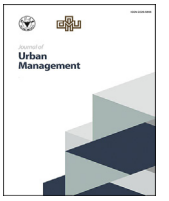
Journal of Urban Management 14 (2025) 1328–1339

HOSTED BY

Contents lists available at ScienceDirect

Journal of Urban Management

journal homepage: www.elsevier.com/locate/jum



Case Report

Fast growing informal peri-urbanization in Africa: The role of local practices in assessing sustainability and planning

João Carrilho [a,b,c,*], Marisa Balas [a,c], Gustavo Dgedge [d], Jorge Trindade [a,c]

[a] Department of Sciences and Technology, Universidade Aberta, 1269-001, Lisboa, Portugal
[b] Observatório do Meio Rural, 11010, Maputo, Moçambique
[c] Centro de Estudos Globais, Universidade Aberta, 1269-001, Lisboa, Portugal
[d] Department of Geography, Faculty of Earth Sciences and Environment, Universidade Pedagógica, Maputo, Moçambique

ARTICLE INFO

Keywords:
Peri-urbanization
Territorial cohesion
SDG monitoring
Local practices
Africa

ABSTRACT

Peri-urbanization occurs differently across world regions, through urban sprawl, local development, and rural exodus. The latter is typical in primarily rural, fast urbanizing underdeveloped regions in an African context. In those regions, semi-urban settlements develop informally from local practices. For their large numbers, undertaking formal assessments and land use planning to any significant extent is impractical. The study applied a flexible framework to assess the role of local practices on sustainability in rapidly expanding settlements in peri-urban areas and how technical resources and narratives can influence and take advantage of such practices. The work reports a mixed-methods case study conducted in settlements North of Maputo, Mozambique using territorial and social cohesion as proxies for sustainability and as a guide for planning interventions priorities. The study used publicly available and participatory geographic information, limited expert opinion surveys, focus group discussions, and individual satisfaction surveys. We show that, while facing limitations, informal practices are conscious of the local suitability of risks in settlements land use planning and favor social cohesion. The framework supports existing theories and reveals that local microscale traditional physical planning brings marginal gains. The research suggests priority to interventions with a higher impact on territorial and social cohesion, such as narrative-based local institutional innovations, enhancing knowledge exchange on standards and risk management solutions, enforcing regulations, and improving regional networking infrastructure and practices, in face of limited resources and city and regional planners. Research is needed to improve the frameworks' replicability as a new tool to assist in peri-urbanization governance.

1. Introduction

The global governance of sustainability in cities and communities is facing challenging times.

In 2022, the world urban population was 4.52 billion out of 7.95 billion people (Ritchie et al., 2024). Urban areas contribute between 67 percent and 72 percent of greenhouse gas (GHG) emissions and respond for 80 percent of global GDP (World Bank, 2023).

After ten years of implementation of the Sustainable Development Goals (SDGs) and 37 years since the launch of "The Brundtland

* Corresponding author. Department of Sciences and Technology, Universidade Aberta, 1269-001, Lisboa, Portugal.
E-mail addresses: jcarrilhoster@gmail.com, 2001476@estudante.uab.pt (J. Carrilho), marisabalas@gmail.com (M. Balas), gudgedge@gmail.com (G. Dgedge), jorge.trindade@uab.pt (J. Trindade).

https://doi.org/10.1016/j.jum.2025.03.004
Received 31 October 2024; Received in revised form 16 February 2025; Accepted 18 March 2025
Available online 19 April 2025

Report" on environment and development (Brundtland et al., 1987) from which such goals originated, only 16 percent of the goals are on track to be reached by 2030; the SDG 11 on Sustainable Cities and Communities is particularly off track (Sachs et al., 2024).

Good governance requires both good assessment and reporting of current and future trends. Reference to semi-urban settlements in peri-urban areas is likely insufficient either because of incomplete reporting or because the corresponding SDG target (11.a) and indicator (11.a.1)[1] do not measure sustainability at the scale of the community. At world and large-world regional scales, progress towards sustainability can be assessed based on the scenario narratives of the Shared Socio-economic Pathways (SSP) (O'Neill et al., 2017; Riahi et al., 2016), where urbanization (Jiang & O'Neill, 2017) and a land use futures (Popp et al., 2017) play a central role. The SSP narratives work as a synthesis of the universal knowledge of natural and social sciences on sustainability. Central elements of these narratives refer to social cohesion, institutions and power relations that can be extended to various territorial scales. Understanding the actual occupation and territorial planning helps assess how sustainably urbanization is progressing compared to a baseline narrative. A vast literature exists on social cohesion relevant for the global south and for Africa, in particular, but while dimensions and variables on social cohesion can be identified and found to conform with universal literature, a direct relation with territorial cohesion and spatial inequality and fragmentation is sparse and an unified and flexible assessment tool was not found, especially in conditions of limited resources (Dodman et al., 2017; Francesco & Zapata-Román, 2022; King et al., 2010; Langer et al., 2017; Sakketa, 2023; UNDP, 2020).

Peri-urban areas are an inescapable part of the process of urbanization. In developing countries of Africa, with high urbanization rates, the peri-urban areas are non-statutory, fragmented administrative, political, or statistical units. These are regions and countries that are primarily rural, where peri-urban villages are as relevant to peri-urbanization as urban sprawl. The peri-urban areas are occupied with settlements of the type of "village" or "diffuse", and is "the category of place that is most often omitted in consideration of peri-urban environments." (Iaquinta & Drescher, 2000, p. 6). They lack updated socio-economic statistical information and are not prioritized in technical[2] and financial resource allocation. These peri-urban settlements are mostly informal semi-urbanized "work in progress" that rely on local practices of land use organization under a flexible land regime, which are dynamically adjusted by new knowledge acquired from the interaction of a demographic that changes in quantity and quality. This local knowledge, participation and social learning based epistemology paradigm is not expected to change radically, and, on the contrary is expected to play a role in future urbanization and climate change adaptation (Harris, 2021; Hedblom et al., 2017; UN-HABITAT, 2024).

This paper outlines a simple-to-adjust and simple-to-apply framework based on the territorial and social cohesion approach and satisfaction survey in non-statutory outer peri-urban informal settlements to assess local sustainability based on extended SSPs narratives and guide priority physical interventions.

The diversity of peri-urban situations represents a challenge to comparability and to identify regularities. Therefore, the framework was intended to be flexible, with an affordable and limited set of variables. The simplicity of adjustment and affordability would allow a strategy of replicating single cases to obtain external validity (Yin, 2018) and the possibility for generalizations based on the sheer number of replications.

A cluster of informal settlements in a peri-urban area North of Maputo, Mozambique, served as the test case study.

This paper proceeds as follows: this first section concludes with the identification of the problem and the research framework. The second section describes the study area. The third section discusses methodology, including the data collection and analysis strategy and the measurement of concepts and constructs leading to answering the research questions that contribute to resolving the problem. This section also summarizes the limitations. The fourth section presents the results and hints at the emerging discussion topics. The discussion is the object of the fifth section, illuminated by the results, and offers suggestions on areas of interest for future research. The sixth section, conclusions, offers a synthesis of answers to the research questions and defends the proposed framework. The paper closes with the implications of the limitations and suggestions for alternative follow-up research in substance and method.

1.1. The research problem and framework

The study of peri-urban sustainability faces the yet unsolved ontological challenge of defining the peri-urban. A vast literature addresses this issue (Andersen et al., 2011; Follmann, 2022; Meeus & Gulinck, 2008; Raimbault & Pumain, 2020; Sahana et al., 2023). Most authors agree that they are easier to characterize and identify than to define. Furthermore, the number of indicators can grow quickly (Sahana et al., 2023). Therefore, reducing the number of indicators to assess their progress affordably is challenging in the context of limited capacity to acquire planning expertise and limited availability of statistical data.

This research focuses on semi-urbanized and semi-dense settlements in outer peri-urban areas with (1) a social identity with mixed power and institutional arrangements, (2) geographically and socially fragmented and mixed occupation, and (3) more than 50 percent of the total population is no longer employed or self-employed in agriculture, with secondary and tertiary sectors linked to neighboring urban centers.

Sustainable settlements are spaces with good living conditions. A good life manifests itself in the level of satisfaction with current territorial and social conditions and the expectations of their improvement in the future. The value of qualitative information from local actors has already been discussed by Lemma et al. (2024).

[1] 11.a) Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning; and 11.a.1) Proportion of population living in cities that implement urban and regional development plans integrating population projections and resource needs, by size of city (UN-HABITAT, 2016, p. seven).

[2] In Mozambique, the annual number of graduates in architecture and physical planning are counted in the few dozens. The number of human settlements of all sizes and categories in 154 districts is above 5000.

By devising a way to measure territorial and social cohesion in non-statutory settlements, from basic spatial analysis and the levels of satisfaction of the peri-urban residents themselves, and inspired by some elements of the narratives of the Shared Socio-economic Pathways it should be possible to obtain information on such issues as socio-economic equality, demographic dynamics, practices of land use and attitudes towards technological change, energy consumption and local initiatives to face risks.

Under the assumptions of limited access to technical and financial resources and given the potential problem-solving capacity of local practices in land use governance, the research question is: in promoting sustainability of fast-growing informal peri-urban settlements, should the enhancement of social cohesion through institutional innovation deserve priority attention, instead of focusing on mainstream physical interventions? This question is disaggregated into:

(1) do local practices manage to keep territorial and social cohesion, including its socio-economic and institutional dimensions in growing informal peri-urban settlements? and
(2) are they able to point to urgent action needed to prevent hard-to-reverse harm to social sustainability and development at the mid-and micro-scale?

If the current practices maintain territorial and social cohesion to a certain extent, then externally induced intervention should only respond to the corresponding extent to specific demands, with economic use of technical-financial resources.

The Drivers-Pressures-State-Impacts-Response (DPSIR) tool (Bradley & Yee, 2015, p. 70) and a specific literature review on social cohesion applying universal concepts to the global south and African context assisted in deriving the research design. (Fig. 1). For practical reasons, the physical observable geographical features are analyzed separately, retaining the designation of "territorial cohesion." Socio-economic cohesion and territorial cooperation and governance are analyzed under "social cohesion" (Kim et al., 2020; Langer et al., 2017; Medeiros, 2016). These high-level concepts reflect the dimensions of the definition of sustainability and the indicators of the stated sustainable development goals. Detailed, updated, and disaggregated measures may or may not exist for units that are not designated in a statistical nomenclature.

These limited set of variables and criteria are intended to reflect local territorial planning practices and general rules that promote self-organization in a system where formal and informal authorities are fluid and constantly rearranged to fit the immediate drivers and pressures and to balance the impacts of practices, as well as the legal and administrative framework of the country.

2. Methodology

Based on the research design, while regional balance and spatial inequalities are usually part of a measure of territorial cohesion, at the present sub-regional scale, the geographical observables, or mapped indicators of (a) environmental integrity, (b) poly-centricity and (c) regional integration are assessed in a binary of presence or absence. Social cohesion is assessed based on satisfaction and perception of (a) social inclusion, with observables of acceptance of diversity and belonging, and (b) trust in institutions and power dynamics in the face of frequent conflicts and challenges.

Local practices were “de-codified” along the assessment, following a basic local and regional spatial analysis: perceptions on territorial cohesion were collected through information and observation, and the perceptions on social cohesion, were collected through adequate interviews and questionnaires. These perceptions were interpreted against experts' opinions and discussed based on existing theories and experiences or studies conducted elsewhere. To make the framework flexible, the instruments were applied leaving room for interview questions to be rephrased according to the context, and the list of practices to be reformulated or updated according to the

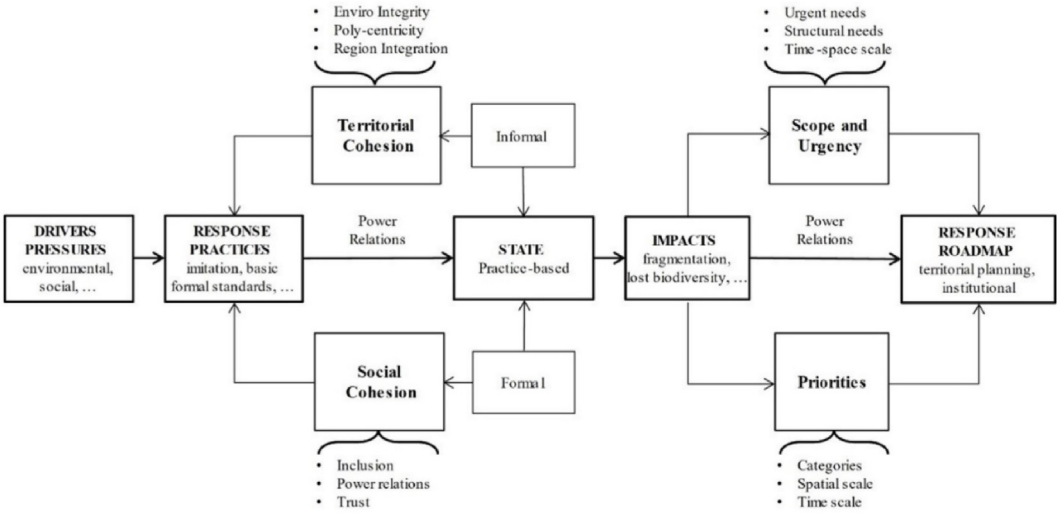


Fig. 1. Research design.

mix of local sources of information and knowledge.

Such qualitative multi-method, sequential three-phase design under a pragmatist philosophy umbrella (Saunders et al., 2019) was adopted to study the case with multiple embedded units (Yin, 2018): a first phase of desk review, including a geographical overview and experts' interviews, a second phase of fieldwork, with field visits, induction meetings, and data collection, from both focus groups and interviews, and a third phase of spatial and qualitative data analysis, with basic statistical treatment. Fig. 2 summarizes the methodological workflow. For transparency, the methodology is presented in detail.

2.1. First phase: desk review

In the first phase, a desk review in preparation for fieldwork included a geographic overview based on reports and open-source data from web portals providing imagery and maps over time – from 1975 to 2024, when available. The option for open-source free software was kept for all phases: while their features do not compete with professional alternatives, the level of processing they provide is deemed enough. Opportunistic interviews with experts provided key issues and information on local entry points and notable places. Preliminary field observations on land use, mobility infrastructure, and economic activity distribution assisted in familiarizing the place.

2.2. Second phase: fieldwork

The available budget determined the limits of instances of meetings and sample size. Field data originated from three sources. First, a panel of eleven experts – lawyers, planners, geographers, from the academia, public and private practitioners –were invited to vote on three to five priorities, out of a list of ten, in five categories of practices: physical planning, service provision, environmental management and regulation, economic development, and institutional structuration practices (Table S1, in Supplementary Material). These categories and practices were derived from a previous literature review (Carrilho & Trindade, 2022). The second source was the focus groups (FG), of 8–12 participants, one from each borough. A local mediator, hired to overcome language and cultural barriers, ensured the gender- and age-balanced composition of the FGs. A plenary session with the five FGs provided information on history, local cultural meanings, geography, boundaries, and power relations. This session also allowed for practicing map-reading and participatory geographical information systems (PGIS). For each borough, the FGs provided information on leadership, the main social groups, forces, actors, and power relations, operating the local "*infrapolitics*" (Scott, 2012). Perceptions were recorded on their roles in exercising, participating, accepting, protesting, and resisting power in six to eight land management decisions in each of five categories: land use planning, official land acquisition, customary land acquisition, involuntary loss of rights, and conflict resolution (Table S2, in Supplementary Material). Discussions in an opportunistic sixth focus group constituted by "enumerators" (two female and four male) reviewed the collected qualitative information and the reaction of the interviewees and supported the PGIS exercise.

The third source was a satisfaction survey to collect data on the same subject matters, this time at the individual level, in real-time, using smart communication devices and a server. Replication logic was adopted for embedded multiple units – the boroughs – using the survey form as a replication device. The replication evaluated social cohesion and organized it into six sections: personal information, livelihood and well-being information, perception of attraction factors and inclusion, challenges, and local institutions' performance.

The questionnaire and discussion forms were developed in a free Kobotoolbox server account (KoBoToolbox, 2024), allowing for real-time geolocation, and the statistical analysis was done using Jamovi (The jamovi project, 2023). Photographic information was also collected.

2.3. Third stage: analysis

Using GIS software, maps and imagery were processed to evaluate the land use mix and population density and to ascertain the polycentricity by verifying the presence of different classes of urban centers. The land use mix index was calculated based on the settlement extents and population map obtained from CIESIN C. for I. E. S. I. N. & Novel-T (2021). The entropy index of the Land Use Analyzer plugin for QGIS was chosen for its simplicity. This follows the same, but simplified, rationale suggested by Musakwa and Van Niekerk (2013), which requires detailed mapping of land use within the settlements.

The responses from the expert voting were tabulated, and the priorities were derived for five and two "winners" of the single transferable vote procedure, using a free dedicated extension for Google Sheets (RankedVote, 2024). The priorities are those chosen by

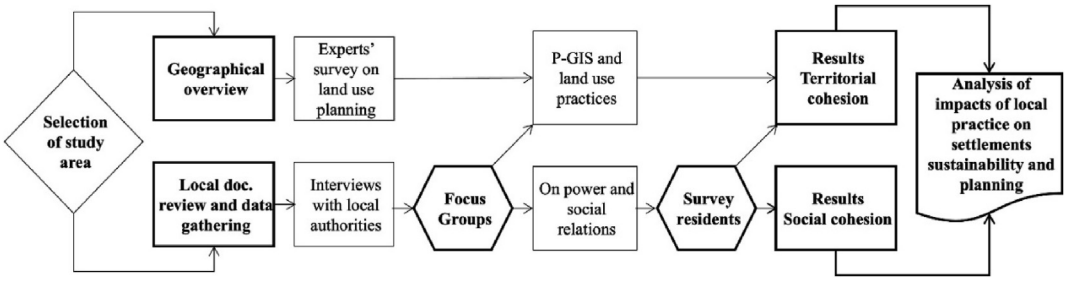


Fig. 2. Methodological workflow overview.

experts and triangulated either with the information provided by the focus groups' discussions and individual surveys or with interviews with local officials.

The results are presented with the following structure:

1) On the assessment of territorial cohesion: the study area is briefly described and followed by a basic spatial analysis to provide a socio-geographic overview. Then, the results of the assessment are presented in the form of tables and analysis of the discourse from the FGs, individual interviews and images, followed by a discussion.
2) On the assessment on social cohesion; the FGs discussions and the analysis of the satisfaction survey provide the social composition, the perceptions of the main variables in the form of tables and synthetic analysis of the discourses, followed by a discussion. Perceptions on power relations are also presented and discussed.
3) On the assessment of priorities: the results on the territorial and social dimensions are pulled together into a table and discussed against expert's opinions and summarized and discussed.

The methodology has the following limitations: (a) The maps and imagery had different resolutions and different coordinate reference systems (CRS), as they come from diverse sources. (b) From the individual interviews, only 96 out of 158 records could safely be used. Records were filtered out when not located within the study area, when collected in a single place or when data was missing.

3. Results and discussion

3.1. Territorial cohesion

3.1.1. The study area overview

The study area is a subdistrict unit, constituted by five boroughs in the localities of Ngalundi and Matalane-sede, in the district of Marracuene (Fig. 3), in the northern border of the city of Maputo, the capital of Mozambique, and its conurbation with Matola city.

The core settlements are Bobole and Matalane, which originated around two centuries ago from regional power balances. In recent decades, during a sixteen-year civil unrest, they were important centers of defense of the capital city of Maputo. The Bobole River crosses the study area in the West-East direction. There is mixed and fragmented land use, predominantly for agriculture.

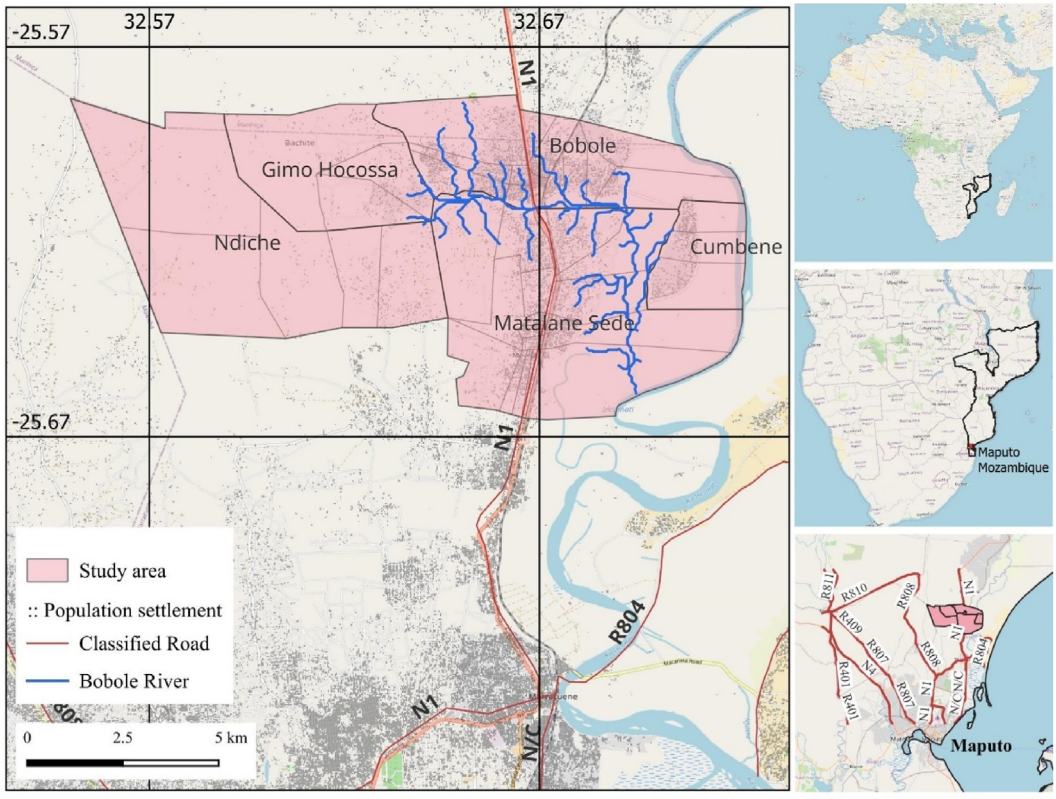


Fig. 3. The study area: boroughs of the localities of Ngalundi and Matalane-sede, district of Marracuene, North of Maputo, Mozambique.

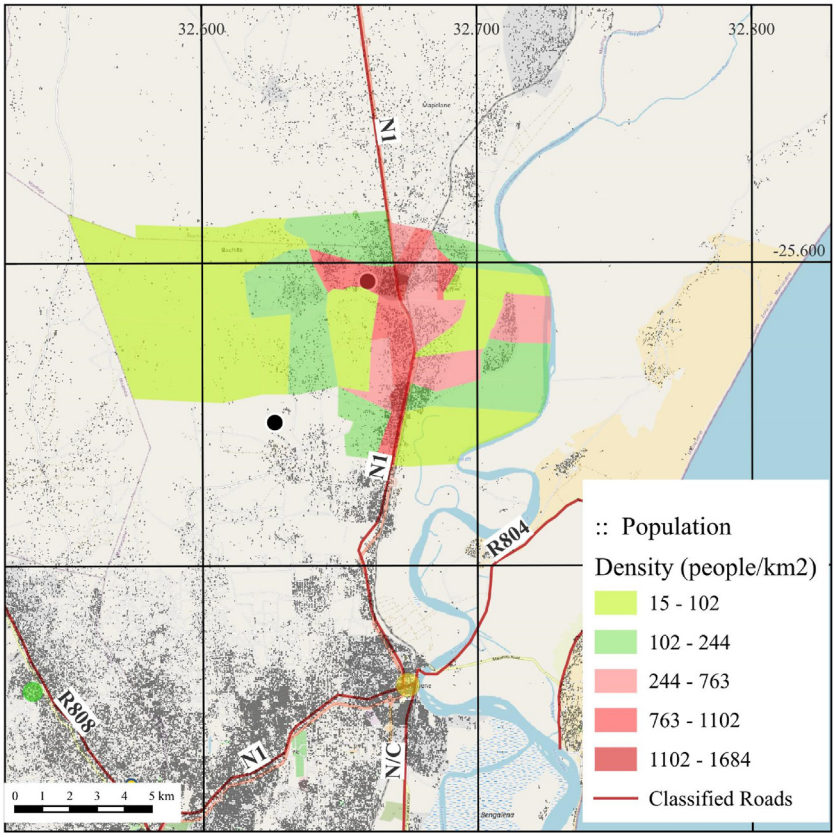


Fig. 4. Population density in the study area.

A biodiversity reserve created with two hundred hectares in 1945 was adjusted to 12 ha in 1967. A safari park is also present to the east, outside but close to the study area.

3.1.2. Basic spatial analysis

The social composition reflects history and geographical realities. There is a mix of local and immigrant people from rural districts and from neighboring urban areas, in search of more affordable living conditions or involuntarily displaced by climate shocks and war. The maximum population density of the census units is below 1.6 thousand inhabitants per square kilometer (1684 people/km^2), calculated based on the high-resolution population layer (CIESIN C. for I. E. S. I. N. & Novel-T, 2021) (Fig. 4).

The rate of change in land use to built-up areas has accelerated in the last decade. The main direction of sprawl and densification of Maputo and Matola cities is in the South-North direction, parallel to N1 road. However, as the Global Human Settlement Layer (GHSL)[3] shows, the densification does not absorb the study area. It moves toward the Matola River, located West of the study area.

Fig. 5 illustrates the actual land use. The development of settlements relies primarily on informal practices of land resource distribution, occupation and regulation, and formal and informal authorities have limited capacity to support the implementation of land use planning-related activities.

Locally, limited external or formal action of territorial planning was initiated to that effect, except the organization of the area as a defense bastion and military training for the city until 1994 and the accommodation of specific groups of people from the city, displaced by flood events. However, improving transport infrastructure in and from the urban centers of reference and installing two agroindustry factories in the region played a role in increasing and making regular commutes to urban centers.

3.1.3. Assessment of territorial cohesion

Table 1 presents the observations and perceptions on territorial cohesion, according to its main categories of regional integration, polycentricity and environmental integrity.

The FGs discussions manifested dissatisfaction against regional initiatives taken by higher levels of government to accommodate people from other areas without information, consultation, engagement, or any other step of the ladder of citizen participation from the local population. This perception was further confirmed when setting priorities for the category of institutional development (see Table 4).

[3] https://human-settlement.emergency.copernicus.eu/visualisation.php.

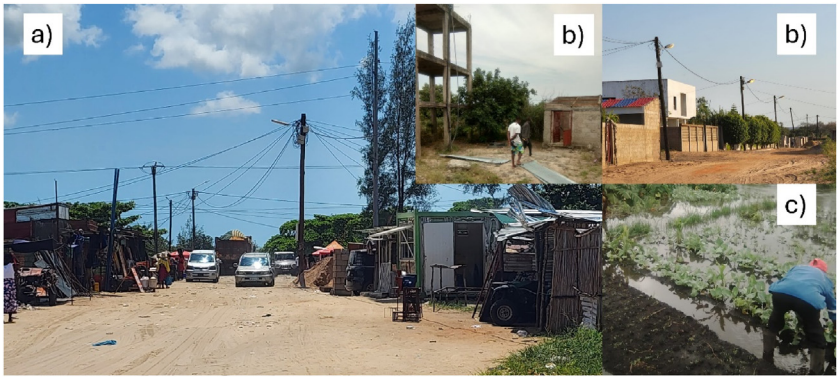


Fig. 5. (a) Market place, (b) types of residence, and (c) flooded small farm in the outer-peri-urban village of Bobole, Maputo, Mozambique.

Table 1
Assessment of territorial cohesion.

Category	Criteria	Criteria	Yes	No	Spatial analysis and field observation [.] denotes qualification from interviews
Regional integration	Well-defined boundaries	1st Subdistrict unit	[+]		With identifiable overlaps and disagreements
		Locality boundaries	[+]		Officially undefined, but locally known and enforced
		Borough boundaries	[+]		Officially undefined, but locally known and enforced
	Networking infrastructure	Classified regional roads	+		
		Regional road terminals	+		
		Regional rail terminals	+		
		River transport		x	
		Classified/named internal roads		x	
		Cellular comm antennae & Banking	+		
	Functionality	Sprawling control		x	For cities' workers and local industry, along roads
		Water and Power network transit	+		Medium voltage
		Food production	+		Rice, bananas, and horticulture. Sugar cane industry
		Industry	+		Food: sugar, beverage, sand mining
		Leisure	[+]		Art museum. Untapped natural potential
Polycentricity	Settlements	Hierarchical settlements network	+		Four classes, including the Maputo-Matola conurbation
	Dependency relations	Low dependency relations		x	For secondary and tertiary public services
		Complementary functions		x	Common functions
	Morphology	Morphology: ordered	[+]		Fairly regular pattern. Lack of intentional public spaces
		Morphology: compact		x	Low density occupation in residential areas
		Morphology: zoning	[+]		Coarse: residential, agriculture, commerce
	Public Infrastructure	Public infrastructure distribution	[+]		Follow population density. Only basic level.
		Safe Internal mobility	[+]		Safe but unpaved, poorly shadowed streets
Enviro integrity	Land use mix, and diversity loss	Low substitution rate with built-up		x	Loss of bushland, shrubland and subsistence agriculture
		Biodiversity protection	[+]	x	Conditionally unused to discourage resource selling
		Fragmentation	+		Subdivision of residential and farm plot
	No settlement in areas at risk	Areas w/risk of erosion/ landslide	+		Slopes and ravines not occupied
		Areas w/risk of floods/flash floods	[+]		Streams banks are used for agriculture. River need dike
	Rate of substitution	Low rate of substitution		x	Especially along classified roads
		Direction of expansion	[+]		Internally away from roads. Regionally along roads
		Regulations to limit		x	Bushland, shrubland, subsistence farms undervalued

Local practices in the case study could cope with the pressure of the attraction of the Maputo-Matola conurbation and keep critical factors of environmental integrity and social cohesion. The relatively ordered overall morphology, the management of the use and occupation of local biodiversity reserves and high-slope areas were kept. The role of the settlements in the regional territorial balance is not adequately understood and promoted. For instance, unlike the initiative in a neighboring locality to create a safari park, no signs were found to take advantage of specific environmental features.

Local practices are struggling to satisfactorily face challenges of typical physical planning of urban centers, such as increasing land

Table 2
Social characterization of validated respondents.

Gender	Count	% of Count	Cumulative%
Female	49	51 %	
Male	47	49 %	
Total	96	100 %	
Place of origin			
Local	37	39.4 %	39.4 %
Rural District	36	38.3 %	77.7 %
Neighboring city	21	22.3 %	100.0 %
Permanence			
Settled	39	40.6 %	40.6 %
Settling	29	30.2 %	70.8 %
Newcomer	28	29.2 %	100.0 %
Main Occupation			
Agriculture	50	52.1 %	52.1 %
Self-employed	27	28.1 %	80.2 %
Services	12	12.5 %	92.7 %
Informal activity	3	3.1 %	95.8 %
Unemployed	3	3.1 %	99.0 %
Industry	1	1.0 %	100.0 %
Document of Land rights			
Statement (Local auth)	56	58.3 %	58.3 %
Petit Papier	14	14.6 %	72.9 %
Other	7	7.3 %	80.2 %
RDUAT - good-faith	2	2.1 %	82.3 %
DUAT - regular official	1	1.0 %	83.3 %
No Document	16	16.7 %	100.0 %

Table 3
Scores on inclusion, trust and perception of legitimacy and competence of institutions.

	Variables	N	Mean	Median	SD
1	Intention to Remain	96	3.65	4.50	1.63
2	Participation in Information and Discussion on matters of Neighborhood	96	3.84	4.50	1.31
3	Hope to Remain in this Place	96	3.76	4.50	1.58
4	Participation in Local Social Events	96	3.88	4.00	1.26
5	Ease to get Land for Residence	96	3.33	3.50	1.57
6	**Rise in Land Prices for Housing and Infrastructures (INV)**	**96**	**3.23**	**3.50**	**1.32**
7	Ease to get Land for Farm	96	2.88	3.00	1.85
8	Expectation of Development of the Settlement	96	2.74	3.00	1.75
9	Ease to Support Family	96	2.67	2.50	1.34
10	Satisfaction with Equal Access to Services	96	2.83	2.50	1.55
11	Land Conflicts (INV)	96	2.72	2.50	1.80
12	Good Relations between informal and government authorities	96	2.65	2.50	1.75
13	Extra Charging for Services corruption (INV)	96	2.48	1.25	1.96
14	Trend of Exodus to Neighboring City (INV)	96	2.24	1.00	1.90
15	Preference for Moving to Neighboring City (INV)	96	1.63	1.00	1.65
16	Lack of Affordable Credit (INV)	96	1.59	0.50	1.79
17	Ease to walking safely	96	2.65	2.25	1.54
18	Criminality Unsafety	96	2.48	2.00	1.66
19	Social Conflicts	96	2.59	2.00	1.81
20	Lack of Land for Agriculture	96	2.65	2.00	1.80
21	Expectation that official authorities consult more People	96	2.33	2.00	1.65
22	**Expectation Traditional Informal Authority will gain Power**	**96**	**2.18**	**1.50**	**1.69**
23	Possibility to Accommodate More People in Residential areas	96	2.02	1.25	1.74
24	Support received from People	96	1.99	1.00	1.78
25	Support received from Local Leaders	96	1.89	1.00	1.71
26	Support received from Government Officials	96	1.66	1.00	1.76
27	Ease to get ride in Safe Public Transport	96	1.81	1.00	1.50
28	Existence of Public Green Spaces with Shadow	96	1.29	1.00	1.15
29	Ease to Find Employment	96	1.01	0.50	1.06
30	Ease to cycle safely	96	1.38	0.50	1.31
31	Possibility to Accommodate more Farms of all types	96	1.79	0.50	1.74

NOTE: reverse interpretation of variables with (INV).

Table 4
Land use planning priority interventions derived from fieldwork per category.

CATEGORY 1: Land use planning and occupation		References
e01	**Register and regularize rights**	A
e09	Order or reorder areas considered disorganized	B
e10	Setting standards for access roads	
e08	**Define standards for construction**	
e02	Define common and socialization spaces	A
CATEGORY 2: Social (service provision)		
s06	**Improve access to streets and internal public transport**	
s04	Improve access to schools - expand or create new ones	A
s10	Improve public safety (att. children, women, at night)	A
s09	**Define baseline standards for service access**	B
s03	Improve access to healthcare - expand or create new units	A
CATEGORY 3: Environment (*Waste management, dikes maintenance* - A)		
v02	**Manage biodiversity loss**	
v10	**Define limits of urban expansion**	
v06	Enforcement of environmental regulations	
v05	Preventing the loss of firewood	
v01	Manage substitution of agricultural land with residential use	B
CATEGORY 4: Economy (production and consumption)		
c04	**Access close to commercial hubs**	A
c05	**Promote connections to nearby cities and towns**	A
c07	Promote hospitality and tourist attraction marketing	A
c08	Promote conditional use for reserved lands	A
c09	Promote space-saving agricultural practices	
CATEGORY 5: Institutions		
i08	Participatory land use planning	
i02	**Define intervention rules for regional, national, or foreign entities**	A
i03	**Collaboration of informal and formal authorities**	A
i01	Define territorial boundaries (subdistricts)	B
i04	Integrate newcomers into decision-making	

Note: In **bold**, the two winners are listed. **A**: corroborated by FGs and individual dwellers. **B**: chosen by authorities.
Notable cases: waste management and maintenance of dikes.

prices and consequent land subdivisions, mobility, the need for public spaces, waste and inner stream management, issues that are amenable to "civic ecology" actions.[4] A "*laissez-faire*" regime may reverse the gains if the immigration flow accelerates.

Local benefits were recognized from interventions at mid-scale or regional levels, but these are of slow onset compared to social changes. Planners are expected to exercise tactical delay (Thompson, 2021) and patiently allow the emergence of matured deliberative and mediated courses of action over time (Forester, 2004).

It was apparent that district and regional authorities do not have the financial and technical capacity to address all the territorial planning issues arising from the fast-growth areas, especially in the outer peri-urban settlements. These authorities have decided on monitoring focus, although their capacity to enforce regulations is insufficient, as is their collaboration with local authorities.

3.2. Social cohesion

3.2.1. Social characterization

Table 2 provides a brief social characterization derived from the survey (N = 96).

The FG narratives show that local informal authorities and other types of social leaders, such as youth, religious and other influential local leaders supersede formal authorities. Social groups are based on workplace or work type, first language, religion, and place of origin. District authorities appoint officials at two levels below (administrative post and localities). It was possible to identify social and kinship connections among officials and social leaders. Formal and informal institutions follow a hybrid and variable arrangement. Vertical and horizontal relations and interactions are both at the local and regional level and include kinship. The tension between the outreach capacity to neighboring urban centers and the interest in consolidating the current settlements is apparent.

3.2.2. Perceptions survey

The categories used to describe social cohesion are those of trust in legitimacy, arbitration, responsiveness, and effectiveness of government, and inclusion, referring to acceptance and belonging.

Respondents provided scores of their perception or opinion, in interval type format, from low to high, represented respectively by 0–5, with intervals of 0.5, to questions formulated with adjustments prompted by information from the FG. Median (M) was used because it is less sensitive to outliers. Values were sorted and separated into three classes of scores: $M \geq 2.5$; $2.5 > M \geq 2.0$; and $2.0 > M \geq 0.0$ (Table 3). Usual statistical procedures were previously applied, to verify good reliability (n = 96, Cronbach $\alpha = 0.926$), non-

[4] "Civic ecology practices are self-organized stewardship initiatives, often taking place in cities" (Krasny & Tidball, 2012, p. 267).

significant sphericity ($\chi^2 = 1997$, degrees of freedom, df = 465, $p < 0.001$), and good overall adequacy (KMO MSA = 0.842). The variables are not normally distributed. An Exploratory Factor Analysis (EFA) resulted in four factors explaining 52.3 % of the variance to establish the validity of the measured concepts.

While the information collected confirmed the non-uniformity of the social landscape, the following consistencies emerged. The main factors of trust are related to institutions and their capacity to effectively arbitrate in cases of conflicts, to respond to needs with equity and without corruption, the capacity to collaborate with informal leaders and promote the citizens' participation. Internal trust is reflected on the perception of ease of mobility and criminality and ranked at the middle of the table almost always attributed to newcomers, who represent 29.2 percent of the residents (Table 2). The main factors of inclusion are acceptance, followed by belonging and networking. Acceptance ranked the lowest and may explain the reluctance to accept newcomers.

The results, together with information on access to resources and income opportunities, show that local practices can keep horizontal cohesion for the majority of settled residents (Kim et al., 2020; Langer et al., 2017; UNDP, 2020). The exception is that access to income is significantly different by gender (non-parametric Kruskal Walli's test, with $\chi^2 = 5.72$, df = 1, $p < 0.017$). Differences were assessed between boroughs, showing that peripheric boroughs are less susceptible to accepting the diversity of origin of newcomers. However, M < 3 is related to issues pertaining to or that can be improved by more trusted and responsive institutions.

It was frequent to hear that sensitive information should not be given to the researcher or field assistants because there was no reason: "*why should they reveal their secrets of land management or their internal organization*?" – from enumerator FG discussion.

3.2.3. Power relations

The results from a separate discussion on the role (exercise, participate, accept, protest, resist) of the main power actors play (state agent, market agent, local informal leadership, individuals) support the view that power does not always require to be "power-over", as it can also be a non-coercive "power-with", in a framework of performative power structures and communication rules (Abizadeh, 2023; Morlacchi, 2021). The categories were based on the Land Law draft revision. As stated above in section 4.2, informal authorities supersede formal authorities. But unlike for instance, the cases of Ghana or Congo (Akaateba et al., 2021; Bédécarrats et al., 2019), where the ex-colonial power traditional authorities opted by a regime of indirect rule, in Mozambique the administrative system absorbed them into the more general category of "community authorities", which sometimes, but not necessarily, coincide with former traditional chiefs ("*régulos*"). This situation further complicates the perception about power relations in the peri-urban settlements. Replies to questions on power relations changed even during the groups' discussion, indicating that the power balances are fluid, with dynamic alliances among the groups, especially when dealing with external forces or groups. All focus groups gave a high score to state agents as the actors that are entitled to and often obliged to exercise power. Individuals in boroughs resist zoning, relocation, customary occupation subdivision, use of intermediaries, offers of compensation and expulsion or resist when somebody evades decisions made. Local leaders usually resist the non-negotiated relocation of people to their boroughs or the construction of infrastructure when coordination with them has not happened.

3.2.4. Priorities assessment vis-s-vis voting by experts

Selected priority interventions included the "winners" voted by experts, for general peri-urban areas triangulated with either the dwellers of the boroughs or the authorities. Priorities identified included regularizing land use rights, improving internal circulation, and establishing connections to nearby urban centers. A locally relevant priority is to maintain the protection of dikes for crops in the river embankments. Table 4 summarizes the identified priorities voted by experts, per category.

Formal administrative authorities favor physical planning interventions. FGs and individual dwellers corroborate mainly related to interventions favoring horizontal social cohesion and vertical collaboration. Once again, individuals and FGs place priority in interventions that are related to or rely on more responsive institutions.

3.3. Assessment of sustainability and planning and the role of local practices

There is no reason to believe that externally initiated microscale land use planning interventions, in line with the physical interventions preferred by the formal authorities, as in Table 4, had better results in enhancing social cohesion than current local practices and the fluid balance of power. The creation of new housing developments to accommodate specifics social groups have resulted in segregation instead of integrating in local societies. Local practices generated creative solutions were adopted, imitating the city, and respecting the original land uses. Indications were found in the study area that local dwellers and informal authorities used available ways and means to counteract or substitute, when necessary, undesirable or inexistent planning interventions (Miraftab, 2009; Nielsen, 2011), while favoring interventions related to social cohesion (King et al., 2010), without foregoing the formal land use planning guidelines widely disseminated in the country (Rodrigues et al., 2006).

Overall, the study confirms existing theories. The adopted framework proved to be flexible and affordable, and allowed to derive the characterization and priorities typical to outer peri-urban, village and diffuse settlements compatible with those suggested by other authors (among others Bayuma & Abebe, 2024; Iaquinta & Drescher, 2000; Sahana et al., 2023). This favorable comparison lends credence to the proposed framework.

The study shows that through current informal practices society developed arrangements to broadly keep territorial and social cohesion. Local knowledge was able to address the immediate challenges of spatial planning and suggests that future pathways narratives (SSPs) should connect social cohesion to the (in)capacity of institutions and their responsiveness. The suggested innovative arrangements to improve responsiveness and hence trust shall contemplate (i) at the local level, promote a form of self-government capable of managing regular sustainability issues in peri-urban informal settlements by improving participation and local knowledge

sharing, (ii) at the regional level, ensure better horizontal and vertical integration of institutions and interconnectedness, and (iii) at the national territorial planning authorities, avoid local micro-management, provide guidance on formal territorial planning standards and enhance their oversight and enforcement capacity in collaboration with local informal institutions to prevent imminent difficult-to-reverse harm to socio-cultural, economic and environmental sustainability.

4. Conclusion

Connected and closely related to cities and urban centers, the process of peri-urbanization occurs at a fast pace. There is no reason to believe that land occupation in non-proximate peri-urban contexts will deviate from the local knowledge, social learning pragmatist epistemic paradigm, strongly associated with social cohesion. The framework was shown to be an adaptable and affordable assessment and planning tool.

The results show that, to promote sustainability in fast growing informal peri-urban settlements, given the potential problem-solving capacity of local practices in land use governance and the limited technical and financial resources available, enhancing social cohesion interventions that improve responsiveness of institutions should have precedence over, and support participation in mainstream physical interventions (such as spatial structuration, zoning, street regularization, parceling). Failing to increase trust in institutions may increase the potential of unsustainability due to social unrest and increasingly frequent inter and intra settlements conflicts which are left unresolved by untrusted organizations. An elevated role should be recognized to professionals and graduates other than physical planners, who should be freed for more strategic regional planning.

It is shown that prioritizing interconnectedness should go beyond linking origin to destination, with multiple infrastructural and social connections, to consider the environmental complementarity and the regional distribution of settlements. Institutional innovations shall contemplate local, regional, and national level actors, improving both horizontal and vertical collaboration and integration and preventing imminent difficult-to-reverse harm to socio-cultural, economic and environmental sustainability.

Limitations. The framework is case study-oriented and has an inherent non-generalizability limitation. The methodology used was not able to provide a deep understanding of the power relations and rules of engagement with "external institutions". An ethnographic approach may be a better choice in future studies. The fast-changing economic, social and institutional context requires constant update. As peri-urban areas may behave like commons, with interests colliding over scarce resources, studies of the common resource pool may assist in local innovative governance arrangements (Ostrom, 1990).

Deeper natural sciences and technology studies were not available about the study area. Themes emerging from the case study include studies of hydrology and soils, the economics of farm consolidation, agricultural product diversification, technology adoption, and incentives for upward expansion and compaction of built-up areas. As high education institutions exist in nearby cities, collaboration for knowledge co-creation and fostering pedagogic "civic ecology" may be feasible.

CRediT authorship contribution statement

João Carrilho: Writing – original draft, Methodology, Formal analysis, Conceptualization. **Marisa Balas:** Writing – review & editing, Formal analysis. **Gustavo Dgedge:** Writing – review & editing. **Jorge Trindade:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Funding

This work was partially supported by the non-profit OMR, Maputo, Mozambique. https://omrmz.org/

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jum.2025.03.004.

References

Abizadeh, A. (2023). The grammar of social power: Power-to, power-with, power-despite and power-over. *Political Studies, 71*(1), 3–19. https://doi.org/10.1177/00323217219969 41

Akaateba, M. A., Ahmed, A., & Inkoom, D. K. B. (2021). Chiefs, land professionals and hybrid planning in Tamale and Techiman, Ghana: Implications for sustainable urban development. *International Journal of Urban Sustainable Development, 13*(3), 464–480. https://doi.org/10.1080/19463138.2021.1971990

Andersen, H. T., Møller-Jensen, L., & Engelstoft, S. (2011). The end of urbanization? Towards a new urban concept or rethinking urbanization. *European Planning Studies, 19*(4), 595–611. https://doi.org/10.1080/09654313.2011.548472

Bayuma, T. B., & Abebe, B. G. (2024). An investigation of the factors underlying informal settlement growth: The case of Burayu City, Ethiopia. *Heliyon, 10*(21), Article e39443. https://doi.org/10.1016/j.heliyon.2024.e39443

Bédécarrats, F., Lafuente-Sampietro, O., Leménager, M., & Lukono Sowa, D. (2019). Building commons to cope with chaotic urbanization? Performance and sustainability of decentralized water services in the outskirts of kinshasa. *Journal of Hydrology, 573*, 1096–1108. https://doi.org/10.1016/j.jhydrol.2016.07.023

Bradley, P., & Yee, S. (2015). *Using the DPSIR framework to develop a conceptual model: Technical support document*. United States Environmental Protection Agency. https://doi.org/10.13140/RG.2.1.1870.7608 EPA/600/R-15/154.
Brundtland, G., Khalid, M., Agnelli, S., Al-Athel, S., Chidzero, B., Fadika, L., Hauff, V., Lang, I., Ma, S., Botero, M., & others. (1987). Our common future; by world commission on environment and development. In *United nations general assembly united nations general assembly New York united nations*. World Commission on Environment and Development.
Carrilho, J., & Trindade, J. (2022). Sustainability in peri-urban informal settlements: A review. *Sustainability, 14*(13), 7591. https://doi.org/10.3390/su14137591
CIESIN, C. for I. E. S. I. N. & Novel-T. (2021). *GRID3 Mozambique settlement extents, version 01.01 [Geo-Referenced infrastructure and demographic data for development (GRID3)]*. Palisades, NY: Columbia University. https://doi.org/10.7916/D8-D023-WS42
Dodman, D., Leck, H., Rusca, M., & Colenbrander, S. (2017). African urbanisation and urbanism: Implications for risk accumulation and reduction. *International Journal of Disaster Risk Reduction, 26*, 7–15. https://doi.org/10.1016/j.ijdrr.2017.06.029
Follmann, A. (2022). Geographies of peri-urbanization in the global south. *Geography Compass, 16*(7), Article e12650. https://doi.org/10.1111/gec3.12650
Forester, J. (2004). *Planning and mediation, participation and posturing: What's a deliberative practitioner to do?*. UNC: UW Lecture (Prepared for the Annual Symposium of the Interdisciplinary Ph.D. Program in Urban Design and Planning University of Washington, Seattle, 15 Apr.).
Francesco, B., & Zapata-Román, G. (2022). Inequality and social cohesion in Africa: Theoretical insights and an exploratory empirical investigation. *IDOS Discussion Paper*. https://doi.org/10.23661/IDP16.2022, 16/2022.
Harris, P. (2021). Reversing the Failures of climate governance: Radical action for climate justice. In S. Böhm, & S. Sullivan (Eds.), *Negotiating climate change in crisis* (pp. 243–252). Open Book Publishers. https://doi.org/10.11647/OBP.0265.
Hedblom, M., Andersson, E., & Borgström, S. (2017). Flexible land-use and undefined governance: From threats to potentials in peri-urban landscape planning. *Land Use Policy, 63*, 523–527. https://doi.org/10.1016/j.landusepol.2017.02.022
Iaquinta, D. L., & Drescher, A. W. (2000). Defining the peri-urban: Rural-urban linkages and institutional connections. *Land Reform, Land Settlement and Cooperatives, 2*, 8–26.
Jiang, L., & O'Neill, B. C. (2017). Global urbanization projections for the shared socioeconomic pathways. *Global Environmental Change, 42*, 193–199. https://doi.org/10.1016/j.gloenvcha.2015.03.008
Kim, J., Sheely, R., & Schmidt, C. (2020). *Social capital and social cohesion measurement toolkit for community-driven development operations*. Washington, DC: Mercy Corps and the World Bank Group. https://www.hks.harvard.edu/centers/mrcbg/programs/growthpolicy/social-capital-and-social-cohesion-measurement-toolkit.
King, E., Samii, C., & Snilstveit, B. (2010). Interventions to promote social cohesion in sub-Saharan Africa. *Journal of Development Effectiveness, 2*(3), 336–370. https://doi.org/10.1080/17449057.2010.504552
KoBoToolbox. (2024). Powerful and intuitive data collection tools to make an impact. https://www.kobotoolbox.org.
Krasny, M. E., & Tidball, K. G. (2012). Civic ecology: A pathway for earth stewardship in cities. *Frontiers in Ecology and the Environment, 10*(5), 267–273. https://doi.org/10.1890/110230
Langer, A., Stewart, F., Smedts, K., & Demarest, L. (2017). Conceptualising and measuring social cohesion in Africa: Towards a perceptions-based index. *Social Indicators Research, 131*(1), 321–343. https://doi.org/10.1007/s11205-016-1250-4
Lemma, F. E., Negeri, P. G., & Boka, J. B. (2024). Suburban farmers' perception about urban sprawl on livelihoods and environment in Ethiopia: Evidence from Sheger City Administration. *Environmental Challenges, 17*, Article 101051. https://doi.org/10.1016/j.envc.2024.101051
Medeiros, E. (2016). Territorial cohesion: An EU concept. *European Journal of Sustainable Development, 1*(60), 1–30.
Meeus, S. J., & Gulinck, H. (2008). Semi-urban areas in landscape research: A review. *Living Reviews in Landscape Research, 2*. https://doi.org/10.12942/lrlr-2008-3
Miraftab, F. (2009). Insurgent planning: Situating radical planning in the global south. *Planning Theory, 8*(1), 32–50. https://doi.org/10.1177/1473095208099297
Morlacchi, P. (2021). The performative power of frictions and new possibilities: Studying power, performativity and process with follett's pragmatism. *Organization Studies, 42*(12), 1863–1883. https://doi.org/10.1177/01708406211031729
Musakwa, W., & Van Niekerk, A. (2013). Implications of land use change for the sustainability of urban areas: A case study of stellenbosch, South Africa. *Cities, 32*, 143–156. https://doi.org/10.1016/j.cities.2013.01.004
Nielsen, M. (2011). Inverse governmentality: The paradoxical production of peri-urban planning in Maputo, Mozambique. *Critique of Anthropology, 31*(4), 329–358. https://doi.org/10.1177/0308275X11420118. Scopus.
O'Neill, B. C., Kriegler, E., Ebi, K. L., Kemp-Benedict, E., Riahi, K., Rothman, D. S., van Ruijven, B. J., van Vuuren, D. P., Birkmann, J., Kok, K., Levy, M., & Solecki, W. (2017). The roads ahead: Narratives for shared socioeconomic pathways describing world futures in the 21st century. *Global Environmental Change, 42*, 169–180. https://doi.org/10.1016/j.gloenvcha.2015.01.004
Popp, A., Calvin, K., Fujimori, S., Havlik, P., Humpenöder, F., Stehfest, E., Bodirsky, B. L., Dietrich, J. P., Doelmann, J. C., Gusti, M., Hasegawa, T., Kyle, P., Obersteiner, M., Tabeau, A., Takahashi, K., Valin, H., Waldhoff, S., Weindl, I., Wise, M., … Vuuren, D. P. van (2017). Land-use futures in the shared socio-economic pathways. *Global Environmental Change, 42*, 331–345. https://doi.org/10.1016/j.gloenvcha.2016.10.002
Raimbault, J., & Pumain, D. (2020). Spatial dynamics of complex urban systems within an evolutionary theory frame. http://arxiv.org/abs/2010.14890.
RankedVote, L. (2024). RankedVote: Add ranked-choice voting to Google forms and Sheets. https://www.rankedvote.co/guides/using-rankedvote/use-ranked-choice-voting-chrome-extension.
Riahi, K., Van Vuuren, D. P., Kriegler, E., O'Neill, B., & Rogelj, J. (2016). *The shared socio-economic pathways (SSPs): An overview*.
Ritchie, H., Samborska, V., & Roser, M. (2024). *Urbanization. Our world in data*.
Rodrigues, H., Martinho, M. C., & Wetela, A. J. B. M. (2006). *Manual de Técnicas Básicas de Planeamento Físico (Guidelines of Basic Techniques of Physical Planning)*. MICOA-DINAPOT.
Sachs, J., Lafortune, G., & Fuller, G. (2024). The SDGs and the UN summit of the future. Sustainable development report 2024. In *Sustainable development solutions network* (pp. 1–512). Dublin: Dublin University Press. https://doi.org/10.25546/108572.
Sahana, M., Ravetz, J., Patel, P. P., Dadashpoor, H., & Follmann, A. (2023). Where is the peri-urban? A systematic review of peri-urban research and approaches for its identification and demarcation worldwide. *Remote Sensing, 15*(5). https://doi.org/10.3390/rs15051316. Article 5.
Sakketa, T. G. (2023). Urbanisation and rural development in sub-saharan Africa: A review of pathways and impacts. *Research in Globalization, 6*, Article 100133.
Saunders, M., Philip, L., & Thornhill, A. (2019). Research methods for business students. In *Pearson education limited* (8th ed.). Pearson.
Scott, J. C. (2012). *Two cheers for anarchism: Six easy pieces on autonomy, dignity, and meaningful work and play*. Princeton University Press.
The jamovi project. (2023). *Jamovi (version 2.3) [open source [cloud, windows, macOS, iPad, linux, ChromeOS]]*. The jamovi project.
Thompson, J. (2021). *Tactical patience*. Horizon performance. https://medium.com/horizonperformance/tactical-patience-fdb38bb19d13.
UN-HABITAT. (2016). *Sustainable Development Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable*. United Nations.
UN-HABITAT. (2024). *World cities report 2024: Cities and climate action*.
UNDP. (2020). *Strengthening social cohesion: Conceptual framing and programming implications*. United Nations Development Programme. UNDP. https://www.undp.org/publications/strengthening-social-cohesion-conceptual-framing-and-programming-implications.
World Bank. (2023). *Enablers of inclusive cities: Enhancing access to services and opportunities*. World Bank. https://doi.org/10.1596/40642
Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE.