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COASTAL COMMUNITY MAPPING: INTEGRATING GIS FOR SUSTAINABLE HOUSING SOLUTIONS IN INFORMAL SETTLEMENTS

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ABSTRACT

This qualitative research study explores the utilization of Geographic Information Systems (GIS) to address housing challenges in informal settlements in coastal areas. Through interviews with GIS experts specializing in coastal areas and housing solutions, valuable insights were gained into the role and applications of GIS technology in understanding and addressing housing challenges in coastal informal settlements. The findings highlight the diverse expertise of the respondents in GIS, ranging from coastal resource management to land use planning, and their extensive experience in these areas. Various GIS applications for informal settlements were discussed, including establishing settlement patterns, mapping structures, and identifying suitable sites for housing projects. Comprehensive data collection methods, integration of remote sensing and field monitoring techniques, and visualization of spatial relationships were emphasized as crucial components of GIS-based studies. Challenges encountered in GIS integration, such as data accuracy and completeness, were identified, along with emerging trends, such as mobile data collection and drone technology, offering promising solutions for advancing research and practice in the field. Recommendations for GIS integration include ensuring spatial and temporal data components, regular data updates, and community participation. Overall, the study underscores the critical role of GIS in informing sustainable housing solutions for coastal informal settlements, contributing to the development of inclusive and resilient housing strategies for coastal communities.

Keywords: Informal Settlements, Coastal Areas, Geographic Information Systems (GIS), Spatial Analysis, Resilience, Sustainable Housing Solutions, Data Collection, Visualization

1. INTRODUCTION

Informal settlements in coastal areas present complex challenges that require innovative approaches for sustainable housing solutions. Geographic Information Systems (GIS) offer promising tools for understanding and addressing these challenges. This study explores the potential of GIS in the context of coastal areas and housing solutions, focusing on informing sustainable housing strategies for informal settlements. Through interviews with GIS experts specializing in coastal areas and housing solutions, this research seeks to gain insights into the role of GIS in assessing informal settlements, visualizing spatial relationships, and promoting environmentally friendly and socially equitable housing interventions. One notable study by Silva et al. (2018) delves into the application of GIS technology in assessing vulnerability and resilience in coastal communities, highlighting its significance in informing decision-making processes related to housing and infrastructure development. Similarly, the work of Bennett et al. (2016) examines the role of GIS in mapping informal settlements and understanding their spatial characteristics, emphasizing its utility in identifying areas susceptible to environmental risks and implementing targeted interventions. Additionally, research by Acioly et al. (2020) explores the integration of GIS and participatory approaches in informal settlement upgrading projects, underscoring the importance of community engagement and spatial analysis in promoting inclusive and sustainable housing solutions. Studies such as those by De Groot et al. (2019) and Fonseca et al. (2017) investigate the use of GIS in land tenure regularization and property rights mapping within informal settlements, shedding light on the potential for GIS to support tenure security and equitable access to housing. By integrating GIS perspectives from these studies, this research aims to contribute to developing inclusive and resilient housing solutions for coastal communities.

Objective of the Study:

This qualitative research study investigates the pivotal role of Geographic Information Systems (GIS) in addressing housing challenges within informal settlements in coastal areas. Through conducting in-depth interviews with GIS experts specialized in coastal areas and housing solutions, the study has several key objectives. Firstly, it seeks to explore the diverse applications of GIS technology explicitly tailored to assess and analyze the intricate dynamics of informal settlements within coastal environments. Secondly, the study endeavors to gain insights into how GIS contributes to developing sustainable housing strategies uniquely suited to the challenges faced by informal settlements along the coast. Additionally, it aims to identify and comprehend the challenges encountered in integrating GIS technology for

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studying coastal informal settlements while exploring emerging trends that may influence future research and practice in this field. Ultimately, the study seeks to provide actionable recommendations for effectively integrating GIS into systematic inventory approaches for studying coastal informal settlements, aiming to inform policymakers, researchers, and practitioners about the transformative potential of GIS technology in fostering inclusive and resilient housing solutions in coastal areas.

METHODOLOGY

The qualitative research study is intricately structured around conducting key informant interviews to delve into the pivotal role of Geographic Information Systems (GIS) in tackling housing challenges within coastal informal settlements, with a primary focus on Davao City. According to Torrentira (2020), the data collection process integrates innovative techniques necessitated by circumstances, such as the COVID-19 pandemic, which has mandated adaptability in research methodologies.

The selection of key informants is meticulous, encompassing individuals with diverse expertise pertinent to the subject matter. This includes a member from the Local Shelter Plan writing team of the Davao City Housing Office, an expert specializing in surveying informal settlements, and two GIS specialists—one affiliated with the Department of Housing and Urban Development (DSHUD), and the other serving as a GIS consultant for the National Housing Authority (NHA), with previous experience as the GIS Division Chief in the Office of the City Planning and Development Coordinator (OCPDC).

The qualitative inquiry unfolds through semi-structured interviews, fostering in-depth discussions on GIS applications, methodological nuances in data collection, visualization strategies, encountered challenges, and pragmatic recommendations for GIS integration into systematic inventory approaches. Torrentira's (2020) methodology provides valuable insights to help you adapt to the current context and ensure data collection efficacy. It emphasizes using alternative data collection methods, such as employing diaries and reflections of participants instead of traditional direct observation, utilizing telephone or mobile phone interviews, and leveraging video conferencing for key informant interviews and focus group discussions.

The data collection process is meticulous, involving detailed recording and transcription of interviews, facilitating comprehensive analysis to unearth commonalities, emerging trends, and critical insights. By synthesizing these insights, the study aims to offer a robust understanding of GIS's pivotal role in addressing housing challenges within coastal informal settlements in Davao City. Ultimately, the findings are poised to inform policy frameworks, shape research agendas, and catalyze practical interventions, fostering sustainable solutions to housing dilemmas in coastal areas and advancing holistic urban development strategies.

2. RESULTS AND DISCUSSION

GIS Expertise, Applications, and Methodologies

1. **GIS Expertise and Contributions:**

   The respondents exhibit diverse expertise in GIS, ranging from coastal resource management to land use planning and environmental assessment. Their experiences highlight the importance of GIS in understanding coastal dynamics and informing housing solutions. Their roles in formulating Land Use Plans for local government units (LGUs), collaborating with Geographic Information Systems (GIS), and conducting field surveys demonstrate their extensive involvement in GIS applications for coastal areas and housing solutions.

2. **GIS Applications for Informal Settlements:**

   The experts emphasize GIS's role in assessing settlement patterns and identifying vulnerable areas in coastal environments. GIS aids in conducting inventories, mapping structures, and establishing easements, which is crucial for decision-making and intervention prioritization. These findings align with previous studies by Bhaduri et al. (2018), which discuss the effectiveness of GIS technologies in mapping and monitoring informal settlements.

   Data Collection and Analysis:

   Data collection methods for GIS-based studies include household indicators and information on coastal resource awareness and attitudes. Integrating remote sensing and field monitoring techniques enhances data accuracy and completeness, facilitating comprehensive analysis. Challenges encountered, such as data accuracy and completeness, are addressed through collaboration with agencies and community engagement efforts, as suggested by Steinmann et al. (2021).

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3. **Visualization and Decision-Making:**

   GIS facilitates the visualization of spatial relationships through thematic maps and overlaying layers, making complex data accessible to decision-makers and communities. Interactive and story maps effectively communicate findings and support informed decision-making. These visualization techniques align with recommendations by Acioly (2020) for integrating GIS into systematic inventory approaches.

Challenges, Innovations, and Strategic Recommendations

1. **Support for Sustainable Housing Solutions:**

   GIS aids in identifying suitable sites for housing projects by considering factors such as land availability, infrastructure accessibility, and vulnerability to hazards. Spatial information enables data-driven policy decisions and promotes environmentally friendly and socially equitable interventions. This echoes the findings of Rahman et al. (2021), emphasizing the role of GIS in urban informal settlements mapping.

2. **Challenges and Technological Advancements:**

   Challenges in GIS-based studies include data accuracy and completeness issues, addressed through collaboration with relevant agencies and active community engagement efforts.

   Emerging trends in GIS technology, such as mobile data collection and drone technology, offer promising solutions for advancing research and practice in coastal housing studies, as highlighted by Bhaduri et al. (2018).

3. **Recommendations for GIS Integration:**

   Recommendations for integrating GIS into systematic inventory approaches include incorporating spatial and temporal data components, ensuring regular updates of data sets, and fostering data exchange among relevant agencies. Community participation and cross-referencing available data sources are essential for effective GIS integration and enhancing the systematic inventory approach to studying coastal informal settlements, as suggested by the respondent and supported by Silva et al. (2018) and Musungu (2015).

   Overall, the insights provided by the respondents underscore the critical role of GIS in studying and addressing housing challenges in coastal informal settlements. Integrating GIS expertise and methodologies enhances the systematic inventory approach, contributing to developing inclusive and resilient housing solutions.

3. CONCLUSION

This qualitative research study delves into utilizing Geographic Information Systems (GIS) to tackle housing challenges within informal settlements in coastal areas.

Through insightful interviews with GIS experts specializing in coastal areas and housing solutions, the study illuminates the role a

nd applications of GIS technology in understanding and addressing housing challenges in coastal informal settlements. The findings highlight the diverse expertise of the respondents in GIS, ranging from coastal resource management to land use planning, showcasing their extensive experience in these domains.

Various GIS applications for informal settlements were explored, including establishing settlement patterns, mapping structures, and identifying suitable housing project sites. Comprehensive data collection methods, integration of remote sensing and field monitoring techniques, and visualization of spatial relationships emerged as crucial components of GIS-based studies.

Challenges encountered in GIS integration, such as data accuracy and completeness, were acknowledged and addressed through collaboration with relevant agencies and community engagement efforts. Additionally, emerging trends such as mobile data collection and drone technology offer promising solutions for advancing research and practice in coastal housing studies.

Recommendations for GIS integration include ensuring spatial and temporal data components, regular data updates, and community participation. By incorporating these recommendations, policymakers, researchers, and practitioners can harness the transformative potential of GIS to develop inclusive and resilient housing solutions for coastal communities.

Overall, the study underscores the critical role of GIS in informing sustainable housing solutions for coastal informal settlements, contributing to the development of inclusive and resilient housing strategies for coastal communities. Through integrating GIS expertise and methodologies, stakeholders can effectively address housing challenges, paving the way for holistic urban development in coastal areas.

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