Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 135 (2014) 123 – 129

Procedia
Social and Behavioral Sciences

CITIES 2013

Sea Level Rise Flood Zones: Mitigating Floods in Surabaya Coastal Area

Annisaa Hamidah Imaduddina[a], Widiyanto Hari Subagyo W[b].*

[a]*Urban and Regional Planning, ITS, Surabaya, Indonesia*
[b]*Urban and Regional Planning, ITS, Surabaya, Indonesia*

Abstract

Sea level rise (SLR) brings with it a negative impact towards Surabaya's coastal area as this particular part of the city is situated only 0-3 meters above sea level. The amount of damage due to the floods indicates the city's level of readiness in facing threats from the flood. With flood height up to 90 centimeters, it is necessary to classify flood risk levels in an attempt to reduce the impact that will occur.

This paper identify sea level rise by using least square regression, which generates the trend and prediction of sea level rise. The next analysis is the identification of a potentially disaster due to sea level rise by using multinomial logistic regression. Identification of flood hazard characteristics through weighted-overlay analysis using flood height and duration as variables. It also identifies factors influencing vulnerability using Delphi analysis. AHP Expert is then employed to calculate the weight of each factor. Vulnerable zones are determined using overlay-weighted-sum on each vulnerable factor. These results are then mapped using Raster Calculator method, placing emphasis on risk functions influenced by hazard and vulnerability.

The final result is a flood risk zone map which identifies 5 risk levels according to the National Disaster Mitigation Guidance.

Peer-review under responsibility of the Cities International Seminar Committee.

*Keywords:*Sea level rise, Mitigation, Risk zone.

1. Introduction

The increase of human activity, especially in the transportation, industry, building construction and human activities affect global climate change marked with an increase in Earth's average temperature from year to year.

* Corresponding author..
*E-mail address:*prananda.navitas@gmail.com

Peer-review under responsibility of the Cities International Seminar Committee.
doi:10.1016/j.sbspro.2014.07.335

Based on research by WWF, Indonesia has an increase in temperature by 0.3 ° C since 1990 and climate change scenarios conducted by WWF Indonesia and the IPCC reported that the temperature will increase by 1.3 ° C to 4.6 ° C in 2100 with the rate by 0.1 ° C to 0.4 ° C that will lead to the sea level rise by 20 - 100 cm in 100 years. The rising of sea level (sea level rise) causes some islands and places lower than sea level in potentiall disaster, which is the fact that in coastal areas.

Surabaya, the second largest city in Indonesia as well as the capital of East Java province, is coastal city that has a delta system in coastal morphology and topography is located on low (average 0-6 meters above sea level) with an average slope <3 % (RTRW Surabaya). P3O-LIPI investigators (1991), meiviana et al (2004) in Proceedings of the National Seminar on Serealia (2009) and workshop proceedings (2010) showed the rate of sea level rise on coastal Surabaya as high as 5.47 mm per year, calculated in the period of 64 years (1925-1989), where the presence of sea level rise brings up the height of tide gauges. Based on data BMKG Maritim Tanjung Perak, Surabaya city was flooded due to the tide height between 150-170 cm above sea level. The followig impact due to sea level rise are the changes of coastal conditions, the increased erosion, the faster the damage to the buildings and the disruption of people's activities such as housing, industry, agriculture and others. Generally the extent of the damage occured will depend on the level and type of area edge of water used (UNDP, 2007).

2. Overview of Floods in Surabaya Coastal Area

Surabaya is located in south latitude and east longitude between 7°12' s.d 7°21' South latitude dan 112°36' s.d 127°54' east longitude. The study area is sub-districts located in the Coastal city of Surabaya. Based on data from the Maritime BMKG Surabaya, 2011 The average maximum height of tide in coastal areas Surabaya is 150-170 cm above sea level and shows a significant rise of sea level rise in surabaya approximately 4.8 mm / year. Here is portraits of flooding due to tides in coastal areas Surabaya.

3. Analysis

Preparation of the risk zone map is one of the mitigation as a result of non structural sea level rise so as to position the community at different levels of risk. here are the steps in the formulation of the risk zone.

3.1. Identification of Sea Level Rise

From the results of tidal analysis based on data per hour tidal Bakosurtanal of 20 years, with a datum Tanjung Perak Surabaya, dated January 1, 1984 to 31 December 2004 Surabaya tidal conditions are included tidal mix-leaning daily double (mixed tide prevelailing semidiurnal tide) which occurs twice a day ,twice as a high tide and twice as a low tide, but has a different height and periods. This type of tidal maters occurs a lot in the eastern Indonesiaobtained predictions of sea level rise trend,as follows:

Table 1. Prediction of Trend Sea Level Rise

No	Tides	Trend of Sea Level Rise	Sea Level Rise (mm/years)	Positions of Sea Level Rise (m)			
				2010	2050	2080	2100
1.	MSL	Y= 1.49737+0.0003x	4 mm/th	1.558	1.732	1.84	1.912
2.	M2	Y = 0.3158+0.0001x	1 mm/th	0.3471	0.3962	0.4311	0.455
3.	S2	Y= 0.3158+0.0001x	4.8 mm/th	0.325	0.515	0.659	1.038
4.	HHWL	Y=2.8308+0.0004x	4.8 mm/th	2.956	3.148	3.292	3.388

Source : analysis result, 2012