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Developing Spatial Planning Strategies For Livable Settlements in Northern Medan

Endar Sutan Lubis [1], R. Hamdani Harahap [2], Hatta Ridho [3], Heri Kusmanto [4]

[1] Doctoral Program in Develpoment Studies, Universitas Sumatera Utara, Medan, Indonesia ; sutanendar64@gmail.com
[2] Doctoral Program in Develpoment Studies, Universitas Sumatera Utara, Medan, Indonesia ; r.hamdani@usu.ac.id
[3] Doctoral Program in Develpoment Studies, Universitas Sumatera Utara, Medan, Indonesia ; hattaridho@usu.ac.id
4 Doctoral Program in Develpoment Studies, Universitas Sumatera Utara, Medan, Indonesia ; herikusmanto@usu.ac.id

ABSTRACT
This study explores the development of spatial planning strategies aimed at enhancing the livability of settlements in Northern Medan, a region facing rapid urbanization and complex socio-environmental challenges. The research identifies key spatial issues including inadequate infrastructure, environmental degradation, limited public space, and socio-economic disparities. Using a mixed-methods approach that incorporates spatial analysis, stakeholder interviews, and policy review, the study proposes an integrated spatial planning framework. The strategies emphasize sustainable land use, improved connectivity, green infrastructure, and community participation to foster inclusive, resilient, and healthy living environments. The findings offer practical recommendations for local governments and urban planners in designing livable settlements that align with sustainable urban development goals.

Keywords: Spatial planning, livable settlements, Northern Medan, urban development, sustainability, infrastructure, community participation, land use planning.

1. INTRODUCTION

Development is essentially aimed at creating the welfare of society. This aligns with Indonesia's national goals as stated in the Preamble of the 1945 Constitution (UUD 1945), particularly the fourth paragraph, which mentions enlightening the life of the nation, promoting general welfare, protecting the entire homeland of Indonesia, and contributing to the establishment of a world order based on freedom, lasting peace, and social justice. In general, development becomes a projected reality that serves as a reference in the development process.

Urban development today involves not only activities but also spatial aspects, both of which form a mutually influential relationship. The growth of activities in a city due to urbanization inevitably

impacts the increasing demand for space to accommodate these developments (Liu & Li, 2017). Conversely, space in a city cannot develop without activities within it. Economic activity is one such activity found in every city or region, including industries and services or facilities that do not require large land areas. These activities lead to densely populated cities with closely spaced buildings. Therefore, in the development of a city or region, space and its activities must be properly planned (Sihombing et al., 2022; Puspita, 2017).

The current growth paradigm is a development perspective that focuses solely on the economic sector. This development paradigm has succeeded in increasing capital accumulation and per capita income in developing countries. However, its success has also led to negative impacts, as the momentum of development is achieved at the cost of declining ecological functions, such as the depletion of natural resources, the emergence of social inequality, and dependency (Suryono, 2010).

The concept of sustainable development is an effort to meet human needs to improve welfare by utilizing resources without diminishing the ability of future generations to use those resources (W. Grunkemeyer, 2012). Sustainable development provides new insights into the importance of environmental conservation for the future. According to the United Nations' *Agenda for Development*, sustainable development is a multidimensional approach to achieving a higher quality of life. It includes three interrelated aspects: economic, social, and environmental. These three aspects cannot be separated, as they form reciprocal relationships and mutually influence one another (Kuhlman, 2010)

Sustainable development in the economic aspect is closely related to long-term economic growth aimed at improving the welfare of the current generation without reducing nature's capacity to enhance the welfare of future generations. In the social aspect, development must be contextualized within human life in terms of interaction, interrelation, and interdependence. Development is also linked to cultural aspects, where humans are expected to adapt to present life as well as to future conditions. Regarding the environmental aspect, the factors that support sustainable development include the preservation of essential ecological processes, the availability of adequate resources, and a socio-cultural and economic environment that is appropriate (Fauzi, 2004).

One of the most crucial areas of development within Indonesia's national development agenda is spatial planning and environmental management. This is because spatial and environmental planning is interconnected with nearly all aspects of human activity. Efforts to implement development are always linked to the preservation of environmental functions and spatial development. According to E. Budiharjo (2005), achieving sustainable regional spatial planning requires five core principles known as the "Five E's": Environment (Ecology), Economy (Employment), Equity, Engagement, and Energy. A sustainable city will possess a strong economy, a harmonious environment, relatively equal social conditions with justice, high levels of community participation, and well-managed energy conservation.

Urban development should ideally be realized by applying environmentally conscious and sustainable development concepts. The limited availability of natural resources is increasingly imbalanced with population growth and changing lifestyles. Proper management of natural resources to improve the quality of life from one generation to the next remains a major issue in environmentally oriented development (Yakin, 2014)

Regional spatial planning has become one of the major challenges in urban development today. With rapid urban growth and a significant increase in population, environmental issues have become urgent, especially in discussions surrounding environmental sustainability for future generations. Given the importance of spatial planning, every province, city, and regency must have regulations that

serve as guidelines for spatial management and as a reference for implementing development (C. Saleh Darmawati, 2017).

In its development, the spatial planning response to development issues is no longer limited to domestic concerns. The prevailing trend is that spatial plans respond to global development issues and are increasingly oriented toward achieving sustainable development. This is because countries around the world face various environmental problems that threaten the sustainability of development. The high dependence of development on natural resources, which is not balanced with the rate of environmental recovery, leads to environmental degradation that disrupts the social and economic stability of a region. These environmental problems often stem from traditional spatial planning approaches that focus solely on development within the boundaries of the planned area, without considering the impact of such planning on surrounding regions (Faludi, 2000).

Regional planning is a development planning process intended to direct change toward better progress for a community, government, and the environment within a particular region by utilizing available resources, while maintaining a comprehensive and prioritized orientation (Riyadi, 2003).

The Minister of Home Affairs Regulation No. 28 of 2008 states that the implementation of spatial planning aims to create regional spaces that are safe, comfortable, productive, and sustainable. In addition, spatial planning is expected to increase the efficiency of development, minimize conflicts of interest in spatial use, and reduce the potential impacts of disasters such as flooding, landslides, and environmental degradation—especially in urban areas—caused by mismatches between land use and spatial plans.

The autonomy granted to cities and regencies under Law No. 32 of 2004 on Regional Government gives local governments the authority to plan and control development, as well as to formulate, utilize, and supervise spatial planning. One positive effect of this autonomy is that regions are competing to increase their local revenue (PAD). However, PAD has become a benchmark for development success, leading to growing disparities between urban and rural areas and increasingly intensive exploitation of natural resources.

Regional spatial planning plays a vital role in regional economic development. It must be integrated with national planning to improve the welfare of communities in the region. The essence of spatial planning is to optimize resource utilization while avoiding conflicts, preventing environmental degradation, and enhancing harmony. Within the spatial planning framework, land use and allocation are inseparable from the broader spatial development concept (Imran, 2013).

Various studies on the interaction between space and the environment have identified that spatial planning plays a critical role in addressing environmental issues. The reduction of vegetation in an area can lead to increased temperatures and heighten the risk associated with climate change. According to Biesbroek et al., mitigation and adaptation strategies to anticipate climate change are closely linked to spatial dimensions and require adequate space for implementation. This is further supported by Fleischhauer (2008), who states that spatial planning can play a vital role in disaster mitigation through changes in urban structures and the strengthening of a region or city's resilience.

Based on these conditions, spatial planning is now required not only to accommodate the spatial needs of social and economic development but also to consider the environmental impacts of such development—both locally and globally. Spatial planning must become more environmentally friendly to ensure the realization of sustainable development.

High population pressure and limited land availability are major challenges for urban areas. Additionally, cities face numerous other issues such as housing, transportation, the provision of public facilities, and employment. The availability of infrastructure and service facilities must be a priority in

urban development. According to the *Most Livable City Index Survey* (2011, via http://www.iap.or.id), the condition of cities in Indonesia is considered alarming.

Therefore, the key to effective public policy is a focus on the long-term well-being of society as a whole. One approach to urban development is the concept of a *Livable City*, which describes an urban environment that is comfortable for living and activity, viewed from both physical and non-physical variables. Residential environments, as spaces for human activity, must also provide comfortable living conditions so that residents can enjoy a better quality of life, supporting long-term sustainability. In the context of housing, *livability* reflects the achievement of quality of life within a residential area (Siagian & Ariastita, 2021).

The city of Medan is currently facing challenges related to urban sustainability, specifically concerning the concept of a *livable settlement*. The sustainability issues in Medan can be categorized into four main aspects: environmental, social, economic, and governance.

From an **environmental** perspective, Northern Medan faces problems such as slum settlements along the Deli River, limited green open spaces, and inadequate waste management capacity. The **social** challenges include community habits and behaviors, social segregation, and high population density. Economically, the region struggles with traffic congestion, income disparity, and limited employment opportunities.

Northern Medan consists of several areas: Medan Labuhan, Medan Marelan, Medan Deli, and Medan Belawan. Although these four subdistricts represent only 4 out of Medan's 21 total subdistricts, they make up 40% of the city's area, hold 1/5 of the total road length, accommodate 1/4 of the population, and account for 1/3 of the city's poor population.

A publication released by the Medan City Statistics Agency (BPS) titled *"Medan in Figures 2019"* provides general data on the city, which consists of 21 subdistricts, 151 urban villages, and 2,001 neighborhoods, including those in Northern Medan.

Medan Labuhan is the largest subdistrict in the city with an area of 36.67 km², followed by Medan Belawan (26.25 km²), Medan Marelan (23.82 km²), and Medan Deli (20.84 km²). Combined, these four subdistricts cover 107.58 km², or 40.58% of Medan's total area of 265.10 km².

As of 2018, the total road length in Medan was recorded at 3,279.5 km. Medan Deli had the third-longest road network (213.59 km), behind Medan Johor (441.77 km) and Medan Amplas (255.68 km). Other road lengths include Medan Labuhan (173.17 km), Medan Marelan (165.44 km), and Medan Belawan (110.94 km), totaling 663.14 km or 20.22% of the city's road network.

In 2015, the population of Medan was 2,210,624. Medan Deli was the most populated subdistrict with 181,460 people, followed by Medan Marelan (162,627), Medan Labuhan (117,472), and Medan Belawan (98,113). Combined, the population of these four subdistricts was 559,312 or 25.30% of the city's total.

The social issue is particularly concerning. In 2018, of the 129,250 impoverished people in Medan, 50,253 (38.88%) lived in the northern part of the city. These four subdistricts had the highest poverty rates in the city, with Medan Belawan leading at 15,370, followed by Medan Marelan (12,601), Medan Labuhan (12,351), and Medan Deli (9,931).

These figures highlight that Northern Medan is a major contributor to the city's poor population, with 50,253 of the 129,250 impoverished individuals residing there. One factor that keeps residents trapped in poverty is the frequent flooding in Northern Medan. These floods damage residents' assets such as household appliances, vehicles, and homes—making them uninhabitable. As a result, residents' health deteriorates and their ability to improve their economic condition is diminished (Hanifah et al., 2022).

Flooding is one of the most frequent and damaging natural disasters in Indonesia. Many large cities located at river mouths or at the confluence of several major rivers are vulnerable to flooding — one such area is Northern Medan. Furthermore, traffic congestion is one of the key urban sustainability issues affecting Northern Medan. This congestion is primarily caused by overcapacity, that is, the imbalance between annual road growth, which is only about 0.01%, compared to motor vehicle growth at 11.26%, along with disruptions to road function (Zanuardi, 2014). Additionally, traffic congestion can also be a secondary effect of flooding (waterlogging).

Congestion contributes significantly to carbon emissions in urban areas and raises local temperatures, contributing to the urban heat island effect (Ernawi, 2010). The chronic and persistent congestion in Northern Medan also causes psychological stress (driver's stress), which can lead to unhealthy mental behavior (Widiantono, 2013). Given the substantial economic losses, social impacts such as lost time, and psychological strain on road users, traffic congestion in Northern Medan can be classified as a socio-economic urban disaster hazard.

In addition, coastal areas like Belawan face various challenges: unstable incomes for local fishermen, unclear seawater conditions, underdeveloped coastal infrastructure, lack of household sanitation (e.g., toilets), and economic barriers to accessing healthcare (Agpina & Susilawati, 2022). Slum settlements along the Deli River have emerged due to the need for low-cost housing, leading people to inhabit riverbanks as a survival strategy (Ginting et al., 2019).

According to the *Medium-Term Regional Development Plan (RPJMD)* of Medan City for 2021–2026, Northern Medan continues to experience a wide range of problems. These include educational issues, such as low access to early childhood education (PAUD) due to the limited availability of PAUD facilities. Health-related issues include low levels of clean and healthy living behaviors, and a lack of awareness about the rational use of medicines, as shown by the common practice of buying medicine without prescriptions or opting for generic drugs.

Other issues concern infrastructure development and maintenance in Northern Medan. First, waste management problems persist due to the lack of public awareness and understanding of waste processing, and many residents continue to litter despite the availability of trash disposal facilities. Second, water resource issues such as incomplete irrigation networks hinder the fulfillment of water needs for vegetable farming and rice fields. Third, drainage issues arise from suboptimal drainage systems that fail to properly direct water flow away from roads, coupled with the public's lack of awareness in maintaining these drainage channels. Fourth, household wastewater management remains problematic due to the absence of community-scale wastewater treatment systems and the low quantity and quality of sanitation infrastructure in residential areas.

The aforementioned issues are related to basic public service provision. The multitude of problems that must be addressed necessitates that the Medan City Government develop a well-structured and high-quality development plan for the Northern Medan area, with the aim of ensuring that future development initiatives can effectively tackle these challenges. Development planning is considered the initial stage in the development process, serving as a reference, guideline, or blueprint for implementation (action plan). A development plan is more effective when it is both implementable and applicable (Riyadi & Bratakusumah, 2003).

Development planning is also crucial as it is fundamentally aimed at identifying the needs of the community, designing strategies for development, and managing social change. The development programs that are created are expected to yield positive outcomes in improving long-term welfare, prosperity, and societal peace. From the above explanations, it is evident that establishing sound and

high-quality development planning is essential. This is because development failures often occur when the planning itself is flawed or poorly executed.

Such development problems include outcomes that fail to meet expectations, particularly when the development does not effectively promote maximum, equitable, and just welfare for the population. In addition, governance-related challenges include urban leadership, spatial planning (covering planning, utilization, and control), and partnership issues.

These various problems have led to paradoxical (ironic) phenomena. On one hand, Medan City serves as a center of civilization, economic superiority, and regional growth. On the other hand, it is also the source of serious issues such as recurrent flood disasters. Based on the area and population size, it can be said that the population density in the Northern Medan area is very high. Flood events are highly sensitive to changes in land use or improper land management (Brath et al., 2006). The high population and limited land availability have led to the conversion of land that should not be developed, such as settlements in protected areas (riverbanks and wetlands). This has resulted in issues such as river narrowing, reduced water absorption areas, and poor drainage systems in Medan. Changes in land use also occur in the upstream areas of the rivers that pass through Medan City, namely Deli Serdang Regency and Karo Regency. This has detrimental effects, causing floods with high volumes, especially during periods of heavy rainfall. Another contributing factor to flooding is the suboptimal emergency response to disaster mitigation and the series of flood risk reduction management programs.

To resolve the ongoing flooding issues, the government has undertaken various flood control measures through several work programs. These work programs are expected to reduce the impact of flooding, which causes significant losses across various sectors. Structural flood control programs are essential; however, there are other critical actions required to address flood disasters, such as the attention of all stakeholders to the spatial planning system in Medan City. The widespread misuse of land is a key factor contributing to flood events. This is because development is often carried out in areas not intended for such purposes, or it does not align with the carrying capacity and environmental capacity.

Fundamentally, disaster is an inseparable aspect of regional and urban planning. The most important function of spatial planning is to allocate land (territorial resources) for the welfare of society, while considering natural disasters (Mei, 2014). Disasters occur when there is an intersection between hazard (danger) and vulnerability (susceptibility), and flood disasters are not something that cannot be avoided or mitigated. The risk of flood disasters will increase if the capacity of the community in the area is insufficient. Based on this, it is essential to emphasize that the capacity of the community and its supporting infrastructure is a critical requirement for areas or cities prone to disasters.

According to Law Number 26 of 2007 on Spatial Planning, it is stated that spatial planning must consider disaster aspects within an area by integrating disaster mitigation into the spatial planning of that region. Spatial planning, as a form of regional and urban planning, has several objectives, including achieving harmony between the natural and built environments, as well as protecting the function of space and preventing negative impacts on the environment due to the utilization of space functions. Specifically, spatial planning has the capacity to reduce vulnerability within an area and enhance its resilience to disasters

The application of an inadequate spatial planning model in the Northern Medan area often leads to various socio-economic issues that affect the welfare of the community. The high population density in the coastal areas, combined with poorly planned spatial management, results in a decline in the quality of life for the residents. Overcrowded settlements, inadequate infrastructure, and limited

access to basic services such as clean water, electricity, and healthcare facilities contribute to structural poverty in the Northern Medan area. In such conditions, the community is trapped in a cycle of poverty that is difficult to break due to limited access to viable economic opportunities.

In addition, socio-economic disparities often emerge as a prominent issue in the area. The imbalance between spatial management, which prioritizes large economic sectors such as industrial zones and ports, and the simpler needs of the local community, such as damaged roads, job opportunities, and small businesses, exacerbates this gap. The people of Northern Medan are often excluded from access to natural resources that they rely on for their livelihoods. In the long term, this disparity widens the social divide and hinders efforts to improve welfare in a more equitable manner.

Furthermore, the imbalance in spatial planning in the coastal areas leads to conflicts of interest between large economic actors and the local community. In many cases, coastal development focused on large-scale investments often sacrifices environmental sustainability and the livelihoods of local communities. Industrial area development or reclamation projects often fail to consider the environmental and social impacts, such as the destruction of coastal areas, water pollution, changes in water flow to the sea, and disruption to coastal ecosystems that support fishing activities. As a result, communities dependent on coastal resources are at risk of losing their livelihoods, which in turn worsens the local economic conditions.

On the other hand, the concept of Livable Settlement offers opportunities to address these issues by promoting a balance between physical, social, and economic aspects of spatial management. The implementation of this concept can bring positive changes to the welfare of coastal communities by creating living spaces that are healthier, safer, and more productive. Livable Settlement includes planning for livable housing, including access to essential facilities, adequate infrastructure, and an environment that supports economic and social sustainability.

In the context of social welfare, the Livable Settlement concept can help create inclusive settlements where coastal communities have better access to education, healthcare services, and economic opportunities. Improved access to basic infrastructure such as sanitation, clean water, and energy can directly enhance the quality of life and health of the community. Well-planned settlements can also reduce the risk of infectious diseases and improve the mental and physical well-being of coastal populations. More than that, this concept emphasizes the importance of community involvement in spatial planning, ensuring that policies are more responsive to local needs.

From an economic perspective, the application of Livable Settlement can have a positive impact on the economic empowerment of coastal communities. With more structured spatial management, sustainable economic opportunities can be created. For instance, well-planned coastal areas can open up access to the development of small and medium-sized enterprises, strengthen the fishing sector, promote eco-friendly tourism, and diversify other economic activities. This allows local communities to engage in more sustainable economic activities, thereby improving their economic welfare.

In addition, enhancing environmental resilience is also one of the main benefits of implementing the Livable Settlement concept in coastal spatial management. By integrating sustainability principles into spatial planning—such as the protection of coastal ecosystems, disaster risk mitigation, and the wise management of natural resources—negative environmental impacts can be reduced. A well-managed and healthy coastal environment will support sustainable economic productivity, ultimately strengthening the economic resilience of coastal communities. The application of this concept can also reduce vulnerability to natural disasters such as flooding, coastal abrasion, and rising sea levels, which are often the main causes of economic losses in coastal areas.

The link between coastal spatial management and the socio-economic well-being of the community is very strong. Unbalanced spatial planning that pursues economic profit alone, without considering social and environmental aspects, will negatively impact the long-term welfare of the community. Conversely, spatial management based on Livable Settlement principles can create more livable coastal areas, where the social and economic welfare of the coastal population can be significantly improved. Ultimately, this concept is able to integrate economic, social, and environmental interests harmoniously.

Therefore, this study seeks to explore more deeply how the spatial management model applied in the coastal region—specifically Northern Medan—can affect the socio-economic aspects of the community, and how the Livable Settlement concept can be effectively implemented in coastal spatial planning. Accordingly, this research is expected to contribute significantly to the development of more inclusive, sustainable, and welfare-oriented spatial planning policies for coastal communities.

2. METHODS

This research is descriptive in nature and adopts a mixed-methods approach. The mixed-methods approach employed begins with examining natural conditions of the object of study, as is typical in qualitative research, by observing real-life phenomena through a deep interaction process between the researcher and the subject being studied. Mixed methods research design refers to procedures in which quantitative and qualitative methods are collected, analyzed, and "mixed" within a single study or a series of studies to better understand a research problem (Creswell & Plano Clark, 2015).

This combined approach is undertaken with the objective of providing a better understanding of the research problems and questions than would be possible by using either approach alone. Mixed-methods research is a methodology that integrates or combines both quantitative and qualitative methods to be used together in a single study, thereby producing data that are more comprehensive, valid, reliable, and objective (Sugiyono, 2014). Creswell also emphasizes that mixed-methods research is particularly useful when quantitative or qualitative methods alone are insufficient for fully understanding the research problem (Sugiyono, 2011).

The researcher employed an Exploratory Sequential Design, wherein data collection begins with qualitative methods, followed by quantitative data collection. The purpose of initiating the study with qualitative data collection is to explore the existing phenomena first, and then proceed to quantitative data collection to explain the relationships between variables identified in the qualitative phase.

The qualitative method focuses on exploring and describing issues related to spatial planning in Northern Medan based on data obtained from the relevant government agencies, in order to gain an in-depth understanding of the phenomenon or social symptoms. Therefore, the emphasis is on "learning about the people" as

subjects, or understanding the phenomenon from the native's point of view—that is, how the phenomenon is interpreted by the community itself.

A. Data Sources

This study will conduct interviews with stakeholders from agencies and institutions related to spatial planning and settlements, relevant NGOs, sub-district (kecamatan) authorities, and the community. However, the distribution of questionnaires will be limited to community members in order to measure the concept of livability in Northern Medan, which comprises four sub-districts: Medan Belawan, Medan Marelan, Medan Deli, and Medan Labuhan.

B. Population and Sample

In the population, a distinction is made between the general population and the target population. The target population refers to the group to which the research conclusions are intended to apply (Sukmadinata, 2010). The research population includes all residents in the northern part of Medan. According to Sugiyono (2013:118), a sample is a subset of the population that possesses the same characteristics. The sample must be truly representative to ensure that the conclusions drawn can be generalized to the entire population. The sample size in this study is determined using the Slovin formula, as the known population exceeds 100 respondents.

C. Data Collection Techniques and Instruments

According to Sugiyono (2013:224), data collection techniques are essential in research, as the primary goal is to obtain data. Data in this study are classified into two types: primary and secondary data. Primary data are collected through fieldwork, observation, and in-depth interviews, while secondary data are obtained through library research, including books, literature, journals, dissertations, research reports, and other relevant materials. The data collection techniques used in this study include:

1). Observation Technique

The researcher will conduct participant observation to directly identify the characteristics and elements of the research setting. Participant observation involves planned and systematic study in which the researcher actively engages in the daily lives of research subjects. This engagement fosters emotional and social connections, allowing the researcher to better understand the attitudes, thought patterns, and feelings of the subjects regarding the issues they face.

2). Interview Technique

In addition to observation, the researcher will use interviews as a primary data collection method. According to Moleong (2006), an interview is a conversation between two people: the interviewer who asks questions and the interviewee who answers them. Interviews are conducted in-depth to gather direct information from

informants and are planned to ensure data validity. According to Bungin (2010), interviews are a process of obtaining information for research purposes through direct interaction, with or without a guide, and involve a relatively prolonged engagement in the social life of the informant.

3). Documentation Technique

Sugiyono (2013) defines documents as records of past events, which can include images, written documents, or other forms of work. Images may consist of photos, sketches, etc., while written documents include life histories, stories, diaries, biographies, regulations, and policies. Document studies serve as a complement to observation and interview techniques.

4). Focus Group Discussion (FGD)

Focus Group Discussion is a technique used in qualitative research to understand the meaning of a theme based on group interpretation. FGD helps avoid researcher bias and ensures a more holistic and valid understanding of the data obtained from interviews.

5). Questionnaire

A questionnaire is a data collection method in which a set of written questions or statements is given to respondents to answer. Questions may be open-ended (requiring descriptive responses) or closed-ended (requiring respondents to choose from pre-set options). This study uses closed-ended questionnaires, in which respondents select answers from provided options.
The questionnaire uses a Likert scale to measure attitudes, opinions, and perceptions about social phenomena. The Likert scale ranges from 1 (strongly disagree) to 4 (strongly agree), ensuring clear and relevant results from respondents.

Response	**Score**
Strongly Disagree (STS)	1
Disagree (TS)	2
Agree (S)	3
Strongly Agree (SS)	4

(Source: Sugiyono, 2014)

D. Data Analysis Techniques

Data analysis is the process of systematically organizing and interpreting the results of interviews, notes, and other collected materials to enhance understanding and present findings. This study uses a sequential exploratory design, which involves qualitative data collection and analysis followed by quantitative analysis. Thus, emphasis is placed on qualitative data in the early phase to explore phenomena, followed by quantitative analysis to validate and explain the findings.

Data collected from interviews undergo processes such as data reduction, classification, and conclusion drawing/verification, to gain a deep understanding of spatial planning in Northern Medan.

E. Research Location

This research is conducted in the northern area of Medan City, which includes four sub-districts: Medan Deli, Medan Labuhan, Medan Marelan, and Medan Belawan. These areas are characterized by diverse spatial planning and settlement issues, viewed through the lens of the Livable Settlement concept.

3. FINDINGS AND DISCUSSION

Findings

A. Rapid Urbanization and Informal Settlements Northern Medan has experienced significant urban growth, leading to the proliferation of informal settlements. These areas often lack access to basic infrastructure, such as sanitation, clean water, and proper road networks. Spatial data indicates a high concentration of low-income communities in flood-prone and environmentally vulnerable areas.

B. Inequitable Distribution of Public Services Survey results and GIS mapping reveal that key public services such as healthcare, education, and green spaces are unevenly distributed. Residents in northern Medan, particularly in peripheral districts, face longer travel times and limited access to essential facilities compared to central districts.

C. Environmental Degradation and Poor Waste Management Environmental assessments show that improper land use, unregulated housing expansion, and inadequate waste management systems have led to pollution of local waterways and degradation of green areas. The Deli River, which runs through several neighborhoods in northern Medan, is heavily polluted and subject to illegal dumping.

D. Lack of Integrated Spatial Planning Interviews with local stakeholders and urban planners highlight fragmented urban policies, overlapping jurisdictions, and limited coordination between government departments. Spatial plans are often outdated or poorly enforced, resulting in uncontrolled sprawl and inefficient land use.

E. Community Aspirations and Participation Gaps Focus group discussions with residents indicate a strong desire for safer, greener, and better-connected neighborhoods. However, mechanisms for public participation in planning processes remain weak or symbolic, with minimal follow-up on community feedback.

Discussion

A. Strategic Integration of Land Use and Transportation Effective spatial planning in northern Medan requires integrated land-use and transportation strategies. Prioritizing mixed-use development near transport hubs and enhancing connectivity through public transit corridors can improve accessibility, reduce congestion, and promote economic activity.

B. Upgrading Informal Settlements through Inclusive Planning Regularization and upgrading of informal settlements should be pursued through participatory methods. This includes providing secure tenure, improving infrastructure, and ensuring access to services while respecting the social fabric and economic activities of residents.

C. Green Infrastructure and Environmental Resilience The restoration of green corridors, reforestation of degraded land, and construction of sustainable drainage systems are vital to enhancing urban resilience. Incorporating green belts and eco-parks can simultaneously address flooding and improve quality of life.

D. Decentralized and Community-Centered Governance Empowering local governments and community-based organizations to co-manage spatial planning fosters ownership and accountability. Decentralized decision-making with clear roles and responsibilities ensures more responsive and context-specific interventions.

E. Smart Spatial Data Systems The use of GIS, satellite imagery, and real-time data platforms can support evidence-based planning. Digital mapping of risk zones, service gaps, and development potential allows for better scenario modeling and resource allocation.

F. Policy Reform and Institutional Coordination Establishing a unified spatial planning authority or strengthening inter-agency coordination is essential

to overcome institutional silos. Policy frameworks must be updated to reflect current demographic, environmental, and economic conditions, aligned with sustainability goals.

4. CONCLUSION

The development of livable settlements in Northern Medan hinges on the implementation of integrated, inclusive, and sustainable spatial planning strategies. The findings reveal that rapid urbanization, environmental degradation, and the unequal distribution of infrastructure and public services have significantly compromised the quality of life for many residents. Moreover, weak institutional coordination and limited community participation have hindered the effectiveness of spatial governance.

To address these challenges, a multi-dimensional approach is essential—one that prioritizes the upgrading of informal settlements, the integration of land use and transportation planning, environmental rehabilitation, and the adoption of smart spatial data systems. Equally important is the need to strengthen local governance frameworks and ensure active community engagement in the planning process. By embracing these strategies, Northern Medan can move toward becoming a more inclusive, resilient, and livable urban region that meets the needs of both current and future generations.

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