features
372 of *Institutions and Behaviour* that particularly fit the *rurban* situation. First, actors are not simply
373 constrained by institutions (Hardin 1968), they can sometimes manipulate them in highly creative ways
374 according to their interests in competitive situations of negotiation and conflict (Bailey 1969; Swartz
375 1966). Second, old institutions are often not replaced by new ones, but pile up in a historical process
376 so that conflicting actors have a heterogeneous, complex and contradictory set of rules at hand that
377 they strategically exploit for their individual advantage (K. Benda-Beckmann 1981; F. Benda-Beckmann
378 1997).

379 In combination, the four perspectives *Endowments and Place*, *Flows and Connectivity*, *Institutions and*
380 *Behaviour*, and *Livelihoods and Lifestyles* thus capture the biophysical as well as socio-cultural
381 dimensions of *rurbanity* across multiple scales. Since they are interrelated in many ways, their joint
382 application bears a high potential to carve out synergies in the comprehensive analysis of *rurban*
383 phenomena. In order to show how they apply to generate knowledge through empirical research, we
384 turn to two examples.

385 **The concept of *rurbanity* in operation**

386 *Rurbanity* is related to spatial features, but not to a specific location. It can be used to analyse
387 transformations in highly contested peri-urban fringes as a response to economic and administrative
388 conflicts, as well as to balcony or rooftop gardening in densely populated urban centres as an
389 expression of cultural values. In West Africa it may also refer to the telecoupled unsustainable
390 intensification of agriculture in remote desert oases as a response to market demands in coastal cities
391 which allows business and consumers to externalise negative consequences of urbanisation on
392 ecosystem services (Liu et al. 2013; Fastner et al. submitted). We present two examples of *rurban*
393 phenomena from our empirical research in India and West Africa, which were analysed previously in a
394 conventional, disciplinary context. We demonstrate where other frameworks fall short in explaining

395 these phenomena, and how the concept of *rurbanity* can help to explain the unity of seemingly
396 incompatible systems of practice, knowledge, and meaning.

397 **Dairy cows in urban India**

398 For thousands of years, keeping cattle close to humans was part of India's socio-cultural traditions.
399 Some decades ago, as part of India's 'Milk Revolution', Holstein-Frisian and Jersey cattle breeds were
400 introduced into the subcontinent and interbred with local breeds to enhance milk yields in small locally
401 interconnected producer units (Kurien 2007). Recent research in Bengaluru, a megacity with more than
402 12 million inhabitants and capital of the south Indian State of Karnataka, has shown that an estimated
403 5,000 buffaloes, 6,000 indigenous cattle, and 75,000 crossbred cattle are kept in the agglomeration
404 (Prasad et al. 2019). The majority of these cattle are kept by individual households in small-scale herds
405 of up to five animals (Figure 4). Their milk yield is either sold directly to inner-city consumers or to the
406 dairy cooperative Karnataka Milk Federation (Reichenbach et al. 2021a).

407 Understanding this system as a *rurban* phenomenon allows us to analyse its features against the
408 background of originally rural skills, traditions, and belief systems of the animal holders in an
409 environment that has been quickly overgrown by the urban structure of a burgeoning megacity (Pinto
410 et al. 2020a). Recent data show that in the inner city, milk yield and body weight of cattle is higher due
411 to better management and access to high quality feedstuff, such as vegetable waste from neighbouring
412 households (Reichenbach et al. 2021b). This entails lower values of enteric methane emission per litre
413 of milk in the peri-urban zone (Pinto et al. 2020a) than in rural areas. Furthermore, inner-urban cattle
414 suffer less from heat stress (Pinto et al. 2020b) and enjoy good hygiene management as derived from
415 low infestation with gastrointestinal parasites (Pinto et al. 2021). At the same time, the very clean but
416 rigid granite and cement flooring of inner-city housing environments leads to an increased frequency
417 of mechanical injuries (hook lesions and lameness) of cattle kept in the densely inhabited areas (Pinto
418 et al. 2020b).

419 The concept of *rurbanity* provides a better understanding of how agricultural traditions of animal
420 keepers from formerly rural communities are closely intertwined with their new urban-based capital-
421 oriented *Livelihood* in which they sell and purchase cows as required by cash needs, market
422 opportunities, and abrupt changes of the social-ecological environment, such as the Covid-19
423 pandemic (Alam et al. 2022). It also highlights that Bengaluru's animal sheds, as a formerly rural unit
424 now adapted to the necessities of the city, are washed with tap water several times per day to prevent
425 that odour disturbs urban neighbours. Animal excreta are thus flushed away rather than recycled as
426 manure to cropland as typical on Indian rural farms (Reichenbach et al. 2021a). From the perspective
427 of *Endowments and Place*, it is evident that housing space and pasture area for the animals are

428 extremely contested in the inner city, and pasture area is continuously declining at the city fringes
429 (Pinto et al. 2020b; Reichenbach et al. 2021a). While, from the perspective of *Institutions and Behavior*,
430 negative environmental impacts such as (ground) water pollution through manure-derived nutrients
431 and enteric methane emissions of ruminants are regulated by Indian laws at the local to national level
432 (Arora et al., 2017), appropriate housing, handling, and feeding of cattle is governed by ethical norms
433 deeply rooted in Hindu culture, which are currently also discussed as guidelines for cow-care at the
434 global level (Phillips, 2021). Alternatively, aspects of farm animal welfare and ethics could also be
435 targeted from the multifunctionality perspective of agricultural production, or rather, 'coordination
436 and organisation' at the farm, cooperative, and societal level, and in this relate to the 'institutional
437 jointness' advocated by Hagedorn (2007).

438 When addressing the *Flows and Connectivity* dimension, it becomes evident that the cattle-keeping
439 families take advantage of the specific opportunities offered by the urbanising environment, for
440 example by happily accepting organic food waste as cattle feed from neighbours, who in turn, buy the
441 animals' milk (Reichenbach et al. 2021b). In addition to the direct flow of materials, this practice is also
442 an example of the social connection between milk-producing farmers and food waste-dispensing
443 neighbours who may be pursuing a wasteful lifestyle (Ganguly, 2017). From the perspective of
444 *Institutions and Behaviour* we have seen that grazing cattle on roadsides and open construction sites,
445 and collecting fodder from lakeshores is a widely used strategy (Reichenbach et al. 2021a; Alam et al.
446 2022) building on common property principles that traditionally support *Livelihoods* in rural India (Gaur
447 et al. 2018). Beyond their contribution to the cattle-keepers' income, the animals provide food
448 products, and employment along the pre- and post-harvest value chain (Younas 2013).

449 At the same time, cattle-keeping in Bangalore supports the *Lifestyles* of non-agricultural middle-class
450 families who, besides buying and consuming milk, source online shops such as www.amazon.in to
451 order well-packed cow manure as fertilizer for urban roof top gardening (Wikström 2017) or for the
452 Hindu Pooja ritual. The collection and composting of animal manure and other organic materials that
453 fuel this flow of materials indirectly connect dairy farmers with, for example, *rurban* rooftop gardeners,
454 and also provide livelihoods for poor people in the important but precarious informal waste recycling
455 sector. Connecting this sector's expertise in waste collection and separation with the currently
456 emerging formal 'urban mining' sector to enhance overall material recycling and reuse could reduce
457 negative impacts on remote areas where raw materials are typically being sourced, strengthen flows
458 and connectivity within the *rurban* arena, and potentially contribute to the emergence of new
459 cooperative behaviour (Arora et al. 2017).

460 **Cattle-fattening in waste-recycling yards in urban Ghana**

461 During the last decade, Agbogbloshie, an e-waste recycling area in Ghana's capital Accra, became widely
462 known as one of the world's most contaminated areas where thousands of new settlers from rural
463 areas dismantle, under ecologically and socially most difficult conditions, broken electrical appliances
464 and other scrap materials such as old tires in search for metals to be sold (Oteng-Ababio 2012; Adanu
465 et al. 2020). It is much less known that in the same location, hundreds of freely grazing cattle and sheep
466 are kept for milking or are stabled in corrals to be fattened for meat production (**Figure 5**). This example
467 can be understood as a *rurban* assemblage with apparently unrelated elements entering into various
468 relations by sharing the same (physical and social) space.

469 By applying the perspective of *Endowments and Place* along with that of *Institutions and Behaviour*, it
470 becomes clear that use-rights of space at Agbogbloshie are heavily contested. They are allocated by a
471 traditional chief who maintains strict order and resolves conflicts with little respect for formal
472 municipal or federal laws. Agbogbloshie and the related slum of Sodom have their own institutions,
473 health system, and security system, governed by what fits best to the needs of the scrapyard and
474 animal fattening business with its local, regional, and global material flows. The same applies to the
475 workforce, which is in high demand for the many activities on the dumpsite. Here, too, it is the chief
476 and his assistants who give permission on where to dismantle tires or computers and where to raise
477 cattle. The *Livelihood* of cattle buying, fattening, and selling is completely in the hands of newly arrived
478 rural migrants coming largely from the Kumasi area of south Ghana who continue their formerly
479 pastoral livestock economy by investing the capital gained from waste recycling in cattle keeping under
480 new social-ecological conditions. The perspective of *Flows and Connectivity* can shed light on
481 interactions between the flow of electronics from within Ghana to a central repair and dismantling
482 area, the long-distance import of e-waste from the Global North, the inflow of people who establish
483 flows of cattle feed from urban vegetable markets and of concentrates from the city fringes and rural
484 hinterlands. These ecologically critical livestock production activities take place in the immediate
485 neighbourhood of well-paying middle-class consumers, for whom regular consumption of high-quality
486 meat in burger restaurants or at traditional grill stands is one expression of their urban *Lifestyle* (Latino
487 et al. 2020). The multifaceted livelihood arrangement at Agbogbloshie is governed by strict rules and
488 hierarchies that defy spatial constraints and concerns about the risks of water and soil contamination
489 for consumers. It is so resilient against disruptions in environmental or legal conditions that the entire
490 animal husbandry-waste recycling complex shifted to the nearby slum of Sodom within days after the
491 municipal government had unexpectedly decided to bulldoze Agbogbloshie in early August 2021 in the
492 wake of speculators' interests in developing these grounds together with those of an adjacent onion
493 market into a luxury residential area (Akese et al. 2022). Should these new land development visons

494 ever gain ground, they would showcase the disastrous consequences on local well-beings by
495 shortcircuiting contaminant flows in a highly contested and subsequently contaminated *rurban*
496 environment.

497 While the examples and reflections above focus on human actors, it is undisputed that non-human
498 beings such as plants and animals also inhabit the *rurban* space. These organisms can constitute both
499 positive endowments, for example through providing ecosystem services such as clean air, shade, or
500 pollination, as well as threats, for example through potential disease transmission or attacks on
501 humans (Perry et al. 2020; Coman et al. 2022; Divakara et al. 2022). Furthermore, complexity and
502 aspirations of modern *rurban* life and lifestyles of human inhabitants also affect habitats and survival
503 of remote non-human organisms through telecoupled processes such as deforestation, expansion of
504 agricultural land, sand and mineral mining, and unidirectional material flows to *rurban* areas that may
505 operate over hundreds of kilometers (Friis and Nilsen 2014; Karg et al. 2016, 2019). The latter, in
506 return, render *rurban* spaces into valuable mining areas for all sorts of ‘waste’ from demolished
507 buildings, electronic devices, and end-of-life vehicles to discarded plastics and organic materials (Arora
508 et al. 2017).

509 **Conclusions and outlook**

510 As a concept to better understand the interdependence and dynamics of environment, society,
511 structures, and processes that shape rural-urban transformations, *rurbanity* enables us to overcome
512 the increasingly blurry divide between the urban and the rural in a rapidly urbanising world. Flows of
513 material, people, cash, and knowledge similarly shape very different places, creating strikingly
514 congruent patterns of *rurban* land use and production systems. Against the background of social-
515 ecological systems theory and assemblage thinking we have elaborated the concept to a coherent
516 analytical framework and developed four perspectives, that can be adopted for qualitative as well as
517 quantitative research and thus inspire combining different epistemologies. They provide familiar entry
518 points for researchers from different scientific disciplines but also leverage potentials for synergies
519 along the course of work. Similar to the object of study, the research approach itself can thereby
520 become dynamic and adaptive, assemble diverse elements in a bricolage, and amalgamate them to
521 new methods for a more holistic understanding of complexity. Tied to resources but also open to
522 dynamically adjust and readjust to multi-faceted conditions, *rurbanity* is exposed to, and coproduces
523 local, regional and global grand challenges. At the same time, however, it is a breeding ground for
524 potential solutions that foster local, regional, and global sustainability.

525 This concept implies that social-ecological entities in a *rurban* mosaic constantly create multiple
526 transient solutions for securing their existence. Some of those may be guided by myopic profitability,

527 others by deeply engraved cultural values or visions for the future. Independent of their time horizon,
528 they may be more or less sustainable. Though in a perpetual state of nascency and thus highly dynamic,
529 they aggregate to constitute a permanence of the impermanent at higher scales, which may grow into
530 a pervasive state of *rurbanity*. Exploring the mechanisms of self-organisation that would channel
531 arbitrary, indeterminate development paths towards long-term global sustainability certainly warrants
532 further research at the interface of interdisciplinary theory-building and empirical research.

533 **Acknowledgments**

534 This work is based on interdisciplinary collaboration in the Research Unit FOR2432 “Social-Ecological
535 Systems in the Indian Rural-Urban Interface: Functions, Scales, and Dynamics of Transition” funded
536 jointly by the Deutsche Forschungsgemeinschaft (DFG, Germany) and the Department of
537 Biotechnology (DBT), Government of India. We thank Dr. Thomas Esch for providing the map shown in
538 Fig. 1, which is a product of the World Settlement Footprint – Evolution of DLR, Germany.

539

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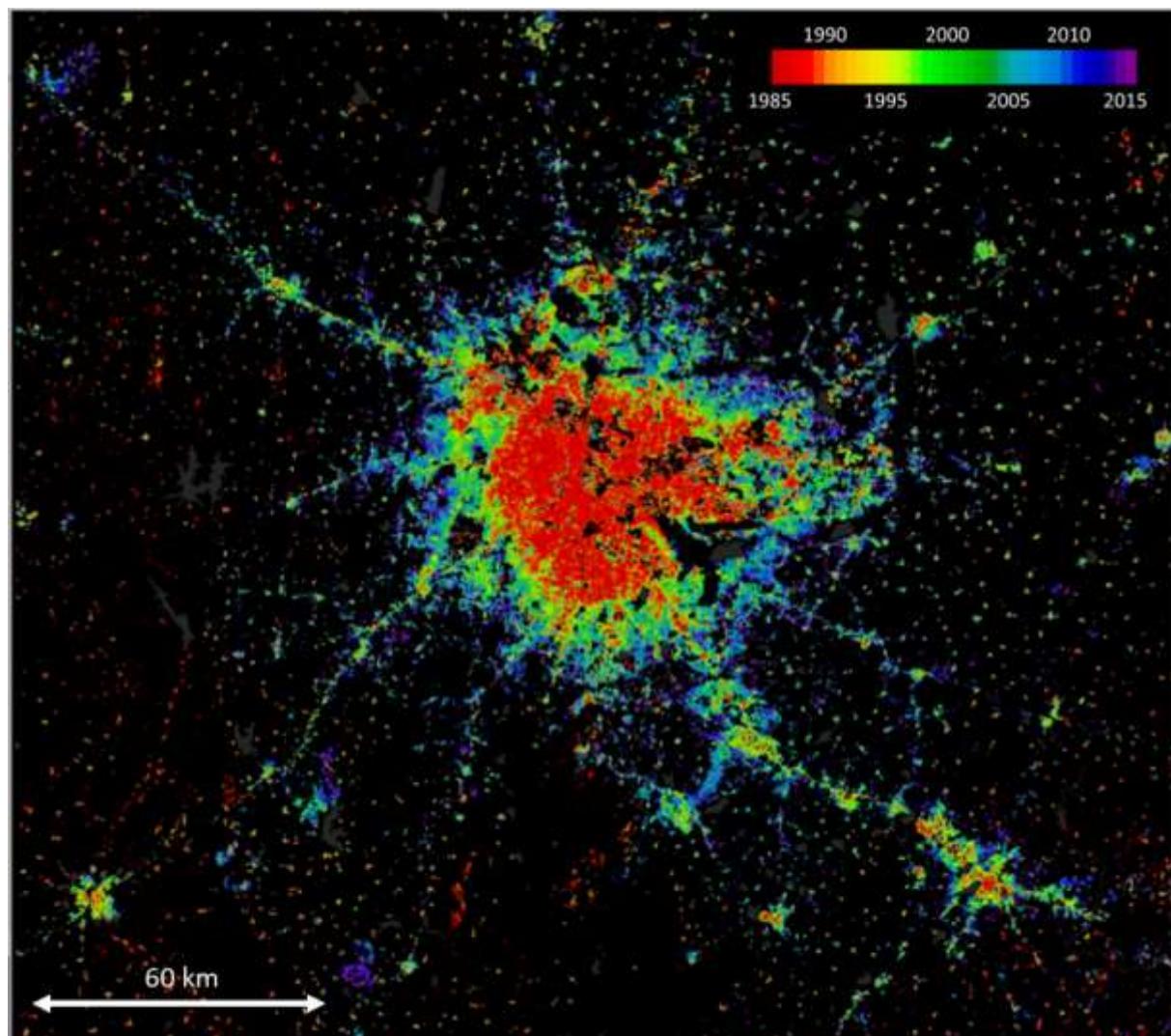
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803 **Figures**



804

805 **Figure 1.** Expansion of built-up area around the southern Indian megacity of Bengaluru from 1985 to
806 2015 (WSF-Evolution, DLR). Multiple and diverse examples of *rurbanity* emerge in the diffuse rural-
807 urban fringes.



808

809 **Figure 2.** Google Earth satellite images of the Bengaluru Metropolitan Area in southern India (above)
810 and the Rabat–Kenitra Corridor in Morocco (below) demonstrating striking similarities in landuse
811 patterns across distant locations and cultural settings.



812

813 **Figure 3.** Ground photographs of *rurban* locations in the Bengaluru Metropolitan Area in southern
814 India (above) and the Rabat-Kenitra Corridor in Morocco (below) demonstrating striking similarities in
815 sceneries across distant locations and cultural settings.



816

817 **Figure 4.** *Rurbanity exemplified by the close relationship between cows and humans in Bengaluru,*
818 *India: Dairy production in an inner-city animal shed (above left), a cow presented as cultural icon*
819 *(above right), and dairy cows kept by households in different urban neighbourhoods (below).*



820

821 **Figure 5.** The e-waste recycling site of Agbogbloshie in Accra, Ghana, just before its dismantling in July
822 2021 (left) and the neighbouring slum of Sodom to where *rurban* cattle fattening activities have shifted
823 in April 2022 (right).