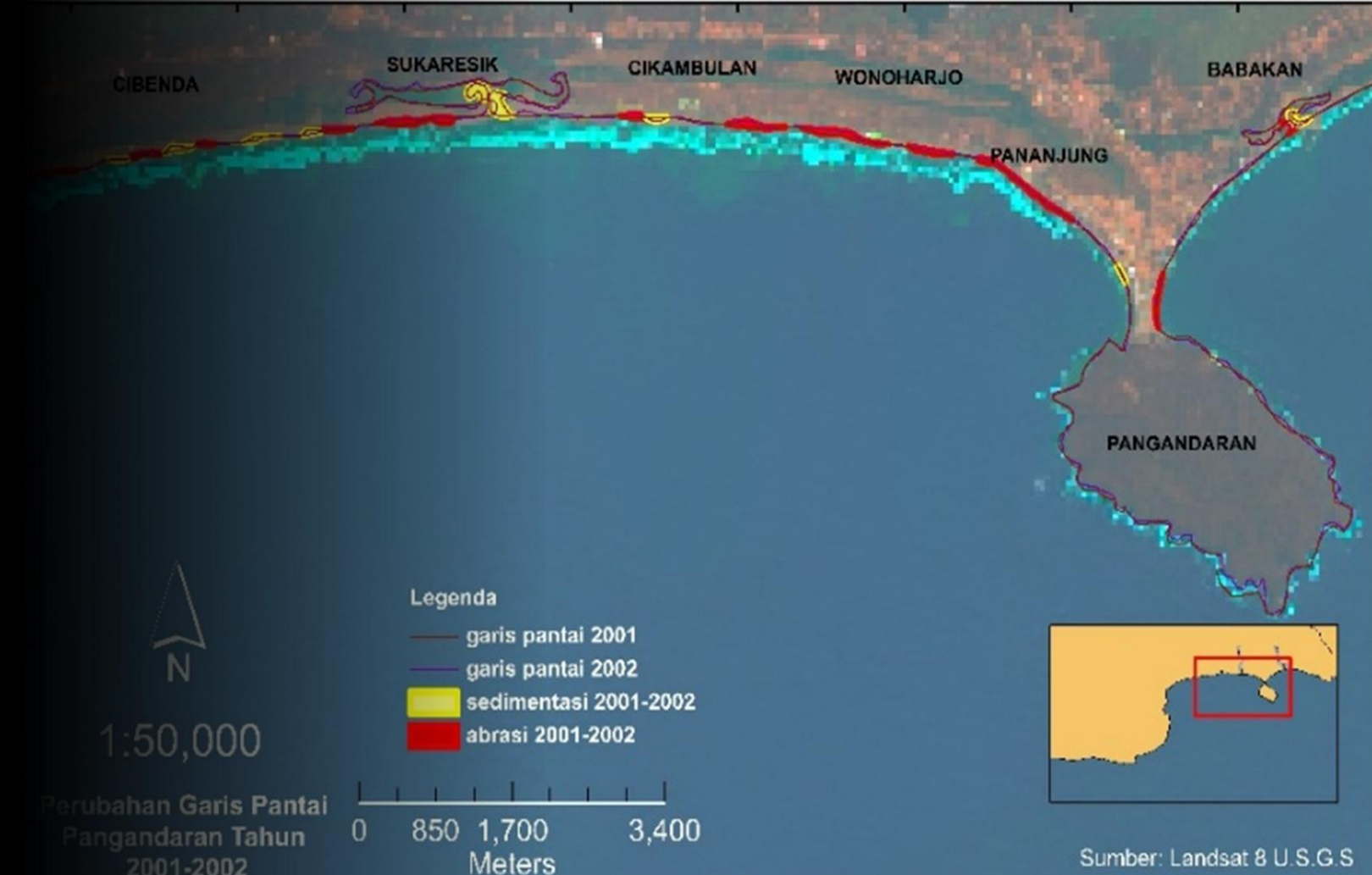# STUDY OF *COASTAL VULNERABILITY* CAUSED BY SHORELINE CHANGE AROUND PANGANDARAN COAST 2001-2016

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INTRODUCTION

Pangandaran Regency is an expansion area of Ciamis Regency which has geographical location latitude -7.710439º and longitude108.48346º. This regency consists of 10 districts and 98 villages. The condition of the coastal ecosystem in Ciamis Regency, including Pangandaran, along 60 kilometers is damaged[1]. The destruction of this coastal ecosystem extends from Kalipucang to Cimerak. West Coast Pangandaran has occured an abrasion of almost 200 m and the coastal tourist area of Batukaras, Cijulang District has occurred an abrasion along the four kilometers and 12 meters wide. The abrasion that occurred in Pangandaran was caused by bad weather and the absence of break water[2].

Remote sensing is science and art of obtaining information about an object, area, or phenomenon through an analysis of data acquired by a device that is not in direct contact with the area, object, or phenomenon under investigation[3]. This research uses remote sensing method because to investigate the change of a coastline, it is necessary to record the morphological condition of the study area from previous years. In addition, the time required to obtain data is much shorter than the direct survey method and can observe areas of study with a wide range of areas without being affected by the topography.

DATA & METHODS

Data in this research is divided into primary data and secondary data.

Primary data consist of :
* Visual of coastal damage
* Length of coastal damage
* Width of coastal damage
* Land use
* Greenbelt width

Secondary data consist of :
* Landsat 7 and 8 satellite images from the US Geological Survey website (earthexplorer.usgs.gov)
* Tidal Range data taken from the Geospatial Information Board website (tides.big.go.id)
* Lithology data from BAPPEDA Pangandaran
* Coastal Slope data from BAPPEDA Pangandaran
* Bathymetric data is obtained from GEBCO (Global Bathymetric Chart of Oceans).
* Significant Wave High data taken by altimetry satellite (aviso.altimetry.fr) and reinforced with data of numerical model from Rizal (2017).

Landsat image data is processed by performing radiometric correction process and image reinforcement using **ENVI** software to obtain image results that have better pixel values and eliminate the effect of atmospheric disturbances making it easier to interpret visually. Corrected image data is digitized on its shoreline using **ArcGIS** software. Then overlay the shoreline every year interval, and analyzed the shoreline changes in the interval of the year.

Table 1. Matrix of coastal physic variable

No	Variable	Score				
		1	2	3	4	5
1	Shoreline Change Rate	0 m/yr	(0-1) m/yr	(1-5) m/yr	(5-10) m/yr	> 10 m/yr
2	Damage Visual	Visible symptoms of damage	eroded but still stable	eroded and looks will be ruins	eroded and ruins but not yet harm the infrastructure	eroded and ruins, harm the infrastructure
3	Damage Length	< 0,5 km	0,5-2 km	2-5 km	5-10 km	> 10 km
4	Damage Width	0 m/yr	1-10 m	10-50 m	50-100 m	> 100m
5	Greenbelt width	> 1500 m	(1000-1500) m	(500-1000) m	(50-500) m	< 50 m
6	Lithology	Rock		Sediment		
		igneous rock, sediment, metamorphic, solid and hard	sedimentary rock, fine grain, solid and soft	gravel and coarse sand, slightly solid	sand, silt, clay, slightly solid	sand, silt, clay, mud, loose
7	Wave Height	< 0,5 m	(0,5-1) m	(1-1,5) m	(1,5-2) m	> 2 m
8	Tidal Range	< 0,5 m	(0,5-1) m	(1-1,5) m	(1,5-2) m	> 2 m
9	Landuse	moor, wasteland, mangrove, and swamp	domestic tourist area and traditional fish ponds	rice field and intensive fish ponds	resident, harbor, office, school, and province road	cultural heritage, industry, state defense facility
10	Slope	0-2 %	2-5 %	5-10 %	10-15 %	> 15 %

$$CVI = \sqrt{\frac{multiple\ variable\ score}{sum\ variable\ score}}$$

Table 2. Classification of Vulnerability

CVI	0-25	25-50	50-75	> 75
Vulnerability	Low	Moderate	High	Very High

CONCLUSION

Based on the results of the research can be concluded as follows :
* The vulnerability of Pangandaran coastal area is divided into low, moderate , high and very high area. But, majority classified as a moderate vulnerability area (15 village).
* The area with the highest vulnerability is in Cibenda Village and the lowest vulnerability is in Karangjaladri Village.
* The highest shoreline erosion rate around Pangandaran Coast occured in Cikambulan Village of **53 m/yr** in 2001-2002 and the highest shorline accretion occurred in Babakan village of **31,5 m/yr** in 2014-2016.
* The largest area of abrasion occured in Batukaras Village area of 77,863 m2 in 2014 to 2016. The largest sedimentation area occured in the Legokjawa area of 75,250 m2 during 2002 to 2014.
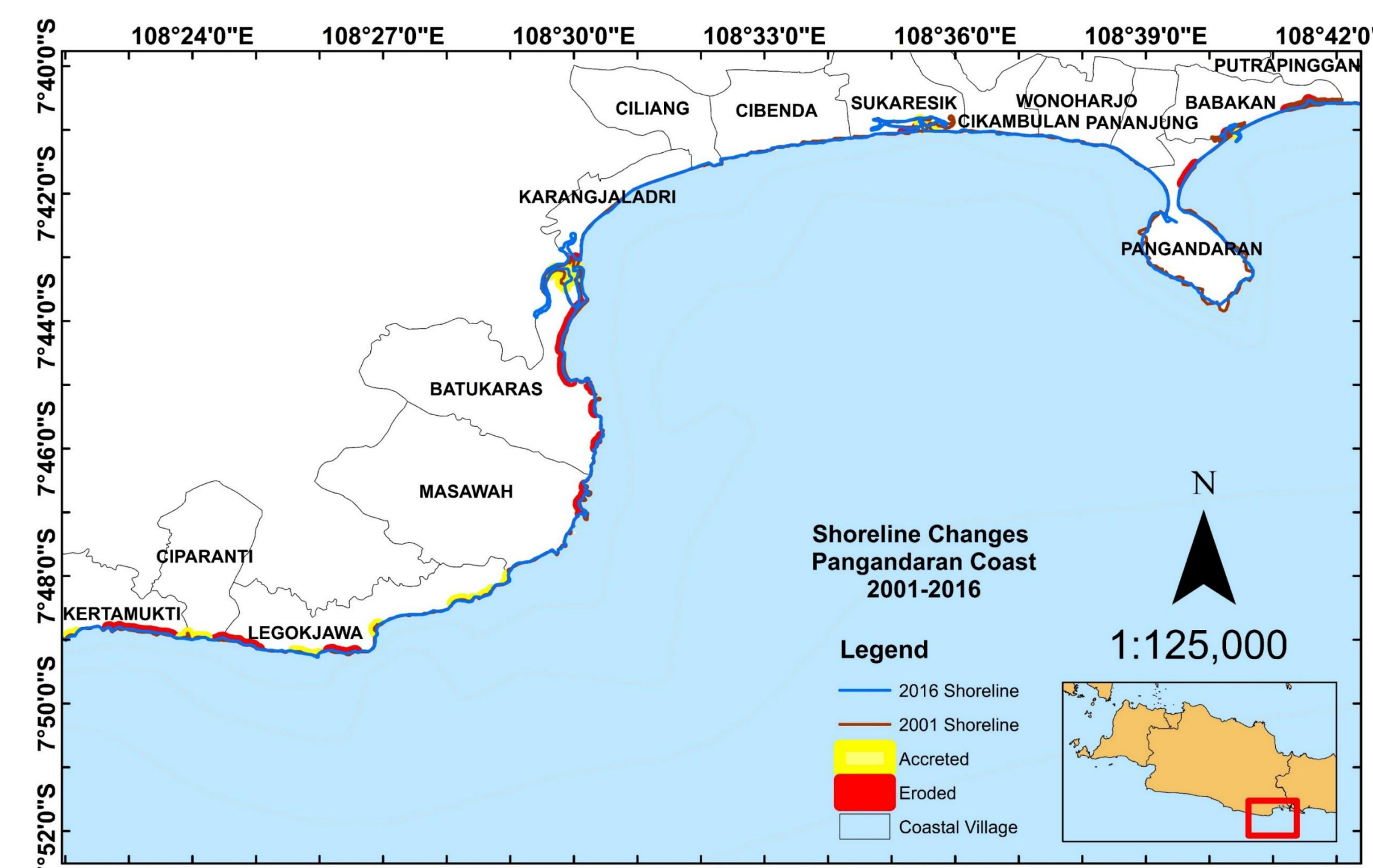
ACKNOWLEDGEMENT

Results

Fig 1. Map of Shoreline Change on Pangandaran Coast 2001-2016

Table 3. Average Rate Shoreline Change

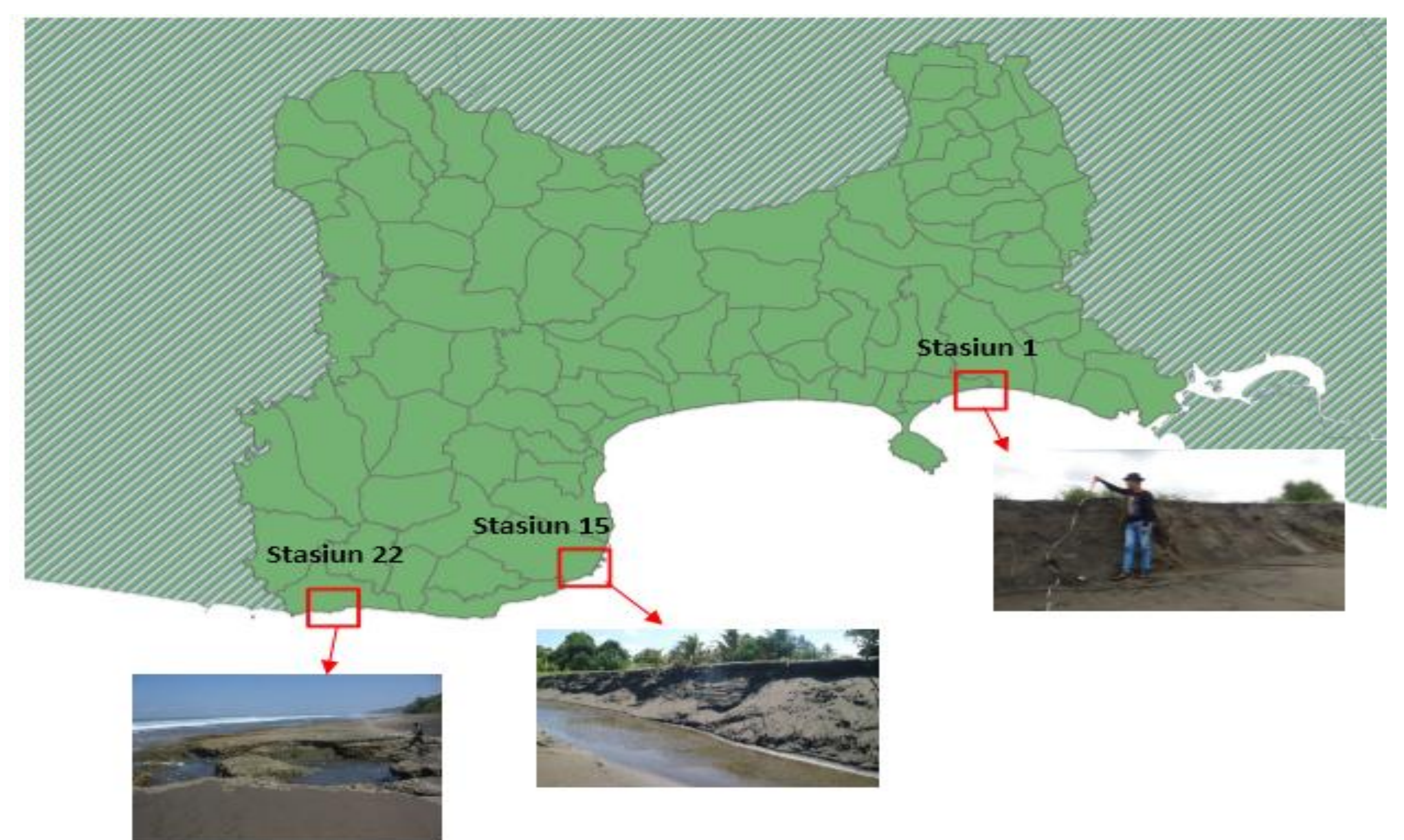| District	Rate of Shoreline Change (m/thn)
Kertamukti	-2.35
Legokjawa	0.91
Masawah	-5
Batukaras	-17.26
Karangjaladri	-11.86
Sukaresik	13.4
Pangandaran	2.05
Babakan	-17.29
Ciparanti	8.86
Putrapinggan	-3.166
Pananjung	-15.02
Cikambulan	-15.81
Cibenda	2.64
Ciliang	-14

Fig 2. Visual Damage of Coast Pangandaran
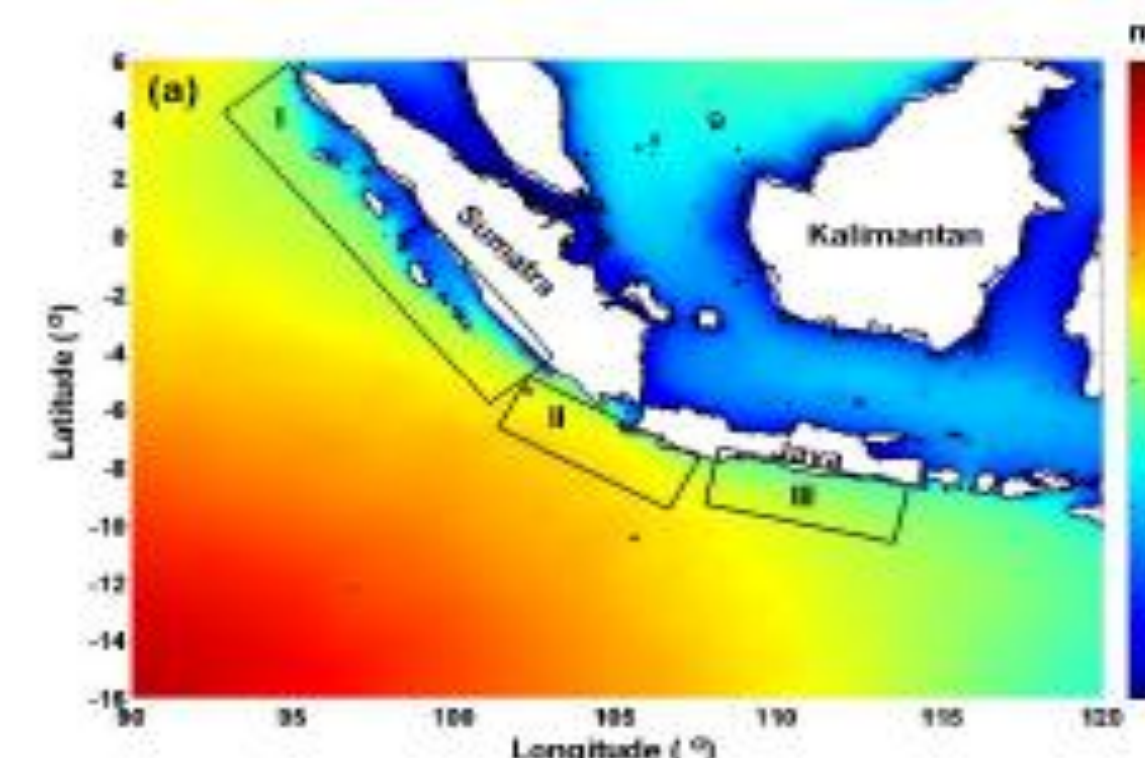
Fig 3. Distribution Average Wave Height
Source : Rizal, 2017

Table 4. Value of Wave Height

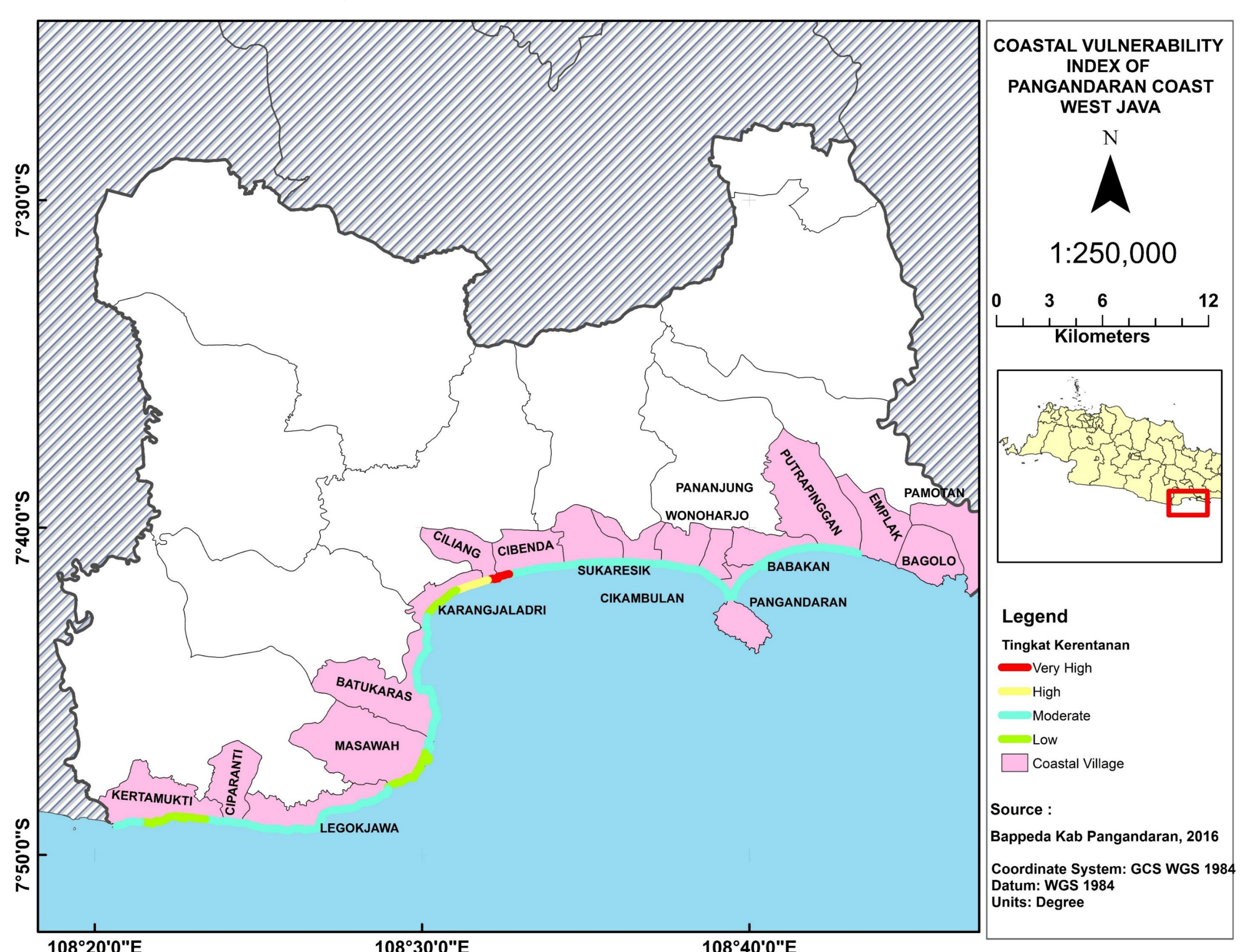| Hs (m)		
Zone I	Zone II	Zone III
0,83	1,21	1,04

Source : Rizal, 2017

Fig 4. Map of Coastal Vulnerability Classification of Pangandaran Coast

REFERENCES

[3]Lillesand dan Kiefer., 1979. *Remote Sensing and Image Interpretaion.* John Wiley & Sons Inc. New York.

Rizal, Ardian Mahiru., 2017, *Variasi Dan Tren Jangka Panjang (1988-2011) Energi Gelombang Di Perairan Selatan Jawa Dan Barat Sumatra Menggunakan Model Simulating Waves Nearshore (SWAN).* Tugas Akhir Program Studi Oseanografi, FITB-ITB, Bandung

[1]http://www.pikiran-rakyat.com/jawa-barat/2013/11/07/257640/pantai-barat-pangandaran-mengalami-abrasi accessed on 9th June 2017 19.00 pm

[2]http://www.harapanrakyat.com/2015/10/abrasi-di-pantai-batukaras-pangandaran-semakin-parah/ accessed on 9th June 2017 pukul 19.00 pm