Animated infographic as information media for earthquake and tsunami mitigation plan on the south coast of Bantul Indonesia

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Abstract. Bantul is a district located in the southern part of Yogyakarta Indonesia. Its located in the lowlands with coastal area on its border, Bantul is a district with the longest coastline in Yogyakarta Province, about 15.65 km. This condition makes Bantul Regency prone to earthquakes and tsunamis from the south coast. In normal situations, disaster management training and simulations are often carried out. However, during the current pandemic, this is no longer possible. This study aims to design an informative and effective information media about tsunami mitigation plan for the community in the pandemic situation. The research applied was descriptive qualitative method. The data were collected through literature study as the basis for designing infographic media. The result of this research is an animated infographic that uses a flat design visual style and is delivered in Javanese language.

1. Introduction
The Indonesian archipelago is geologically located on the collision course of three large tectonic plates, namely the Indo-Australian Ocean Plate, the Eurasian Continental Plate, and the Pacific Plate. Being on the meeting point of these tectonic plates causes Indonesia to have many mountains and volcanoes. The existence of these volcanoes fertilizes the Indonesian soil and makes it prone to various natural disasters.

Bantul is a district located in the southern part of Yogyakarta. Located in the lowlands at the tip of the southern coast of Yogyakarta, Bantul is the district with the longest coastline in Yogyakarta Province, which is about 15.65 km. The display of the coastline in Bantul Regency gives it many beautiful beaches as tourist destinations such as Parangtritis beach, Depok beach, and Goa Cemara beach. Located in the collision path between Indo-Australian Ocean and the Eurasian Continental Plates, Bantul is prone to natural disasters such as earthquakes and tsunamis.

Earthquakes are the original vibrations from within the earth which then propagates to the earth's surface, causing the land surface to shift and shake violently. Earthquakes can be caused by dynamics movements of the earth (tectonic), volcanic activity, falling meteors, under the sea avalanches, or nuclear bomb explosions. Tectonic earthquakes are the most common earthquakes. Tectonic earthquakes are vibrations coming from rock breaking events due to the collision of two plates in which the accumulated impact energy exceeds the strength of the rock [1].

The term tsunami comes from Japanese language. The word “tsu” means harbour, and “name” means wave. The term Tsunami is used for tidal waves that reach the harbour. On the high seas, for example,
there is an 8 metres tidal wave, but once it enters the port area, the height of the tidal wave gets as high as 30 m. Tsunamis usually occur when an earthquake happens on the seabed with a fairly large vertical movement. A tsunami can also occur if there is a volcanic eruption or an avalanche that occurs at the sea [1].

In the current pandemic situation, disaster mitigation training and simulations - which were usually carried out by gathering a large number of people - can no longer be done. This kind of condition can be circumvented by utilizing information media that can be used independently. The media must also look attractive and informative. To answer these problems, the researchers designed an animated infographic media as an effort to provide information about earthquake and tsunami mitigation for the coastal community in Bantul.

According to the Oxford Advanced Learner's Dictionary, infographic is information or data that is displayed in a graph or diagram, so that it is easier to understand. An infographic is an image that combines data and design. Infographics can help an individual or organization communicate a message to the audience briefly. More formally, infographics can be defined as visualizations of data or ideas that seeks to convey complex ideas but can be understood quickly and easily [2]. Infographics have several formats. The basic formats of infographic include static infographics, interactive infographics, and animated infographics [3]. The division of these types mainly depends on the multimedia components of the infographic [4].

As a medium for delivering messages, Infographics have many advantages. Infographics can simplify scientific facts into more attractive visual data. Infographics can utilize shortened text, integrated icons, images, illustrations and videos with technical workmanship that is increasingly easy to make. Infographics are easy to distribute, especially nowadays where the internet has become a widely accessible medium for everyone [1], [5], [6]. Several previous studies, especially in the field of education, have shown the effectiveness of using infographics when used as an alternative to text information [7], [8].

The result of this animated infographic creation is expected to help the coastal community in Bantul, both local residents and tourists, save their selves in case a disaster occurs.

2. Research Methods
This study used the ADDIE design method (Analysis, Design, Development/ Production, Implementation, and Evaluation). ADDIE model was first developed by the Center for Educational Technology at Florida State University in 1975. At that time, the ADDIE model was developed by Dick and Cary. It was further revised in 1981 by Russel Watson. The ADDIE model is an essential means in the development of education and training programs [9]. Here are the steps taken in designing the animated infographics about earthquakes and tsunami:

2.1. Analysis
In the analysis stage, the researcher collected data related to the animated infographic that would be created. The data collected include: 1) observation of the coastal area of Bantul related to efforts, infrastructure, and media regarding disaster mitigation that had been available and implemented previously, 2) expected target of the animated infographic, and 3) Audience’s understanding of the material to be presented. The data used in the animated infographic were obtained using several data collection methods such as interviews, observations and questionnaires. The data collected by the researcher were then processed as the basis of designing the animated infographic.

2.2. Design
The second stage in the ADDIE method is the design stage. At this stage, the researchers began to design the creative concepts based on the analysis results from the previous stage. Some of the creative concepts that were determined include scripts and visual concepts. The human eye has a tendency to see rather than to read. The human brain has a preference for information in visual form [13]. This makes graphics and information visualization an important part in the strategy of conveying information [14]. The
illustrations used in this animated infographic feature 2-dimensional illustrations in a flat style. The illustration reference refers to the illustration from the Kurzgesagt youtube channel, as shown in Figure 1. The color palettes selected were bright and contrasting colors that fit the intended target audience, as shown in Figure 2. The points in this design concept will be continued in the next stage: production.

![Figure 1. Visual reference taken from Kurzgesagt YouTube channel (https://youtu.be/EhAemz1v7dQ?t=13)](image1)

**Figure 1.** Visual reference taken from Kurzgesagt YouTube channel (https://youtu.be/EhAemz1v7dQ?t=13)

![Figure 2. Colour Palette](image2)

**Figure 2.** Colour Palette

2.3. Development/Production

The third stage is to realize the design concept into a product. At this stage, all creative concepts from scripts, illustrations, music were assembled into an animated infographic entitled *Cara Selamet saka Lindhu lan Tsunami* (How to Survive Earthquakes and Tsunamis). The visual display of the animated infographic is shown in figure 3. As a supporting media, several promotional media were also created to support the dissemination of the animated infographic video about disaster mitigation. As shown in figure 4, some of the media created were printed stickers and Instagram posts.

![Figure 3. Screen capture of the animated infographic](image3)

**Figure 3.** Screen capture of the animated infographic
2.4. Implementation

In the fourth stage, the animated infographics were shown to several sample audiences, namely those aged 17-35 years. Technically, this was done by uploading the animated videos through the YouTube channel, and sharing the link to several respondents. Some feedbacks were recorded and, if deemed appropriate, would be implemented.

2.5. Evaluation

In the last stage, the researcher implemented feedback from the respondents to improve the main work. One of the inputs was about the use of a language that was previously a mixture of Indonesian and Javanese. It was finally improved to be delivered in full Javanese language.

3. Discussion

Earthquakes and tsunamis have been recorded to have hit Bantul Regency several times. One of the major and destructive earthquakes that ever hit Bantul Regency was the Bantul earthquake in 2006. Based on the earthquake catalogue, several other major earthquakes had hit Bantul Regency beside the 2006 earthquake. The catalogue released by the Meteorology Climatology and Geophysics Council (BMKG) recorded significant and destructive earthquakes from 1821 to 2018 in Bantul district as listed in Table 1.

| Date         | Location  | Magnitude | Victim (person) | Damage (house) |
|--------------|-----------|-----------|-----------------|----------------|
| 26 Mei 2006  | Jawa Tengah | 5.9       | 22,544          | 204,831        |
| 08 August 2007 | Jawa barat | 6.9       | -               | -              |
| 26 June 2010 | Jawa Barat | 6.3       | -               | -              |
| 21 August 2010 | Yogyakarta | 5.0       | 7               | 29             |
| 08 July 2013 | Malang    | 5.9       | -               | -              |
| 25 January 2014 | Kebumen   | 6.5       | -               | -              |
| 16 Nov 2016  | Pantai Selatan | 6.2     | -               | -              |
| 23 Jan 2018  | Lebak     | 6.4       | -               | -              |

Disaster mitigation is a series of efforts to reduce disaster risk, both through physical development as well as awareness and capacity building in dealing with disaster threats (Article 1 paragraph 6 of
Government Regulation No. 21 of 2008 concerning the Implementation of Disaster Management). Some of the disaster mitigation activities include:

- disaster risk identification and monitoring;
- participatory disaster management planning;
- development of disaster awareness culture;
- implementation of physical, non-physical efforts, and disaster management arrangements;
- identification and recognition of sources of disaster hazards or threats;
- monitoring of natural resource management;
- monitoring of the use of high technology;
- supervision of the implementation of spatial planning and environmental management

From the above points about disaster mitigation, the animated infographic video shows the way to survive earthquakes and tsunamis on several aspects including:

a. Development of disaster awareness culture. This point is conveyed through information about how tectonic earthquakes occur, which then creates tsunamis that threaten communities located on the coast. This information raises public awareness of the coastal residents of Bantul, particularly about the disaster risks they face.

b. Implementation of physical, non-physical efforts, and disaster management arrangements. This point is conveyed through information about what the community should do when earthquake and tsunami occur. It is conveyed in the animated infographic that when an earthquake occurs, individuals should stay away from objects that have the potential to collapse and seek strong shelter. When a tsunami hits, each individual must know what to do, including: seek higher ground or escape to a tall building that has a strong foundation. If gets carried away by the current, people must hold on to objects that float easily and know how to find a refuge location.

c. Identification and recognition of the source of the hazard or threat of disaster. This point is conveyed through information on signs of a tsunami so that the community can prepare to take mitigation efforts.

d. Monitoring of the use of high technology. This point is conveyed through the information on how to find the location of a refugee camp using the help of a gadget.

4. Conclusion

Earthquakes and tsunamis are a problem that will never end because Indonesia is located in a disaster-prone location. During the current pandemic situation, disaster mitigation information must be delivered using interesting, informative, and easily accessible media. Today, most people prefer watching videos over reading text. Infographics are commonly made in digital format which is easy to share and not limited in terms of distribution [5][15]. Penetration of mobile devices and internet networks facilitate the efforts to disseminate disaster mitigation using animated infographics. Infographics can be published on YouTube or shared via WhatsApp as an effective alternative for mitigation plan dissemination.

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