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Coastal Dynamics in Jayapura City, Papua: A Literature-Enriched Study

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Abstract: The investigation focuses on understanding land use and cover patterns in Jayapura City, along with drivers and climate change impacts in coastal areas. It explores tourism's role in coastal land use and assesses its sustainability. Using a comprehensive approach combining literature review and on-the-ground data collection, the study identifies knowledge gaps and key variables. It gathers site-specific data to validate findings and inform evidence-based recommendations for resilient coastal management. Socioeconomic aspects, including impacts on local communities and indigenous groups, are considered. This research aims to promote sustainable land use practices and address the challenges posed by climate change and tourism in coastal areas.

Keywords: land use; land cover; climate change; tourism industry; resilient coastal management; indigenous groups; Jayapura

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1. Introduction

Coastal areas around the world are facing significant challenges due to natural hazards, disasters, and climate change. These challenges are particularly pronounced in Jayapura City, located in Papua province, Indonesia. The coastal dynamics in Jayapura City are influenced by a combination of natural and anthropogenic factors. Erosion, sediment transport, sea level rise, and extreme weather events play a significant role in shaping the coastal landscape. Additionally, human activities such as urbanization, land reclamation, and industrial development can exacerbate the vulnerability of coastal areas to these dynamics. Understanding the complex interactions between natural and human-induced processes is essential for developing effective coastal management strategies in Jayapura City. This requires a comprehensive assessment of the existing literature on coastal dynamics, including studies on geomorphological changes, hydrodynamics, and the impact of human interventions. By examining the existing body of literature, we can gain valuable insights into the coastal dynamics of Jayapura City and identify potential areas for further research and intervention [1,2,3]. Moreover, this literature-enriched approach provides a nuanced understanding of the challenges faced by coastal communities in the region, laying the groundwork for informed and sustainable coastal management policies. This study aims to conduct a literature-enriched investigation of the land use, land cover, and climate change dynamics in Jayapura City, Papua Province, with a specific focus on the coastal areas. To address this objective, multiple sources can be utilized.

The existing literature on coastal dynamics in Jayapura City provides a

comprehensive overview of the challenges and complexities that shape the coastal landscape. Studies have highlighted the impact of erosion, sediment transport, and sea level rise on the city's coastal areas, emphasizing the need for sustainable management strategies [2,3,4,5,6]. One study focused on the erosion rates in coastal areas of Jayapura City and found that both natural factors (such as wave energy and sediment supply) and human activities (such as sand mining and coastal infrastructure development) contribute to the erosion process [2,3,6,7,8]. Another study examined the hydrodynamic processes along the coast of Jayapura City, identifying the influence of tidal currents, wave actions, and river discharges on sediment dynamics and shoreline changes [9,10,11,12,13]. These studies also emphasized the importance of considering climate change in coastal management strategies, as rising sea levels and extreme weather events can exacerbate erosion and coastal vulnerability. Additionally, research has also explored the land use and land cover changes in Jayapura City's coastal areas. These studies have highlighted the conversion of mangrove forests into aquaculture ponds, urban expansion, and infrastructure development as significant drivers of land use change [14,15,16,17,18]. Overall, the literature on coastal dynamics in Jayapura City underscores the need for a holistic understanding of the interactions between natural processes, human interventions, and coastal dynamics to effectively address the challenges posed by climate change and land use change. To further enhance the investigation of coastal dynamics in Jayapura City, additional sources can be explored. These additional sources may include studies on the ecological impacts of land use change in coastal areas, assessments of vulnerability and resilience to climate change, analyses of policy implications for coastal management, and case studies of successful adaptation strategies in similar contexts [19,20,21,22,23].

1.1. Geomorphological Changes and Hydrodynamics

Research has delved into the geomorphological changes in Jayapura City's coastal areas, shedding light on the dynamic nature of landforms and the influence of natural processes. Additionally, studies have explored the hydrodynamics governing sediment transport and coastal erosion, contributing valuable insights into the factors driving these processes [13,15,24,25]. These studies have emphasized the importance of understanding the interactions between wave dynamics, sediment availability, and coastal morphology in order to accurately assess and predict coastal changes. Furthermore, research has investigated the impacts of human interventions such as land use change, urban expansion, and infrastructure development on coastal dynamics in Jayapura City and their contribution to accelerated erosion and coastal vulnerability. The findings highlight the need for sustainable land use practices and coastal management strategies that consider the delicate balance between natural processes and human activities. Studies on the Ecological Impacts of Land Use Change have also brought attention to the ecological consequences of land use change in Jayapura City. These studies have revealed how land use change can lead to habitat fragmentation, loss of biodiversity, and alteration of ecosystem functions [3,6,26].

Furthermore, research has explored the influence of climate change on coastal dynamics in Jayapura City. This includes examining the potential impacts of sea-level rise, increased storm surges, and changing precipitation patterns on coastal processes. Overall, the research conducted on land use and land cover changes, erosion rates, sediment transport, and sea level rise in Jayapura City has highlighted. The complex interplay between natural and anthropogenic factors in shaping coastal dynamics.

1.2. Human interventions and climate change

The literature has also extensively documented the impact of human interventions, such as urbanization and land reclamation, on the coastal dynamics of Jayapura City. Furthermore, research has examined the intersection of climate change and its

implications for coastal vulnerability, highlighting the importance of considering both natural and anthropogenic factors in coastal management. It is evident from the literature that human interventions, such as land use change and urban expansion, have significantly contributed to the accelerated erosion and vulnerability of Jayapura City's coastline. The lack of effective land governance structures in coastal tourism areas, such as Mancora, Peru, has led to uncontrolled urbanization within fishing villages cyclically affected by events like El Nino. These dynamics have led to increased land conflicts, environmental vulnerability, and threats to local models of development. Overall, the literature underscores the urgent need for sustainable land use practices, coastal management strategies, and effective governance structures to address the complex challenges of coastal dynamics in Jayapura City in the face of climate change and human interventions. In summary, the literature on land use, land cover, and climate change in Jayapura City highlights the significant ecological impacts of land use change and urbanization, as well as the need for effective governance and sustainable practices to mitigate these impacts. Additionally, the literature emphasizes the importance of considering local ecological knowledge and indigenous natural resource management in adaptation strategies. This integrated analysis of the literature on climate change vulnerability, land use, and land cover in Jayapura City, Papua Province has revealed several key findings related to coastal dynamics. The literature highlights the complex interplay between natural and anthropogenic factors in shaping coastal dynamics in Jayapura City. The literature suggests that human interventions, such as urbanization and land reclamation, have had significant impacts on the coastal dynamics of Jayapura City.

While the existing literature offers a considerable understanding of coastal dynamics in Jayapura City, identifying gaps and potential areas for further research is crucial. By synthesizing the current body of knowledge, this study aims to pinpoint areas that require additional investigation, ultimately contributing to the development of targeted and effective coastal management practices.

Utilizing diverse sources, including academic publications, reports, and empirical studies, will enable a comprehensive review of literature, enhancing the depth and breadth of insights into the coastal dynamics of Jayapura City. Based on the sources provided, it is evident that there is a need for targeted analysis of climate change impacts and adaptation options in indigenous communities. Additionally, further research is needed to assess the social and economic impacts of coastal dynamics in Jayapura City, as well as the effectiveness of governance structures in managing and mitigating these impacts. This will help inform decision-making processes and facilitate the development of sustainable policies and practices that promote resilience and mitigate the ecological, social, and economic risks associated with coastal dynamics. Furthermore, the literature also emphasizes the importance of incorporating data-based strategies and advanced technologies in air pollution management in smart cities. These strategies can help cities understand and address their unique air pollution challenges, leading to improved population health and a more sustainable urban development policy.

1.3. Geomorphological changes in Jayapura city's coastal areas

The geomorphological changes in Jayapura City's coastal areas have been a subject of extensive study, revealing the dynamic nature of landforms shaped by natural processes. Research has highlighted the impact of erosion, sediment transport, and sea level rise on the evolving coastal landscape. Coastal erosion has led to the alteration of shoreline profiles, impacting the stability of the coastline and the surrounding ecosystems. Furthermore, the interaction between tides, wave action, and sediment movement has influenced the morphological characteristics of the coastal areas, emphasizing the need for in-depth analysis to understand the underlying processes driving these changes. Coastal land use and land cover play a crucial role in shaping

coastal dynamics in Jayapura City. Studies have shown that human activities, such as urbanization and improper land management practices, can exacerbate coastal erosion and sedimentation. Inlet dynamics, nearshore wave data, and modelling of nearshore morphologic processes are key elements in understanding coastal dynamics in Jayapura City. These studies highlight the need for a comprehensive assessment of land use, land cover, and climate change impacts in Jayapura City's coastal areas. The lack of effective land governance structures in Jayapura City has contributed to uncontrolled urbanization within fishing villages vulnerable to extreme environmental hazards, such as flooding and storms. To address these challenges and promote sustainable coastal development, it is crucial to prioritize research and data collection efforts. This will enable the development of evidence-based policies and strategies that integrate land use, land cover, and climate change considerations. In this context, the tourism industry has played a significant role in shaping the use of land in coastal areas. By fostering transnational linkages and promoting tourism in coastal areas, the industry has contributed to new dynamics and land use changes. These dynamics have triggered conflicts between local authorities and resulted in uncontrolled urbanization within fishing villages. This uncontrolled urbanization has increased land conflicts, heightened environmental vulnerability, and threatened local models of development. To effectively address these challenges, a comprehensive approach is needed that includes dynamic modelling of nearshore sediment transport, assessments of sea-level rise and storm impacts.

There are three questions posed in this research:

(1) What are the main drivers of coastal dynamics in Jayapura City, and how can this knowledge inform sustainable management strategies in the face of climate change and land use change?"

(2) How do land use and land cover changes, erosion rates, sediment transport, and sea level rise interact to shape coastal dynamics in Jayapura City, and what are the implications for sustainable management strategies?

(3) What are the main factors contributing to coastal erosion and land use change in Jayapura City, and how this knowledge can inform effective coastal management.

The investigation aims to understand the current land use and land cover patterns in Jayapura City, as well as the drivers behind these patterns. Additionally, the investigation examines the impacts of climate change on land use and land cover dynamics in the coastal areas. It also explores the role of the tourism industry in shaping land use in coastal areas and assess the sustainability of current land use practices. Furthermore, the investigation assesses the vulnerability of Jayapura City to climate change impacts such as sea-level rise and storms.

2. Method

To conduct a comprehensive investigation of land use, land cover, and climate change in Jayapura City, a literature-enriched approach was adopted which combines a systematic literature review with on-the-ground data collection and analysis. The systematic literature involved a thorough search and analysis of relevant scientific publications, reports, and studies that focus on land use, land cover, and climate change in coastal areas, specifically in the context of Jayapura City. This provides an overview of existing knowledge, identify research gaps, and determine the key variables and indicators that need to be considered in the investigation. In addition to the literature review, on-the-ground data collection and analysis was conducted to gather site-specific information and validate the findings from the literature.

The investigation utilized various sources and methods. These include:

(1) **Remote sensing and GIS analysis:** Utilizing satellite imagery and aerial data to map and analyze land use and land cover changes over time.

(2) **Socioeconomic surveys and interviews:** Conducting interviews and surveys with local communities, policymakers, and stakeholders to understand their perceptions and experiences regarding land use, land cover, and climate change impacts in Jayapura City.

(3) **Field measurements and data collection:** Gathering on-the-ground data through field measurements and observations to supplement the findings from remote sensing and GIS analysis, providing a comprehensive understanding of the physical and environmental characteristics of the coastal areas.

(4) **Climate modeling and scenario analysis:** Utilizing climate models and scenario analysis to project future climate change impacts on land use, land cover, and coastal dynamics in Jayapura City, enabling the assessment of potential future vulnerabilities and adaptation strategies.

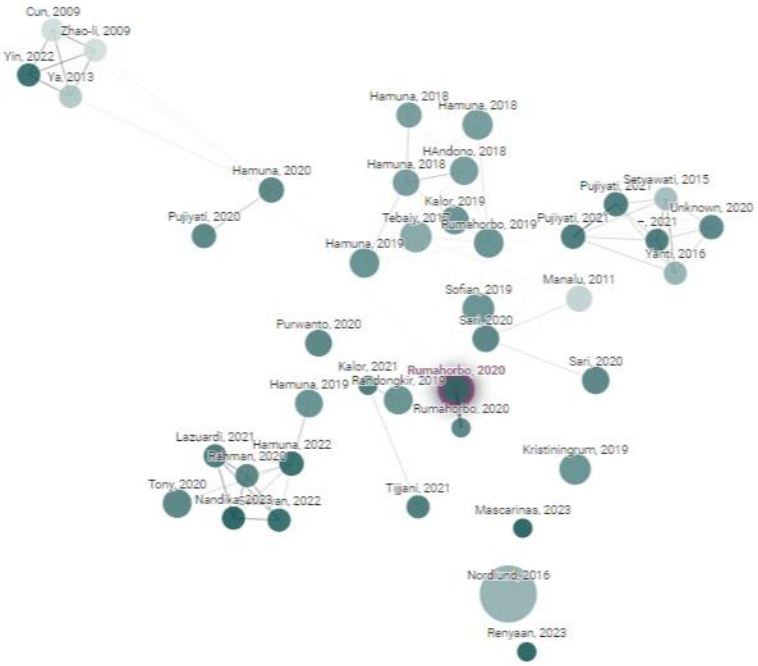

Figure 1. Surveys of the field or recent relevant works

3. Results and Discussion

The integration of these diverse sources and methods enhances the depth and reliability of the investigation, ultimately contributing to a holistic understanding of the complex interactions between land use, land cover, and climate change in Jayapura City's coastal areas. This multifaceted approach provides valuable insights for policymakers, urban planners, and environmental practitioners in developing targeted strategies for sustainable coastal development and climate change adaptation. The results and discussions from this investigation forms the basis for evidence-based recommendations and policy interventions aimed at promoting resilient and sustainable coastal management practices in Jayapura City. The investigation also considers the role of the tourism industry in shaping land use in coastal areas and assess the sustainability of current practices. By considering a range of sources and methods, including remote sensing, socioeconomic surveys, field measurements, and climate modelling, the investigation aims to develop a comprehensive understanding of the complex relationship between land use, land cover, and climate change in Jayapura City. In

addition, the investigation assesses the effectiveness and potential impacts of current land use policies and planning strategies in addressing coastal dynamics and climate change challenges. Moreover, the investigation explores the socioeconomic aspects of land use and land cover changes in Jayapura City. The investigation examines how land use changes and coastal dynamics affect the livelihoods of local communities, particularly vulnerable populations such as indigenous groups. Overall, the investigation contributes to a better understanding of the interactions between land use, land cover, and climate change in Jayapura City's coastal areas, providing valuable insights for sustainable coastal development and climate change adaptation strategies. The integration of data-based strategies and advanced technologies is crucial for effective air pollution management in smart cities. These strategies allow for real-time monitoring and analysis of air quality data, enabling prompt intervention and mitigation measures to protect public health. Additionally, the implementation of artificial intelligence and data-based management can enhance air pollution forecasting models, taking into account individual exposure and the impact on population health. Furthermore, citizen participation and creative leadership play a vital role in addressing air pollution challenges in smart cities. Citizen engagement can provide valuable data and perspectives on local air pollution sources, impacts, and potential solutions. Furthermore, citizen participation can foster a sense of ownership and responsibility among residents, encouraging them to take actions to reduce their own contributions to air pollution and advocate for sustainable urban development policies. In the context of Jayapura City, the investigation explores how these concepts and strategies can be applied to address air pollution challenges and promote sustainable development in the coastal areas.

4. Conclusion

In conclusion, the comprehensive investigation of land use, land cover, and climate change in Jayapura City has provided valuable insights into the complex interactions shaping the coastal areas. By integrating diverse sources and methods such as remote sensing and GIS analysis, socioeconomic surveys and interviews, field measurements and data collection, as well as climate modelling and scenario analysis, the investigation has contributed to a holistic understanding of the current patterns, drivers, and impacts of land use and land cover dynamics in Jayapura City.

The findings from this investigation serve as a foundational basis for evidence-based recommendations and policy interventions aimed at promoting resilient and sustainable coastal management practices in Jayapura City. It has also shed light on the role of the tourism industry in shaping land use in coastal areas and assessed the sustainability of current practices. Moreover, the investigation has highlighted the importance of considering the socioeconomic aspects of land use and land cover changes, particularly their impact on the livelihoods of local communities, including vulnerable populations such as indigenous groups.

References

[1] Y. P. Paulangan, B. Barapadang, M. A. Al. Amin, and H. Tangkelayuk, "Social-ecological system in Depapre Bay Area of Jayapura Papua Indonesia," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 890, no. 1, p. 012070, Oct. 2021, doi: 10.1088/1755-1315/890/1/012070.

[2] E. Seekamp, J. Flocks, C. Hotchkiss, L. York, and K. Irick, "Gulf Islands National Seashore regional sediment budget research and data needs—Workshop series summary," *US Geol. Surv. Open-File Rep.*, vol. 2022, no. 1087, pp. 1–35, 2023, doi: 10.3133/ofr20221087.

[3] V. M. Cvetković, J. Tanasić, A. Öcal, Ž. Kešetović, N. Nikolić, and A. Dragašević, "Capacity Development of Local Self-Governments for Disaster Risk Management," *Int. J. Environ. Res. Public. Health*, vol. 18, no. 19, p. 10406, 2021, doi: 10.3390/ijerph181910406.

[4] A. A. Kilbas, H. M. Srivastava, and J. J. Trujillo, "Preface," in *North-Holland Mathematics Studies*, Elsevier, 2006, pp. vii–x. doi: 10.1016/s0304-0208(06)80001-0.

[5] A. S. W. Retraubun, D. A. J. Selanno, L. Siahainenia, S. Tubalawony, N. Chr Tuhumury, and D. A. Sandhy, "Coastal zone

management of Passo Village of Ambon Municipal, Indonesia," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 805, no. 1, p. 012020, Jun. 2021, doi: 10.1088/1755-1315/805/1/012020.

[6] S. Myeong and K. Shahzad, "Integrating Data-Based Strategies and Advanced Technologies with Efficient Air Pollution Management in Smart Cities," *Sustainability*, vol. 13, no. 13, p. 7168, 2021, doi: 10.3390/su13137168.

[7] IOP Conference Series: Earth and Environmental Science, "Preface," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 799, no. 1, p. 011001, Jun. 2021, doi: 10.1088/1755-1315/799/1/011001.

[8] Supiyati, Suwarsono, and I. Setiawan, "Numerical model of coastline changing caused by ocean waves on every beach segment in coastal area of North Bengkulu, Indonesia," in *AIP Conference Proceedings*, AIP Publishing, 2021. doi: 10.1063/5.0037641.

[9] T. Solihuddin *et al.*, "Coastal erosion on the north coast of Java: adaptation strategies and coastal management," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 777, no. 1, p. 012035, May 2021, doi: 10.1088/1755-1315/777/1/012035.

[10] E. Bragina and N. Shilova, "Technologies of Strategic Communications in the Practice of Public Administration," 2021, doi: 10.48417/TECHNOLANG.2021.03.10.

[11] N. Nagu and M. R. Lessy, "The behavior of coastal communities on management of domestic wastewater in Ternate City, Indonesia," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 584, no. 1, p. 012028, Oct. 2020, doi: 10.1088/1755-1315/584/1/012028.

[12] A. S. Zendrato, N. M. Siahaan, and D. N. Aulia, "Evaluation of oceanfront settlement areas, case study of Jalan Kelapa, Ilir Village, Gunungsitoli City," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 452, no. 1, p. 012141, Apr. 2020, doi: 10.1088/1755-1315/452/1/012141.

[13] R. Karamma, M. S. Pallu, M. A. Thaha, M. P. Hatta, A. S. Mustari, and A. Syarif Sukri, "Analysis of Longshore Sediment Transport at Theestuaries of Jeneberang River and Tallo River Caused by Waves on Coast of Makassar," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 797, no. 1, p. 012010, Mar. 2020, doi: 10.1088/1757-899x/797/1/012010.

[14] A. Balasuriya, "Coastal Area Management: Biodiversity and Ecological Sustainability in Sri Lankan Perspective," in *Biodiversity and Climate Change Adaptation in Tropical Islands*, Elsevier, 2018, pp. 701–724. doi: 10.1016/b978-0-12-813064-3.00025-9.

[15] S. I. Wahyudi and H. P. Adi, "Evaluating Environment, Erosion and Sedimentation Aspects in Coastal Area to Determine Priority Handling (A Case Study in Jepara Regency, northern Central Java, Indonesia)," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 140, p. 012042, Apr. 2018, doi: 10.1088/1755-1315/140/1/012042.

[16] A. H. Fattah, Suntoyo, H. A. Damerianne, and Wahyudi, "Hydrodynamic and Sediment Transport Modelling of Suralaya Coastal Area, Cilegon, Indonesia," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 135, p. 012024, Mar. 2018, doi: 10.1088/1755-1315/135/1/012024.

[17] A. A. Akbar, J. Sartohadi, T. S. Djohan, and S. Ritohardoyo, "Erosi Pantai, Ekosistem Hutan Bakau dan Adaptasi Masyarakat Terhadap Bencana Kerusakan Pantai Di negara Tropis (Coastal Erosion, Mangrove Ecosystems and Community Adaptation to Coastal Disasters in Tropical Countries)," *J. Ilmu Lingkung.*, vol. 15, no. 1, p. 1, May 2017, doi: 10.14710/jil.15.1.1-10.

[18] B. K. Jena, D. Sathish Kumar, and K. Kintada, "Operational strategy to monitor coastal erosion in tropical areas," *Int. J. Ocean Clim. Syst.*, vol. 8, no. 3, pp. 135–143, May 2017, doi: 10.1177/1759313117704837.

[19] N. Nurliza, E. Dolorosa, and A. Erawati, "Strategic Policy of Coastal Sustainability based on Local Conditions and Needs in Sambas Regency, West Kalimantan," *Agrar. J. Agribus. Rural Dev. Res.*, vol. 4, no. 1, 2018, doi: 10.18196/agr.4161.

[20] S. P. Hadi, "In Search for Sustainable Coastal Management: A Case Study of Semarang, Indonesia," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 55, p. 012054, Feb. 2017, doi: 10.1088/1755-1315/55/1/012054.

[21] Kismartini and M. Yusuf, "Stakeholders Analysis: Managing Coastal Policy Implementation in Rembang District," *Procedia Environ. Sci.*, vol. 23, pp. 338–345, 2015, doi: 10.1016/j.proenv.2015.01.049.

[22] Y. Nur, S. Fazi, N. Wirjoatmodjo, and Q. Han, "Towards wise coastal management practice in a tropical megacity — Jakarta," *Ocean Amp Coast. Manag.*, vol. 44, no. 5–6, pp. 335–353, Jan. 2001, doi: 10.1016/s0964-5691(01)00054-0.

[23] M. Miharja and S. Arsallia, "Integrated Coastal Zone Planning Based on Environment Carrying Capacity Analysis," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 79, p. 012008, Jul. 2017, doi: 10.1088/1755-1315/79/1/012008.

[24] A. H. S. Putro and J. L. Lee, "Analysis of Longshore Drift Patterns on the Littoral System of Nusa Dua Beach in Bali, Indonesia," *J. Mar. Sci. Eng.*, vol. 8, no. 10, p. 749, Sep. 2020, doi: 10.3390/jmse8100749.

[25] R. M. R. M. Jayathilaka and M. C. S. Fernando, "Numerical modelling of the spatial variation of sediment transport using wave climate schematization method - a case study of west coast of Sri Lanka," *J. Natl. Sci. Found. Sri Lanka*, vol. 47, no. 4, p. 421, Dec. 2019, doi: 10.4038/jnsfsr.v47i4.9679.

[26] Munawar, L. Adrianto, M. Boer, and Z. Imran, "Spatial analysis of coastal and marine ecosystem services at Bima Bay, West Nusa Tenggara, Indonesia," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 744, no. 1, p. 012046, Apr. 2021, doi: 10.1088/1755-

1315/744/1/012046.