DAMAGE AND LOST ASSESSMENT (DALA) AFTER GIANT TIDAL WAVE USING UAV DATA IN DEPOK BEACH, PARANGTRITIS, KRETEK, BANTUL, YOGYAKARTA (CASE STUDY: GIANT TIDAL WAVE PERIOD JUNE 2016)

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Abstract. The phenomenon of the giant tide in the June 2016 hit several coastal areas in Indonesia. The southern regions of Java, especially the Special Region of Yogyakarta (DIY) have also been affected by the giant tidal wave. One area that is affected is Depok Beach, Parangtritis, Kretek, Bantul. The purpose of this study is to perform calculations of Damage and Loss Assessment (DaLA) in Depok Beach based on aerial photo taken using a drone. Data collection method used was field survey, taking aerial photo, and interviews with the local community. The level of damage to buildings is interpreted through aerial photography. There are 12 buildings were damaged by the giant tidal wave and are divided into three classes, namely the level of heavy damage (destroying three huts belonging to the community worth IDR 3,000,000), the degree of damage being (1 building destroyed wall, but still standing with IDR 3.500.000 worth of damage), and the level of minor damage in 8 houses eroded the foundation and house paint (losses reached IDR 5.000.000). Rate lose conducted by direct observation in the field and conduct interviews. Known at least a decline in economic conditions in the tourism sector that is shrinking turnover of houses (IDR 100,000/day) and travel businesses ATV (IDR 30.000/day). In addition, the economic downturn also occurred in the fisheries sector. Big waves for 3 days resulting in a potential loss of revenue of IDR 51.000.000.

Keywords: Giant Tidal Wave, UAV, Depok Beach, Bantul

1. Introduction

Coastal region is the entry door for the development of most regions of the world. Martinez et al. (2007) suggested that the coastal zone is one of the most influential region in the world in the development of settlements. Theories about the importance of coastal region is also applicable in Indonesia. It can be seen that most of the metropolis is in the coastal zone. Examples of these cities are Jakarta, Semarang, Surabaya, Makassar and many more.Considering the importance coastal region, the coastal area of sustainable management must be performed well.Theimportance of coastal zones is partly because theyaccommodate a wide range of strongly contrastingecosystems (Cocharda et al. 2008).

The dynamism of coastal zone largely affected from the interaction between waves, tides, and fluvial inputs,in their turn modified by relative sea-level changes, climatic setting,and neo-tectonic

processes (Pethick 1984).One of the main issues was currently became a national issue in Indonesia is huge waves that hit the south coast of Java, including Yogyakarta. Big waves problems became increasingly worse for the southern coast of Yogyakarta will serve as the "front yard" of Special Region of Yogyakarta.Depok Beach, which is located in Bantul district is one of the beaches affected by this huge wave.

The impact of huge waves in Depok Beach is the destruction of several stalls and setbacks that threaten shoreline of the tourist area. The purpose of this study was to quantify the damage and loss assessment due to big waves that occur in Depok Beach. Monitoring and assessment of damage and losses helpful for the future impact of large waves can be minimized.

2. Study Area

The study was conducted in Depok Beach, Parangtritis. Depok Beach is one of the beaches that were in Bantul. The location of Depok Beach is at coordinates 8°1'0"-8°0'30" S and 110°17'0"-110°18'0" E. The typology of Depok Beach is a sandy. Land use in Depok dominated by the seafood stalls, fish market, fish auction place, ATV rentals, fishing boat mooring, parking and visitor vehicles. Some trade and rental business has the potential to do in Depok Beach. The research location is the place that has the bustling traffic on Saturdays, Sundays and national holidays. The location of the research can be seen in Figure 1.

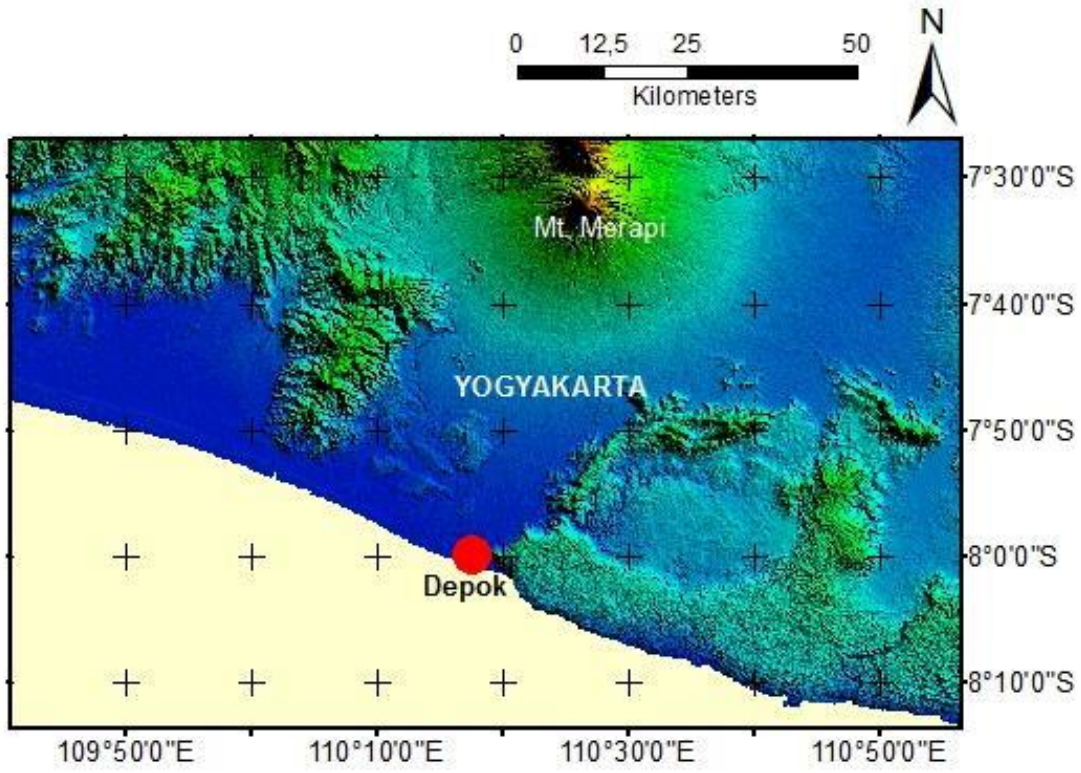

Figure 1. Study area. Source: Maulana, 2016

3. Data and Methods

Collecting data of Damage and Loss Assessment (DaLA) in Depok Beach is done by in-depth interview, taking aerial photo using UAVs, and field observations. In-depth interviews were conducted to public figures, fish traders, fishermen and All-Terrain Vehicle (ATV) businessmen. The interview aims to assess the losses experienced by the population in time of disaster and after the rob flood. In addition to losses in the event the fishery, which estimated losses in the form of losses in terms of buildings. Some buildings suffered damage and destruction caused by the flood. The photo shoot was

conducted to determine the data UAV starfish damages buildings flooded abrasion. Observations using UAV rated the best media easier and faster to assess losses caused by the disaster. Shortly after the disaster closed access to the scene, making field observations impossible. Field observations carried out at some point that is not directly affected by the flood event. Observations doing to take the documentation of the flooding impact. The data collected is a spatial data which is then processed using mathematical calculations to calculate losses. All obtained data performed calculations to estimate losses.

4. Results and Discussion

4.1. Giant Tidal Wave Period June 2016 of East Java

Southern coastal areas of Java are prone to giant tidal waves disasters. One of the most severe in 2006, precisely on July 17, 2006. (Amijaya et al. 2015; Tejakusuma 2008). Big wave that occurred in 2006 is said to be quite severe as to cause a tsunami, triggered an earthquake measuring 7.7 on the richter scale (the Meteorology and Geophysics Agency recorded 6.8 on the richter scale) on the south coast of Pangandaran with a depth of 34 kilometers (Tejakusuma 2008; Lavigne et al. 2007). Height of the tsunami generated in some locations recorded ranging from 4.2 to 10.4 meters (Hand 2014; Lavigne et al. 2007).Tsunami run-up heights in Batukaras reached 10.4 meters and went as far as 120 meters from the shoreline inland. Meanwhile, in Keboncarik tsunami run-up heights of 9.2 meters. Run-up height of 4.2 meters was found in Parangtritis (Smart et al. 2016; Hand 2014). The death toll is estimated at 668 people, 65 were declared missing, and 9299 people were injured as a result of this tsunami.

Genesis giant tidal wave, but did not cause a tsunami, was repeated in June 2016 from the west along the island of Sumatra, the southern part of East Nusa Tenggara, North Maluku, to Papua Barat (Kompas 2016a. Especially for the DIY coastal areas, peak tidal waves occur on 8-9 June 2016 in the sea with a wave height 4-6 meters. In June the weather should not be dominated by high rainfall. It is estimated that this extreme weather anomaly occurs because it relates to the La Nina phenomenon which causes the equatorial region of the Pacific Ocean decreases (Winarso 2016). Such conditions have an impact on the warming temperatures in the region of Indonesia intensifies as the Madden-Julian Oscillation, causing the number of clouds in the Indian Ocean increased (Balbeid et al. 2016).

Extreme weather conditions improve existing hydro-meteorological disasters in Indonesia, especially in Java. Disasters arising not only in coastal areas, but also on land. Some landslides occurred due to rainfall in the first 30 years of a shift. Rainfall during the rainy season is getting lower, while precipitation increases during the dry season (Kompas 2016b). This condition is triggered landslides and flooding in some areas in Central Java.

4.2. Aerial Photography of Depok Beach

High resolution Aerial Photography has become an alternative to fast response mapping. Aerial Photography activities are generally carried out in the assessment of disaster that occurs briefly. Aerial photography on Disaster assessment capable of extracting information affected by disaster.

The process of acquisition of aerial photographs in Depok Beach made on July 9, 2016. At the time of the shooting the air, the wave has lasted for three days on July 7, 2016. The spacecraft used was DJI Phantom 3 Professional. This is a type of unmanned Copter with four propellers and is able to maintain its position. This advantage provides convenience in doing a photo shoot straight in Depok Beach, Parangtritis with strong wind conditions. Utilization unmanned aerial photography is very effective to avoid the cloud cover (Niendyawati 2014).

The main obstacle in Remote sensing is the presence of cloud cover that often cover the object of study. Generally unmanned flown at a height of 50 meters above sea level to 450 meters above sea level. The advantages of UAVs capable of having high temporal resolution, in other words, this UAV is capable of recording the remote sensing data almost every time of need. The high mobility and ease operate UAVs make the UAV is able to be used in monitoring the coastline and disaster.

Aerial photo small format contains physical information such as land cover and land use in detail. Such information is a basic input for the analysis of potential losses for both economic loss, social and ecological in detail (Handayani 2014). Excess UAV can be summarized as follows: 1) it can be operated relatively quickly anywhere and anytime with relatively normal weather conditions so as to produce real-time data; 2) being able to fly low so as to produce a high resolution; 3) the cost is relatively cheap compared to manned flights, or even launch remote sensing satellite; 4) applications that can be accessed easily; and 5) without the need for pilots in UAV (Shofiyanti 2011).

Table 1. Specification of UAV

Specification of UAV		**Specification of camera**	
Type	Quadcopter	Censor	Sony EXMOR 1/2.3”
Hover accuracy	Vertical: 0.5 m Horizontal: 1,5 m	Lens	FOV 94^0 20mm
		Resolution	12.4 MP
GPS	GPS/GLONASS	Resolution of photo	4000x3000 pixel
Fly length	23 minutes	Format of photo	JPEG, DNG
Speed	16m/s	ISO	100 - 1600
Weight	1280 g (include battery and propellers)	Shutter speed	8s-1/8000s
Voltage	Intelligent Flight Battery 68 Wh / 15.2 V	Video record	UHD, FHD, HD
Remote control transmission distance	3 KM	Video format	MP4, MOV (MPEG-4 AVC/H.264)

Sumber: *http://www.dji.com/product/phantom-3-pro/inf*

Photographs are taken at 12:30 pm with a height of 55 meters in ortho (straight). Photos captured have a resolution of 2.5 cm. Photographed long coastline along the 400 meters. Shooting results showed traces of waves coming to the mainland reached 50 meters. This led to the building stalls and shops are located less than 50 meters of coastline hit by the waves resulting in approximately 5 buildings collapsed.

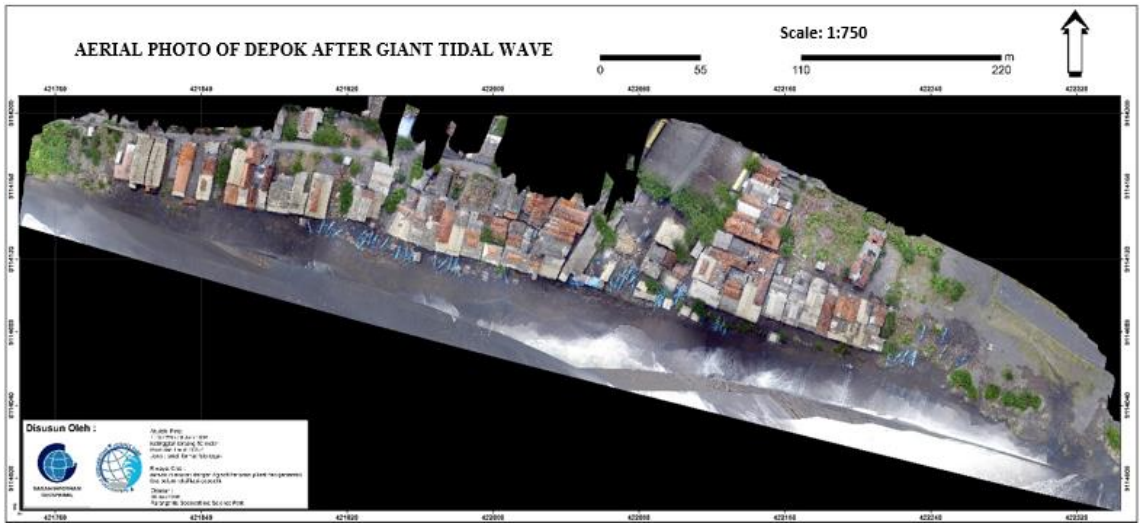

Figure 2. Aerial Photo of Depok Beach after Giant Tidal Wave (Source: Ibrahim 2016)

4.3. Damage and Loss Assessment post Giant Tidal Wave in Depok Beach Period June 2016

Depok Beach is one of the tourist attractions in Bantul. The land use in the coastal area of Depok, mostly used for restaurants and kiosks serving typical dishes of the coast. Besides trading, Depok residents also work as fishermen. Depok Beach is also used as a fisherman catches fish auction.

Figure 3. Fishermen activity in Depok Beach. Source: PGSP 2016

Recently, in the south coast of Java frequent bad weather. Bad weather conditions caused a wave of South Sea of Java to be quite high, so many fishermen are forced to fish (DIY Statistics 2014). The tidal wave phenomena also occurred back on 8 and June 9, 2016 which resulted in a lot of damage and loss, especially in Depok Beach. To calculate the amount of damage and losses that have occurred can use Damage and Loss Assessment method (DaLA). From the results of data collection in the field, the devastation in Depok Beach, classified into three types of damage can be observed in Table 2.

Table 2. Damage data post giant tidal wave in Depok Beach

No	Damage Level	Object	Unit	Model Kerusakan
1	High	Building	3	Houses Destroyed
2	Medium	Building	1	Collapsed Wall
3	Low	Building	8	The foundation eroded and damaged paint

Source: Analysis 2016

Data destruction in Depok Beach is the primary data taken directly from the field through field surveys. Furthermore, for the loss assessment, carried out by conducting interviews with community and in-depth interviews with local figures. Loss assessment results can be seen in Table 3.

Table 3. Loss data post giant tidal wave in Depok Beach

No	Sector	Description
1	Economy	An economic downturn in the tourism sector, which is shrinking turnover of restaurants and ATV businesses
2	Fisheries	A decrease in turnover of fishery

Source: Analysis 2016

Both the data, including data damage and loss, then converted to rupiah to get the magnitude of potential loss. The conversion results an estimated value arising from Tidal Wave in Depok Beach.

Thus the need for the reconstruction of buildings and rehabilitation of Coast region will fund, may soon be known. Calculation of conversion, can be seen in Table 4 and 5.

Table 3. Damage assessment post giant tidal wave in Depok Beach

No	Damage Level	Object	Unit	Cost	Conversion Result
1	High	Building	3	@IDR 3.000.000,00	IDR 9.000.000,00
2	Medium	Building	1	@IDR 3.500.000,00	IDR 3.500.000,00
3	Low	Building	8	@IDR 5.000.000,00	IDR 40.000.000,00
Total Conversion					IDR 52.500.000,00

Source: Analysis 2016

Table 4. Loss assessment post giant tidal wave in Depok Beach

No	Sector	Description	Time	Unit	Income	Conversion Result
1	Economy	An economic downturn in the tourism sector, which is shrinking turnover of restaurants	3 active days	27	@IDR 450.000,00	IDR 36.450.000,00
			2 holidays	27	@IDR 750.000,00	IDR 405.00.000,00
		ATV businesses	5 days	56	@IDR 75.000,00	IDR 21.000.000,00
2	Fisheries	A decrease in turnover of fishery	3 active days	25	@IDR 150.000,00	IDR 11.250.000,00
			2 holidays	25	@IDR 500.000,00	IDR 25.000.000,00
Total						IDR 134.200.000,00

Source: Analysis 2016

The analysis conducted found that the damage and loss estimates are quite large. That is because, Depok Beach area is an area of vital attraction, which became the foundation of society in the search for income. One area of public income Depok coast, influenced by the arrival of the tourists in the area. If the conditions of the coastal area are interrupted, automatically public revenue will also decline. Giant tidal waves in the southern island of Java, has the potential to happen again, so needed a good spatial planning in coastal areas Depok Beach.

5. Conclusions and Recommendations

Big wave that occurred in the South Coast of Java causing huge losses. Depok Beach is one of the beaches in Bantul, Yogyakarta affected by the huge waves. The total damage caused by the huge waves reaching IDR 52,500,000.00. Those damage includes damage to stalls located on the shoreline. The total loss caused by large waves reaching IDR 134,200,000.00. Structural mitigation efforts should be made to minimize the risk of large waves in the future.

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