

# Waste Service Retribution Management in Selayar Islands Regency through Website-Based Solutions

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## Abstract

The waste retribution management system at the Environmental Service office in Selayar Islands Regency is currently suboptimal. Customers are required to register for waste collection in person at the office, and the payment process must be done through a collection officer who visits the customer's location. Additionally, there is no formal channel for customers to provide feedback on the waste services they receive. To address these issues, an application is proposed to streamline waste service usage for the community and facilitate reporting for Environmental Service employees. The study aims to design and implement an Application for Data Collection and Reporting of Waste Service Retribution at the Environmental Service of Selayar Islands Regency. The research utilized field research, library research, interviews, and documentation to gather relevant data. The research methodology employed was Rapid Application Development (RAD), which involves stages such as requirements planning, user design, development, and implementation. The findings of the study suggest that the proposed application is highly feasible, based on the results of the respondents' assessments. This application is envisioned to significantly improve waste service management and customer experience in Selayar Islands Regency.

**Keywords:** Application; Waste Retribution; Management System; Reporting

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## Introduction

In the Selayar Islands Regency, according to Regulation Number 60 of 2021 issued by the Regent, residents are obligated to pay a monthly waste levy to the Environmental Office. However, the management of this levy has faced challenges in its implementation. Currently, individuals who wish to subscribe to waste transportation services must register in person at the Environmental Office, and the levy payment process requires a collection officer to visit the customer's location. Furthermore, there are issues with the waste transportation service, such as officers not returning trash cans to their original locations and inconsistent waste collection (missed pickups). Reporting of levy payments is also inefficient, as collection officers must manually record payments and submit them to the treasurer for reporting.

Previous studies have explored solutions to improve waste management systems. For example, (Magdalena, Santoso, & Rochmayani, 2019; Shabani & Jerie, 2023) developed a web-based waste retribution system to enhance waste transportation service quality and transition from manual to web-based systems. This system aimed to streamline fleet supervision, regulate transportation schedules, simplify levy payments, and facilitate reporting. They applied the Object Oriented Analysis and Design (OOAD) method (Deni, Djamal, Husain, Deni, & Abd Radjak, 2024). Another study by (Sinduningrum, Utama, & Kamayani, 2021) focused on designing an Information System for Levy Payment Data using a prototype system. This system aimed to simplify levy deposit collection, generate detailed payment reports, and automatically monitor levy deposits.

(Permatasari & Firda, 2023) conducted a study Strategy for Increasing Solid Waste Levy Revenue in Ogan Ilir Regency, South Sumatra Province. They utilized the Rapid Application Development (RAD) method in their application development process (Sihombing, 2023; Yumhi, Dharmawan, Febrian, Sutisna, & others, 2024). Considering these challenges and previous research, this study aims to design a website-based application for data collection and reporting

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of waste service retribution at the Selayar Islands Regency Environmental Office. The application will streamline customer data collection, report generation, levy payment processes, and feedback submission on waste transportation services. The Rapid Application Development (RAD) method will be used, allowing for continuous user involvement to ensure the application meets the necessary requirements (Qowindra & Wiratama, 2023).

## Method

The method utilized in developing this application is Rapid Application Development (RAD) (Haq, Hendrawan, Mubarak, Suarnatha, & others, 2023). This approach enables developers to utilize existing components (libraries), eliminating the need to recreate components (libraries) (Rashidi, Rashidi, Pour Mohammad Bagher, & Bahrani, 2023; VS, Sethuraman, & Khan, 2023). The stages of system design using the RAD method are outlined as follows:

**Requirements Planning:** This stage involves identifying the application's purpose, the problems it aims to address, and determining the necessary components for building a data collection and reporting application for waste service levies.

**User Design:** During this stage, the application's design is developed to meet the identified needs and provide a solution to the existing problem. This includes:

- System design using UML diagrams (e.g., use case diagrams, activity diagrams, sequence diagrams, and class diagrams).
- Database design outlining the relationship between entities in the use case diagram and specifying table details.
- Interface design describing the layout of the waste service levy collection and reporting application.
- The use case diagram provides a brief overview of the activities that users (admins, customers, and waste officials) can perform within the system. Admins, for example, manage data in the waste service levy reporting application, while customers use waste transportation services. The Head of the Waste Division oversees waste service levy management.

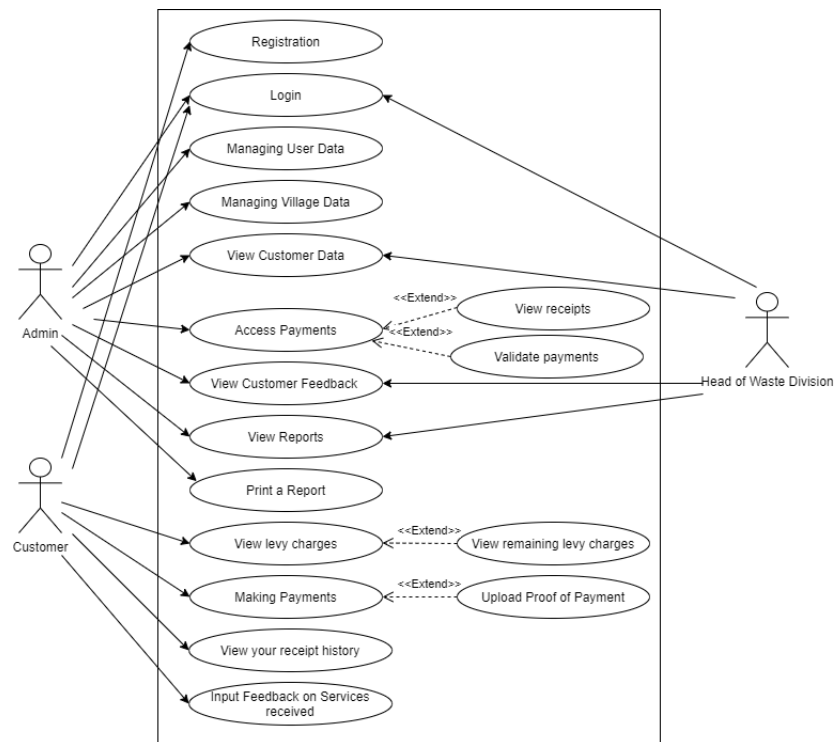


Figure 1. Use Case Diagram

**Construction:** This stage involves building the planned application, starting with coding. The application's design is transformed into a functional application.

**Cutover:** In this stage, the built application undergoes testing to identify and rectify any defects. Blackbox Testing is employed to test the software's functionality and minimize the risk of system defects.

## Results and Discussion

### Result

Based on the research conducted, a Data Collection and Reporting Application for Waste Service Retribution at the Selayar Islands Regency Environmental Office was developed using PHP, HTML, CSS programming languages with Visual Studio Code software. The application consists of various pages such as the Admin Page, Dashboard Page, User Data Page, Village Data Page, Customer Data Page, Payment Page, Customer Feedback Page, Report/Print Report Page, Customer Page, Customer Register Page, Levy Bill Page, Receipt History Page, and Head of Division Page.

The application allows administrators to manage user data, village data, customer data, payment data, customer feedback, and generate reports on waste service levies. Customers can register, view and pay their waste retribution bills, view payment history, provide feedback, and contact administrators. Overall, the research results indicate that the Data Collection and Reporting Application for Waste Service Retribution at the Selayar Islands Regency Environmental Office is functional and well-received by users, including administrators, customers, and the head of a division.

#### 1. Display Interface

##### a. Admin Page

##### 1) Login Page

The login page is the page that first appears when accessing the application. On this page there is a login form to enter the username and password of the user who has been registered in the system so that the user can use this application.

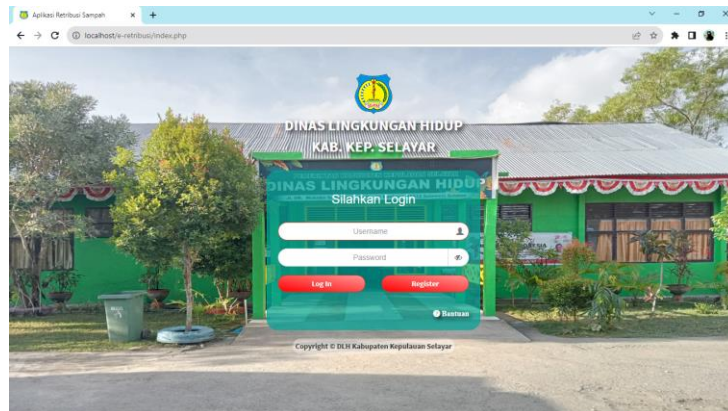


Figure 2. Login Page Display

##### 2) Dashboard Page

The dashboard page displays information on the number of active users, total customers, total unregistered users, number of unresponded customer feedback, number of unpaid customers, total unpaid bill costs, number of customers who have paid, and total income (total retribution fees that have been paid).

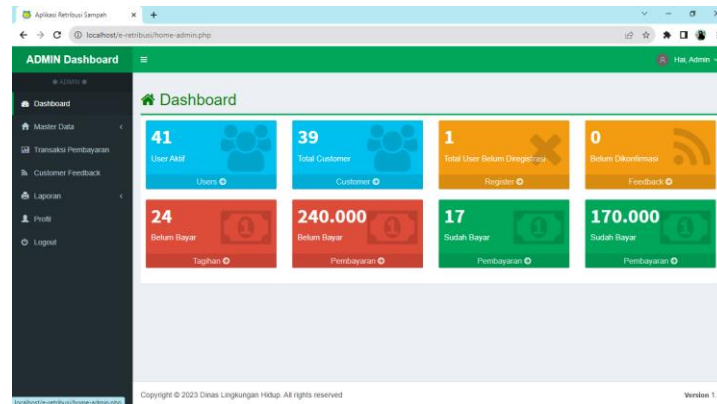


Figure 3. Dashboard Page Display

### 3) User Data Page

The user data page displays the details of the user data. On this page, admins can manage data from users such as adding, changing, and deleting user data, and can enable and disable user accounts.

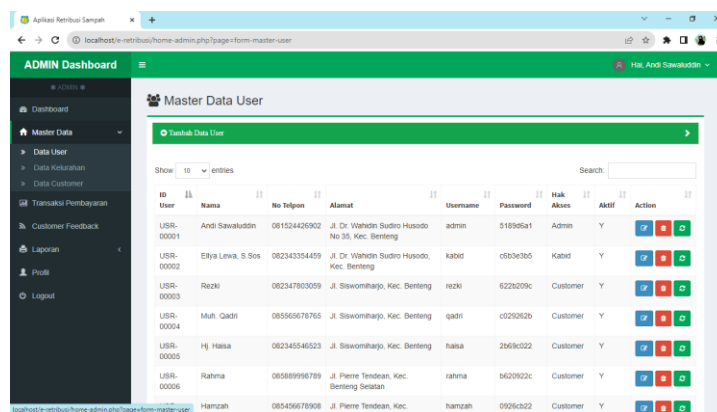


Figure 4. User Data Page Display

### 4) Village Data Page

The village data page displays village data. On this page, admins can manage village data such as adding, changing, and deleting village data.

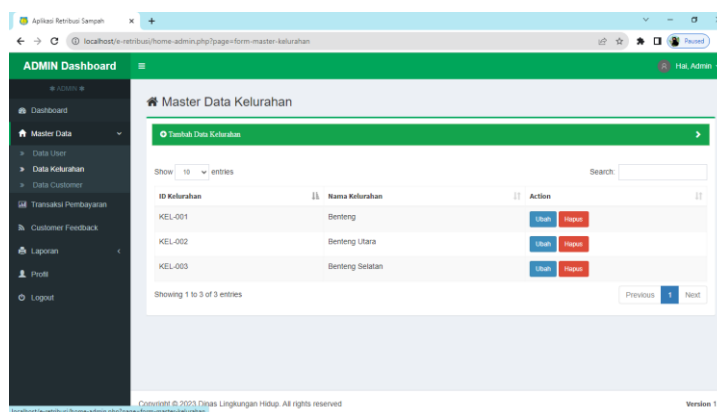
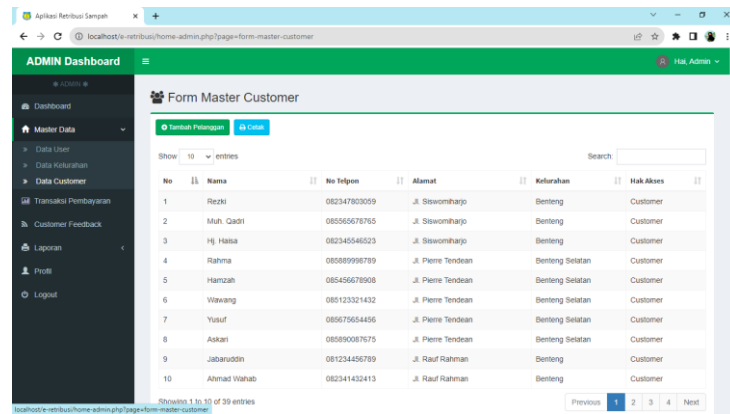


Figure 5. Village Data Page Display

## 5) Customer Data Page

The customer data page displays the details of customer data or waste service customers. On this page the admin can manage customer data such as adding data and printing customer data.

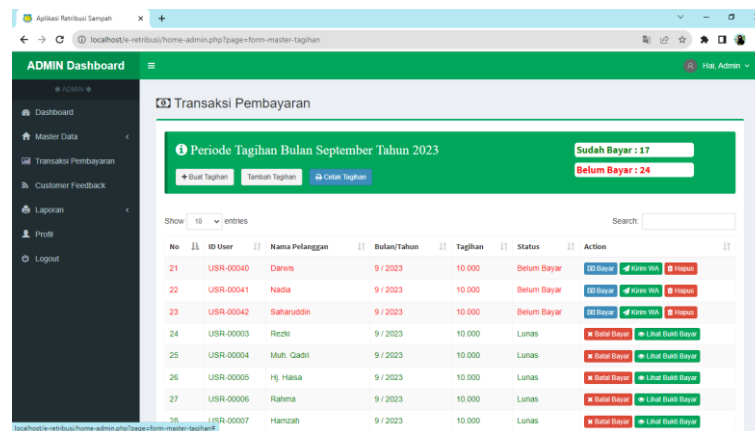


No	Nama	No Telp	Alamat	Kelurahan	Hak Akses
1	Rezi	08234780309	Jl. Siwomhago	Benteng	Customer
2	Muh. Qadri	085565678765	Jl. Siwomhago	Benteng	Customer
3	Hj. Halsa	082345546523	Jl. Siwomhago	Benteng	Customer
4	Rahma	08089999799	Jl. Pierre Tendean	Benteng Selatan	Customer
5	Hamzah	085456678908	Jl. Pierre Tendean	Benteng Selatan	Customer
6	Wakang	08123321432	Jl. Pierre Tendean	Benteng Selatan	Customer
7	Yusuf	085675654456	Jl. Pierre Tendean	Benteng Selatan	Customer
8	Askan	08589087675	Jl. Pierre Tendean	Benteng Selatan	Customer
9	Jabaruddin	081234456799	Jl. Rauf Rahman	Benteng	Customer
10	Ahmad Wahab	082341432413	Jl. Rauf Rahman	Benteng	Customer

Figure 6. Customer Data Page Display

## 6) Payment Page

The payment page displays customer waste levy bill payment data. On this page, admins can create and add bills to be sent to the customer page and can send payment reminder notifications via WhatsApp. Admins can also print a list of waste levy payments.



No	ID User	Nama Pelanggan	Bulan/Tahun	Tagihan	Status	Action
21	USR-00040	Darvis	9 / 2023	10.000	Belum Bayar	[QR Bayar] [Kirim WA] [Hapus]
22	USR-00041	Nadia	9 / 2023	10.000	Belum Bayar	[QR Bayar] [Kirim WA] [Hapus]
23	USR-00042	Saharuddin	9 / 2023	10.000	Belum Bayar	[QR Bayar] [Kirim WA] [Hapus]
24	USR-00003	Rezi	9 / 2023	10.000	Lunas	[QR Bayar] [Lihat Riwayat Bayar]
25	USR-00004	Muh. Qadri	9 / 2023	10.000	Lunas	[QR Bayar] [Lihat Riwayat Bayar]
26	USR-00005	Hj. Halsa	9 / 2023	10.000	Lunas	[QR Bayar] [Lihat Riwayat Bayar]
27	USR-00006	Rahma	9 / 2023	10.000	Lunas	[QR Bayar] [Lihat Riwayat Bayar]

Figure 7. Payment Page Display

## 7) Customer Feedback Page

The customer feedback page displays customer feedback or comments on waste services. On this page the admin can respond and delete customer responses.

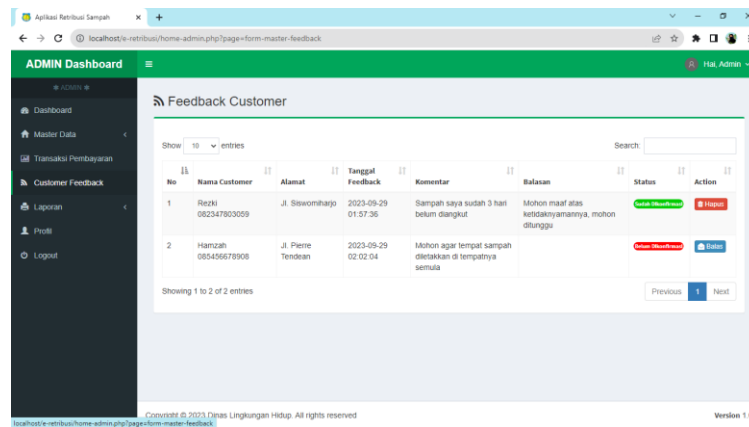


Figure 8. Customer Feedback Page Display

## 8) Report/Print Report Page

Report page to view reports on waste service levies. Admins can view and print these reports from various categories such as payment status, then the amount of income based on the choice of month and year and based on a certain period of time.

No	ID User	Nama Pelanggan	Bulan/Tahun	Tagihan	Status
1	USR-00003	Rezi	9 / 2023	10.000	Lunas
2	USR-00004	Muh. Qadh	9 / 2023	10.000	Lunas
3	USR-00005	Hj. Halsa	9 / 2023	10.000	Lunas
4	USR-00006	Rahma	9 / 2023	10.000	Lunas
5	USR-00007	Hamzah	9 / 2023	10.000	Lunas
6	USR-00008	Wawang	9 / 2023	10.000	Lunas
7	USR-00009	Yusuf	9 / 2023	10.000	Lunas
8	USR-00010	Askari	9 / 2023	10.000	Lunas
9	USR-00011	Jabaruddin	9 / 2023	10.000	Lunas
10	USR-00012	Ahmad Wahab	9 / 2023	10.000	Lunas
11	USR-00013	Supriadi	9 / 2023	10.000	Lunas
12	USR-00014	Ahmad L	9 / 2023	10.000	Lunas
13	USR-00015	Patta Nasra	9 / 2023	10.000	Lunas
14	USR-00016	Ratna	9 / 2023	10.000	Lunas

Figure 9. Report/Print Report Page Display

## b. Customer Page

### 1) Login Page

The login page is the first page that appears when users access this application. On the login page there is a form to enter the username and password of the user who has been registered in the system so that the user can access the menus contained in this waste service levy data collection and reporting application.

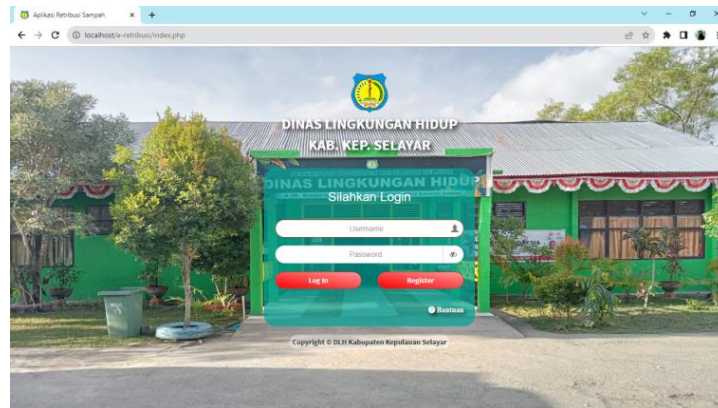


Figure 10. Login Page

## 2) Customer Register Page

This customer registration page is used to register as a customer of the Environmental Agency's waste service. Registration is done by filling in personal data on the registration form to get an account in order to access the waste service levy data collection and reporting application.

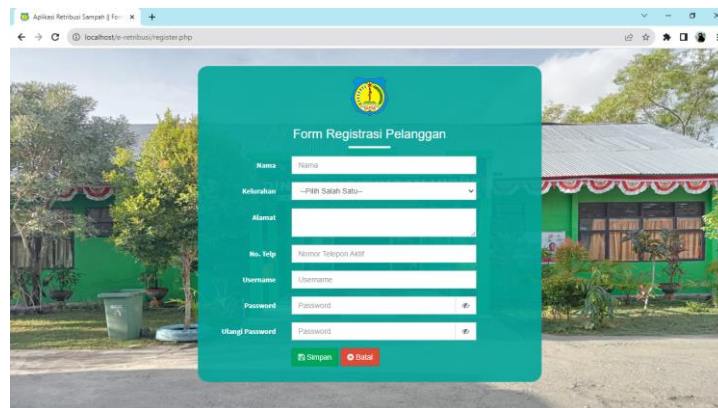


Figure 11. Customer Register Page Display

## 3) Dashboard Page

The dashboard page is the page that first appears after logging in. This page displays information on the total remaining unpaid levy bills, total bills that have been paid, and the amount of feedback that has not been responded to and that has been responded.

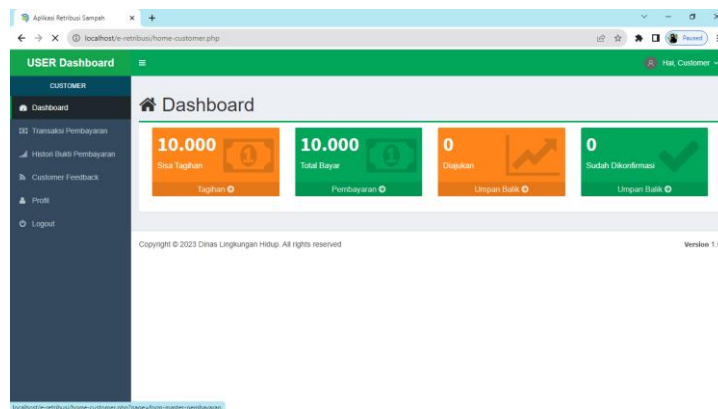


Figure 12. Dashboard Page

#### 4) Levy Bill Page

On the levy bill page, customers can find out the waste levy bill and the total remaining bill to be paid. On this page customers can choose to pay and cancel payments.

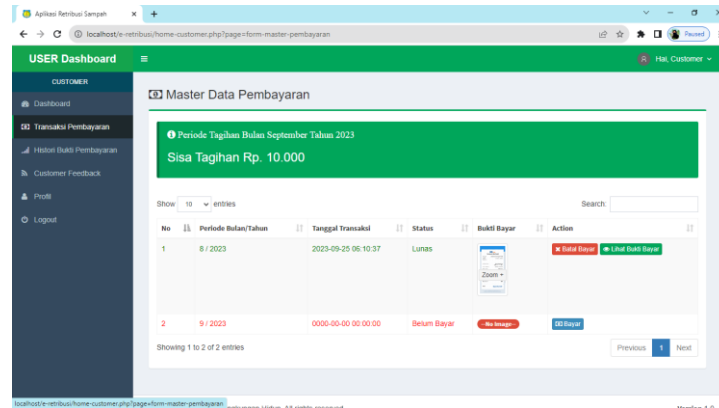


Figure 13. Levy Bill Page Display

#### 5) Payment Page

On the customer payment page, there is a form to pay the waste retribution bill. Customers only need to complete the data requested on the payment form and upload proof of transfer of levy fees.

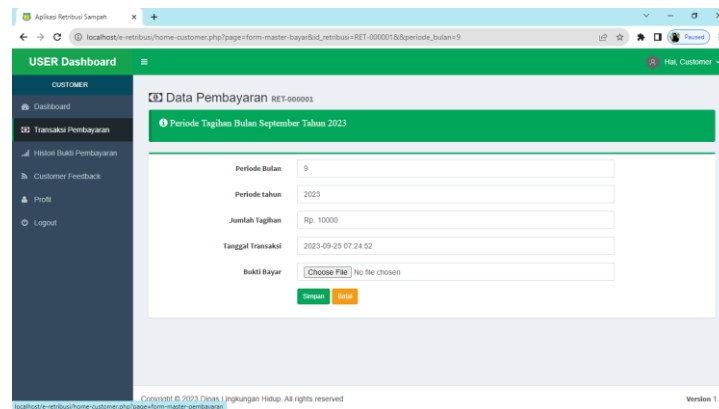


Figure 14. Payment Page Display

#### 6) Receipt History Page

The proof of payment history page is a page to view the payment history of junk levy bills along with proof of payment. On this page, there are remaining unpaid bills.



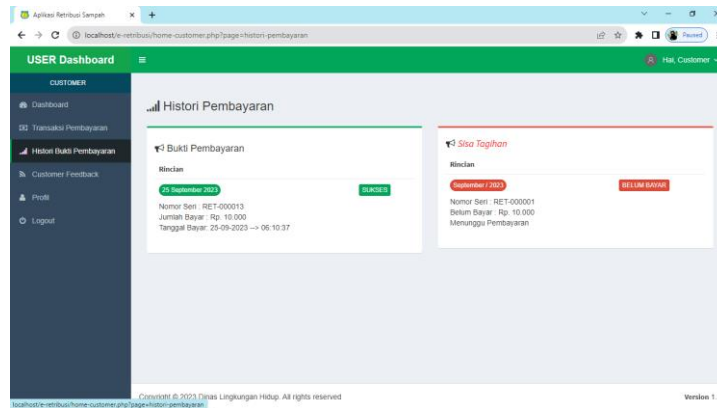


Figure 15. Receipt History Page Display

## 7) Customer Feedback Page

Customer feedback page to submit customer feedback or comments on waste services. On this page, there is a form to input comments which will then be sent to administrators and field heads.

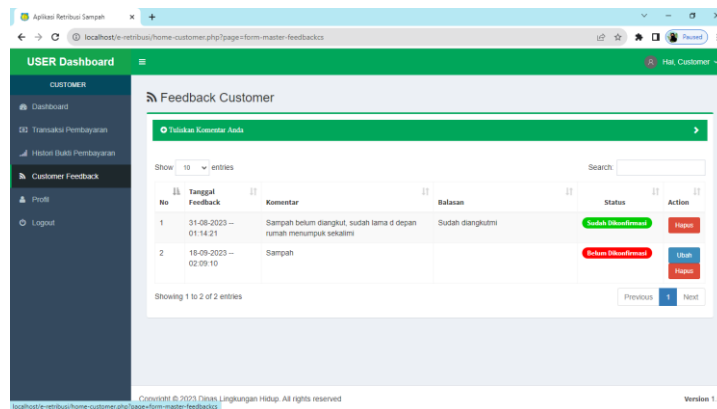


Figure 16. Customer Feedback Page Display

## c. Head of Division Page

### 1) Login Page

The login page is the first page that appears when users access the garbage retribution collection and reporting application. On this page there is a form to enter the username and password of the user who has been registered in the system in order to use this application.

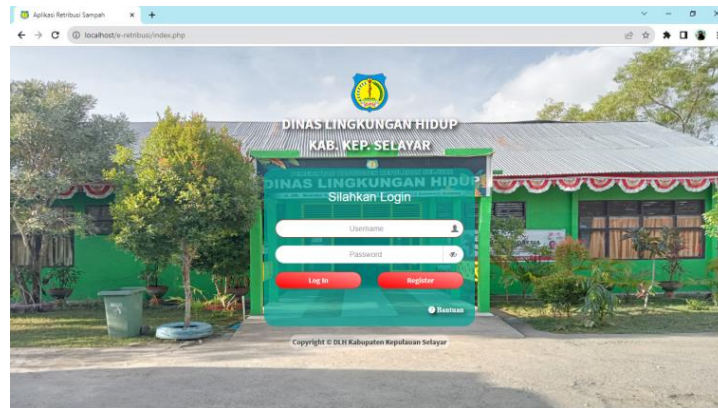


Figure 17. Login Page Display

## 2) Dashboard Page

The dashboard page displays information about the number of customers, the number of customer feedback, the number of customers who have not paid and the number of customers who have paid.

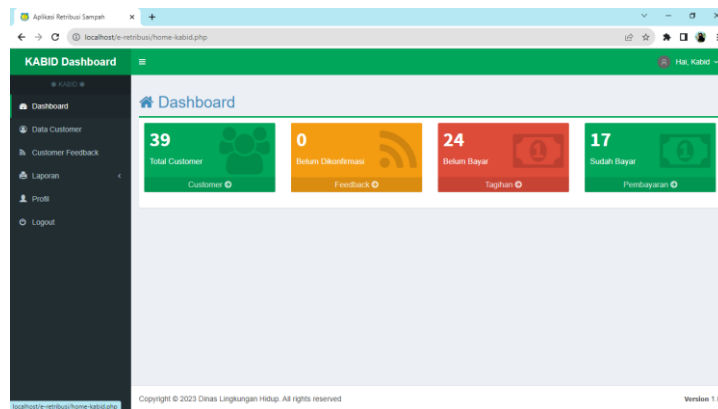


Figure 18. Dashboard Page

## 3) Reports Page

Report page to view waste service levy income reports by month and year. On the page, the head of the division can view and print the report.

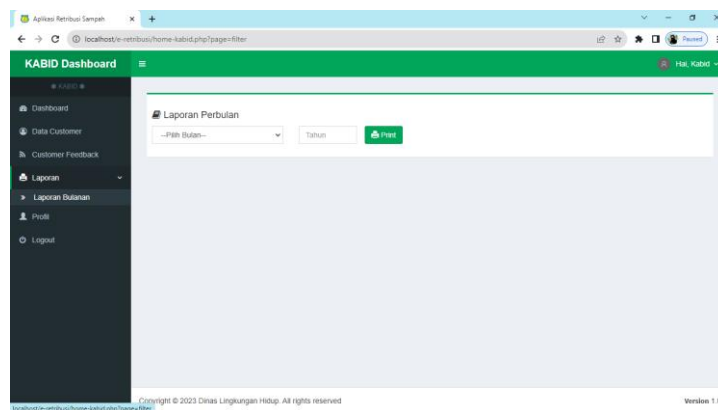


Figure 19. Reports Page Display

Testing this app using Black box testing and UAT testing. Black box testing is carried out based on instruments in the form of test cases that describe all components contained in the system. Based on black box testing, it is stated that each test case carried out obtained results that were in accordance with expectations or ran well according to their functions. In addition to black box testing, user testing is carried out. To find out the response from users about the waste service levy collection and reporting application, a questionnaire was made using a google form. This questionnaire contains 10 questions given to 23 respondents, consisting of 21 customers, 1 administrator, and 1 head of division. The user response that has been obtained is then calculated using UAT (User Acceptance Test) calculations. The scale used in this questionnaire is the Likert scale which consists of five points which include Strongly Agree (SA), Agree (A), Agree Enough (AE), Disagree (D), and Strongly Disagree (SD). Interpretations of each Likert scale can be seen in Table 1.

Table 1. Likert Scale Score

Answer	Likert Score
Strongly Disagree	1
Disagree	2
Agree Enough	3
Agree	4
Strongly Agree	5

Table 2. Eligibility Rate

Score Interpretation with Interval = 20	Category
0% - 19.99%	Very Unworthy
20% - 39.99%	Not Worth It
40% - 59.99%	Pretty Decent
60% - 79.99%	Proper
80% - 100%	Very Worth It

Based on the answers from the respondents above, the percentage of UAT scores can be calculated using the following formula:

$$\text{Percentage UAT} = \frac{\text{Number of Questionnaire Scores}}{x} \times 100 \%$$

$$x = \text{Highest likert scale score} \times \text{Number of questions} \times \text{Number of respondents}$$

The Likert scale that has the highest score is Strongly Agree (SS) with a score of 5. The number of statements on the questionnaire was 10 statements with 23 respondents. So the calculation for the value of x is:

$$x = 5 \times 10 \times 23 = 1.150$$

Once the x value is known, it is used to calculate the percentage of UAT.

$$\text{Percentage UAT} = \frac{941}{1.150} \times 100 \% = 81,82\%$$

Based on UAT's calculations, 81.82% of results were obtained which showed that the application for data collection and reporting of waste service levies at the Selayar Islands Regency Environmental Office was feasible for use.

## Discussion

The findings of this study are consistent with the research conducted by (Budihardjo, Sumiyati, Sawitri, Octaviani, & Wati, 2023) on the Using Material Flow Analysis (MFA) for Waste Management Planning in Batang Regency. Their study emphasized the necessity for waste management departments to implement a waste retribution payment information system. Such a system would not only streamline the waste retribution payment procedure but also simplify the process for the community to make payments and aid Environmental Agency employees in collecting and reporting data with well-organized information.

In this study, the application underwent both Black Box testing and User Acceptance Testing (UAT). Black Box testing was conducted using test cases that comprehensively describe all system components (Mariam, 2023; Somers,

Douthwaite, Wagg, Walkinshaw, & Hierons, 2023). The results demonstrated that each test case performed as anticipated, ensuring the correct functioning of the application.

Furthermore, user testing was conducted to obtain feedback on the waste service levy collection and reporting application. A questionnaire, designed using Google Forms, was distributed to 23 respondents, including 21 customers, 1 administrator, and 1 head of division. The questionnaire, utilizing the Likert scale with five points, aimed to gauge respondents' agreement levels (Strongly Agree, Agree, Agree Enough, Disagree, and Strongly Disagree) regarding various aspects of the application.

Based on the User Acceptance Test (UAT) calculations, the application achieved a score of 81.82%. This score indicates that the application for data collection and reporting of waste service levies at the Selayar Islands Regency Environmental Office is suitable for use. These results align with previous studies that have highlighted the effectiveness of web-based applications in waste management systems (Nwokediegwu & Ugwuanyi, 2024; Salac, Salac, & Samonte, 2023), underscoring the importance of user feedback and testing in ensuring the functionality and acceptance of such applications.

## Conclusions and Suggestions

### Conclusions

Based on the research findings, it can be concluded that the implementation of a website-based application for data collection and reporting of waste service levies at the Selayar Islands Regency Environmental Office is feasible and beneficial. The application was tested using Black Box testing and User Acceptance Testing (UAT), with positive results indicating that the application functions as intended. The use of the application can streamline waste service levy collection and reporting processes, making it more efficient for both the community and Environmental Office employees.

### Suggestions

To improve the application further, it is recommended to continuously gather feedback from users and stakeholders to identify areas for enhancement. Additionally, regular maintenance and updates should be conducted to ensure the application remains relevant and effective in managing waste service levies. Furthermore, training should be provided to users to maximize the benefits of the application and ensure its proper utilization. Overall, the application has the potential to significantly improve waste management processes in the Selayar Islands Regency. Its successful implementation can lead to better service delivery, increased efficiency, and improved data management in waste service levy collection and reporting.

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