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OPEN BIG DATA FOR INDONESIAN BIODIVERSITY BASED ON AN ONLINE CROWDSOURCING PLATFORM

DHANAR INTAN SURYA SAPUTRA[1*], IMAM TAHYUDIN[2], DINAR MUSTOFA[3], HARTANTO[4] and TRI MAHARDIANTO[5]

[1,3,5]Department of Informatics, Faculty of Computer Science, Universitas Amikom Purwokerto, Indonesia
[2,4]Department of Information System, Faculty of Computer Science, Universitas Amikom Purwokerto, Indonesia

Abstract:

As a tropical country, Indonesia is rich in natural resources and Biodiversity. Indonesia consists of 34 provinces, one of which is Central Java, with 29 regencies and 6 cities, including the BARLINGMASCAKEB area (Banjarnegara, Purbalingga, Banyumas, Cilacap and Kebumen) with seven types of ecosystems (Rivers, Ponds, Yards, Rice Fields, Community Forests, Plantation Forests and Natural Forests). The lack of recognition of biological wealth in the community is a problem. Therefore, we need a media that can record data on the distribution of Biodiversity, especially in the BARLINGMASCAKEB area and supporting media for education and information. In this case, this is a shared responsibility, the role of Hexa Helix Stakeholders. In this study, we present the concept of Open Big Data for Indonesian Biodiversity Based on an Online Crowdsourcing Platform. We started by conducting a systematic analysis of several relevant articles and conducting observations and interviews with several sources. This study found some data on flora and fauna protected by law and application concepts that can be widely utilized by using Big Data.

Keywords: Big Data; Biodiversity; Crowdsourcing; Hexa Helix.

I. INTRODUCTION

Indonesia is a tropical country that is rich in biodiversity and natural resources. Biodiversity is an important component of life on Earth and is the cornerstone of long-term development. Its current and future uses are determined by how it is now used and the impact of human activities on environmental and economic functions. Biodiversity, with its extraordinary complexity, diversity and dynamic relationships between organisms, is the basis of ecosystems closely related to human well-being on Earth [1]. This layer of living organisms comprises innumerable plants, animals, and microbes containing millions of species, including humans. Therefore, the influence of human behaviour on ecosystems on a small or large scale has a tremendous impact on human well-being, for better or for worse.

Endangered animals in Indonesia are scattered throughout the archipelago and have different diversity. The government has determined the types of protected animals. Species of animals

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are designated as protected animals because these animals have high economic value. The number of distributions at this time is increasingly threatened with extinction and rare. The maintenance of animals that the government and the community should protect is not balanced with concern and curiosity about their existence and sustainability. This is because the information obtained by the public about animals is very little, and the level of concern is starting to decline. Banyumas Regency is one of the regencies in western Central Java, which has seven types of ecosystems (Rivers, Ponds, Yards, Rice Fields, Community Forests, Plantations and Natural Forests) with an altitude range of 10 m above sea level in the south to > 3000 m in the south. north which is included in the area of the South Slope of Mount Slamet. Such conditions are thought to provide very high biodiversity and benefit local communities [2].

Biodiversity in Banyumas Regency is still very high, but some species populations continue to decline. The results showed that in the Banyumas Regency area, 793 species of plants and animals were found, not including those that were cultivated. These species include 87 species of plants used to produce wood and furniture, 42 plants that produce industrial materials, 120 medicinal plants, 139 species of ornamental plants, 17 species of alternative carbohydrates, 70 orchids, and 52 species of ferns. The types of animals observed included: 98 species of birds, 33 species of fish, 6 species of shrimp, 4 species of frogs, 104 species of butterflies, and 13 species of snakes. These species of organisms are scattered in various habitats. However, the largest number except found in the forest on the southern slopes of Mount Slamet [3], because it is still relatively good, it is a habitat for various organisms. Another study found 248 plant species and 98 bird species Familia Passerinae in the forest area of Baturraden and Baturraden Botanical Gardens (BBG). BBG is one of the Regional Botanical Gardens whose management is under the Regional Government of Central Java Province with 143.50 hectares with temporary Javanese mountain plants. In the area along the slopes of Mount Slamet found at least 104 species of butterflies, 41 species of orchids, and 13 species of snakes [2], [4]–[6].

A large amount of biodiversity in Banyumas Regency needs special attention to maintain the ecosystem so it can be maintained. A shared responsibility, in this case, is the role of Hexa Helix Stakeholders [7], [8], namely between (1) Government; (2) the Business World; (3) Universities; (4) Non-Government Organizations (NGOs); (5) Mass Media; and (6) Affected Communities. The existence of Hexa Helix collaboration will positively impact what can be felt from biodiversity. Besides that, the process and efforts to provide education to the community will also be easier. In line with the conditions of the industrial revolution era 4.0, automation, Artificial Intelligence (AI), Internet-of-Things (IoT), cloud computing, blockchain, image processing technology and big data [9] will facilitate synergy and collaboration between Hexa Helix Stakeholders. Big Data is described as large-scale data that cannot be presented, processed, and analyzed using existing technologies, methods, and theories [10]. Big Data presented in real-time can help obtain information and determine strategies or decisions within an organization. Technology is here to facilitate various activities in daily life [11].

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Given this background, there is an opportunity to develop Open Big Data for Indonesian Biodiversity Based on an Online Crowdsourcing Platform, with Hexa Helix Stakeholders to participate in data collection, introduction, and biodiversity education to the public at large. The Online Crowdsourcing Platform allows users in the Hexa Helix environment to share information [12], conduct discussions in the provided forums, and cooperate in processing information or certain cases. The selection of the Online Crowdsourcing Platform was deemed appropriate, considering the current technological developments and potential supporters such as smartphone operating systems, mobile apps, websites, social media, or other applications that are already familiar to many people. So the approach and design of the concept of Open Big Data for Indonesian Biodiversity Based on an Online Crowdsourcing Platform can be seen as a promising solution for technology in data collection, processing and education about biodiversity in Indonesia.

In this study, we present the concept of Open Big Data for Indonesian Biodiversity Based on an Online Crowdsourcing Platform which is presented through an in-depth analysis approach and carried out together with problem identification. So that the results of this study can be presented systematically, this article is organized into several parts. Part II describes the materials and methods in this research. Part III presents the results and discussion of this research, and Part IV presents the main conclusions and directions for future work.

II. MATERIALS AND METHODS

This study will be limited to the concept of Open Big Data for Indonesian Biodiversity Based on an Online Crowdsourcing Platform aimed at Hexa Helix Stakeholders, namely the Government; Business World; Universities; Non-Government Organizations (NGOs); Mass Media; and Affected Communities. The research area is limited to the BARLINGMASCAKEB area, namely Banjarnegara Regency, Purbalingga Regency, Banyumas Regency, Cilacap Regency and Kebumen Regency, Central Java Province, Indonesia. Through this system, it is hoped that the biodiversity database will be stored and managed properly to make it easier for stakeholders to use, present, process information, and provide education to the community and other supporting needs.

The Seybold Report
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Figure 1. Hexa Helix Stakeholder [8]

The flow of this research starts from determining the research location, namely the area in BARLINGMASCAKEB, followed by a literature survey on Open Big Data and Online Crowdsourcing Platform and the design of the technology to be used, namely a mobile application (smartphone or tablet) with integrated location detection of processed biodiversity objects.

1. Study Area

The research area is limited to the BARLINGMASCAKEB area, consisting of the Banjarnegara Regency, Purbalingga Regency, Banyumas Regency, Cilacap Regency and Kebumen Regency, in Central Java Province, Indonesia. Indonesia is an archipelagic country located in a tropical area between two continents (Asia and Australia) and two oceans (the Indian Ocean and the Pacific Ocean), consisting of about 17,500 islands with a coastline of about 95,181 km. The territory of Indonesia is about 9 million km^2 (2 million km^2 of land and 7 million km^2 of sea). The area of Indonesia is about 1.3% of the Earth's area but has a very high level of biodiversity [13].

Indonesia consists of 34 provinces, one of which is Central Java, with 29 regencies and 6 cities, including the BARLINGMASCAKEB area. Banjarnegara Regency geographically, the northern zone is the mountainous area of the Dieng Plateau and the North Serayu Mountains. The middle zone is a zone of the Serayu depression, which is quite fertile, and the South Zone is part of the South Serayu Mountains, which have steep reliefs. Purbalingga Regency is located in a basin flanked by several mountain ranges. There are mountains (Mount Slamet and the Dieng Plateau); the southern part is the Serayu Depression, fed by two large rivers, Kali Serayu and its tributary, Kali Peguling. Other tributaries are Kali Klawing, Kali Gintung, and other tributaries. Banyumas Regency with a state area between the mainland and the mountains. The mountainous structure consists of part of the Serayu River valley, part of the highlands, and part of the mountains for plantations and tropical forests located on the southern slopes of Mount Slamet.

Figure 1. Map of Indonesia with BARLINGMASCAKEB area

The Seybold Report
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The natural wealth of the Banyumas Regency is still classified as potential because there are Slamet mountains with a peak height of about 3,400 m above sea level and are still active. Cilacap Regency is the largest district in Central Java province, with an area of about 6.2% of the total area of Central Java. The northern part is a hilly area that continues the Bogor chain in West Java, with a peak of Mount Pojoktiga (1,347 meters), while the southern part is lowland. Forest areas cover the northern, eastern and southern parts of Cilacap Regency. To the south is Nusa Kambangan, which has the "Nusa Kambangan Nature Reserve". To the southwest, there is an inlet known as "Segara Anakan". The southern part of Kebumen Regency is lowland, while the northern part is in the form of mountains and hills, which are part of the South Serayu Mountain range. Meanwhile, in the Gombong area's west, there is the South Gombong Karst Area, a series of limestone mountains that stretch to the south coast in a north-south direction. This area has more than a hundred stalactites and stalagmite caves. Meanwhile, the length of the beach is approximately 53 km, most of which are beaches with the phenomenon of dunes. The BARLINGMASCAKEB area is shown in Figure 2, a map of Central Java [14].

2. Open Big Data

Big data is a collection of larger and more complex data, sourced from new data and revolutionary from traditional data analysis. It can also be interpreted as collecting and using information from various sources to make better decisions [15]. Big data can be regarded as a concept of our ability to collect, analyze, and understand a large amount of data every day [16].

Big Data is now widely used as a source in decision making, both in the government, public and private sectors. For example, to monitor climatic and environmental changes, investigate the relationship between sea surface temperatures and the effects of fire activity in South America, and also to identify World Heritage sites affected by conflict in the Middle East [17]–[19]. With open big data, it will be easy to track, investigate, use and contribute between broad multi-sources and can be presented for free or premium users [20].

3. Online Crowdsourcing Platform

Crowdsourcing is a method used to collect information from many people who want to do something or achieve a certain goal. Citizen involvement in gathering information for environmental monitoring is becoming increasingly common and is often referred to as crowdsourcing. Crowdsourcing is generally applied to conservation and biodiversity, but recently it has also been applied in various fields in geoscience [21]. The crowdsourcing

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approach empowers the "crowd" to gather sufficient data into the knowledge base via the internet as the main goal. The data or knowledge provided by the crowd is then shared with other users. Crowdsourcing has emerged as a hot topic and is gaining increasing traction for collecting and sharing data [22].

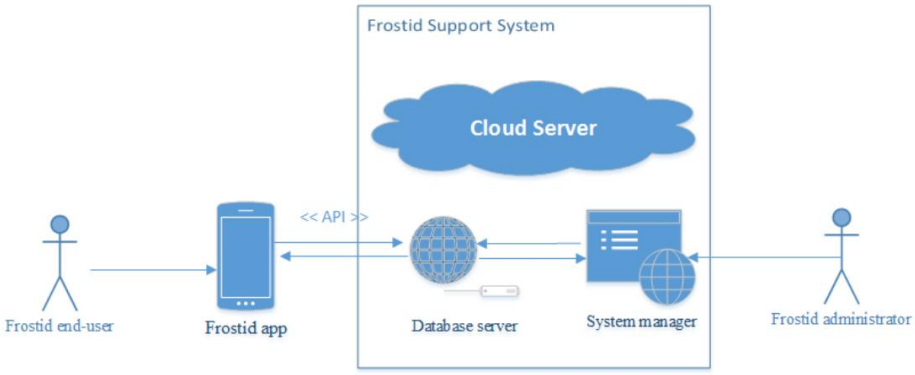

Figure 1. Crowdsourcing system architecture [22]

In its implementation, Crowdsourcing (Figure 3) consists of several components, namely actors, systems, and big data. Actors include end-users or anyone involved in the system, system administrators and management. The system is built based on the expected functions and objectives and can be built with a website or smartphone mobile application. This system will communicate with the big data cloud server and collect, present, and display information.

III. RESULTS AND DISCUSSION

1. Biodiversity in BARLINGMASCAKEB

The world community knows Indonesia as one of the mega-biodiversity countries. This designation is supported by the natural conditions in Indonesia with a tropical climate which is a suitable habitat for various flora and fauna. One institution that oversees biodiversity in Indonesia is the Natural Resources Conservation Center (in Bahasa Indonesia: Balai Konservasi Sumber Daya Alam/ BKSDA). The BARLINGMASCAKEB area is in the BKSDA work area of Central Java Province. The results obtained when coordinating with Hexa Helix Stakeholders at least obtained some biodiversity data presented in Table 1.

Table 1. Biodiversity data protected by Law

No	Category	Items	Scientific Name
1	Mammals	9 species	*Cercopithecidae; Cervidae; Felidae; Hylobatidae; Hystricidae; Manidae; Prionodontidae; Viverridae; Tragulidae*

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2	Bird	26 species	*Accipitridae; Aegithalidae; Ardeidae; Anhingidae; Bucerotidae; Capitonidae; Charadriidae; Chloropseidae; Ciconiidae; Corvidae; Cuculidae; Estrildidae; Falconidae; Nectariniidae; Pandionidae; Pelecanidae; Pittidae; Psittacidae; Recurvirostridae; Rhipiduridae; Scolopacidae; Sternidae; Strigidae; Sturnidae; Viverridae; Zosteropidae*
3	Reptile	1 species	*Pythonidae*
4	Fish	1 species	*Notopteridae*
5	Insect	1 species	*Papilionidae*
6	Flora	7 species	*Arecaceae; Asteraceae; Fagaceae; Nepenthaceae; Rafflesiaceae; Dipterocarpus littoralis; Pisonia grandis*

From Table 1, at least information is obtained from the Monitoring and Evaluation Data on the Status of Biological Diversity of the "Segara Anakan" Region in 2020 [23], and The Central Java Province BKSDA - Regional Conservation Resort (in Bahasa Indonesia: Resor Konservasi Wilayah/ RKW) Cilacap for several types of animals, flora and fauna are protected by law.

2. Contribution of Hexa Helix Stakeholder

The era of globalization of corporations or business entities demands a role in sustainable development. It contributes to implementing a more just world economic order for current and future generations. This encourages the development of a more environmentally responsible (ecological) business ethic. Referring to this, the orientation of corporate responsibility has also developed to include environmental and social responsibility. This makes environmental factors and biodiversity around the operational area also included in determining company goals.

One form of corporate responsibility in this regard is to include the company's partisanship and involvement in environmental protection efforts (Biodiversity) as a standard for assessing company performance. PT. Pertamina Refinery Unit IV Cilacap is a commitment to choosing an area in the "Segara Anakan" area as an area for biodiversity management, protection and preservation. The program that has been launched is “KOLAK SEKANCIL” Conservation of the Cilacap "Segara Anakan" Lagoon [23].

The role of academics and universities is also quite high in environmental sustainability and biodiversity. All fields of science have a fairly important role, not closing the opportunity also from the side of informatics science. In this case, Universitas Amikom Purwokerto also contributes to preserving biodiversity ecosystems, including through continuous research and

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the involvement of a student organization, namely Students of Informatics Care for the Environment (in Bahasa Indonesia: Mahasiswa Informatika Peduli Lingkungan/ MIPL). From the community side, Banyumas Regency has a Biodiversity Society, which is a community that has a goal to preserve Indonesia's biodiversity. Research and education activities for the community are the main activities of this community, which are carried out continuously in the Banyumas area and its surroundings BARLINGMASCAKEB.

(a) (b) (c) (d)

Figure 2. Hexa Helix Stakeholder Activities

Figure 4 shows the role of Hexa Helix Stakeholders who contribute to the preservation of Biodiversity in the BARLINGMASCAKEB area, (a) Monitoring the Javan Leopard; (b) Monitoring of flora and fauna diversity; (c) Waterbird Census; (d) Education on stopping primate hunting.

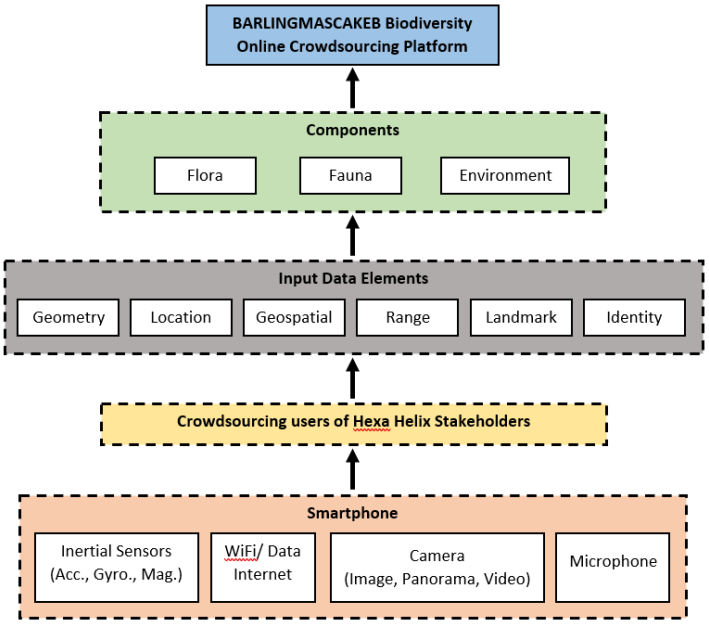

Figure 3. The Concept of BARLINGMASCAKEB Biodiversity Online Crowdsourcing Platform

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Based on the draft of the BARLINGMASCAKEB Biodiversity Online Crowdsourcing Platform Concept, the process flow shown in Figure. 5, the components of Biodiversity that are recorded consist of Flora, Fauna and Environment. The required data elements include geometry, location, geospatial, range, landmark, and the identity of the object obtained from the user. Crowdsourced users make input data from smartphones with minimum specifications: sensor (e.g. accelerometer, gyroscope, magnetometer), WiFi or internet data, camera, and microphone.

IV. CONCLUSION

This study suggests The Concept of BARLINGMASCAKEB Biodiversity Online Crowdsourcing Platform, which can bring together Hexa Helix Stakeholders to collect data and identify and educate about Biodiversity in the BARLINGMASCAKEB area. In its development, we started by conducting a systematic analysis of several relevant articles and conducting observations and interviews with several sources. The study results found several data on flora and fauna protected by law and application concepts that can be used and open challenges for implementation and future research on the Biodiversity Online Crowdsourcing Platform, which is applied in various regions or nationally.

Further discussion is needed on the mass implementation of The Concept of BARLINGMASCAKEB Biodiversity Online Crowdsourcing Platform because it will affect the use and security of data related to Open Big Data. At least through the results of this research, it presents the possibility and opportunity to continue to develop similar services so that they can be used as a promising solution for technology in data collection, processing and education about Biodiversity in Indonesia. Of course, this will benefit many sectors, but there is a need for government policies to regulate the use of data and access to information presented.

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The Seybold Report
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