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Implemetation of ArcGIS story maps as a media information and counseling of COVID-19 in palu city

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Article Info

ABSTRACT

The COVID-19 pandemic continues to increase, transmission, spread, and death rates are increasing, resulting in the implementation of large-scale social restrictions on community activities in Indonesia. This high rate of transmission can be caused by poor public behavior towards prevention programs that have been announced by the Government. In order to increase public knowledge in prevention and communication and minimize the spread of COVID-19, socialization and outreach media are needed that can encourage more effective delivery and dissemination of information. Technological developments encourage the delivery of information to become more interactive. One use of technology is delivering information with spatial integration through ArcGIS Story Maps. Story Maps can be handy for spreading knowledge on several topics, focusing on where the story occurs. In this paper, we explore the opportunities offered by Story Maps to implement Story Maps as an outreach media and a solution for socializing and disseminating information during the pandemic. Specifically, we refer to a series of different applications offered by Esri for building Story Maps based on different approaches and techniques. The results of using Story Maps are in the form of presenting information, information media, and counseling in the form of an interactive map which contains a general description of COVID-19, case conditions, level of spread, and how to handle it and related regulations through the Story Maps feature. This story map involves geospatial elements, web GIS, text, images, and video so that it can be an alternative solution for related parties in socializing and disseminating information during the pandemic.

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https://doi.org/10.52465/joscex.v4i4.194

1. INTRODUCTION

The investigation into a cluster of cases of unusual pneumonia by Chinese health authorities in December 2019, in Wuhan City, China, identified a novel coronavirus, severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) as the causative agent [1].

Subsequently, the virus spread globally, arriving on the African continent in February 2020 in Algeria and Egypt. As of 31 March 2021, over 3 million confirmed cases and over 75 thousand deaths have been reported in the World Health Organization (WHO) African Region [2].

The unprecedented scale and magnitude of the coronavirus disease 2019 (COVID-19) pandemic simultaneously affecting all 47 WHO member states required the reengineering of existing emergency information management systems at the WHO Regional Office for Africa (AFRO) to meet the demand of accurately collecting, analyzing, and disseminating timely information to enhance monitoring of the pandemic and inform public health response actions. WHO Emergency Response Framework requires timely collection and dissemination of health information during epidemics to guide evidence-based operations and support member states in mounting a public health response [3], [4].

A broad family of viruses called coronaviruses can infect both humans, animals and cause sickness. Infectious disease is brought on by the SARS syndrome and the most recent coronavirus (COVID-19). A particular virus that affects people and causes respiratory conditions is called COVID-19. Its surface, which is covered in spikes that resemble crowns, is referred to as the corona. The Covid-19 pandemic has reached all regions of the world [5], [6]. Coronavirus or severe acute respiratory syndrome coronavirus 2 (SARSCoV-2) is a virus that attacks the respiratory system. Disease due to infection with this virus is called COVID-19. This virus has a negative impact on a person's health which is accompanied by mild to severe symptoms such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) [7], [8].

COVID-19 is a new type of disease that has never been identified in humans before. This virus is transmitted through physical contact, sharing items with confirmed positive for COVID-19 patients, and not wearing masks when talking to people with COVID-19 [8]. The coronavirus can cause mild disorders of the respiratory system, severe lung infections, and even death. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), better known as the coronavirus, is a new type of coronavirus that is transmitted to humans. Coronavirus is a collection of viruses that can infect the respiratory system [9], [10].

Epidemiology in six continents, more than 1,998,.111 confirmed cases, 126.604 fatalities, and the presence of COVID-19 have been reported as of 15 April 2020 by 210 countries and territories worldwide. Hypoxia is more likely since the infection targets the lungs. The patient should be given oxygen and a nasal catheter immediately. The patient should have either minimally invasive or invasive mechanical ventilation in an emergency [5].

The phenomenon of the beginning of 2020 has become a year that has attracted quite a lot of attention around the world. In Indonesia, the spread of this virus was first reported in March 2020. The addition of cases of the COVID-19 virus in the country in the last two years has become the center of attention. It started with a spike in patients infected with the COVID-19 virus and until now it continues to spread, attack, and even mutate in the body [11].

The COVID-19 pandemic has had a global impact hitting more than 200 countries [12]. Indonesia is one of the countries where regencies and cities have been most struck [13], This situation exacerbates some countries' policies in responding to this pandemic, from social distancing to lockdown policies [14]. The Covid-19 pandemic has reached all regions of the world in 2020 as we know all teaching and learning activities in Indonesia will be carried out online to avoid the spread of the COVID-19 virus [15]. COVID-19 is an infectious disease caused by a new type of coronavirus. The virus that spread from China caused a pandemic that hit every country on various continents. To avoid the widespread spread in March, the President of Indonesia implemented a policy that forced us to do our activities online [16], [17].

Observations of the number of cases and the estimated risk of death indicate that increased public health mediation, good hygienic conditions, social distancing, and restrictions on public movement can control the COVID-19 epidemic [18], [19]. This virus is growing rapidly along with a very high spike in patients with the same complaint so that the condition is designated as a pandemic case. This caused the greatest loss, especially to the health and world economy which stopped almost overnight [20]. The latest update published by WHO, Indonesia reported 1,051,795 confirmed cases of COVID-19, 29,518 deaths, but 852,260 patients who recovered [2], [21].

Epidemics including SARS, Zika, and Ebola employed GIS to ensure authorities and responders were equipped with up-to-date map-based information about confirmed cases, populations at highest risk, and availability of healthcare resources [22]. GIS has also been used for decades to manage immunization campaigns around the world [23]. However, the advent of web-based GIS software tools, spatial data, map-enabled surveys, and interactive visualizations, coupled with the rapidly advancing global nature of the COVID-19 pandemic, further solidified the role of GIS as a critical, broadly useful, and efficient tool for

response [24], [25]. Almost immediately after the COVID-19 outbreak was first identified, GIS was used to analyze, formulate plans, and mitigate impacts. Within weeks, thousands of organizations were deploying GIS to study the situation, and millions more were consuming the resulting maps and data. Esri responded to more than 5300 requests for assistance globally.

Story Maps can be not only robust but also versatile tools for visualizing spatial data effectively and when combined with multi-media assets (e.g., photos, videos, 3D representations) and narrative text, they can provide support for scientific storytelling in a compelling and straightforward way [26]. Thereby, Story Maps can be used in order to disseminate and understand scientific findings to broader non-technical audiences [27], [28].

To prevent the spread of this virus, a map is needed. The map must describe areas that are affected by the spread of the virus and areas that are still minimally spread as well as useful information related to this virus. Maps can be used as a medium to convey geospatial information about the real world [29].

Maps can tell stories about the real world, and object relationships in the real world all the time [8], [28]. Maps can be enriched by utilizing various media and narratives to present information interactively. An example of an application for presenting stories that are equipped with maps and various media and narrations is the ESRI Story Map [30], [31]. Esri Story Maps is a web-based geospatial information system (GIS) application developed by ESRI using the ArcGIS Online platform. The Esri Story Map is capable of telling a location-based story [32].

In order for the maps to be understood and read by the wider community, a storytelling map technique is needed. The storytelling map technique is an advanced method for conveying messages to users directly on a geospatial basis [33]. Storytelling maps contain stories in which there are maps (geospatial information) or geospatial data and story narratives made for the purpose of conveying problems, spreading knowledge, and so on [34]. By producing maps that can be read and understood by the public, it is hoped that the spread of this virus can be suppressed and in areas where there are not many cases, additional cases of its spread can be minimized.

This study aims to explore the opportunities offered by Story Maps to implement Story Maps as an outreach media and a solution for socializing and disseminating information during the pandemic. Provide spatial information in the form of a map of COVID-19 cases, the number of exposures, and the distribution of referral hospitals that can be obtained and accessed via ArcGIS Story Maps. Apart from that, it can provide knowledge and information for the community and become an alternative solution for related parties in conducting good counseling and dissemination of information during a pandemic.

2. METHOD

The research methodology describes the stages carried out in a study. The methodology flow can be shown in Figure 1.
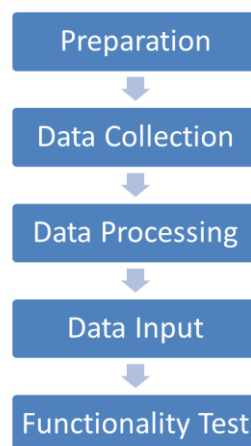

Figure 1. Methodology flow

This study uses secondary research methods. Secondary research is a research method that involves the use of existing data, including published research materials in research reports and similar documents provided by public libraries, websites, government, and non-government institutions that can be used for research purposes. This method is run with. This research consists of 5 stages, namely preparation, data collection, data processing, uploading or inputting, and functionality testing. There are several stages in processing the data in order to achieve the expected goals:

2.1 Preparation

At the preparatory stage, identification and formulation of the problem were carried out, and then carried out a literature study. In this stage, a search for data sources is carried out in the form of articles, books, regulations, and related journals that are appropriate to the topic of this research as a comparison and additional material in this research.

2.2 Data Collection

The second stage is data collection, the data used is spatial data in the form of a map of the administrative boundaries of the city of Palu and 13 coordinates of the location of referral hospitals. Then non-spatial data in the form of COVID-19 case data (7 days) which includes positive and confirmed cases, was obtained from the City Government website and other trusted sources on the internet.

2.3 Data Preprocessing

The third stage is data processing, at this stage the data that has been collected in the previous stage is carried out by processing spatial data and creating attributes (database). There are 2 stages of data processing, namely spatial data processing and attribute data. Spatial data processing using ArcGIS 10.8 software and attribute data processing using Microsoft excel software. Then the two data are processed into information using a database.

2.4 Data Input

Then the next step is the creation and input of data in the form of spatial data, photos or drawings, video, and narration to the GIS portal and Story Maps. Story maps contain stories in which there are maps (geospatial information) or geospatial data and story narratives that aim to convey information, disseminate knowledge, and so on [8].

2.4 Functionally Test

The fourth or final stage is results and analysis, in this stage, a program or functionality test is carried out. In this test, it is done by accessing the application using several different internet browsers. This study uses Google Chrome, Mozilla Firefox, Opera and Microsoft Edge browsers on computer devices and uses Google Chrome, Firefox Rocket, Opera Mini and Safari browsers on smartphone devices.

The method is applied to solve problems including procedures, measuring, and analytical methods. Methods should make the reader able to reproduce your experiment. Provide enough detail to allow the work to be reproduced. The published method should be indicated by reference: only relevant modifications should be explained. Do not repeat details of existing methods, just refer to the literature.

3.   RESULTS AND DISCUSSIONS
3.1 Title and Header

The results of this study are a story map entitled "Development of August 2021 COVID-19 Cases (Diffusion Level in Palu Village)". The template chosen for making story maps in this study is Story Maps full of navigation. In general, this story map consists of several sections, introduction to COVID-19, Spread, and Development, Classification and Criteria, Prevention, and Information. (Figure 2).

Figure 2. Lung cancer

3.2 Header

The sub-section contains information on COVID-19 starting from the GIS portal, photos, images, narrations, videos, and related news. The layout on the story map page is designed to attract attention and be easily understood by users. This story map was designed as a platform for presenting information and as a media for outreach about COVID-19.
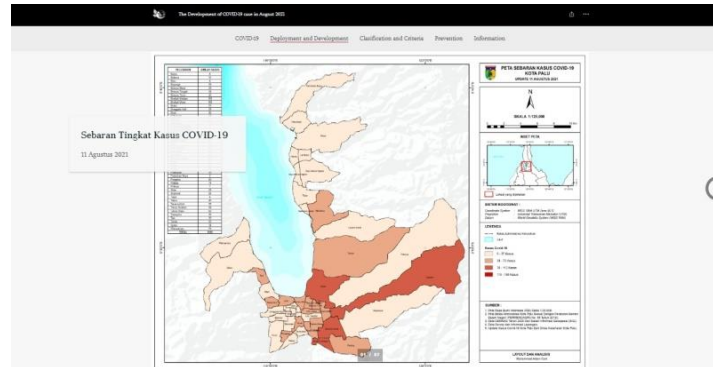

Figure 3. Map of the number of cases

In the COVID-19 section, the page displays explanations and problems of COVID-19. In addition, images and a web map of the distribution of cases by word are loaded, so that the information presented can be easily accessed and downloaded by users. The next part of the story map is narrative information from each part which is equipped with photo and image captions. In this section of the map page, users can find out information on the development of COVID-19, starting from initial confirmation, conditions, and current status in Indonesia.

There is some information about the criteria and classifications for handling COVID-19 cases. Several terms are used by the Ministry of Health of the Republic of Indonesia: suspected case, probable case, confirmation case, close contact, traveler, discarded, completed isolation period, and death. This criterion is based on the patient's condition and track record, this narrative information is shown in Figure 4.

Figure 4. Narrative information and text

3.3 Dashboard

In presenting the data on this story map, an analysis was carried out on 45 sub-districts in Palu City (with 7 days of cases). The results of the analysis show the number of cases in each sub-district based on confirmation days, which are loaded on the web map. The web map displays area boundaries and the distribution of cases in each sub-district in Palu City which is visualized with red polygons. This visualization will make it easier for users to distinguish the number of cases and help users to identify boundaries and coverage areas. The results of this analysis reveal that the high number of cases in a village is caused by the density of the population (Figure 5).
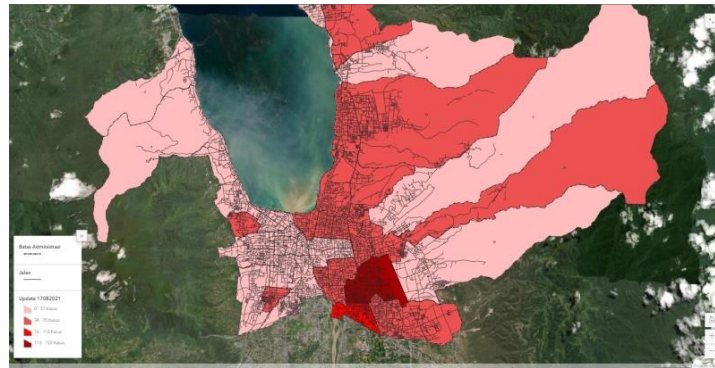
Figure 4. Web map COVID-19 case decelopment map in palu city

3.4 Map Tour

The map of the distribution of the community health clinic is presented using a map tour on the story map showing their location and on the left is the address and recent photos of the community health clinic and hospitals. Making it easier for users to see the location along with geographical conditions. The map page section is shown in Figure 6.
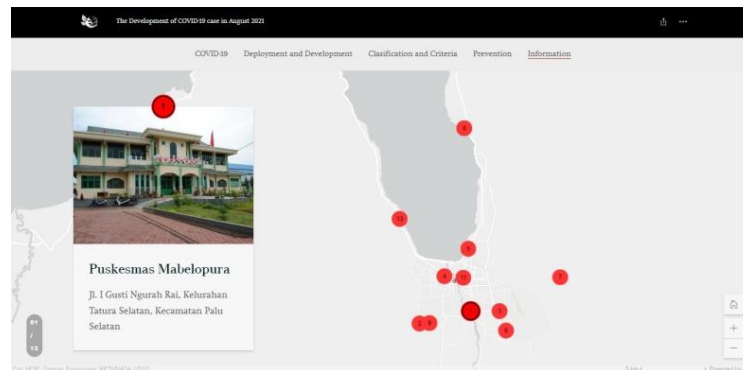

Figure 6. Distribution of referral hospitals and health centers for handling COVID-19 in palu city

3.5 Information

The last part (information) of this story map is the presentation of important information including call centers, distribution of community health centers and referral hospitals for handling COVID-19 in Palu City, regulations and protocols for COVID-19, information map for distribution of COVID-19 cases in Central Sulawesi, Corona statistics, Coronavirus COVID-19 (2019-nCoV) web portal, informational videos, and related news. Thus, users can find out the location, conditions, and the latest developments. Story pages are presented simply, so users can view information and developments by scrolling down the page.

3.6 System Functionality Test

System functionality testing is carried out by accessing the application using several different internet browsers using a computer and smartphone. The results of the system test can be seen in table 1.

Table 1. System Test Results

Tools	Web Browser	Result
Computer	Google Crome	Succeed
	Mozilla Firefox	Succeed
	Opera Mini	Succeed
	Microsoft Edge	Succeed
Smartphone	Google Crome	Succeed

Mozilla Firefox	Succeed
Opera Mini	Succeed
Safari	Succeed

4.   CONCLUSION

The results of making a story map entitled "The Development of COVID-19 case in August 2021 COVID-19 (Diffusion Level in Urban Village of Palu)" can be a medium for counseling and contributions in disseminating information related to COVID-19, especially in Palu City. These present information media, and counseling in the form of an interactive map which contains a general description of COVID-19, case conditions, level of spread, and how to handle it and related regulations through the Story Maps feature. This story map involves geospatial elements, web GIS, text, images, and video so that it can help the public more easily see the development of COVID-19 and find out the location of the distribution of health centers and referral hospitals for handling COVID-19 and that it can be an alternative solution for related parties in socializing and disseminating information during the pandemic.

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