

Multi-hazard Assessment in Penida Island, Bali Using Coastal Hazard Wheel

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Introduction



Penida Island's stunning natural scenery has attracted a growing number of tourists, resulting in increased villa development along its coastal areas. However, because the island faces the Indian Ocean and lies close to one of the world's most active tectonic plates, it is highly susceptible to tsunamis. To address and manage such risks, the Coastal Hazard Wheel (CHW) can be used as a simple tool for assessing coastal hazards and providing recommendations for local coastal management (1).

Methodology



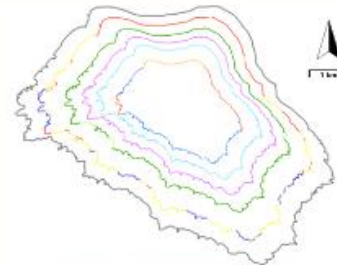
- Data Collection:
DEM SRTM, Geology Map, Land Cover, Tidal and Wave Data.
- CHW Parameterization :
(1) Landform; (2) Wave exposure; (3) Tidal range; (4) Flora/Fauna; (5) Sediment balance; (6) Storm climate
- This research focused in Coastal Area of Penida Island, Bali

Implication



Coastal Management	A	B	C	D	E
Coastal zoning	All	1-5	All	All	All
Ecosystem based management	All				
Fluvial sediment management	1; 2	1; 2	1; 2	1; 2; 4	1; 2
Wetland restoration	1; 2; 4	1; 2; 4	1; 2; 4	1; 2; 4	1; 2; 4
Coastal setback		All		1; 2	1-5
Managed realignment		1-5		1; 2	1-5
Dikes		1-5	1-5		1-5
Floodproofing		1-5			1-5
Flood mapping					1-5
Flood warning system					1-5
Floating agricultural system		1; 2	1; 2		1; 2
Land claim		1; 2		1; 2	
Groundwater management		1; 2	All		
Cliff stabilization					
Tsunami warning system					All

Results



Overlay map of each CHW parameter

Coastal Hazard Class

CHW	A	B	C	D	E
PL-10	4	4	2	3	3
PL-14	4	4	2	3	3
FR-18	1	3	2	1	2
FR-20	3	3	2	1	2
FR-22	4	3	2	1	2
R-1	1	1	1	1	1
R-3	4	1	1	1	1

A : Ecosystem
B : Inundation
C : Intrusion
D : Erosion
E : Flooding

Discussion



Based on the CHW assessment, Penida Island has seven coastal hazard classes, with ecosystem and inundation hazards being the most dominant. The CHW also provides priority coastal management recommendations in the form of coastal zoning, which can help mitigate coastal hazards identified across the five listed classes.

Conclusions



Penida Island faces coastal hazards that affect both its ecosystems and flooding risk. Effective coastal management should include the implementation of coastal zoning.

References



Widantara KW, Mutaqin BW. 2024. Multi-hazard assessment in the coastal tourism city of Denpasar, Bali, Indonesia. *Natural Hazard*. 170: 7105-7138.

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