

Web-Based Population Administration Information System at Sidokumpul Village

Muhammad Faris Afif Putra¹, Bonda Sisephaputra²

^{1,2}Universitas Negeri Surabaya, Surabaya, Indonesia

muhammad.19095@mhs.unesa.ac.id, bondasisephaputra@unesa.ac.id

ABSTRACT

Population administration services in Sidokumpul Village are predominantly managed through conventional manual procedures, resulting in long administrative queues, service delays, accumulation of physical documents, and limited access to information for residents. These challenges indicate the need for a digital solution that can improve efficiency, accuracy, and accessibility of population administration services at the village level. This study aims to develop a web-based population administration information system that enables residents to submit administrative request online, support digital queue management, and provides village map visualization along with residents' land asset information through Web-Based Geographic Information System (WEBGIS) technology. The system was developed using the Extreme Programming (XP) method, which emphasizes iterative development through planning, design, coding, and testing stages to ensure adaptability to user needs. The application was implemented using the Laravel framework and MySQL database, following the Model-View-Controller architecture. Key system functionalities include user authentication, online submission of population administration services, application status monitoring, administrative queue management for village staff. System testing was conducted using the black-box testing method, and the result demonstrate that all system features function according to defined user requirements. The implementation of this system successfully facilitates the transition from manual administration to an integrated digital service, improves service efficiency and transparency, and supports the adoption of e-government practice at the village level.

Keyword: Extreme Programming (XP), Laravel Framework, WebGIS, Population Administration System, Web-Based Information System, Black-Box Testing

Article Info:

Article history:

Received February 24, 2026

Revised March 04, 2026

Accepted May 18, 2026

Corresponding Author

Muhammad Faris Afif Putra

Universitas Negeri Surabaya, Surabaya, Indonesia

Muhammad.19095@mhs.unesa.ac.id

1. INTRODUCTION

Population administration service play a crucial role in supporting public governance and ensuring citizens' legal identity and access to public services. At the village level, population administration includes essential services such as identity card issuance, family registration, domicile letters, and other civil documentation. However, many village administrations in Indonesia still rely on conventional manual procedures to manage these services[1]. Manual administrative systems tend to cause inefficiencies, data redundancy, and

delays in service delivery particularly when administrative demand increase[2]. These challenges highlight the importance of utilizing information technology to improve the quality and efficiency of public services at the grassroots level.

Sidokumpul Village is one example of a local government unit that still predominantly applies manual population administration processes. Administrative request are processed through face-to-face interactions and physical document submission, resulting in long queues, service delays, accumulation of paper-based record, and higher risk of document loss or misplacement. In addition, residents have limited access to information regarding the status of their administrative requests, which reduces transparency and public trust. Similar conditions have been identified in other village administrations, where conventional systems hinder service effectiveness and responsiveness [3].

Along with the increasing use of smartphones and internet access among rural communities, the implementation of web-based information systems has become a viable solution for village-level public services[4]. A web-based population administration information system allows residents to submit administrative request online, monitor application status, and reduce dependency on physical visits to the village office. From the government perspective, such systems support structured data management, improve accuracy, and enable faster administrative processing[5]. However, the adoption of digital systems in village environments must also consider accessibility, usability, and security, particularly due to varying levels of digital literacy among residents[6].

To address these challenges, this study proposes the development of a Web-Based Population Administration Information System at Sidokumpul Village. The system is designed to facilitate online submission of population administration requests, support digital administrative queue management, and integrate spatial visualization of village area and residents' land asset information through WebGIS technology. By integrating administrative and spatial data within a single platform, the system aims to enhance service efficiency, transparency, and data integration at the village level.

The main objective of this research is to develop and evaluate a web-based system that improves accessibility, usability, and security of population administration services in Sidokumpul Village. This study contributes both practically and academically by providing a real-world case study of digital public service implementation at the village level and offering a reference model for similar rural administrations seeking to implement e-government initiatives. The findings of this research are expected to support the modernization of village governance and encourage broader adoption of information technology in public administration services.

2. METHODS

This research is a system development study aimed at designing and implementing a Web-Based Population Administration Information System to improve public service efficiency at Sidokumpul Village. The research adopts a qualitative descriptive approach, focusing on analyze existing administrative processes and translating user needs into a functional digital system. The system development process and translating user needs into a functional on digital system. The system development process applies the Extreme Programming (XP) methodology[7], while data collection is conducted through observation, interviews, and documentation studies. System evaluation is carried out using the black-box testing method to ensure that all system functionalities operate according to user requirements.

2.1 Approach Method

Extreme Programming is a software development model that emphasizes flexibility, rapid development, and continuous user feedback, making it suitable for systems that require frequent changes and close interaction with stakeholders[8]. This methodology is considered lightweight and effective for small development teams and community-based systems. The Extreme Programming method used in this study consists of four main iterative stages: planning, design, coding, and testing, which are repeated until the system meets the defined requirements[9].

2.1.1 Planning

The planning phase focuses on identifying system requirements through an analysis of existing population administration services at Sidokumpul Village. This phase includes the identification of functional requirements, such as online administrative submissions, digital queue management, and application status monitoring, as well as non-functional requirements, including accessibility, usability, and security. In addition, this stage compares conventional administrative workflows with the proposed web-based system to determine necessary process improvements and system features that address existing service inefficiencies.

2.1.2 Design

In the design phase, system modelling is carried out to describe user interactions and system behaviour. This includes the creation of use case diagrams to define system actors and their interactions, activity diagrams to illustrate administrative workflows, and database design to structure population and land asset data. User interface designs are also developed to ensure that the system is intuitive and accessible for users with varying levels of digital literacy. WebGIS components are designed to support the visualization of village areas and residents' land asset information.

2.1.3 Coding

The coding phase is the implementation stage where the system design is translated into program code. The system is developed as a web-based application using the PHP programming language with the Laravel framework, supported by MySQL as the database management system. The coding process includes implementing user authentication, online administrative submission features, queue management, application tracking, and WebGIS integration. This phase focuses on building system functionality according to the defined specifications before comprehensive testing is conducted.

2.1.4 Testing

The testing phase aims to verify that the developed system meets user requirements and functions correctly. Testing is conducted using the black-box testing method, which evaluates system functionality by examining inputs and outputs without considering internal program structure. This testing ensures that each feature operates as intended, identifies system errors, and confirms that the application is ready for use by village officials and residents.

2.2 Data Collection Techniques

2.2.1 Interview

The interview method was used to collect primary data by conducting direct discussion with village government officials, particularly those responsible for population administration services at Sidokumpul Village. The interviews aimed to obtain detailed

information regarding existing administrative procedures, challenges faced during manual service delivery, and the main foundation for defining system requirements and guiding the development of the Web-Based Population Administration Information System. Each interview question played a crucial role in shaping system functionality, ensuring that the proposed digital transition addressed real administrative needs, minimized resistance to adoption, and improved service efficiency and data security.

Table 1 Interview

Research Topic	Development of a Web-Based Population Administration Information System at Sidokumpul Village
Related Units	Muhammad Faris Afif Putra (Author)
Discussion	The current manual population administration process administrative service bottlenecks, document management issues, queue handling, and the need for digital transformation to improve efficiency, accuracy, and public service quality
Day and Date	Tuesday, August 12 2025
Location	Sidokumpul Village Office, Bangilan District, Tuban Regency
Time	07.30 – 09.30 WIB
Draft Question	<ol style="list-style-type: none"> 1. What are the main challenges faced by residents when using the current manual population administration process, and how do these challenges affect service efficiency and data accessibility? 2. From your perspective, what key feature should a web-based population administration system include to improve data accuracy while ensuring ease of access for residents? 3. How do administrative staff currently manage high volumes of service requests within traditional queue systems, and what obstacles could be addressed through the implementation of digital queue management? 4. What challenges do residents encounter when adopting digital government services, and how can the system interface be designed to accommodate varying levels of digital literacy? 5. How should security measures be implemented in a web-based system to ensure the protection of personal data while maintaining usability for both residents and administrators? 6. What strategies or training programs could be implemented to support residents in transitioning smoothly from manual administrative processes to an efficient digital system?

2.2.2 Questionnaire

Questionnaire-based data collection was conducted by distributing questionnaires to residents of Sidokumpul Village through social media platforms. This method was used to gather information related to residents' preference, digital readiness, and familiarity with technology. The collected data were utilized to determine the most suitable platform for the system implementation and to support interface design decisions. By analyzing questionnaire response, the system interface was designed to align with users' capabilities, user-friendly, and easily adopted by the village community.

2.3 Data Analysis Methods

The data analysis in this study focused on evaluating the functionality, usability, and reliability of the developed Web-Based Population Administration Information System. System validation was conducted using the black-box testing method by providing the specific inputs and observing the resulting outputs to verify whether each feature operated in accordance with predefined functional requirements[10]. Functions that produced outputs matching the expected results were considered valid, while discrepancies were used as the basis for system refinement. In addition, user requirement analysis was performed through descriptive analysis of interview and questionnaire data to assess system accessibility, ease of use, and effectiveness in supporting population administration services, particularly for users with varying levels of digital literacy. Technology requirement analysis was also conducted to ensure compatibility with commonly used devices and web browsers, confirming that the system could operate reliably under typical usage conditions without performance issues.

3. RESULTS AND DISCUSSION

3.1 Result

3.1.1 Iteration 1 : Core System Design and Implementation

Iteration 1 focused on establishing the core structure of the Web-Based Population Administration Information System. At this stage, the development process emphasized identifying system functionalities, defining user roles, and designing data relationships as the foundation for subsequent iterations. The outputs of this initial phase are represented through the use case diagram and class diagram, which collectively describe both the functional and structural aspects of the system.

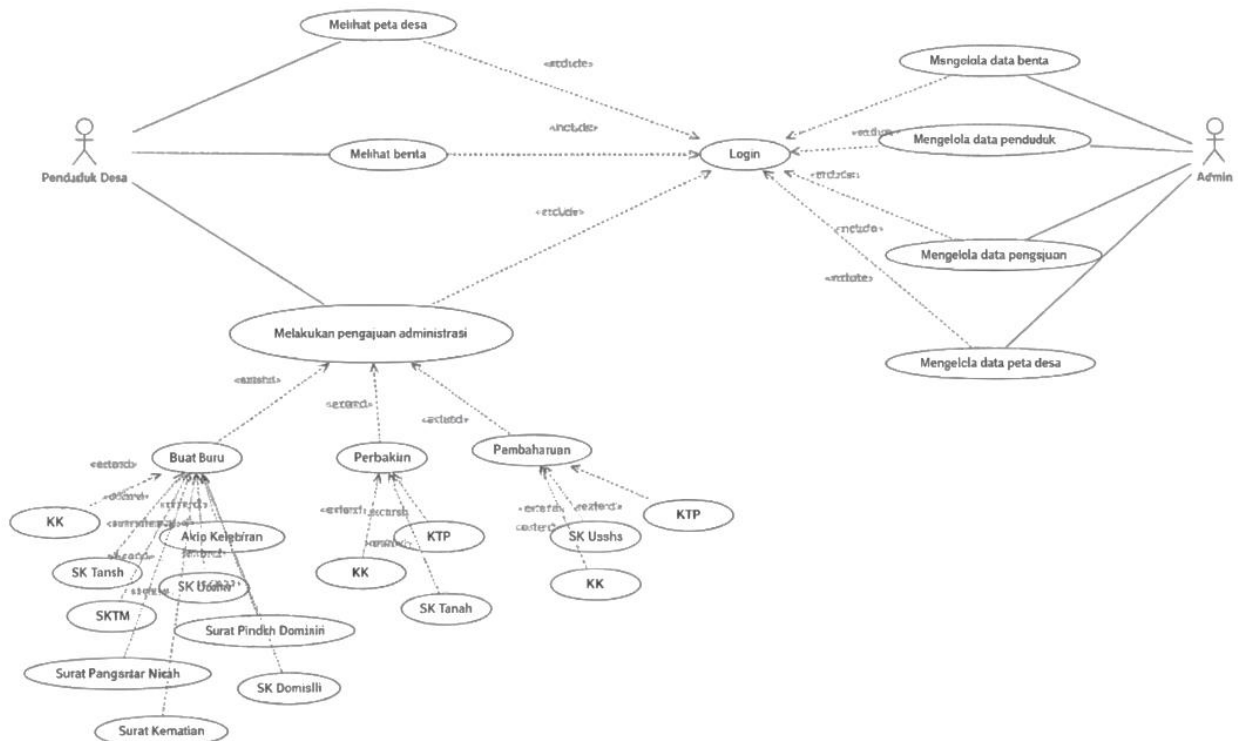


Figure 1 Use Case Diagram

The use case diagram illustrates the interaction between two primary actors: residents and the village administrator. Residents are able to submit administrative service requests, monitor application status, and access village-related information. Meanwhile, the administrator is responsible for managing population data, processing service applications, and controlling system access. Through this representation, the functional scope and user interaction boundaries of the system are clearly defined, ensuring that identified user requirements are systematically accommodated.

Complementing the functional model, the class diagram presents the structural design of the system database. It depicts the relationships among key entities such as residents, applications, users, and land assets. This structural modelling supports data consistency, maintains integrity between related entities, and enables efficient data management during system operation.

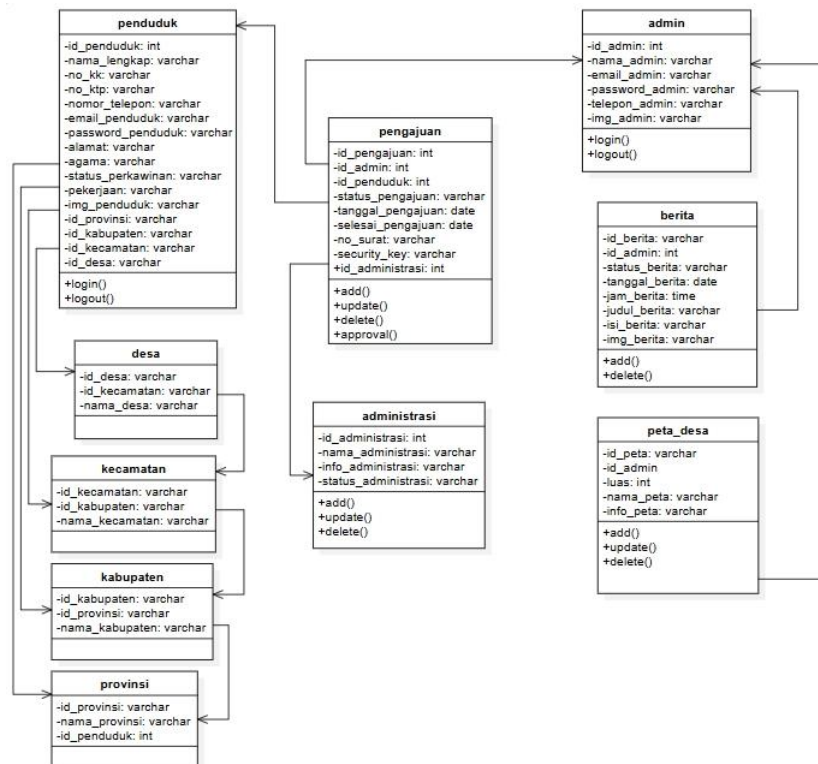


Figure 2 Class Diagram

3.1.2 Iteration 2: Queue System Development & Data Management

Following the implementation of core administration service features in Iteration 1, Iteration 2 focused on improving service efficiency and data organization through the development of a digital queue system and structured population data management. This iteration addressed issues related to manual queuing, service delays, and unstructured data handling by introducing automated queue logic and centralize data processing. The development activities during this iteration are summarized in Table 2.

Table 2 Iteration 2 Development Activities and Results

Development Phase	Key Activities	Resulting Output
Requirement Analysis	Identifying digital queue requirement based on interview results and defining queue logic using timestamp	Iteration 2 feature backlog
System Design	Designing queue database tables, real-time queue interface for residents, CRUD modules for population data, and service status update flow	Additional ERD and queue & data management UI design
Implementation	Implementing digital queue system, service status updates (accepted, processed, completed), population data CRUD in admin dashboard, and visual status notifications	Functional digital queue and population data management features
System Testing	Testing queue order accuracy, service status updates, population data CRUD operations, and applying minor improvements based on test result	All features functioned correctly and met system requirements

Based on the result presented in Table 2, the digital queue system successfully replaced the traditional manual queuing process by automatically assigning queue numbers using timestamp-based logic. The real-time queue interface allowed residents to monitor service progress, while administrators were able to update service statuses efficiently through the dashboard. Additionally, the implementation of CRUD functionality for population data improved data accuracy and reduced redundancy, contributing to faster administrative processing and better service management.

3.1.3 Iteration 3: WebGIS Integration and System Security

Iteration 3 focused on enhancing the system by integrating WebGIS functionality and strengthening data security mechanism. This iteration was designed as a value-added development to support land asset visualization while ensuring controlled access to sensitive administrative data. The integration of spatial information aimed to improve transparency and decision-making for village administrators, while middleware-based authentication was implemented to protect system integrity. The development activities and outcomes achieved during this iteration are presented in Table 3.

As shown in Table 3, the integration of WebGIS successfully enabled the visualization of village land assets through an interactive map interface, allowing administrators to access spatial information efficiently. The use of ArcGIS facilitated accurate marker placement and improved data clarity. Additionally, the implementation of middleware-based authentication ensured that only authorized administrators could manage land asset data, reducing the risk of unauthorized access. These enhancements not only added functional value to the population administration system but also improved data security and system reliability.

Table 3 Iteration 3 Development Activities and Outcomes

Development Phase	Key Activities	Resulting Output
Requirement Analysis	Defining WebGIS integration as a value-added feature, identifying land asset data to be mapped, and determining system security strategies	Iteration 3 feature backlog
System Design	Designing land asset database structure, WebGIS map interface, admin roles for WebGIS management, and authentication flow using middleware	Land asset table schema and WebGIS map mockups
Implementation	Implementing WebGIS using ArcGIS, integrating land asset database, adding land asset markers to the map, and implementing middleware-based access control	Fully functional WebGIS module with secured admin access
System Testing	Testing map visualization and markers, CRUD operation for land asset data, authentication and data security mechanism, and applying minor fixes	Stable system with secure WebGIS functionality

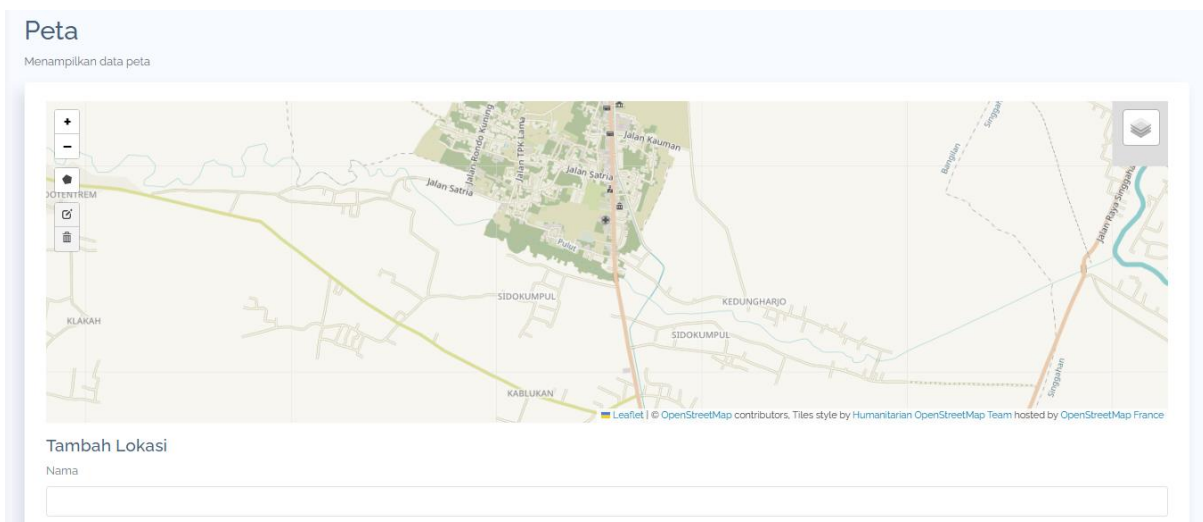


Figure 3 WebGIS-Based Visualization of Land Assets in Sidokumpul Village

3.2 Discussion

3.2.1 Black-Box Testing Results

Black-box testing was conducted to evaluate the functional correctness of the web-based population administration information system. The testing process focused on validating system functionality by providing input scenarios and observing system outputs

without examining the internal program structure. The test result show that all main features, including user authentication, online submission of administrative requests, digital queue management, status updates, population data management, and WebGIS-based land asset visualization, function in accordance with the defined system requirements. The successful outcomes of the black-box testing indicate that the system is capable of supporting population administration services effectively. Functional validation across all development iterations confirms that the system can replace conventional manual processes with a reliable and integrated digital service. Therefore, the development system is considered functionally feasible for implementation at the village administration level.

CONCLUSION

Based on the problem formulation that has been presented, it can be concluded that the development of a web-based population administration information system for Sidokumpul Village can be carried out through several structured stages using the Extreme Programming (XP) method. These stages include planning, design, coding, and testing, which are conducted iteratively to ensure that the system aligns with user needs. The system was developed to support online administrative services, digital queue management, population data management, and land asset visualization through WebGIS integration.

The system development process resulted in a web application that enables residents to submit administrative requests, monitor service status, and access spatial land information, while allowing village administrators to manage population data and service workflows more efficiently. System testing using the black-box testing method showed that all system functionalities operated according to the expected results for each input scenario. This indicates that the developed system functions properly and meets and defined functional requirements. Therefore, the web-based population administration information system is considered suitable to support administrative service activities in Sidokumpul Village.

ACKNOWLEDGEMENTS

The author would like to express sincere gratitude to the Government of Sidokumpul Village, Bangilan Sub-district, Tuban Regency, East Java Province, for the support and assistance provided during the completion of this research. Special thanks are extended to the Village Secretary and all village officials who contributed their time, information, and cooperation in supporting the system development and data collection process.

REFERENCES

- [1] Kirana Anindya Saffa, Annaera Arastha, Ghaisani Fazilatunnisa, Muhammad Fatih Al Kutsar, and Firman Lukman, "Transformasi Birokrasi Digital melalui Inovasi Kebijakan: Studi Kualitatif atas Implementasi Aplikasi M-Paspor di Indonesia," *Desentralisasi : Jurnal Hukum, Kebijakan Publik, dan Pemerintahan*, vol. 2, no. 2, 2025, doi: 10.62383/desentralisasi.v2i2.576.
- [2] Y. R. Murti, H. Irawan, and D. Ramadhani, "Pengembangan Ekosistem Pelayanan Publik Digital Terpadu di Kelurahan Sukagalih Kabupaten Garut," *PRIMA PORTAL RISET DAN INOVASI PENGABDIAN MASYARAKAT*, vol. 4, no. 3, 2025, doi: 10.55047/prima.v4i3.1792.

- [3] M. Annisa, E. Suryani, and I. Irham, "PENDAMPINGAN PENGELOLAAN KLASIFIKASI ARSIP DINAMIS MENGGUNAKAN E-DIGITAL DI DESA CIBENING," *An-Nizam*, vol. 4, no. 1, 2025, doi: 10.33558/an-nizam.v4i1.11084.
- [4] R. Abarna and D. Siva Senthil, "An Adaptive IoT-Based Framework for Crime Surveillance and Prevention," *International Journal of Information Technology and Computer Engineering*, vol. 13, no. 3, 2025, doi: 10.62647/ijitce2025v13i3pp241-247.
- [5] T. Handayani *et al.*, "PENGANTAR SISTEM INFORMASI: Konsep, Teknologi Dan Implementasi," in *PENGANTAR SISTEM INFORMASI: Konsep, Teknologi dan Implementasi*, 2025.
- [6] Y. Mohamad, Z. Bonok, and S. Abdussamad, "Digital Transformation: Tabumela Village Government Administration Management Through a Web-Based System," *Jurnal Pengabdian Pada Masyarakat*, vol. 2, no. 2, 2024, doi: 10.37905/ejppm.v2i2.25.
- [7] B. Pramudya *et al.*, "Implementation of Extreme Programming (XP) in the Development of Dental Clinic Information Systems," *JESICA: Journal of Enhanced Studies in Informatics and Computer Applications*, vol. 2, no. 1, 2025.
- [8] N. P. A. Wirniasih, I. N. Y. A. Wijaya, and P. T. H. P. S, "Implementasi Extreme Programming pada Pembangunan Sistem Informasi Administrasi Berbasis Website Desa Tegal Tugu Gianyar," *remik*, vol. 9, no. 3, 2025, doi: 10.33395/remik.v9i3.14821.
- [9] Z. Carrete, M. Tellería, and G. Iglesias, "Information architecture for the management of psychiatric medical records," *Revista de Ciencias Médicas de Pinar del Río*, vol. 25, no. 5, 2021.
- [10] N. Maymuna, R. Utomowati, R. Noviani, and H. N. Bin Ismail, "WEBGIS-BASED TOURISM POTENTIAL MAPPING USING QUANTUM GIS (QGIS)," *Jurnal Ilmiah Ilmu Terapan Universitas Jambi*, vol. 9, no. 1, 2025, doi: 10.22437/jiituj.v9i1.32411.