The concept of outer small island information system

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Abstract. The outermost small islands in Indonesian waters have a strategic value in representing Indonesia in the border area as a gateway for the entry of foreign vessels into Indonesian territorial waters. With 111 islands scattered in Indonesian waters, the condition and status of their utilization are not widely known by the public. As a result, these islands are not fully utilized and their existence tends to be ignored by either the Government or the community. This research is aimed at providing a special information system platform related to the outermost small islands in Indonesian waters that can be easily accessed by the public. By utilizing spatial data that is already owned by Ministries / Institutions in Indonesia, we can present it on a web-based platform as a means of publishing marine information that can be used by the public. The data collected is in the form of a national portal that can be accessed from the pages of the Ministries/Agencies, which can then be processed to present the information needed by the government and the public in utilizing the islands. With the existence of an information system for small islands, the public can access data on these islands and participate actively in building and managing the outer islands which are the front pages of the Republic of Indonesia.

1. Introduction

The management of coastal areas and small islands in Indonesia is carried out by the Provincial Government through the document of the Zoning Plan for Coastal Areas and Small Islands (RZWP3K) with the authority to manage natural resources except for oil and gas [1, 2]. Resource management needs to be integrated with the development priorities of the Central Government to minimize overlapping authority in natural resource management [3], including outermost small islands. Apart from being an integral part of the archipelagic state, the outer islands also form the front yard on the border with neighboring countries. With diverse geographical conditions, not all of the outer small islands can be utilized optimally.

The obstacles faced by the Provincial Government in managing the outermost small islands are access to islands that are quite far apart from the big islands and the absence of detailed information regarding the potential resources that can be used on these islands. The unavailability of detailed information regarding the outermost small islands is the cause of the neglect of management so that the potential contained therein is not utilized.

The management of the outermost small islands needs to be managed by cross-sector because it involves border arrangements with neighboring countries. From the perspective of the management of the Provincial Government, the use of small islands in the RZWP3K framework is carried out for the benefit of each region. The role of the Central Government is very much needed to uniform the management concept of the outermost small islands scattered in many Provinces. Resources that can be utilized are biological resources, non-living resources, artificial resources, and environmental services.

In order to support the uniformity of information on the outermost small islands, an information system is needed that collects marine data for the area and collects it in a portal that can be accessed by the public. In the era of open information, public participation in development can be increased by
providing as much information as needed by the community. With proper information dissemination, it is hoped that the community can be active and take initiatives in the management of the area, including the outermost small islands.

The integrated information system for the outer small islands is in line with the spirit of the one map policy previously implemented by the Indonesian Government. Ministries/institutions that have an interest in the management of the outermost small islands will be partners who provide marine data needed by the community. With the existence of a special information system for the outermost small islands, it is hoped that it can increase the attention of the Government and the community to develop the border areas of the State of Indonesia so that they are worthy of being the front page in the interaction of the State of Indonesia with neighboring countries.

2. Materials and Method

2.1. Field work
An island is defined as land that occurs naturally, surrounded by water, and is always above the water surface at the highest tide. The island must not sink during high tide. There are four conditions that must be met in order for an object to be called an island, namely having land, naturally occurring, being surrounded by water, and always being above the highest tide line [4].

A small island is defined as an island with an area smaller than or equal to 2,000 km² along with its integrated ecosystem. Meanwhile, the outermost small island is defined as an island with an area smaller than or equal to 2,000 km² along with its integrated ecosystem which has geographic coordinate base points connecting straight baselines of islands in accordance with the provisions of national and international law [5]. The outermost small islands have strategic value so that there needs to be attention from the Government to develop the potential that exists in these islands. In Indonesia, the outermost small islands are divided into three types, including small islands near large islands, small islands far from the mainland, and small islands that form small islands.

This research was conducted in 111 outer islands which have the potential to be utilized as much as possible for the community. The distribution of the islands is shown in Figure 1.

![Figure 1. Distribution of the outer small islands in Indonesia [6]](image)

2.2. Data Analysis

2.2.1 Data Source. To present an information system, the input required is marine data which will be processed to be displayed on a portal that can be accessed by the public. Referring to the provisions of Provincial Sea management, the data required to compile the RZWP3K document is presented in Table 1.
Table 1. Marine data for Outer Small Information System Category [7] and Sources

| No. | Data Category                        | Data Source                                      | Relevant agencies                               |
|-----|--------------------------------------|--------------------------------------------------|-------------------------------------------------|
| 1   | Baseline                             | LPI                                              | BIG                                             |
| 2   | Bathymetry                           | LPI and Nautical Chart                           | BIG and Pushidros TNI AL                       |
| 3   | Provincial Sea Boundary              | Basic Data from BIG                              | BIG                                             |
| 4   | Oceanography                         | Physical Oceanographic Maps, Chemical Oceanographic Maps, Biological Oceanographic Maps | Pishidros TNI AL, Marine and Fisheries Ministry, LIPI |
| 5   | Geology and Marine Geomorphology     | Marine Geological Map and Geological and Geomorphological Maps of the Seabed | Ministry of Energy and Mineral Resources        |
| 6   | Coastal Ecosystems and Small Islands | Mangrove Map, Coral Reef Map, and Seagrass Map   | Oceanographic Research Center, BIG, LIPI, and Marine and Fisheries Ministry |
| 7   | Fish Resources                       | Fishing Area Map                                 | Marine and Fisheries Ministry                   |
| 8   | Utilization of Existing Marine Space | Sea Area Utilization Map, Conservation Area Map, Marine Maps, and KSNT Map | Marine and Fisheries Ministry                   |
| 9   | Coastal Water Utilization Planning Documents | Planning documents                           | Regional Work Units                             |
| 10  | Social, Economic and Cultural        | Population and Social Map, Traditional Fishermen Catch Map, Regional Economic Map, | Office of Binamarga and Spatial Planning, BPS, Marine and Fisheries Ministry, and the Regional Development Agency |
| 11  | Disaster Risk                        | Distribution Map of Hazard Prone Areas and Disaster Risk | BIG, BNPB, Ministry of Energy and Mineral Resources |

2.2.2 Database. The database is a collection of data that is not excessive sharing between different application systems [8]. The database consists of spatial databases, namely data related to space above the surface or inside the earth's surface expressed in points, lines, and polygons, and non-spatial databases, namely data that complements information from spatial data or what is known as attributes. These two types of databases are related to each other, characterized by coding (classification or feature level).

Database design is the first step in the activity of making Geographical Information Systems (GIS). The effect of data structures on program structures and the complexity of procedures causes database design to have a major influence on GIS [9]. The database design process is a closed relationship of 4 (four) main stages, namely the identification of needs, conceptual models, logical models, and physical models.
a. Identify User Needs
   The purpose of this stage is to identify and describe what data is needed by the user. The input is the required information and the application the user wants, while the output is a specification of what the user wants.

b. Conceptual Model
   At this stage, the resulting overall information about the existing organization. The information generated is in the form of entities and a list of attributes which in the next stage will be carried out by the normalization process to obtain a good database and linked through an entity-relationship.

c. Logical Model
   The purpose of this stage is to connect the existing database to database management (SMBD). This database structure can be in the form of a hierarchical, network, or relational data model.

d. Physical / Implementation Model
   In this last step, the database structure is stored in physical forms such as data files and tables. This step is already associated with automation issues, such as the software and hardware used to collect, store, and recall database structures.

Database Management System (SMBD) is a system that is a collection of certain programs that can manipulate and maintain data in a database. This system is designed to organize data sharing traffic neatly and to ensure the integrity of the database so that it can be maintained. SMBD can act as the control center of all user interactions. With these advantages, SMBD can simplify the tasks of developing computer applications. The selection of an SMBD is quite a complicated job. Therefore, a data model is known that can describe and manipulate data in the database. There are 3 (three) classical data models used to organize the database, namely:
   1. Hierarchical Data Model
   2. Network Data Model
   3. The Relational Data Model
   The last data model is a data model that will be applied to the design of the database concept design in this case study. The data is arranged in a 2 (two) dimensional table consisting of rows and columns which are easy to create and understand by the user. Each table shows a relationship or relations. Because different users will see different data sets with different relationships between them, it is necessary to create a sub-set of table columns and combine the tables into a larger table.

3. Result and Discussion

3.1. Interface
   The database that has been built is then made an interface program with illustrations such as Figure 2 with the interface part 1 in the form of a toolbox, part 2 in the form of a map layer part 3 is the face of the map.
   Part 1 contains a toolbox with the following details:
   1. Home: contains the initial page of the information system website which contains a general explanation of the small island information system website. This explanation contains the background for the creation of this information system, the objectives, and benefits of the small islands information system.
   2. Info: the info section contains the data information used in this website. This information data is important because the data used comes from official data belonging to the government from various agencies so that complete documentation of the data used is required so that it can be used as needed.
3. News: this section contains the most current news about Indonesia's maritime activities in general.
4. About us: contains a brief description of the designer of the small island information system website in Indonesia.
5. Contact: contains the contacts of the website designer so that if there are deficiencies or suggestions can be given to these contacts.
6. Sign In: intended to record visitors from this website
7. Search: as a search engine for keywords on this website.

Whereas section 2 contains the thematic map layers according to the RZWP3K which consists of Marine Geology and Geomorphology, Oceanography, Coastal Ecosystems, Fishery Resources, Land Use and Land Status, Utilization of Marine Areas, Water Resources, Infrastructure, Demographics and Social, Regional Economy, and Disaster and Pollution Risk. Section 3 contains the map faces, which will alternate according to the activated thematic map layer.

3.2. Discussion
The utilization of natural resources in the sea consists of biological, non-biological, artificial resources, and environmental services [10]. In the context of the management of the outer small islands, the Central Government needs to ensure the sustainability of the outermost small islands management that has been delegated to the Provincial Government. This supervision is inseparable from the existence of a base point that becomes the reference for drawing boundaries with other countries. The information system for the outer small islands is required for a uniform management model implemented by the Provincial Government. Data from ministries/institutions can be accessed by the Regional Government to be used in managing the outermost small islands. In addition, with a system that can be freely accessed by the public, it opens up opportunities for increased public attention to participate in the development of the outer small islands.
Basepoint management by the Central Government, implementation of RZWP3K by the Provincial Government, and active community participation can increase activities in the outermost small islands so as to optimize the potential of the area so as to improve the standard of life of the people living around the outermost small islands.

4. Conclusion
The Outermost Small Islands Information System holds an important position in the dissemination of information on the potential of the outer small islands so that it can be utilized and managed optimally.

1. Providers of data to support development in coastal areas and small islands
2. Access comprehensive marine data on the outer islands
3. Integrated marine data in the outermost small islands in one information gate
4. There is cross-checking of data between agencies to avoid overlapping marine data in the outer small islands

With the information system for the outer small islands, it opens up opportunities for development stakeholders to participate actively in the development of the outer small islands.

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References
[1] Indonesian Government 2014 Undang-Undang Nomor 23 Tahun 2014 tentang Pemerintahan Daerah. State Gazette of the Republic of Indonesia Number 244 (Jakarta: Republic of Indonesia Government)
[2] Indonesian Government 2014 Undang-Undang Nomor 1 Tahun 2014 tentang Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil. State Gazette of the Republic of Indonesia Number 244 (Jakarta: Republic of Indonesia Government)
[3] Mujio et al 2016 Analisis Potensi Konflik Pemanfaatan Ruang Kawasan Pesisir : Integrasi Rencana Tata Ruang Darat dan Perairan Pesisir. Program Studi Pengelolaan Sumberdaya Pesisir dal Lautan, (Bogor: Sekolah Pascasarjana IPB)
[4] United Nations 1982 United Nation Convention on The Law of The Sea (UNCLOS)
[5] President Regulation 2005 Peraturan Presiden Nomor 78 Tahun 2005 tentang Pengelolaan Pulau-Pulau Kecil Terluar. State Gazette of the Republic of Indonesia Number 244 (Jakarta: Republic of Indonesia Government)
[6] Azzahra N K 2018 Kajian Perubahan Jumlah Pulau-Pulau Kecil Terluar Indonesia. Program Studi Teknik Geodesi dan Geomatika (Bandung: ITB)
[7] Marine and Fisheries Ministry 2016 Pedoman Teknis Pemetaan Rencana Zonasi Wilayah Pesisir Dan Pulau-Pulau Kecil Provinsi (Jakarta: Directorate of Marine, Coastal and Small Islands Spatial Planning)
[8] Howe D R 1989 Data Analysis for Data Base Design (London: Edward Arnold Press)
[9] Prahasta E 2002 Konsep-Konsep Dasar Sistem Informasi Geografis (Bandung: Penerbit Informatika)
[10] Indonesian Government 2014 Undang-Undang Nomor 32 Tahun 2014 tentang Kelautan. State Gazette of the Republic of Indonesia Number 244 (Jakarta: Republic of Indonesia Government)