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WebGIS Utilization for Information Dissemination of Indonesia Outer Small Islands

M T Al Asy'ari[1], M F Muhyidin[2], A Poniman[3] and M Supriyatno[4]

[134] Sensing Technology Program Study, Defense Technology Faculty

[2] Weaponry Technology Program Study, Defense Technology Faculty

Indonesia Defense University, Sentul, Indonesia

muhammad13@mhs.physics.its.ac.id; farid.muhyidin@gmail.com; arispk2007@gmail.com;

makmur.supriyatno@gmail.com

ABSTRACT:

Indonesia is a country that has an area of 1.9 million km2 with a total of 16,056 islands. The realization of Indonesia as an archipelagic country can be achieved by optimally and effectively utilizing the territorial wealth of Indonesia which is the capital and common property of the Indonesian people. As an archipelago, Indonesia must be able to maintain national security by safeguarding its territory and securing existing maritime resources. This research shows how to use webGIS using Google Earth web version, Google My Maps, and ArcGIS Online to disseminate information on Indonesia's outer small islands. From the results of the study, obtained information on the name of the island, another name of the island, waters, coordinates of the outer point of the island, administrative data, neighboring countries, and population. WebGIS that has been made requires additional data in the form of resolution satellite imagery to identify outermost small islands that are not clearly visible. With the dissemination of information on the outer small islands, it can help policymakers in the development of the outer small islands can be done by paying attention to aspects of defense and security.

Keywords: webGIS, Indonesia outer small islands, Google Earth web version, ArcGIS Online

1. INTRODUCTION

Indonesia is an archipelagic country that has an area of 1.9 million km2 with a total of 16,056 islands based on the Indonesian Central Statistics Agency in 2018. The realization of Indonesia as an archipelagic country can be achieved by optimally and effectively utilizing the territorial wealth of Indonesia which is the capital and common property of the Indonesian people. As an archipelago, Indonesia must be able to maintain national security by safeguarding its territory and securing existing maritime resources.

Based on the United Nations Convention of the Law of the Sea (UNCLOS), the island is a naturally formed land area surrounded by water and when the tide will be above sea level. Based on Presidential Decree No. 6 In 2017, Indonesia has 111 outer small islands which are the frontier points of measurement of the boundaries of Indonesia and other countries. The outer small islands are directly bordered by other countries, namely Malaysia, Singapore, Thailand, Vietnam, the Philippines, Papua New Guinea, Timor Leste, India, and Australia [1]. The outer small islands can trigger potential problems between two or more countries. The outermost small islands are very important for Indonesia, this is because the geographical position of Indonesia's outer islands determines the boundaries of the Indonesian state,

especially in determining the territorial waters of Indonesia [2]. The names of 111 Indonesia's outer small islands can be seen in Table 1 based on the Republic of Indonesia's Presidential Decree No.6 Year 2017.

Table 1. The names of Indonesia's outer small islands

The province	Number of Islands	The Name of the Outer Islands
Sumatera Utara	3	Simuk, Wunga and Berhala
Aceh	7	Simeuluecut, Salaut Besar, Raya, Rusa, Benggala, Rondo and Weh
Sumatera Barat	3	Sibarubaru, Pagai Utara and Sinyaunyau
Riau	4	Batumandi, Rupat, Bengkalis and Rangsang
Kepulauan Riau	22	Berakit, Sentut, Tokong Malang Biru, Damar, Mangkai, Tokong Nanas, Tokong Belayar, Tokong Boro, Semiun, Sebetul, Sekatung, Senua, Subi Kecil, Kepala, Tokonghiu Kecil, Karimun Kecil, Nipa, Pelampung, Batuberantai, Putri, Bintan and Malangberdaun
Lampung	1	Bertuah
Bengkulu	2	Enggano and Mega
Banten	3	Deli, Karangpabayang and Guhakolak
Jawa Barat	2	Batukolotok and Nusamanuk
Jawa Tengah	1	Nusa Kambangan
Jawa Timur	3	Nusabarong, Sekel and Panikan
Bali	1	Nusa Penida
Nusa Tenggara Barat	1	Sophialouisa
Nusa Tenggara Timur	7	Alor, Batek, Rote, Ndana, Sabu, Dana and Mangudu
Kalimantan Utara	2	Sebatik and Karang Unarang
Kalimantan Timur	2	Maratua and Sambit
Sulawesi Tengah	3	Lingian, Salando and Dolangan
Sulawesi Utara	12	Bongkil, Mantehage, Makalehi, Kawaluso, Kawio, Marore, Batubawaikang, Miangas, Marampit, Intata, Kakarotan and Kabaruan
Maluku	19	Arakula, Karerei, Penambulai, Kultubai Utara, Kultubai Selatan, Karang, Enu, Batugoyang, Nuhu Yut, Larat, Asutubun, Selaru, Batarkusu, Marsela, Metimarang, Leti, Kisar, Wetar and Liran
Maluku Utara	1	Yiew Besar
Papua Barat	3	Moff, Fani and Miossu
Papua	9	Fanildo, Bras, Bepondi, Liki, Habe, Komolom, Kolepon, Laag and Puriri

The outermost small islands become geopolitical interests in maintaining Indonesia's sovereignty because it is the starting point of Indonesia's borders with other countries. So it is necessary to optimally manage the outermost small islands that are the country's leading islands [3]. In addition, a strategy is needed to maintain the existence of the island in order to avoid cases of island escape from Indonesia such as the case of the release of Sipadan Island and Ligitan Island in 2002. The release of the two islands is based on an International Court

decision by applying the principle of effective control, as evidenced by the construction of lighthouses and a nature reserve that has been carried out by Malaysia [4].

Another problem with the outer small islands is the name problem. Naming the outer small islands can also lead to potential disputes between the two countries. The name Semakau Island was once a problem because Singapore claimed the Indonesian Semakau Island. This has been clarified that the Semakau Island in question is Semakau Island which is a part of Singapore. The misunderstanding occurred because there was a similarity between the name of Semakau Island in Indonesia and Semakau Island in Singapore [5].

The outer small islands that are far from the center of the Indonesian government are prone to cause problems with other countries. In addition to being far from the center of the Indonesian government, many of Indonesia's small outer islands are uninhabited, making them vulnerable to the control of other countries. In addition, there are several small outer islands that have the potential to be lost due to natural things such as abrasion. This will have an impact on the area of Indonesia and the border regions of Indonesia [6].

Website Geographic Information System (WebGIS), Based on the Decree of the Minister of Defense of the Republic of Indonesia Number: KEP / 1255 / M / XII / 2015 concerning the National Defense Policy of 2016, one of the efforts in the development of the outermost small islands is by building facilities and infrastructure including satellite-based remote monitoring and sensing vehicles. Remote sensing data in the form of images must be processed first through the stages of interpretation and analysis, so as to produce geospatial information that can be utilized. In-Law No. 4 In 2011, geospatial information is processed geospatial data that can be utilized as a tool in decision making, policy formulation, and activities related to geospatial.

The implementation of geospatial information can be carried out by collecting geospatial data, processing geospatial data and information, storing and securing geospatial data, disseminating data and geospatial information, and using geospatial information. So we need a geospatial-based information system commonly called the Geographic Information System (GIS). The system can be used to enter, store, process, analyze, and produce geo-referenced data [7]. Geographic Information System (GIS) can process spatial data from remote sensing data. Dissemination of geospatial data and information based on Law no. 4 of 2011 can be done by utilizing the internet so that it can be accessed by the public anywhere and anytime. So we need a web-based GIS which is commonly called the Web Geographic Informatics System (WebGIS) which can be accessed through a web browser.

WebGIS is based on client-server web architecture. The client functions to request a certain service to the server, while the server receives a service requested from the client. WebGIS can work with internet networks that adhere to the hypertext transfer protocol (HTTP) protocol [8]. WebGIS can be used as dissemination of information on the outer small islands needed for identification and inventory of islands in Indonesia as a database that can be used for the management of the islands in Indonesia. Systematic identification and inventory of islands are useful for obtaining accurate information because the number of islands in Indonesia is expressed in different amounts from various sources [9].

2.   METHODS

The design of webGIS for the dissemination of information on the outer small islands, the main data collected about the outer small islands listed in Presidential Decree No. 6 of 2017 in

the form of island names, other names of islands, coordinates of the outer points of the island based on latitude and longitude, waters, and base points and hints of island baselines. Data supporting the island in the form of a zip code, sub-district, district, nearest country and population. The application used in webGIS design can be seen in Table 2.

Table 2. Tools which is used in this research

Application	Purpose
1. Microsoft Excel	As a database of small islands outermost and as the conversion of the coordinates of the island in the format latitude longitude into latitude longitude. The coordinates conversion aims to make it easier to find the location of the island in Google Earth web version and ArcGIS.
2. Google Earth web version	As an analysis of the location of the outer small island whether in accordance with the coordinates that have been determined and as a tool to create webGIS.
3. Visual Studio Code	As an HTML text editor used to present information on the outer small islands and as a Keyhole Markup Language (KML) editor obtained from Google Earth web version.
4. Google My Maps	As a comparison webGIS with webGIS made using the Google Earth web version which only supports Google Chrome.
5. ArcGIS online	Used to create webGIS and as a comparison with webGIS created using the web version of Google Earth web version. Comparisons are made because the satellite imagery used by the two is different.

3. RESULT AND DISCUSSIONS

The coordinates of the outer small islands that are obtained based on Presidential Decree No. 6 of 2017 are checked with Google Earth web version. The results of the webGIS design using Google Earth web version can be seen in Figure 1.
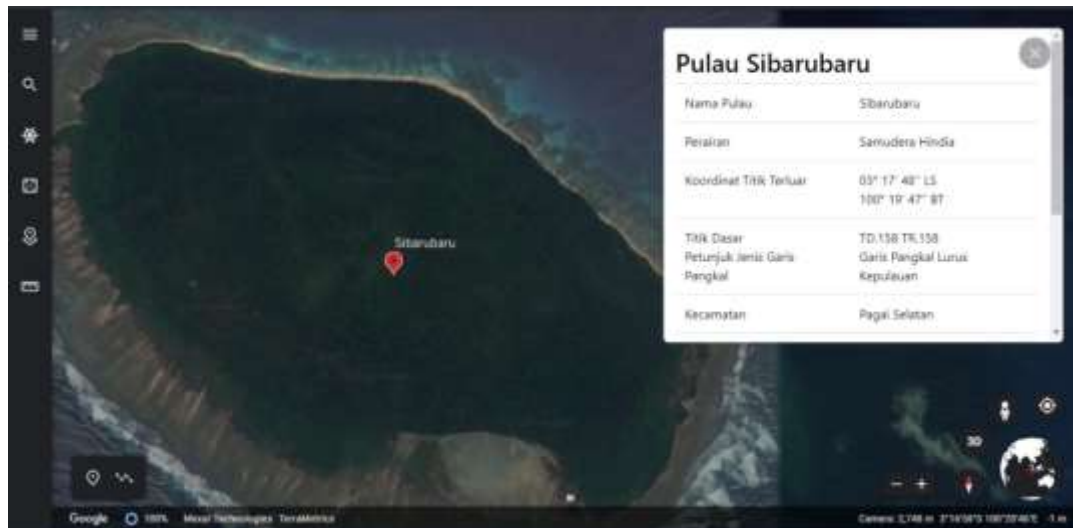

Figure 1. Display webGIS by using Google Earth web version

Presentation of information on one of the outermost small islands in Indonesia can be seen in Figure 2. The information is in the form of the name of the island, another name of the island, the name of the waters, coordinates of the outermost point of the island, the base point and baselines, and island administration data in the form of districts, districts, ZIP code, province,

nearest country and population. Island administration data is needed as identification and inventory of outer small islands. The administration data that is displayed can also be used as a differentiator from an island that has a similar name as Ndana Island which is located in Southwest Rote District, Rote Ndao Regency and Dana Island which is located in Raijua District, Sabu Raijua Regency.

Figure 2. Presentation of outermost small island information

The KML obtained from Google Earth web version by exporting can be imported to Google My Maps or ArcGIS Online. KML is an XML language used to visualize geospatial data in the form of vectors, rasters, animations and 3D images [10]. In this webGIS, KML is used as a placemaker from the outer small islands that displays information on the outer small islands of Indonesia. The results of webGIS design using Google My Maps can be seen in Figure 3.
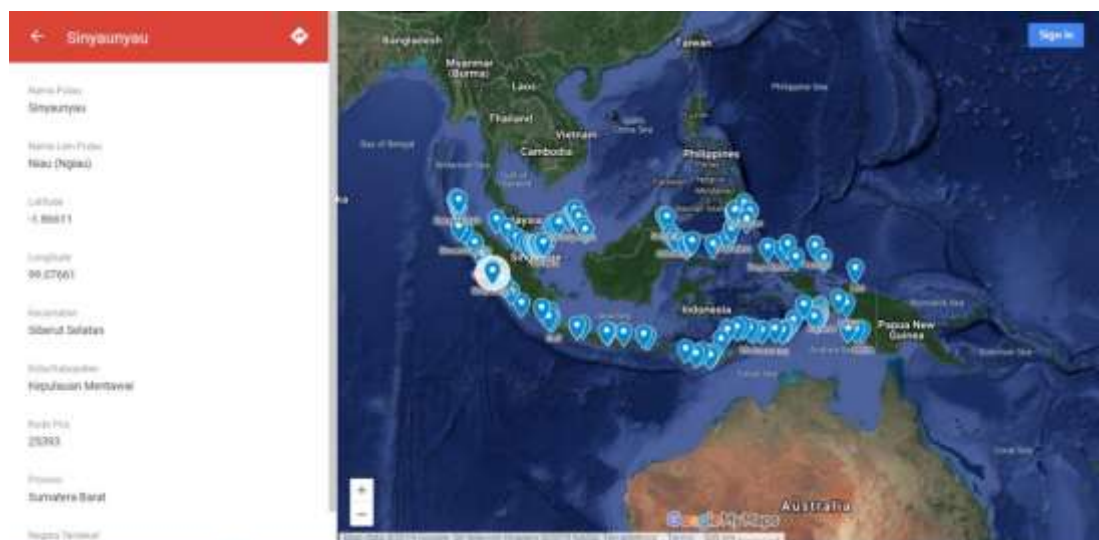
Figure 3. Display webGIS by using Google My Maps

While the results of the webGIS design using ArcGIS Online can be seen in Figure 4..

Figure 4. Display webGIS online by using Google My Maps

WebGIS with ArcGIS Online was created as a comparison with webGIS which was created using Google Earth web version. Besides webGIS with ArcGIS online is used as an identification of outer small islands that are not visible in Google Earth web version due to the low resolution and cloud-covered image quality. There are six outer small islands that cannot be seen in Google Earth web version, namely Tokong Island Malang Biru, Batumandi Island, Bengal Island, Karangpabayang Island, Karang Unarang Island and Habe Island. Whereas in ArcGIS Online there are three outermost small islands which cannot be seen clearly, namely Karang Unarang Island, Karangpabayang Island and Batumandi Island.

Figure 5. Bateeleblah Island in Google Earth web version

Figure 6. Bateeleblah Island in ArcGIS Online

In addition there are some islands that look unclear because of low-resolution satellite imagery in Google Earth web version. So high resolution satellite imagery is needed to see some islands that are unclear.

4. CONCLUSION

This research shows how to use webGIS using Google Earth web version, Google My Maps, and ArcGIS Online to disseminate information on Indonesia's outer small islands. From the results of the study, obtained information on the name of the island, another name of the island, waters, coordinates of the outer point of the island, administrative data, neighboring countries, and population. WebGIS that has been made requires additional data in the form of resolution satellite imagery to identify outermost small islands that are not clearly visible such as Tokong Malang Biru Island, Batumandi Island, Benggala Island, Karangpabayang Island, Karang Unarang Island and Habe Island. With the dissemination of information on the outer small islands, it can help policymakers in the development of the outer small islands can be done by paying attention to aspects of defense and security, welfare aspects and environmental aspects.

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