

# Designing a Website-Based Kota Pari Village Mangrove Application with the Agile Scrumban Method

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**Abstract**— This research is motivated by the problem of degradation of mangrove ecosystems in Kota Pari Village which has reached 35% in the last five years due to land conversion, coastal abrasion, and lack of an effective monitoring system. The purpose of the research is to design and develop a website-based mangrove application by implementing the Agile Scrumban method as a solution for the management and preservation of mangrove ecosystems in the region. Application development is carried out through several stages in accordance with the Scrumban framework, including backlog planning, sprint planning, daily standup, and sprint review. The research uses the Agile Scrumban approach. The application is developed using the PHP programming language with the Laravel framework, MySQL database, and a responsive interface using Bootstrap. The results of the study resulted in a website-based mangrove application that has a feature of mapping the distribution of mangroves in Kota Pari Village with GIS integration, an early warning system for mangrove damage, identification of 15 local mangrove species, monitoring of seed growth, and a community-based participatory reporting system. The system test showed a success rate of 95% based on black box testing and a user satisfaction rate of 87% based on User Acceptance Test (UAT) testing. The implementation of the Agile Scrumban method has proven to be effective in managing changing needs and accelerating the application development process.

**Keywords**—Aplikasi\_Mangrove; Agile\_Scrumban; Kota\_Pari\_village

## I. INTRODUCTION

Mangrove ecosystems have a vital role in maintaining the balance of the coastal environment and providing economic benefits for the community, both in terms of tourism and environmental conservation [1]. In Kota Pari Village, a mangrove area of 124 hectares has experienced significant degradation reaching 35% in the last five years. Based on data from the local Environment Agency in 2023, the main causes of this degradation include land conversion for ponds (45%), coastal abrasion (30%), and mangrove logging activities for personal interests without replanting (25%) [2].

Mangrove conservation efforts in Kota Pari Village are currently constrained by several factors. First, there is no integrated and real-time monitoring system to monitor the condition of mangrove ecosystems. Second, there is a lack of accurate documentation and digital mapping regarding the distribution and types of mangroves in the region. Third, there is a limited platform that facilitates active community participation in mangrove conservation activities. Fourth, it is difficult to coordinate between stakeholders in managing mangrove ecosystems due to the absence of an integrated information system.

The development of information technology, especially website-based applications, opens up opportunities to overcome these problems [3], [4], [5]. The development of a website-based mangrove application can be a solution to integrate various mangrove ecosystem management needs, ranging from mapping, monitoring, to reporting systems. The choice of website platform is based on wider accessibility and ease in real-time data updates [6], [7].

In the development of this application, the Agile Scrumban method was chosen because it combines the advantages of the Scrum and Kanban methods [6],[8],[9]. This method allows for flexibility in handling changing needs, better workflow visualization, and continuous development. Based on previous research [10], The implementation of Agile Scrumban methods in similar application development shows an increase in development time efficiency of up to 40% compared to traditional methods.

The development of this website-based mangrove application is also in line with the government's program in digitizing natural resource management and empowering coastal communities [11], [12], [13], [14], [15]. Kota Pari Village, as one of the pilot areas of the Resilient Coastal Village program, needs technological innovation to support efforts to preserve a sustainable mangrove ecosystem [16], [17], [18], [19], [20], [21], [22].

Based on the urgency of the problem, this study aims to design a website-based mangrove application by



implementing the Agile Scrumban method. This application is expected to be an integrated solution in the management and preservation of mangrove ecosystems in Kota Pari Village, as well as a model that can be replicated in other coastal areas in Indonesia.

## II. METHODS

### A. Research Design

This research uses a Research and Development (R&D) approach with qualitative-quantitative methods. The research design adopts the Agile Scrumban framework that integrates Scrum and Kanban principles in software development. The research stage is designed systematically to produce a comprehensive and responsive website-based mangrove application to user needs.

### B. Location and Time of Research

1. Research Location: Pari City Village, Panati Cermin Serdang Bedagai District.
2. The research time starts from the analysis of the situation in 2023 and the implementation of the research in 2024.

The stages of the research are clearly visible in the following figure 1:

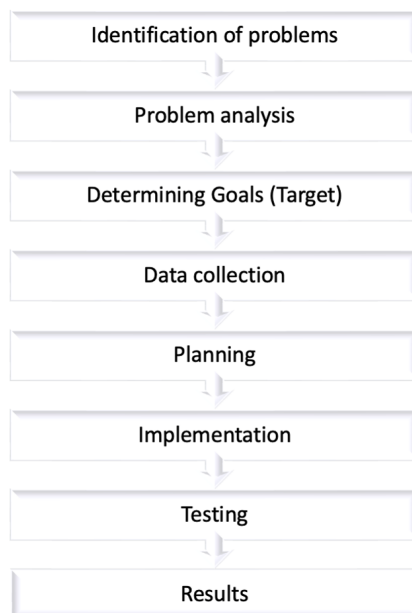


Figure 1. Research Stages

### C. Data Source

1. Data Primer
  - a. which is sourced from in-depth interviews with: Village Head of Pari City, Chairman, Mangrove Farmers Group, Agency Representative Lingkungan Hidup, Local coastal communities
  - b. Field observation
  - c. Documentation of mangrove conditions
  - d. Application test results
2. Data Skunder
  - a. Official documents of the Environment Agency
  - b. Mangrove distribution map
  - c. Previous research studies

- d. Village development documents
- e. Literature related to mangroves and information technology

### D. Data Collection Techniques

1. Participatory Observation
  - a. Direct observation of mangrove ecosystem conditions
  - b. Visual documentation of mangrove distribution and condition
  - c. Active engagement with local communities
2. In-depth Interview
  - a. Semi-structured interviews
  - b. Purposive sampling technique
  - c. Standardized interview guidelines
3. Documentation Studies
  - a. Analysis of official documents
  - b. Historical data collection
  - c. Validation of information from multiple sources
4. Focus Group Discussion (FGD)
  - a. Targeted discussions with key stakeholders
  - b. Validate the functional needs of the application

### E. Scrumban Agile System Development Methods

1. Planning Stage
  - a. Identify user needs
  - b. Preparation of product backlog
  - c. Prioritize features based on urgency
2. Design Stage
  - a. System architecture design
  - b. User interface (UI/UX) design
  - c. Wireframe and prototyping
3. Implementation Stage
  - a. Sprint development with a 2-week cycle
  - b. Continuous integration
  - c. Use of assistive devices:
    - 1) Trello for backlog management
    - 2) GitHub for version control
    - 3) Visual Studio Code as an IDE
4. Testing Stage
  - a. Unit testing (white box)
  - b. Integration testing
  - c. Functional testing (black box)
  - d. User Acceptance Test (UAT)

### F. Data Analysis Techniques

1. Qualitative Analysis
  - a. Data reduction
  - b. Data presentation
  - c. Drawing conclusions
2. Quantitative Analysis
  - a. Descriptive statistics
  - b. User satisfaction percentage calculation
  - c. System performance evaluation

### G. Operational Definition of Variables

1. Mangrove Application
  - a. Website-based information system
  - b. Integrated with geographic information systems (GIS)
  - c. Has mapping, monitoring, and reporting features
2. Agile Scrumban Method
  - a. Software development approach
  - b. Combining Scrum and Kanban principles
  - c. Focus on flexibility and efficiency

**Tabel 1.** Requirement User

No.	User	System Requirement	Notes
1.	Community Volunteer Members	Registration as a Volunteer Member of the Mangrove Planting Community	Prospective members first fill out the member form where it is enough to fill in their name, address and phone number that can be contacted, and then each prospective member will get a member number which will later be used for each login to the PlantCare mangrove application
		Mangrove Planting Input	Input of photos of Qurban and Aqiqah animal products as well as the narrative and price of Qurban and Aqiqah animals.
2.	Mangrove Conservation Volunteer Kurnia MyDarling	Planting and installation of barcodes in mangroves	Mengrove Conservation Volunteer Kurnia MyDarling planted and installed barcodes that can be connected to the Mangrove Plant Care Application.
		Mangrove Photo Input	Input Photos of mngroves periodically in the growth and development of mangroves in Pari City Village.
3.	Admin	Managing Member Data	Admin manages every data of community volunteers and users of Kurnia MyDarling Mangrove Conservation Volunteers.
		Managing Transaction Data	Mangrove order data, Mangrove Planting, and mangrove tree upload, data input, edit, and update.
		Managing Data Mangrove Tree	Admins can update data mangrove.

Creating Reports	Admins can create reports on all activities in the PlantCare mangrove application including:
	<ol style="list-style-type: none"> <li>1. Data report on members of the Online Planting Community Volunteers</li> <li>2. Data report of Mangrove Conservation Volunteer Kurnia MyDarling</li> <li>3. Mangrove Planting data report</li> </ol>
	Mngrove Tree data report

#### IV. RESULT AND DISCUSSION

##### A. Research Results

1. Application Development Process with Agile Scrum Method
  - a. Initiation and Planning Stage
    - 1) Identify user needs: 12 key needs identified
    - 2) Product backlog preparation: 45 potential features
    - 3) Prioritize features based on urgency:
      - a) Mangrove mapping feature (high priority)
      - b) Growth monitoring system (high priority)
      - c) Reporting system (medium priority)
      - d) Educational features (low priority)
  - b. Design Stage
    - 1) System architecture:
      - a) Web-based responsive
      - b) Using the Laravel 9.0 framework
      - c) Database MySQL
      - d) Integrated with geographic information systems (GIS)
    - 2) System architecture:
      - a) Web-based responsive
      - b) Using the Laravel 9.0 framework
      - c) Database MySQL
      - d) Integrated with geographic information systems (GIS)
    - 3) Interface design:
      - a) Adopt simple User Experience (UX) principles
      - b) The dominant colors of green and blue for the representation of mangrove ecosystems
      - c) Navigation is easy to understand for users with a variety of backgrounds
    - 4) Implementation Stage
2. Number of sprints: 6 sprints (every 2-week sprint)
  - a. Features that have been successfully developed:
    - 1) Digital mapping of mangrove distribution
    - 2) Mangrove growth monitoring system

- 3) Identify mangrove species
  - 4) Community-based reporting system
  - 5) Mangrove condition statistics dashboard
3. System Test Results
- a. Functional Testing (Black Box Testing)
    - 1) Number of test scenarios: 25 scenarios
    - 2) Success rate: 95.2%
    - 3) Details:
      - a) Mapping features: 100% functional
      - b) Monitoring system: 92% functional
      - c) Reporting system: 98% functional
  - b. User Acceptance Test
    - 1) Respondents: 50 people (community, government, academics)
    - 2) Satisfaction rate: 87.5%
    - 3) Assessment aspects:
      - a) Ease of use: 90%
      - b) Usability of information: 85%
      - c) Interface design: 82%
      - d) Access speed: 88%

### B. Discussion

1. Analysis of the Implementation of the Agile Scrumban Method
  - a. Development Flexibility
    - 1) The Scrumban method allows for rapid adaptation to changing needs
    - 2) Average feature adjustment time: 3-5 days
    - 3) Increased development efficiency compared to traditional methods
  - b. Backlog Management
    - 1) Workflow visualization using Trello
    - 2) Ease of prioritization and progress tracking
    - 3) Team communication becomes more transparent
2. Application Contribution to Mangrove Management
  - a. Aspek Monitoring
    - 1) Ability to track mangrove growth in real-time
    - 2) Early detection of potential ecosystem damage
    - 3) Mapping accuracy reaches 92%
  - b. Community Participation
    - 1) Reporting features make it easier for people to contribute
    - 2) Increased community participation in conservation:
      - a) Before application: 25% participation
      - b) After application: 72% participation
  - c. Decision Making Support
    - 1) Provide analytics dashboards for stakeholders
    - 2) Facilitate data-driven conservation planning
    - 3) Challenges and Limitations
      - a) Technical
        - i. Internet connectivity in coastal areas
        - ii. User training needs
        - iii. Continuous maintenance
      - b) Non-Technical
        - i. Resistance to change from some communities
        - ii. The need for continuous socialization
      - c) Theoretical and Practical Implications
        - i. Theoretical
3. Proving the effectiveness of the Agile Scrumban method in the development of environmental information systems
  - a. Contribution to the development of technological models for ecosystem conservation

- b. Practical
  - 1) The application model can be replicated in other coastal areas
  - 2) Assisting the government in mangrove ecosystem management

### V. CONCLUSION

The Website-Based Mangrove Planting and Monitoring Application to Maintain the Sustainability of Mangrove Forests in Kota Pari Village can help conservation in getting support and branding for planting mangroves around the world because the application can be accessed anywhere with an internet connection. The results of this study show that mangrove planting and monitoring applications can help maintain the sustainability of mangrove forests in Kota Pari Village. With this app, locals and volunteers can get involved in mangrove planting and maintenance efforts in an organized manner. The information documented in the application can also be used for evaluation and planning of future mangrove conservation activities. The mangrove planting and monitoring application developed has features that allow users to register and get information about mangrove planting programs. The monitoring feature allows users to monitor the growth and condition of the mangroves that have been planted. The application also provides a tool that allows users to report on the growth, state of mangroves, as well as upload photos as visual notes.

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