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## **COVER LETTER**

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12 August 2024

Dear,

I/We wish to submit an original research article entitled "Assessment of Revetment Performance Against Wave Overtopping for Mitigating Tidal Flooding at Lebih Beach" for consideration by SINERGI.

We confirm that this work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere. We promise not to withdraw this article after it has been processed by the Editorial Team. If there is a withdrawal, we are willing to pay a penalty of USD 150 (IDR 2000K) to the SINERGI Editorial Team.

Field	:	Civil Engineering
Topic	:	Hydrological and Hydrolic Engineeering
Brief Background		Indonesia, as one of the largest archipelagic nations globally, consists of approximately 17,504 islands, with a vast maritime area of around 6,400,000 km <sup>2</sup> and a coastline stretching 108,000 km. This extensive coastline presents significant challenges in coastal management, particularly in regions like Bali, which has a coastline of 633 km. Coastal erosion has become a critical issue, notably in Gianyar Regency, where significant erosion rates have been observed. To address this, the Indonesian government has implemented revetment structures along the coastline, including at Lebih Beach, to mitigate the impacts of coastal erosion. Revetments are crucial in coastal protection, designed to prevent erosion and safeguard the shoreline. However, at Lebih Beach, severe coastal flooding occurred in 2019 and 2022, leading to substantial wave overtopping of the revetment structures. Wave overtopping, driven by factors such as sea level rise, wave dynamics, and climate change, can compromise the structural integrity

In this paper, I/we report on / show that:



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	of these protections if not properly designed. Despite advancements in coastal protection, Gianyar
	Regency continues to experience alarming levels of erosion, exacerbated by climate change and the lack of
	comprehensive evaluations of existing structures. This research aims to address these gaps by evaluating the performance of the revetment structure at Lebih Beach, assessing its effectiveness in mitigating wave overtopping, and recommending necessary improvements. A novel methodological approach, integrating field surveys with hydraulic analyses using the CMS-Wave model, will be employed to determine the optimal revetment height required to protect the coastline effectively.Therefore, this research aims to evaluate the existing revetment structure at Lebih Beach comprehensively. This research evaluates the performance of the existing revetment structure at Lebih Beach against contemporary wave conditions, focusing on its physical and functional effectiveness in mitigating wave overtopping. This study seeks to assess the adequacy of the revetment in safeguarding the coastline and to recommend requisite adjustments or enhancements. A novel methodological approach will be employed, integrating structural evaluation results from field surveys with comprehensive wave hydraulic analyses utilizing the CMS-Wave model in SMS 10.1. This dual methodology will facilitate the determination of the optimal revetment height necessary to mitigate wave
Research Problem	overtopping and coastal flooding effectively.
TResearch Floblen	and wave overtopping at Lebih Beach in Gianyar Regency, Bali, despite the construction of revetment structures designed to protect the shoreline. The current revetments have proven inadequate in preventing wave overtopping during severe weather events, such as those in 2019 and 2022, leading to damage and disruption to the local community. This issue is exacerbated by factors like climate change, sea level rise, and inadequate revetment crest height, highlighting the need for a comprehensive evaluation of the existing coastal protection measures. The research seeks to assess the physical and functional effectiveness of the current revetment structures and to recommend necessary adjustments or enhancements to ensure



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	adequate coastal protection.
Overview of Method	adequate coastal protection. This study focuses on evaluating the physical and functional performance of the revetment structures at Lebih Beach in Gianyar Regency, Bali. The coastline was divided into six segments due to the varying conditions of the revetment structures in each area. The research involves both field-based observations and advanced data analysis techniques, incorporating data such as topographic and bathymetric maps, wind data (2014-2023), tidal data, and geographical information about Bali Island. The methodology begins with an initial survey to gather preliminary information about the revetment structures and identify key issues like erosion, wave overtopping, and structural damage. Subsequent problem identification guides targeted data collection, focusing on the revetment's physical condition through detailed inspections. This primary data is then used to assess whether the revetment effectively protects the coastline and remains structurally sound. The evaluation process includes the use of comprehensive maps, wind data, and tidal information to simulate wave conditions that the revetment might encounter. The SMS 10.1 software is employed to simulate wave transformations and determine the wave height at the revetment, which is then used to calculate the necessary crest elevation to prevent overtopping. The study also calculates the structure's condition index, along with the functional performance values (classified as "Good" or "Bad"), helps determine the necessary actions, ranging from monitoring to rehabilitation. The wave generation process, essential for understanding wave impacts on the revetment, is
	simulate wave transformations and determine the wave height at the revetment, which is then used to calculate the necessary crest elevation to prevent overtopping. The study also calculates the structure's condition index, using a scale from 1 (best condition) to 4 (worst condition), based on observed indicators. This index, along with the functional performance values (classified as "Good" or "Bad"), helps determine the necessary actions, ranging from monitoring to rehabilitation.
	The wave generation process, essential for understanding wave impacts on the revetment, is modelled using wind stress factors, effective fetch, and sea wind speed. The wave height and period are calculated, followed by the simulation of wave transformation using the CMS-Wave model. Water surface fluctuations, including wave set-up, wind set-up, and sea level rise, are also calculated to determine the design water level, ensuring the revetment can withstand varying water pressures.





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	elevation, incorporating factors like run-up and freeboard, to evaluate whether the existing structures are adequate or require enhancements to mitigate wave overtopping effectively.
Significant finding	The study provides a comprehensive evaluation of the physical condition and functional performance of the revetment structure at Lebih Beach by assessing different segments (S1 to S6). The analysis reveals a significant variation in structural integrity across the segments. Segment S2 emerges as the most robust, displaying high index values in the crest, body, and material components, which suggests effective maintenance and resilience against wave forces. However, other segments, particularly S1, S3, S4, S5, and S6, exhibit notably lower index values, indicating considerable deterioration. For instance, Segment S1, while showing some strength in its material and body components, is weakened by deficiencies in the crest and foundation. The consistently low ratings across segments S3, S4, S5, and S6 underscore a critical need for urgent structural improvements to enhance their ability to protect the coastline. The analysis indicates that while certain areas of the revetment are adequately maintained, others are in a state of significant disrepair, necessitating immediate intervention to ensure the overall effectiveness of the coastal defense structure.

We have no conflicts of interest to disclose.

Thank you for your consideration of this manuscript.

Sincerely, I Gusti Agung Putu Eryani



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## AUTHORSHIP STATEMENT

I/We wish to submit an original research article entitled "[*title of article*]" for consideration by SINERGI.

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript.

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Please send 3 (three) prospective reviewers (who are not yet registered in SINERGI) to speed up the review process who are competent for the topic and have a good reputation in the field. Please ensure that *they are willing to review* this paper.

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