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Sustainable Human Settlements Development in Urban Area: Conceptual Connotation, Logical Construction

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ABSTRACT - Environmental pressure and governance on sustainability have become complex and, in many cases, fragmented during the process of urbanization. Existing analytical models can be conceptually ambiguous, overlook interdependencies of urban systems, the dynamic character of the urban phenomenon and its normative dimension. In this respect, this study advances the understanding of sustainable human settlements with the help of a suitable framework that is theory-based. Based on systems theory, urban governance research, and sustainability science, the research builds a three-pronged logical-based system logic, process logic, and value logic. These logics together capture more structural, evolutionary, and ethical dimensions of sustainability across the intelligence, energy, and material levels. A framework incorporates a spatial structure, a social organization, an ecological support, and an institutional governance, connected through a set of dynamic mechanisms that ensure long-term goals such as inclusivity and inter-generational justice. While retaining classical theory of human settlement, as well as global benchmarks (SDG 11, UN-Habitat), the framework goes beyond outcome framework approach through an explicit inclusion of governance processes as well as normative aspects. The framework itself is theoretical in nature but offers practical implications for regional planning, indicator development, and smart city governance. This study builds a normative model of sustainable urban human settlements, which provides a clearer theoretical foundation for academic analysis and policy practice.

INTRODUCTION

Sustainable human settlements in an urban area are becoming more complex over time (Cirella, Mwangi, Streltsova, Abebe, & Russo, 2022). Due to rapid urbanization, uncoordinated expansion, and periodical unevenness in resource allocation, spatial fragmentation is pronounced; the functional coherence of urban systems is considerably weakened (Zhang et al. 2024). At the same time, the growing ecological stress—seen in the impoverishment of natural habitats, loss of green infrastructure, and expansion of carbon footprints—has added to the vulnerability of urban ecosystems (Das et al., 2024). According to Haque and Sharifi (2024), exclusionary patterns, including social inequalities in housing quality, access to services, and community integration are injurious to the social foundation of urban sustainability.

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Fragmentation of governance, which refers to having sectoral silos and overlapping mandates, also constrains coordinated responses (Lah 2025). The combination of these pressures contributes to the difficulties faced by cities in meeting international targets, particularly those set out under SDG 11.

In this context, sustainable human settlements are back on the agenda. There has been a gradual shift since the early 1990s from discussions about specific housing and infrastructural needs to broader issues of environmental degradation, livability, and social equity (Bayulken & Huisingh, 2015; Friel et al., 2011). Over the years, global agendas (Habitat I to Habitat III) have brought the realization that settlements must be environmentally sound, socially inclusive, economically viable, and institutionally resilient (Nash, 1977; Okpala, 1996; Croese, Cirolia & Graham, 2016), Ajibade (2017). According to Nkengla-Asi et al. (2024), interest in how cities can change their built environments and governance arrangements to support sustainable development has been further accelerated by SDG 11.

Past research highlighted primarily physical aspects like housing standards (Wu et al., 2020), basic infrastructure (Parikh, Parikh, & McRobie, 2013), and land-use efficiency (Melchiorri et al., 2019). The early work of UN-Habitat also viewed settlements largely as geographical spaces for population and activities (Citaristi, 2022). Models focusing on technocratic solutions tend to lose out on the cognitive aspect and lived experiences in daily urban space (Bibri, 2022).

Focus has increasingly turned towards more holistic and systemic perspectives within recent years (Creutzig et al., 2024). The conceptualization and assessment of sustainable urban settlements requires increased integration of spatial, ecological, social, and institutional perspectives, according to researchers (Zhang, Ghosh, & Park, 2023). Develop sophisticated multi-dimensional frameworks to capture the interactions of built environments, ecosystem services and social networks (Ghodsvali, Dane, & De Vries, 2022). Simultaneously, resilience thinking and systems theory have emerged with new tools for understanding how urban human settlements adapt in the face of uncertainty and climate risk (Chirisa & Nel, 2022). Even with this advancement, there are gaps conceptually, and methodologically. Definitions of “sustainable human settlement” vary immensely. Some studies such as this one (El-Kholei, Yassein and Rizkallah 2025) focus primarily on environmental performance and livability. Other studies touch on governance capacity and cultural identity (Hofisi and Tshombe 2024). According to Khorrami et al. (2021) and Sánchez-Rivero et al. (2023), it is inherently challenging to compare evaluation frameworks due to inconsistent indicators, varying weighting approach, and uneven data availability. Further, ongoing models still depend on static ones and don’t take notice of the course of governance, institutional learning, or feedbacks (Ehrlich et al., 2021). According to Zhang and He (2024), Creutzig et al. (2024), Prescott, Dobbie, and Ramirez Lovering (2021) note that emerging integrative models that draw on complexity theory, network governance and socio-technical transitions are beginning to address these issues, but they remain underdeveloped.

A survey of the literature shows, therefore, three persistent defects. Ambiguity in conceptions and definitions; insufficient theorization of structural functional dynamic interactions; partial evaluation systems that ignore interdependencies between spatial, ecological, social, and institutional ones.
Theoretical innovation and policy application are both restricted. To fill the gaps, the study undertakes to develop a conceptual framework of sustainable urban human settlements, which systematically integrates the various sustainability dimensions into one coherent analytical logic. The research aim is to enhance the academic grounding of the discipline with a view to better governance, planning and evaluation.

There are three interrelated research objectives. Clarifying the conceptual connotation of sustainable human settlements by identifying their main dimensions and theoretical roots. The framework explains the internal structure and functional processes of sustainable settlements, particularly spatial, ecological, social, and institutional perspective. Study whether the framework is relevant for urban governance and design policy in planning processes, regulatory systems performance evaluation.
Corresponding there are three research questions. What are sustainable urban human settlements? How can the structural and procedural elements be organized into a coherent theoretical model? How can the suggested model enhance inclusivity and efficacy in sustainability strategies?

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CONCEPTUAL CONNOTATION OF SUSTAINABLE HUMAN SETTLEMENTS

2.1. Terminological Clarification and Historical Evolution

The term 'human settlements' first observed a global policy discourse at the United Nations Conference on Human Settlements (Habitat I) in Vancouver in 1976. At that time, it was mainly defined by the physical arrangements of cities, towns, and villages, along with the provision of essential services for daily life (Tang, He, Zhou, Zeng & Xiao, 2018). Due to apprehension of rapid population growth, inadequate housing and limited institutional capacity, there was quite a 1970s policy debate. Urban development was examined predominantly through a developmentalist point of view which looked at built environments as functional objects to house growing people under shortage of resources (Munzwa & Wellington, 2010).

The definition of human settlements is starting to change due to issues like global warming, inequality, and uncontrolled city growth. The document "Residential Development (Okpala, 1996) build sustainability on the back of the momentum of the 1987 Brundtland Report which demanded the balance of meeting present needs with intergenerational justice Spijkers 2018 was presented at Habitat II. The 2015 adoption of Sustainable Development Goal 11 reportedly broadened the agenda to include sustainable cities defined as "inclusive, safe, resilient and sustainable" (Watson, 2016). The broader definition which is sustainable human settlement includes the physical infrastructure and spatial form as well as ecologically sound, social inclusive, economically viable, and institutionally effective (Fritz & Koch, 2014).

Defining the concept of "sustainable human settlements" entails making a distinction from several similar concepts. For instance, livability focuses on the residents' perceived quality of life, which includes green space, safety, comfort of housing, and access to amenities (Baobeid et al., 2021). Although it has elements of sustainability, livability tends to focus on present conditions with little explicit attention to ecology. In response to increasing climate risks and disaster vulnerabilities, urban resilience emerged more recently. The definition focuses on the ability of a city to withstand shocks and continue operating normally, especially through adaptability, redundancy, and strength of systems (Chelleri, 2012) Though resilience drives sustainability, it is over a narrower and a risk-based agenda. On the contrary, the urban quality of life generally depends on subjective well-being and regular indicators of socio-economics but pays little attention to institutional processes and environmental limits (Mittal, Chadchan, & Mishra, 2020).

As urban systems are becoming more complex and interdependent, sustainable human settlements are best conceptualized as systems located at the crossroads of spatial configuration, ecological functioning, social justice, and governance capacity. Cities can no longer be seen just as a physical structure. According to several contemporary scholars, cities can be viewed as a socio-spatial system. It comprises mostly ecological, institutional, and human spatial processes which interact continuously with each other. In urban studies increasingly, the focus is on issues of sustainability; that is, the impact of governance and infrastructures, and social justice in urban studies.

The evolution from a focus on the physical in Habitat I to a multi-dimensional lens in SDG 11 confirms that definitions have expanded but remain fragmented. None of livability, resilience and quality of life captures the whole story. Each one grabs an important aspect. None explains in an integrated way how spatial, ecological, social, and institutional components operate together as a coherent system. This gap in concepts indicates that there is a need for a solid theoretical framework that the subsequent section of this paper will undertake.

2.2. Multi-Dimensional Attributes of Sustainability

The sustainability of human settlements in urban areas cannot be understood through a particular indicator or sectoral outcome in a defined process. The long-term sustainability, equity, and resilience of urban living systems (Figure 1) emerge not from the "triple bottom line" of three separate domains, as the sustainable development paradigm holds; rather, from the interplay of four interrelated dimensions – environmental and social, institutional, and spatial. These dimensions are not independent of each other; they affect and condition one another, forming a foundation for the analysis of theory and policy.

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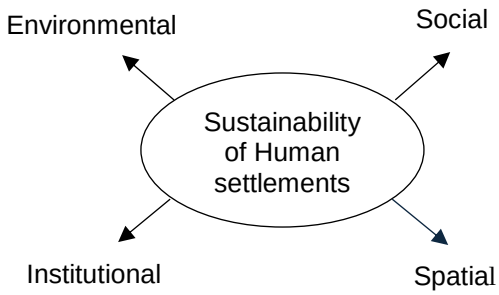

Figure 1. Urban Human Settlements Sustainability Framework

2.2.1 Environmental dimension

As depicted in Figure 1, the ecological dimension creates the environmental baseline upon which everything else relies. It refers to the responsible use of natural resources (e.g., water, energy, soil, materials) and the maintenance of ecological functions through green infrastructure, biodiversity networks, and climate-responsive design. In simpler terms, ecological resilience is seen as the ability of urban ecosystems to withstand shocks, absorb disturbances and cope with changes. Furthermore, being able to withstand ecological disturbances is seen as an essential characteristic of a sustainable settlement. The idea behind regarding urban ecosystems as dynamic agent of settlement design is to move sustainability away from just minimizing damage to enhancing ecological performance.

2.2.2 Social dimension

The social dimension related to settlements refers to equity, inclusion, and livability. Equity means that housing, public services, and other urban amenities are provided according to need. Having inclusion means migrants, informal dwellers, elderly, and persons with disabilities can participate in urban life meaningfully. The combination of objective conditions (safety, health, accessibility) and subjective experiences (identity, culture, belonging) are what give rise to the concept of livability. A socially sustainable settlement, which strengthens social networks and trust, does not undermine the capacity of future generations to meet their own needs.

2.2.3 Institutional dimension

The institutional dimension is related to the governance capacities that allow cities to respond to demographic, environmental and technological change. Governance is built on transparency, accountability, and participatory processes through government public institutions. Responsive policies are essential to maintain credibility and to adjust to changing realities in the long run. In practical terms, it contains planning instruments, regulatory frameworks, and collaborative mechanisms that align public interests with environmental constraints.

2.2.4 Spatial dimension

The spatial dimension points to how settlement form, land use patterns and connectivity shape sustainability. Using land rationally helps minimize conflicts between residential, commercial, industrial, and ecological uses. A well-designed network of transport and public spaces improve access to jobs, services, and social interaction. The quality of space also linked to mental health and public quality. As such, a proactive, cross-sectoral planning process that accommodates human aspirations but respects ecological limits is a precondition for a sustainable spatial structure.

2.2.5 Integration of the four dimensions

The interactions between the dimensions, and not their individual performance, create sustainability (Figure 1). It also shows that although each dimension is distinct, creating sustainability requires governance structures that are adapted to the specific characteristics of each dimension. The degradation of the environment can worsen social inequality; spatial fragmentation may weaken civic engagement; ineffective institutions tend to fail in protecting ecological assets; socially exclusive forms of development can undermine spatial efficiency as well as ecological capacity. The highlighted

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feedback loops show that a sustainable urban transformation needs to have a systemic view that integrates ecological functioning, social justice, institutional adaptability, and spatial organization.
All together, these four dimensions provide a comprehensive analysis to assess the sustainability of human settlements. There's also a need for a new theory that can account for the dynamic interconnectedness of urban systems today.

2.3. Conceptual Framework Construction

A tripartite conceptual framework of sustainable urban human settlements is suggested in this paper (Figure 2). The discussions earlier have shown that sustainability is conceptually vague and multidimensional. The framework considers sustainability not as a fixed endpoint but rather as an evolving outcome influenced by human experience and institutional interaction in an ecological setting. The three key principles of sustainable settlements which give values and operational logic to the design or evaluation of settlements are: human-centered orientation, collaborative co-construction, and dynamic adaptability.

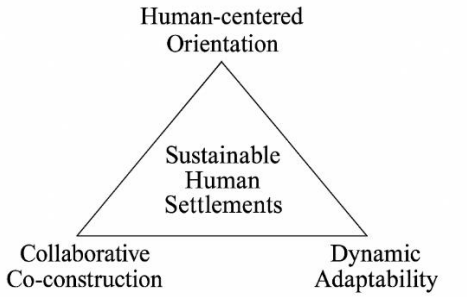

Figure 2. Triadic Conceptual Framework for Sustainable Urban Human Settlements

2.3.1 Human-centered orientation

The starting principle of the framework is the lived realities, need and aspirations of urban dwellers. Technical efficiency and environmental indicators alone do not capture what we mean by "sustainable development". We must also ask how people experience safety, dignity, mobility, and well-being. These reframing positions residents not as passive recipients of planning decisions but as active subjects whose identities, rights and vulnerabilities must be acknowledged. The concept of 'collective witnessing' denotes simultaneous urban experiences undergone by large groups which in turn shape their everyday practices and sense of belonging.

2.3.2 Collaborative co-construction

The second principle states that it is important to engage multiple stakeholders in planning and governance Sustainable outcomes that last rarely come from a top-down approach; they emerge from negotiations among governments, communities, business, and civil society. The aim of this principle is to acknowledge the variance in interests and asymmetry of institutions affecting urban planning and decision-making and call for the need for formal and informal modes of cooperation. In addition to policy tools, co-construction concerns everyday practices, e.g., community workshops, participatory budgeting, neighborhoods planning initiatives. Through such processes, local actors jointly define problems and arrive at solutions together. As shared responsibility grows, sustainability becomes not an externally imposed obligation, but a local and internally supported commitment.

2.3.3 Dynamic adaptability

Urban settlement systems can adapt to the changes in ecological, technological, demographic, or economic order, as per the third principle. Cities today must manage greater uncertainty due to climate change, migration flows, and changing political–economic conditions. Sustainable settlements must have the ability to learn and adapt over time through institutional reflexivity, spatial flexibility, and infrastructure redundancy. The framework values resilience and adjustment, rather than an ideal static balance, as practical indicators of sustainability.

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2.3.4 Illustrative example

A practical example can be found in several Asian and African cities' community-based neighborhood upgrading projects. In these cases, a human-centered orientation is seen in the redesign of public spaces according to residents' daily mobility and safety criticisms. Participatory workshops allow community members, planners, and the local government to work together and determine priorities like drainage improvement or street lighting. A dynamic adaptability occurs when local institutions utilize channels of feedback to adjust settlement layouts, infrastructure designs, or maintenance routines to evolving population needs or environmental conditions. When things are combined, they are seen to show how the three principles work.

In conclusion, the tripartite framework offers a useful and comprehensive prism for rethinking sustainable urban human settlements, contributing to empirical research and policy experimentation in diverse urban settings through normative values, participatory governance, and adaptive capacities.

LOGICAL CONSTRUCTIONS OF SUSTAINABLE HUMAN SETTLEMENTS IN URBAN

In order to achieve sustainable human settlements, it is important to understand how physical systems, governance arrangements and social norms function as an integrated whole (Figure 3). This paper advocates the use of adaptive management to design and manage infrastructure that is owned by public organizations. The study examines how spatial form, ecological resilience, institutional responsiveness, and social cohesion affect sustainability outcomes. As illustrated in Figure 3, the framework comprises three interlinked layers. The base of factors supporting governance orientations represents structural subsystems at its lower level, dynamic process mechanisms at intermediate level, and normative values at the upper level.

3.1 Structuring Theory: From Problem Identification to Analytical Base

Challenges of urban settlement often arise from conflicting structure and institution. Rapidly growing cities are often characterized by uncoordinated spatial expansion, unequal access to housing and services, ecological degradation, and declining social trust. Such problems do not happen in isolation; they build up as feedback loops and create systemic weaknesses. In order to solve this problem, the paper classifies urban problems into four thematic categories: spatial disarticulation, social exclusion, environmental stress; and governance disconnection. Each of the categories is linked to a theoretical lens derived from systems theory, institutional analysis, and sustainability studies. This categorization serves as the analytical basis for the three-tier logic that we have represented in Figure 3, which shows how empirical problems correspond structurally, processual, and normatively.

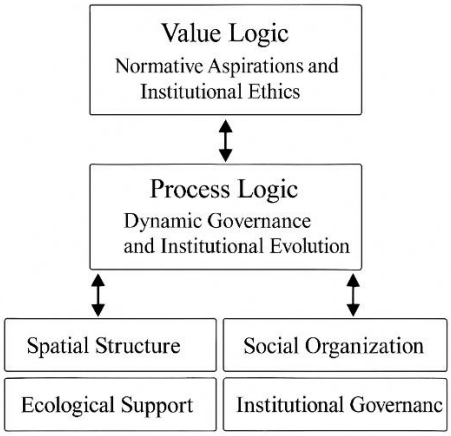

Figure 3. A Three-Tiered Logical Framework for Sustainable Urban Human Settlements

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3.2 System Logic: Structural Components and Functional Linkages

The structural organization of four interrelated subsystems that influence one another is emphasized by the system logic. The bottom tier of Figure 3 is where these subsystems have been placed. These subsystems are spatial structure, social organization, ecological support, and institutional governance. Every subsystem does a specific job but none works alone. The accessibility and land use efficiency are determined by spatial form; the community network and collective action by social organization; eco-systems resilience by green infrastructure and climate risk by ecological and institutional governance determines policy co-ordination and service delivery.

The logic of the system is strong in its understanding of the co-creation of sustainability via such subsystems. A compact spatial form, namely, tends to decrease ecological pressure, while equitable institutions facilitate more public services, thereby reinforcing social cohesion. The framework argues that sustainable settlements cannot be built through sectoral reforms alone; cross-scale, cross-sector integration is essential to maintain coherence in the system.

3.3 Process Logic: Evolutionary Dynamics and Adaptive Capacity

Human settlements are not simply static physical entities, but dynamic evolving systems. In urban areas, buildings or space are not just physical structures; they are dynamic evolving systems. The ongoing processes of adjustments, negotiations and collective learnings create the world of objects and other people, in addition to their tangible existence. The logic of process change implies a temporal dimension relation indicating how settlements over time reflect and respond to whether internal feedbacks or external disturbance. Changes in governance systems, such as moving from state-centered over-centralization to more networked and multi-actor forms, show how institutions accommodate urban complexity.

In recent years, participatory mechanisms have become salient vehicles for enhancing deliberative legitimacy. Through community planning forums, civic digital platforms and linked public services, common experiences are transformed into feedback for governance. Local authorities are enhancing the urban dwelling environment through hotlines, e-governance, etc. which help residents report problems and give suggestions. By engaging the various actors in follow-up and including them in the decision-making process with adequate information, it allows for emerged issues to be picked up before they become established structurally.

At the same time, the ability of the institutions to innovate without degrading their core functions is a key indicator of adaptive capacity. The analytical concepts of path dependence, feedback loops and socio-technical transitions help to show how past planning choices continue to impact present development trajectories while still leaving some room for change and reform. Through this lens, sustainability is not a closure; it is an ability to respond, learn and adjust to social, ecological, institutional changes.

3.4 Value Logic: Norms Orientation and Governing Principles

The upper part of Figure 3 describes the apparent logic in which normative foundations for sustainable human settlements is laid out. Being technically efficient is only part of sustainability. Equity of public good, ecological responsibility, and intergenerational justice matters equally. People's values influence the criteria through which they judge public choices.

This longitudinal value orientation transforms policy formulation from meeting immediate needs to enhancing human flourishing over the long term. The principles of fairness, inclusiveness and shared responsibility enhance harmonious relations between communities and increase the legitimacy of governance. Similarly, acknowledging ecological limits means that urban development should not diminish capacities for future safety and well-being.

The value logic helps to ensure that sustainability is rooted in ethical commitments, not operational goals. By means of system logic, process logic, and value logic, Section 3 integrates structural conditions, governance evolution, and normative principles into one analytical model. This logic will clarify how sustainable human settlements are developed while also providing an operational basis to identify weaknesses and design integrated policies.

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THEORETICAL POSITIONING AND COMPARATIVE REFLECTION

The conceptual framework presented in this study positions sustainable human settlement within a broader framework which is spatial, institutional, and normative (Figure 4). The proposed framework takes a relational and adaptive view of urban sustainability, unlike previous approaches that focused largely on physical infrastructure and functionalist planning. The framework, which develops the classic human settlement framework beyond its ecological and social constructs, governance processes resonate with SDG 11 and UN-Habitat but reframes improved on them.

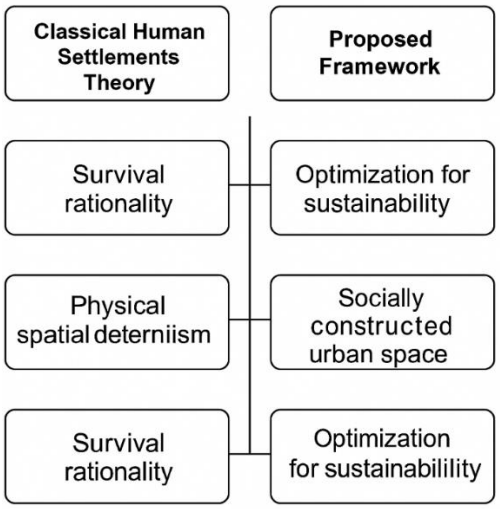

Figure 4. A Paradigm Shift from Classical Human Settlements Theory to an Integrated Framework for Sustainable Urban Settlements

4.1 Distinction from Classical Human Settlements Theory

The conventional urban settlement theories usually put emphasis on physical layout, infrastructure provision and functional zoning. The concept of human settlements as fixed spatial units emerged in the post war period which had the main task of providing basic shelter and services. The urban space was treated as a neutral container, the planning focused on land-use efficiency, transport flows and housing density.

This framework developed in the paper is not static oriented. It perceives communities as sophisticated adaptable systems where ecological stability, social inclusion, and institutional responsiveness are of paramount importance. Urban space can be understood as a social, or public, environment also. It is a social construction that is constantly reconstituted through state, community, market, and culture interactions. It signifies a departure from spatial determinism towards a view of settlement development as dynamic, pluralistic, and processual.

4.2 Linkage with International Frameworks

It perceives communities as sophisticated adaptable systems where ecological stability, social inclusion, and institutional responsiveness are of paramount importance. Urban space can be understood as a social, or public, environment also. It is a social construction that is constantly reconstituted through state, community, market, and culture interactions. It signifies a departure from spatial determinism towards a view of settlement development as dynamic, pluralistic, and processual. Nonetheless, they prefer to prioritize results metric, while they tend to pay less attention to the structural relationship and process dynamics, which creates the results.

To clear a confusion about a sentence. Even though global models provide us with a universal framework, they fail to capture how the sustainability outcomes occur due to different institutional settings and spatial scales. The new framework will bridge the gap between global principles and local governance capabilities, social conditions, and ecological constraints.

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Sustainable development goals can have multiple meanings in various contexts. Thus, it allows global sustainability goals to be reinterpreted in locally responsive strategies that recognize diverse settlement trajectories and governance challenges.

4.3 Complementing and Advancing Existing Research

For quite several years, the urban sustainability research domain has been guided by indicator systems, measurement tools, and sector assessments. These approaches often disentangle complex social, ecological, and institutional interactions even while producing useful data. The proposal in this paper improves previous studies on both levels.

4.3.1 Contribution to theory

Urban settlement systems do not remain idle; they have components that continue to operate and interact over time. By linking system logic, process logic and value logic into one conceptual unification, this study makes a systematic theoretical contribution to our understanding of urban transformation. Framework views settlements not merely as fixed physical entities but socio-ecological-institutional systems, as these evolve over time. This viewpoint enriches current theories of urban change by explicitly recognizing interdependence, feedback, and adaptation. At the same time, however, it integrates normative. considerations (such as equity, collective responsibility, and intergenerational justice) into the core of sustainability analysis, thus enhancing the ethical underpinnings of human settlements theory.

4.3.2 Contributions to Policy and Planning Practice

In practical terms, the framework offers a coherent lens through which we can analyze how spatial fragmentation, weak institutional coordination, or growing ecological pressures shape sustainability outcomes in cities. This approach focuses on establishing an integrated governance approach that aligns spatial planning, institutional arrangements, and environmental management rather than promoting isolated responses to sectoral problems. In this sense, the framework serves as a conceptual tool kit that helps to translate international commitments into planning strategies that are operational, context-sensitive, and flexible. Most relevant in empirical applications regarding urban regeneration, participatory planning processes and the sharpening of sustainability indicators. The framework collectively links the theoretical innovations and governmental requirements. As urban environments rapidly change with time, it supports the development of more robust analytical tools and promotes improved policy interventions.

CONCLUSION AND FUTURE DIRECTIONS

5.1. Conclusion

This paper offers proposal of a logically integrated conceptual framework of human settlements by bringing together system logic, process logic and value logic. Through this approach, Sustainable Human Settlements are not an outcome of physical or spatial arrangements but are adaptive socio-spatial systems that evolve through complex interactions amongst structures, institutions, and social values. The primary contribution of the framework is the ability to bridge structural properties, governance processes and normative commitments within a single analytical framework. By doing so, it clears up long-standing conceptual ambiguities. These ambiguities can be found in many of the international sustainability approaches and they provide a more coherent basis for understanding the production of sustainability across place and institutional context.

Apart from its theoretical contribution, the framework has two broader implications. To generate impacts, it encourages researchers to make the leap to do less indicator-driven assessments but rather pay attention to relational dynamics, institutional learning and values embedded in settlement systems. Spatial planning and governance provide a holistic perspective that brings together spatial design, institutional capacity, and social equity. This supports cross-sectoral coordination and makes urban development practice more consistent in decision making.

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5.2. Limitations

Even though it made a theoretical contribution, it has a few limitations as well. To start, it has not been systematically subjected to empirical test. Certain analytical aspects, particularly those associated with normative values such as fairness and intergenerational justice, present considerable challenges in applying and measuring them. Moreover, the applicability of the framework is likely to differ in political, institutional, and cultural contexts. It is easier for cities that have strong administrative capacity to implement this as compared to those that have fragmented governance structure or face political constraints. For future reports, it may be beneficial to add historical climate data, environmental factors at multi-scales, and governance measures more detailed to improve empirical robustness. To overcome these challenges, a methodological refinement and comparative empirical research on various kinds of urban settlements will be required.

5.3. Future Research Directions

Future research can build on this study by focusing on several priority directions.

5.3.1 Developing measurable and context-sensitive indicators
There must be more work on translating the conceptual dimensions into indicators that will capture equally ecological limits, social inclusion, institutional responsiveness, and spatial quality without overemphasizing any single dimension.

5.3.2 Testing the framework in specific urban contexts
The concrete application of the framework to the rapidly growing metropolitan areas, or transforming secondary cities, would allow us to measure its explanatory power and how local conditions shape it.

5.3.3 Integrating the framework into digital and smart city governance
The use of digital assets and smart infrastructure in urban management has increased. Future research should examine how digital assets and smart infrastructure can help in participatory planning, adaptive governance, and real-time monitoring of sustainability outcomes. The framework can move beyond the realm of ideas and into the world of planning practice and policy and long-term strategies for sustainability through these efforts.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHORS CONTRIBUTION

CRediT author statement: **Liu Zhongxiu**: Writing- Original draft, Writing- Reviewing and Editing. **Nor Kalsum Mohd Isa**: Supervision.

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ETHIC STATEMENTS

Not applicable in this section.

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