

## Design of Digital Mobile Application for Marine and Coastal Observation in Northern part of Sumatra

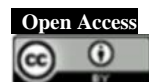
Mutiara Simanjuntak<sup>1</sup>, Juanto Simangunsong<sup>1</sup>, Aprima A. Matondang<sup>1,\*</sup>

\* Corresponding author email : [aprimahinn@gmail.com](mailto:aprimahinn@gmail.com)

<sup>1</sup> Department of Technology and Information of Universal, Medan, Sumatera Utara

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### Abstract

We have successfully developed a mobile program to address the challenges of marine and coastal observation serves as a solution to the communication gap between local peoples with ocean issues. In this app, we examine common of marine problems encountered by civilian and discuss the methods used to diagnose and resolve these issues. Some preventive measures can be taken are mangrove replanting programs, satellite and drone monitoring systems to monitor illegal activities at sea and campaigns to reduce the use of single-use plastics and raise awareness of the importance of marine conservation. These can be combined in a digital application connected to a smartphone. The application can answer future challenges related to observation and preventive measures for strengthening and mitigating disasters in marine and coastal ecosystems that can support maritime-based economic resilience in Indonesia. The application is MyOcean that can handle several problems related with ocean issues. The following displays the home page and registration page on the web-based boarding search application. By utilizing these applications, users can improve their understanding, management, and preservation of coastal areas. These applications are suitable for various groups, including fishermen, government, and the general public.

**Keywords:** Ocean, Digital, Application, Android, Mobile

### 1. Introduction

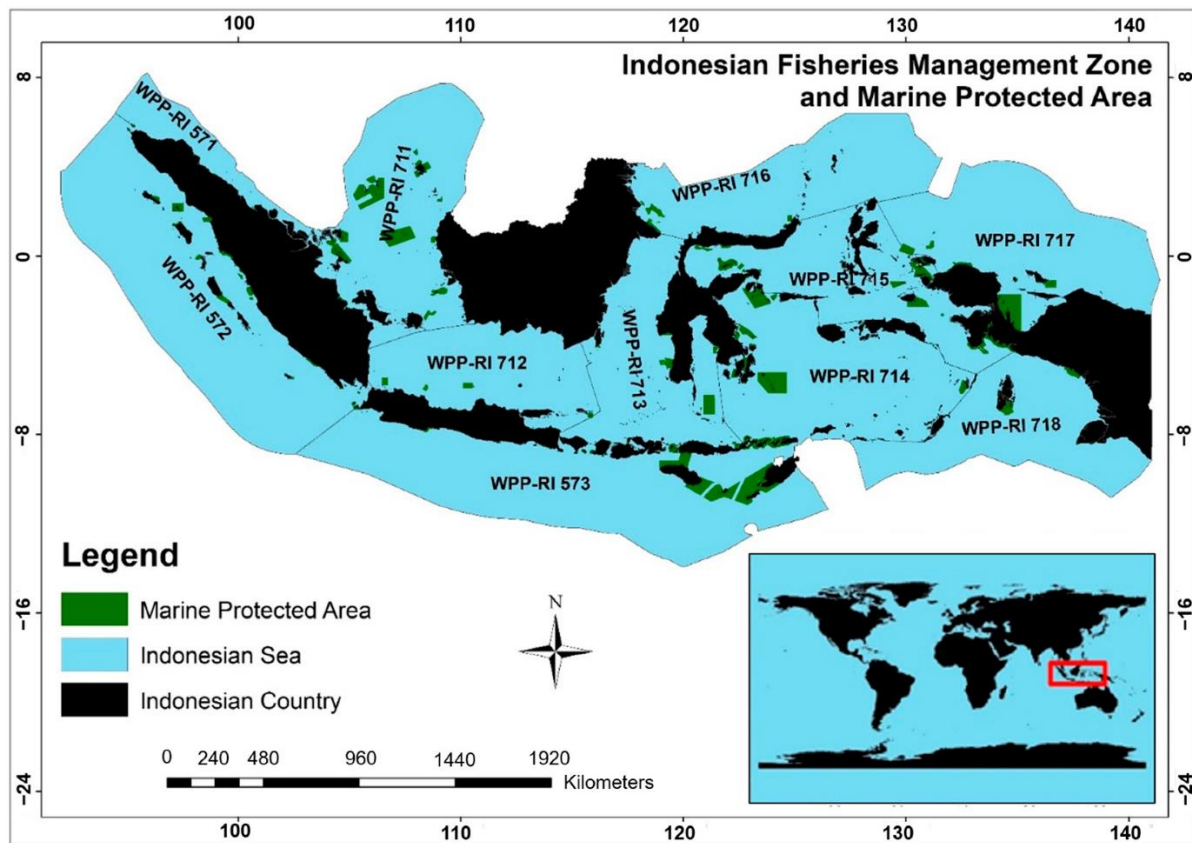
We have successfully developed a mobile program to address the challenges of marine and coastal observation serves as a solution to the communication gap. In this app, we examine common of marine problems encountered by civilian and discuss the methods used to diagnose and resolve these issues. From routine observation to more complex problem solution, we will explore the underlying causes of various coastal problems and the technologies and tools used in modern diagnostics. Digital marine and coastal observation refers to the use of digital technology to monitor, analyze, and manage marine and coastal environments. This includes various methods and tools used to collect data on the physical, chemical, biological, and ecological conditions of marine and coastal waters. Our focus is on the northern part of Sumatra and its surroundings.

Indonesia, the world's largest archipelagic country with more than 17,000 islands and the second longest coastline faces various challenges and cases related to the marine and coastal environment. Indonesia has the largest mangrove

forests in the world, but more than 50% have been damaged due to land conversion for shrimp ponds, plantations, and infrastructure development. Around 30-40% of Indonesia's coral reefs are damaged due to destructive fishing (such as fish bombs and cyanide), pollution, and climate change, such as the damage to coral reefs in Raja Ampat due to a cruise ship that ran aground in 2017. In addition, Indonesia is the second largest contributor of plastic waste to the sea in the world after China. Plastic waste pollutes waters and damages marine ecosystems. Oil drilling activities and tanker leaks cause oil spills that damage marine ecosystems. The oil spill in the Java Sea in 2021 polluted waters and killed thousands of fish. In addition, overfishing has caused a decline in fish stocks in several areas, such as the Java Sea and the Malacca Strait, which has cost Indonesia billions of dollars every year. Moreover, coastal areas such as Jakarta, Semarang, and Surabaya are experiencing increasingly severe tidal flooding due to rising sea levels, causing infrastructure damage and threatening residential areas. Some preventive measures can be taken are

mangrove replanting programs, satellite and drone monitoring systems to monitor illegal activities at sea and campaigns to reduce the use of single-use

plastics and raise awareness of the importance of marine conservation.



**Fig 1.** Maritime condition in Indonesia archipelago with sea boundary with Indonesian Fisheries Management Zone (IFMZ) and Indonesian marine protected areas (MPAs) (Fauzi et al., 2023)

These can be combined in a digital application connected to a smartphone. The application can answer future challenges related to observation and preventive measures for strengthening and mitigating disasters in marine and coastal ecosystems that can support maritime-based economic resilience in Indonesia.

## 2. Method

### 2.1 Block Diagram

To guarantee usability, functionality, and user pleasure, a methodical approach is required while developing a mobile application. This section describes the research techniques used to inform the application's development and improvement, with an emphasis on comprehending user requirements, assessing rivals, and confirming design choices. Often abbreviated as "app," a mobile application is software made specifically to operate on portable electronics like tablets and smartphones. These apps, which offer features ranging from social networking and gaming to productivity tools and e-commerce, are designed to take advantage of the special capabilities of mobile platforms. Usually, app stores like the App Store for iOS and Google Play for

Android are where users download and install mobile apps.

#### 1. User Research:

- User Interviews and Surveys: Conducted to gather insights into user preferences, pain points, and expectations regarding similar applications.
- Persona Development: Based on collected data to create representative profiles of target users, guiding design and feature prioritization.

#### 2. Market Analysis:

- Competitor Analysis: Examined existing applications to identify strengths, weaknesses, and gaps in the market.
- Market Trends: Researched current trends in mobile app design, functionality, and user expectations relevant to the application's domain.

#### 3. Design and Prototyping:

- Wireframing and Prototyping: Iteratively designed and tested wireframes and prototypes to visualize user interfaces and gather early feedback.
- Usability Testing: Conducted usability tests with prototypes to evaluate

navigation, user flow, and overall user experience.

#### 4. Development and Iteration:

- Agile Development: Adopted an agile methodology to facilitate continuous improvement and responsiveness to changing requirements.
- Feedback Loops: Incorporated user feedback from testing phases into subsequent iterations to refine features and address usability issues.

#### 5. Evaluation and Validation:

- Beta Testing: Released beta versions to a limited group of users to gather feedback on performance, stability, and feature satisfaction.
- Metrics Analysis: Utilized analytics tools to track user engagement, retention rates, and feature usage to inform further development priorities.

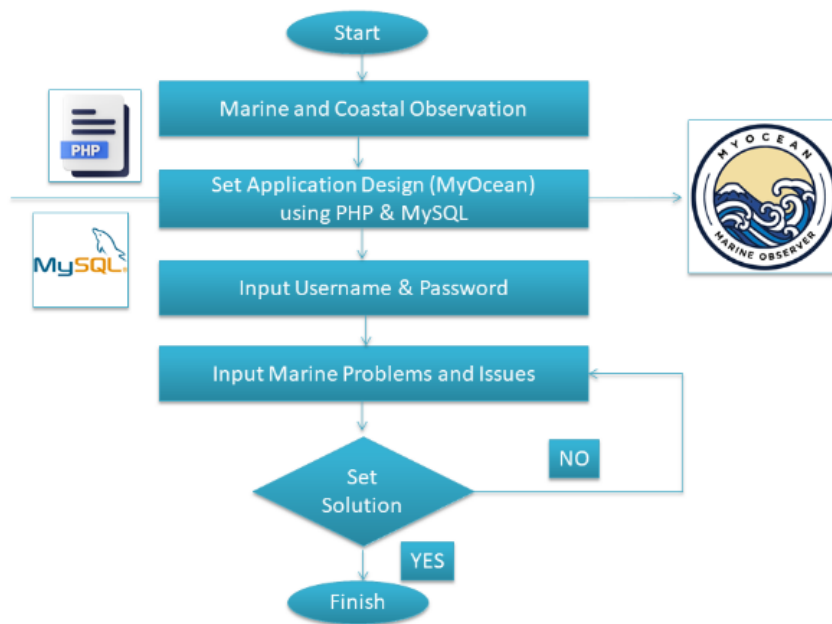


Fig 2. The flowchart of this study.

#### 6. Ethical Considerations:

- Data Privacy: Ensured compliance with data protection regulations and implemented measures to safeguard user data and privacy.
- Informed Consent: Obtained informed consent from participants involved in user research and testing phases.

#### 7. Tools and Technologies:

- Development Tools: Utilized IDEs (Integrated Development Environments), version control systems, and collaboration platforms to streamline development and communication.
- Testing Tools: Employed automated testing frameworks and device emulators/simulators to ensure compatibility across different mobile devices and platforms.

##### 2.1 PHP (Hypertext Preprocessor)

PHP is a programming language that plays a vital role in server-side scripting, which involves processing code on the server rather than displaying it directly in a web browser. This characteristic distinguishes it from JavaScript, which functions on the client side.

PHP, which stands for Hypertext Preprocessor, is predominantly utilized for web development and supports the creation of dynamic and interactive websites. Recognized for its versatility, PHP accommodates various databases, web servers, and operating systems. It streamlines several tasks, such as handling forms, processing files, and integrating databases, making it a favored choice among developers for a wide range of web applications, from simple blogs to complex enterprise solutions. To illustrate its functionality, consider the development of a multiplication program on a website that calculates the product of three numbers. The initial step would involve creating a user-friendly form for input. Subsequently, a PHP script would be implemented to manage and process these inputs. Upon form submission, the data would be sent to the server, where PHP would execute the necessary calculations and return the results to the user. This collaborative process between client-side and server-side scripting exemplifies how PHP effectively contributes to a seamless user experience in web development.

##### 2.2 MySQL

MySQL is a powerful and reliable open-source relational database management system (RDBMS) that is widely recognized for its exceptional flexibility

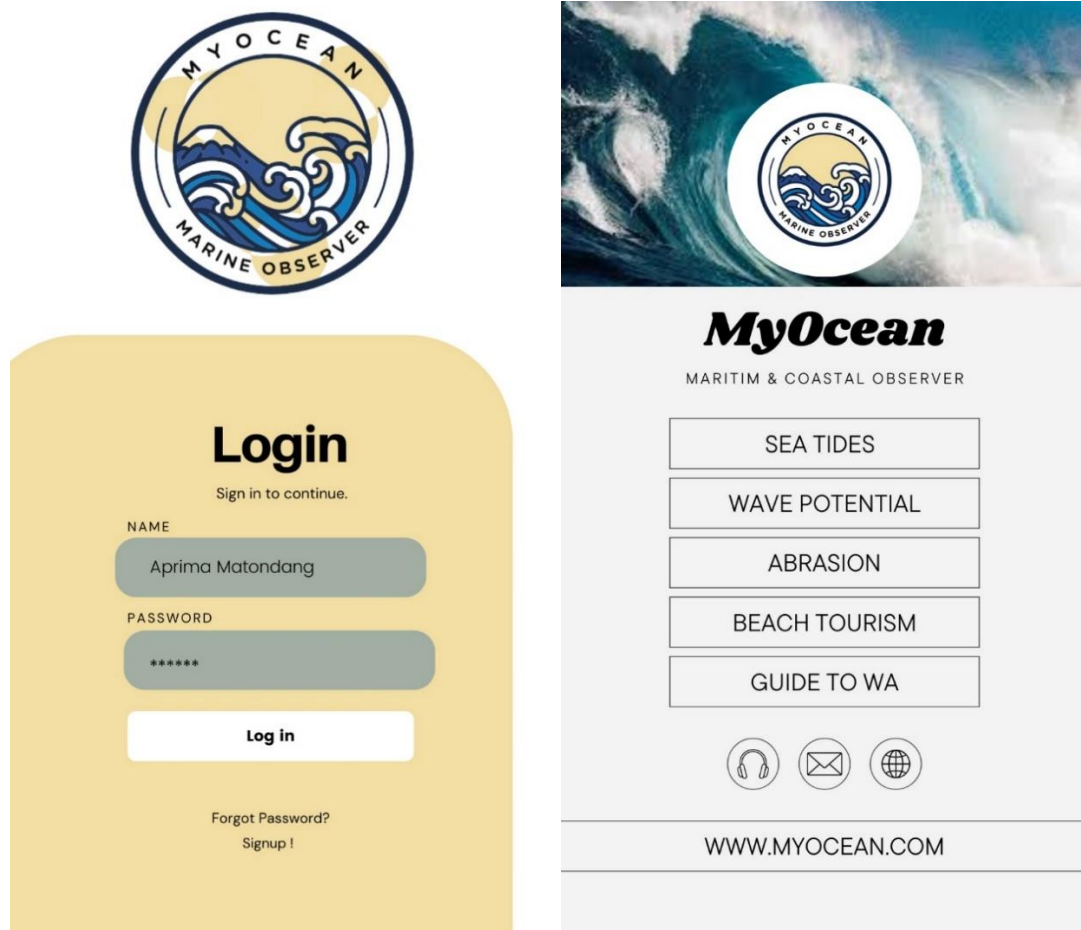
and performance. It enables users to efficiently store, manage, and retrieve data organized in tables, utilizing Structured Query Language (SQL). With robust support for diverse data types and transactions, MySQL ensures data integrity and features advanced indexing that streamlines efficient data retrieval. Its scalability and seamless integration with other technologies make it the preferred choice for web applications, data-driven websites, and business solutions.

In MySQL, data is systematically organized into separate tables, significantly enhancing the speed of data manipulation. SQL acts as a standard interface for relational database management systems and operates effectively on personal computers. It clarifies how data is organized and where it is located, making it a valuable tool for users. While SQL is more straightforward than programming languages, it offers greater complexity than basic

spreadsheet or data processing software. A single SQL statement can initiate multiple requests for information stored across various computers in different locations, demonstrating its powerful capabilities in handling extensive data operations. (Perkasa and Setiawan, 2018).

### 3. Result and Discussion

Android applications for the marine sector can help fishermen, researchers, students and the general public in monitoring, analyzing and understanding sea conditions and supporting marine-related activities. Digital applications for marine coasts are designed to help maintain, manage and preserve coastal areas and support activities related to these areas. This application was built to help peoples that have several problems with ocean problems, starting from prices, facilities and location.



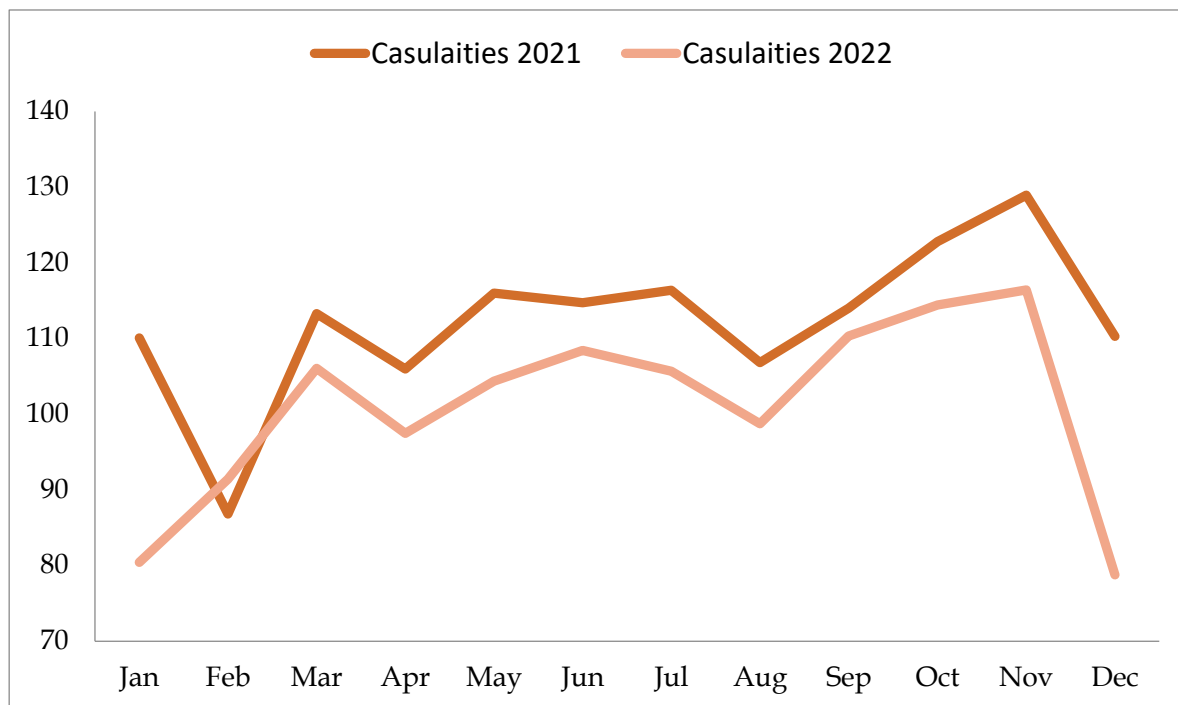
**Fig 3.** The application program of MyOcean as the android program. The design of start menu with login menu (left) and the menu for the application that contains of several problems chosen.

This application also makes it easier for peoples who want to knows when they go to the beach. Peoples may want to know owners to promote ocean problems. In addition, Indonesia is the second largest contributor of plastic waste to the sea in the world after China. Plastic waste pollutes waters and damages marine ecosystems. Oil drilling activities and tanker leaks cause oil spills that damage marine ecosystems. The oil spill in the Java Sea in 2021

polluted waters and killed thousands of fish. An algorithm was made to work in order to analyze the sound coming from the maritime problems using the correlation coefficients obtained from two distinct clustering methods of the power density of the spectrum. The implementation of fuzzy logic in the Android platform performed well as the results show a complete match between the crisp values from the Android platform and the crisp values obtained from

the fuzzy logic toolbox in Matlab®. A graphical user interface was designed in order to control the functionality of the system. The GUI is equipped with button controls and display menus for result visualization. The succeeding section shows the performance results of the developed application.

The digital application show that the system is capable of total recognition at a rate of 56% of total casualties in maritime and coastal issues. The fuzzy logic implementation in the Android platform is complete at a rate of 100%.



**Fig 4.** Graph shows the total casualties in maritime and coastal based on automatic reports on mobile digital application.

The crisp output of the system is the same as with the Matlab output. This study also explored in using the designed Android application. Furthermore, peoples can play many roles through the application. Seekers can see the location and the problem. This application was built using the PHP programming language and MySQL as the database.

## 6. Conclusion

We have successfully developed a mobile program to address the challenges of marine and coastal observation serves as a solution to the communication gap between local peoples with ocean issues. In this app, we examine common of marine problems encountered by civilian and discuss the methods used to diagnose and resolve these issues. Some preventive measures can be taken are mangrove replanting programs, satellite and drone monitoring systems to monitor illegal activities at sea and campaigns to reduce the use of single-use plastics and raise awareness of the importance of marine conservation. These can be combined in a digital application connected to a smartphone. The application can answer future challenges related to observation and preventive measures for strengthening and mitigating disasters in marine and coastal ecosystems that can support maritime-based economic resilience in Indonesia. The application is MyOcean that can handle several problems related with ocean issues. The following displays the home

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