

# Designing an Integrated Waste Levy Payment System to Increase Local Own-Source Revenue

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**Abstract:** Revenue from waste levy by the Malang Regency Government has not been optimally achieved because the financial management process related to waste levy is currently still carried out manually. This study aims to design an integrated waste levy payment system to increase Local Own Source Revenue. This study uses a qualitative descriptive approach with system engineering, focusing on the design of the waste collection fee payment system. Data collection was carried out through observation, interviews, and documentation at the Dinas Lingkungan Hidup, Malang Regency Government. The research stages were carried out with the System Development Life Cycle, namely planning system, system analysis, system design, and system design validation. The research results indicate that the design of a waste levy payment system consists of procedures for collecting mandatory retribution data, setting tariffs, collecting and paying, and recording revenue from waste levy. This research resulted in the implementation of a digital-based regional waste levy payment system integration concept that specifically focuses on the waste management sector, a situation that has not previously been developed in Malang Regency. The waste levy payment system model can be adopted by local governments to optimize local revenue and improve the accuracy of financial reporting.

**Keywords:** waste levy, system design, local own source revenue

## 1. Introduction

Waste is one of the major problems facing society. Waste management is also one of the obligations of the state. Waste management is reflected in (Presidential Regulation No. 97 of 2017 on National Policy and Strategy for the Management of Household Waste and Household-like Waste, 2017) which states that the government, from the ministry, provincial government, and district government, has an obligation to formulate, implement, and evaluate waste management. Waste that is not properly managed in an area will have a negative impact on the environment and human health (Pheakdey et al., 2022). Waste management is important and must be done properly. Avita et al., (2022)

explains that the availability of waste disposal facilities and infrastructure has a significant relationship with household waste management practices. To overcome this, cooperation between individuals, businesses, the wider community, and the government is needed for effective waste management

In order to achieve good waste management, contributions from the community are needed through the payment of reasonable waste levies, and the government must provide support in terms of transportation facilities and infrastructure, waste management up to the final stage, and prevention of environmental damage. In fact, the community can sort waste themselves to reduce household waste costs (Jiang et al., 2023). Waste levies are paid into the regional treasury and form part of the Regional Original Revenue that can be used to finance various regional development programs. Several related studies state that waste levies contribute to an increase in regional revenue, one example being in North Nias Regency (Gea et al., 2022). However, the challenge for developing countries is the lack of budget and law enforcement, resulting in low income levels (Agamuthu et al., 2023). Local governments that implement good quality waste levy services will see an increase in revenue for the region, which can then be allocated to improving other public services such as health, education, and infrastructure (Wilson et al., 2022).

The Malang Regency Government is one of the regencies with the second largest area in East Java. With an area of 3,534.86 km<sup>2</sup> and a population of 2.7 million, it can produce 15,000 tons of waste per day (Pemerintah Kabupaten Malang, 2019). Currently, waste management institutions in Malang Regency are managed by the Malang Regency Environment Agency through the Regional Technical Implementation Unit (UPTD) and community self-help groups. The Malang Regency Government also facilitates RT, RW, and Kelurahan in waste management. A major problem related to waste management in the Malang Regency area is the lack of community contribution in paying waste levies, even though the amount of waste that must be managed every day reaches thousands of tons. The waste levy payment process is still carried out manually, is limited, and is not well systematized. The community still pays waste levy in cash, which can lead to fraud by levy collection officers in the field. The billing process is also only based on a database that is still managed manually using written records. This activity makes the waste levy recording process suboptimal, the government has difficulty controlling the waste levy

operational process, and many opportunities to obtain local revenue from waste levies are not realized. The implementation of e-retribution can prevent corruption even though there are infrastructure gaps in each region (Ismail, 2025; Kim & Lee, 2022; Munshi & Manni, 2025).

One way to address issues related to waste levy is through the use of integrated applications. The waste levy payment system is an important mechanism in the operational cost management process (Chong & Ooi, 2022; Doku, 2020). The application should begin with the design of an accounting system. The design of the accounting system will provide a clear picture of the waste levy payment process. Prabowo & Marwah, (2023) explains that electronic retribution payments made by the DKI Provincial Government have a significant effect on the effectiveness of levies payments. In addition, the system, information, and quality of service affect the satisfaction of levies payers. (Prihanto et al., 2023) Waste management can be an opportunity to increase the local revenue of Malang Regency. One source of local own source revenue is local levies, which play an important role in supporting the financing of government administration and public services. The research by Siregar et al., (2024) x explains that Local Own-Source Revenue through local taxes has a positive effect on economic growth in the Gorontalo Province. However, local levies, as one source of Local Own-Source Revenue, did not contribute significantly in a study conducted in Central Java Province, so there is a need to evaluate the management of these levies to increase Local Own-Source Revenue (Astuti & Kartika, 2024). Good local revenue management is essential to achieve sustainable increases in local revenue and support equitable regional development.

Various studies show that digitizing payment systems can overcome classic problems such as data loss, late reporting, and potential illegal fees. Budi et al., (2024) developed a web-based garbage fee payment information system in Bakbakan Village, Gianyar, Bali, which has successfully improved data management efficiency and ease of payment. The research by Kusumawardhani & Nurlita (2022) The research by Kusumawardhani & Nurlita (2022) assessed the readiness of the Pekanbaru City Government in implementing a non-cash payment system for waste management services. There were many challenges in implementing the waste payment system, such as a lack of transparency, slow billing processes, and limited payment methods, which resulted in low public compliance rates (Setiawan & Rahmawati, 2021). Innovation in the

waste collection fee payment system is essential, such as digitizing payments through applications or integrating with banking systems, to improve efficiency, accountability, and transparency, thereby supporting the optimization of local revenue (Yuliani, 2020).

The best solution is to digitize the waste management process, starting from user data collection, billing, payment, validation, and reporting. Digitization of the waste fee payment process can improve efficiency, effectiveness, transparency, and convenience in waste management. The use of an integrated information system is very important for the effectiveness of data collection, documentation, and recording of fee transactions (Allu et al., 2020; Amali et al., 2024; Lee & Kim, 2023). The benefits that can be obtained are that citizens can pay levies online through applications or e-wallets without having to come to the service office, reducing the risk of fund misuse, reducing administrative errors, increasing payment compliance, and allowing the government to monitor the process. Digital transformation is a good strategy for reducing the risk of leakage, overcoming bureaucratic inefficiency, improving local revenue performance, and regional financial accountability. Through the above explanation, the researcher wants to design a waste levy payment system that is tailored to the needs of the community and local government (Al-Sa'eed & Khaleel, 2024; Amoako & Asamoah, 2025; Chirchir & Chepkemoi, 2025; Wanjala, 2023).

## **2. Research Method**

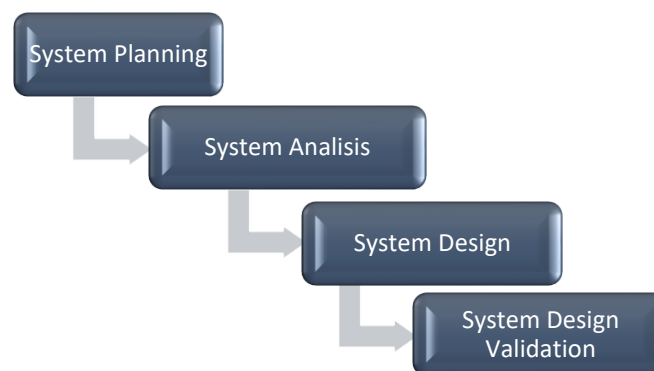
This type of research is qualitative descriptive research using a system development approach. This research focuses on the design of an integrated waste collection fee payment information system that can create efficiency, effectiveness, and transparency in the financial management process, which is expected to have an impact on increasing local revenue. The results of this research are in the form of a system flowchart, data flow diagram, and supporting documents that can be used as references in the system development stage.

The research was conducted at the Malang Regency Environment Agency and several waste collection service points in Malang Regency. This research was conducted from May to July 2025. The data sources required for this research were primary and secondary data. Primary data included information related to the current waste levy payment system, obstacles encountered in using the manual process, information needs of stakeholders, types of documents used in the manual process, and system design

validation. Secondary data included regulations related to waste levy management, waste statistics, documents related to financial reports (levies), and previous research results.

Data collection techniques used observation, interviews, and documentation. Observations were made by directly observing activities related to the waste levy payment process, starting from the current system flow, technical obstacles in the field, and the documents used. Interviews were conducted by asking direct questions to sources involved in the issues and system requirements. The sources involved included leaders and staff of the Malang Regency Environment Agency, fee collection officers, and residents. Documentation was carried out by collecting documents such as registration forms, billing data, receipts, levy collection reports, regional income data, and other documents.

Data analysis is carried out in several stages using the System Development Life Cycle (SDLC) approach. Wang et al., (2025) explain that the stages in the System Development Life Cycle (SDLC) are highly relevant to requirements and design. One of the keys to successful information system project management is the ability to adapt to the SDLC method, including data privacy and security (Doku, 2020; Hossain, 2023). This approach was chosen because it can help researchers carry out the stages systematically, starting from system planning, analysis of the current system, identification of system requirements, and system design.



Source: Processed Data

Picture 1. Data Analysis Stage

The system planning stage is the initial stage for identifying key issues within the organization, system development objectives, system scope, and determining system users. The system analysis stage involves studying and analyzing the current system conditions, starting from the processes, parties involved, and shortcomings. Next, a

system requirements analysis will be carried out by identifying the needs of users and the organization. The system design phase involves developing new process flows (flowcharts), data flow diagrams (DFDs), supporting documents, and Standard Operating Procedures (SOPs). The final phase involves validating the system design to ensure that it meets user needs, can be easily implemented, and can address any issues that arise.

### **3. Result and Discussion**

#### **3.1. System Design**

This section provides a comprehensive identification of the main problems encountered in the waste levy payment process, the scope of the system to be developed, and all parties involved in the operation of this system. Interviews were conducted with the Head of the Finance Subdivision of the Malang Regency Environment Agency in order to carry out a targeted system planning process.

*Until now, the waste levy payment process has been carried out manually, resulting in many violations between officers and levy payers in the field. One example is the lack of transparency in payments and the difficulty in identifying which levy payers have paid. If this continues, it will result in the department not maximizing its levy revenue..*

The problems that occur in Malang Regency are the lack of community contribution in paying waste levies, and the fact that waste levy payments are still recorded manually, which makes them vulnerable to fraud and means that the realization of Local Own-Source Revenue (PAD) is still far from expectations in the waste levy sector. The scope of this system is to design a workflow for the mandatory waste levy registration process, waste levy payment, waste levy collection, reporting, and recording of levy revenue in the SIPD. The payment system design must also consider fairness factors to ensure a high level of compliance (Stern et al., 2020).

The parties involved in the waste collection fee payment process are the staff at the main office of the Malang Regency Environment Agency's waste management division, staff at each Waste Management Technical Implementation Unit (UPT) spread across the Malang Regency, and those liable for waste levies. Those liable for waste levies are parties who have an obligation to pay waste levies because they receive waste transportation facilities.

#### **3.1. System Analysis**

An analysis of the current system was conducted to identify the existing waste levy payment process. Information was obtained from interviews with the DLH finance

department and the billing department in the field. Some of the information obtained included the mandatory levy data collection model, the determination and issuance of bills, levy collection, levy payment, payment verification, receipt recording, report preparation, and monitoring and evaluation. Overall, waste levy payments are being made, but the operational process is still carried out manually. The current waste levy payment system consists of bill issuance, levy collection, levy payment, payment verification, receipt recording, report preparation, monitoring, and evaluation.

A system requirements analysis was conducted to identify the requirements needed in the waste levy payment system, so that the system to be designed would meet expectations. To obtain relevant information, the researcher conducted interviews with the DLH finance department, the field billing department, and fee levy payers. One of the main requirements from the government, namely the Malang Regency DLH, as conveyed by the Head of the Finance Subdivision, focused on identifying levy payers and a payment model that is practical for the community.

*From the government's perspective, we want a system that can identify waste levy payments to increase community contributions, because so far many payments have been unaccounted for due to the lack of a proper recording system, creating opportunities for fraud. Billing is only done manually from door to door by collectors in each Technical Implementation Unit (UPT). The billing process is also lengthy, from the treasurer issuing the bill, to validation by the Head of the Office, before being distributed to each UPT. Meanwhile, from the community's perspective, we hope to provide an easy and practical payment model. From an accounting perspective, we currently record retribution on a monthly basis in the SIPD because it is difficult to obtain the actual amount of retribution revenue that has been paid. We hope to be able to record retribution daily in the SIPD with the actual amount.*

Based on the above requirements, some information related to the waste levy payment system requirements was then divided into four types of requirements, namely input, process, output, and control. Wang et al., (2025) x explains that the details of the requirements analysis should map the input, process, and control components, particularly to ensure transparency in public sector systems. This approach makes it easier to formulate data input requirements, data processing procedures within the system, expected outputs, and controls that support transparency, security, and accountability in an integrated system.

Table 1. System Requirements Analysis

Component	Description
Input	mandatory levy identification data, average waste volume data, payment transaction data, billing data, and paid/delinquent status
Process	automatic billing based on waste volume and specific areas, automatic billing, online payments, automatic payment validation, all payment transactions stored in a centralized database.
Output	electronic proof of waste collection fee payment, reports related to waste collection fee payment, dynamic dashboard for monitoring and evaluation activities by leaders
Control	notification features for levy payers and the DLH finance department, different access rights for different users according to their needs, activity log features to view input and data edit records, regular automatic data backups, data encryption to provide data security.

Source: Processed Data

Based on the above information, the system requirements are tailored to the characteristics of levy payers who need ease of payment. Levy payers need, among other things, access to an application with an easy and attractive interface, billing calculations that reflect current conditions, payment histories that can be checked at any time, and the certainty of adequate waste management services. The system requirements are also tailored to the characteristics of government institutions that want to provide excellent service in waste levy payments, operational efficiency, transparency in payment collection, accurate data control of local own-source revenue leakage, and ease of monitoring and reporting. Digitization in the waste levy system for public services is key to reducing leakage, increasing transparency, and directly supporting revenue growth (Tetteh et al., 2022).

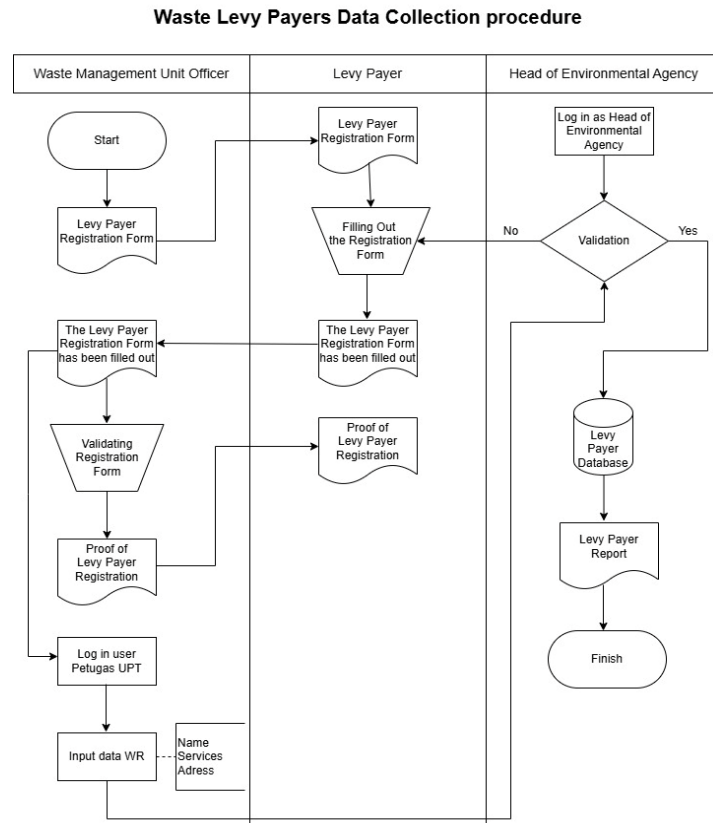
### 3.2. System Design

The system design stage is an important stage in building an information system based on the results of the analysis of the needs desired by the organization. Next, the researcher designed an integrated waste levy payment system by designing a flowchart of the waste levy payment system, related functions, supporting documents, and reports generated. The results of the waste levy payment system design were compiled to provide a significant increase in local own-source revenue.

#### 3.2.1. Waste Levy Payers Data Collection Procedure

Waste levy payer data collection procedure is a procedure for recording all profiles of waste levy payer to be registered in the system. Data collection is mandatory

in order to obtain data on individuals, business entities, or other parties registered as customers or recipients of levy services. The data collection process is carried out through a combination of manual and computerized activities.



Source: Processed Data

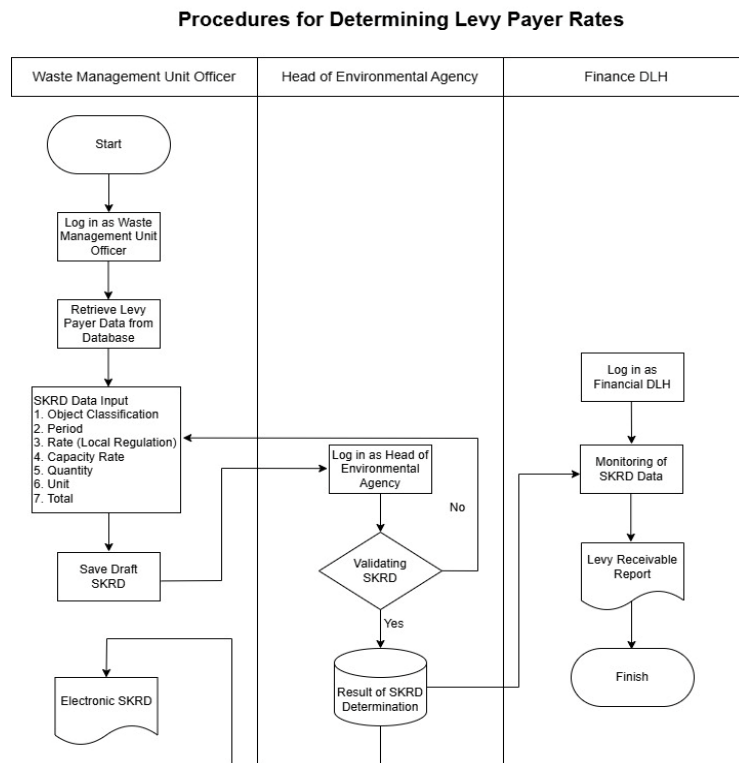
Picture 2. Waste Levy Payers Data Collection Procedure

Data collection activities are carried out by UPT Persampahan officers by visiting the homes of those liable for levies or receiving those liable for levies who come to the nearest UPT Persampahan office. The WR Registration Form is given to levy payers to fill out manually. Some of the information that must be filled in by levy payers includes their name, address, WhatsApp number, sub-district/district service category, and UPT. Officers are required to validate the completed levy payer registration forms. Levy payers then receive a copy of their waste levy registration proof from the officer. The officer then registers the data filled in by the taxpayer through the system. The taxpayer data entered into the system must be validated by the Head of the Environmental Agency to approve the document. The Head of the Agency can monitor the profile and number of taxpayers through the Taxpayer Report.

- Related functions : Waste Management Unit Officer, Levy Payer, Head of Environmental Agency
- Document : Levy Payer Registration Form
- Report : Levy Payer Report

### 3.2.2. Procedures for Determining Levy Payer Rates

The procedure for determining levy payer rates is a procedure for setting the mandatory waste levy rate imposed on those liable for waste levy in accordance with local regulations. The mandatory rate is set to determine the actual levy rate that must be paid by those liable for the levy, adjusted to the quantity of waste produced by individuals, business entities, or other parties registered as customers or recipients of levy services. A pricing model based on the weight/volume of waste is considered highly effective, but it does require accurate digital measurement infrastructure such as IoT and Smart Bin. (Massarutto et al., 2020; Patil et al., 2023; Sharma & Sharma, 2024; Y. Wang et al., 2021). The process of determining levy rates is carried out through an information system to accelerate the stages of rate adjustment and the preparation of the Regional Levy Determination Letter (SKRD).



Source: Processed Data

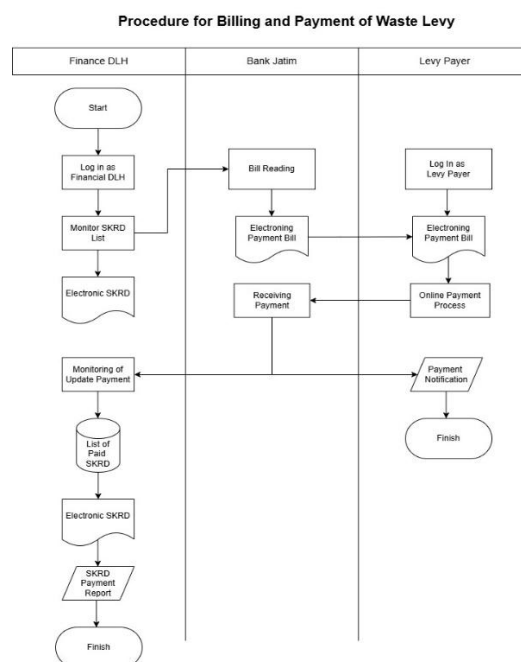
Picture 3. Procedures for Determining Levy Payer Rates

The determination of mandatory levy rates begins with UPT Persampahan officers entering the application and retrieving mandatory levy data from the database. Officers fill out the SKRD form, which includes the classification of levy objects according to their category, billing period, levy rates in accordance with local regulations, mandatory levy rates, quantity, units, and total. The SKRD draft is then saved and validated by the Head of the Environment Agency. If the SKRD draft is rejected, adjustments are made by the UPT waste management officer. If the SKRD draft is accepted, the SKRD document is stored in the database for monitoring by the DLH Finance Department. Monitoring is carried out regularly by the DLH Finance Department by viewing the latest SKRD through the Levy Receivables Report.

- Related functions : Waste Management Unit Officer, Head of Environmental Agency, DLH Finance
- Document : Levy Payer Data, SKRD Form
- Report : Levy Receivables Report

### 3.2.3. Procedures for Billing and Payment of Waste Levy

The procedure for billing and payment of waste levy is a procedure for issuing bills to those liable for the levy and receiving payment. The billing process is based on the Regional Levy Determination Letter (SKRD) from the previous process and is sent to those liable for the levy. Payment of the levy is made by those liable for the levy through a partner bank of the local government. In this case, payment can be made through Bank.



Source: Processed Data

Picture 5. Procedures for Billing and Payment of Waste Levy

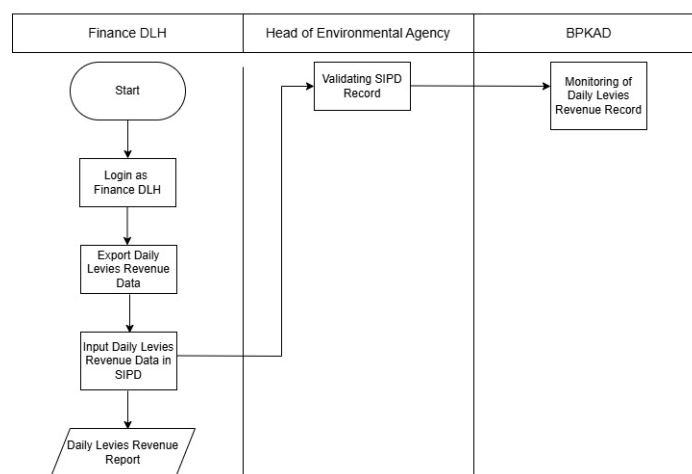
The billing procedure begins with DLH financial staff logging in to monitor the Electronic SKRD for the current period. Next, data is transferred to Bank Jatim to read the mandatory electronic levy payment bills. Electronic payment bills will appear on the mandatory levy user's account. To remind mandatory levy payers of their levy bills, messages can also be sent automatically by the provider. Payments can be made by levy payers using the available Bank Jatim Virtual Account number or QRIS. Upon payment, the funds are deposited into the DLH current account at Bank Jatim, and the levy payer receives a notification of the payment made. Data updates occur on the DLH Finance user to monitor the List of Paid SKRD. For further reporting and data analysis needs, there is a Paid SKRD Report.

- Related function : Finance DLH, Bank Jatim, Levy Payer
- Document : Electronic SKRD, Electronic Payment Bill
- Report : SKRD Payment Report

#### 3.2.4. Procedures for Recording Waste Levy Revenue

The procedure for recording waste levy revenue is a process of recording or journaling revenue into the government financial system known as SIPD. Until now, this recording has been done once a month because the mechanism for paying waste levies has not been properly systematized. The researchers recommend that levy revenue be recorded daily so that the value of levy revenue can be identified on a daily basis. The aim is to provide transparency of revenue to the public and financial auditors. Integration between the waste levy payment system and SIPD is needed for this model to be applied.

Procedure for Recording Waste Levy Revenue



Source: Processed Data

Picture 5. Procedures for Recording Waste Levy Revenue

- Related functions : Fanance DLH, Head of Environmental Agency, BPKAD
- Document : Daily Levies Revenue Data
- Report : Daily Levies Revenue Report

The recording procedure begins with the Revenue Treasurer logging into the user account and exporting the daily waste collection fee revenue data. The data consists of regional revenue collected by the banking system in a single day. Next, the SIPD operator inputs the daily retribution revenue into the SIPD. For reporting and monitoring purposes, a daily retribution revenue report can be printed. The Head of the Environmental Agency is responsible for validating the levy revenue records. Further monitoring is carried out by the BPKAD to ensure that the levy revenue has been recorded in the correct account, namely levy revenue and regional cash.

### 3.4. System Design Validation

System design validation is carried out by submitting the system design results to the Environmental Agency. There are functional, non-functional, and internal control aspects that are the focus of the system design validation stage. The functional aspect validates how the procedures for mandatory retribution data collection, rate setting, billing, payment, recording, and reporting can run well. Non-functional aspects validate the ease of implementation, transparency, and accountability of the system. Internal control aspects validate compliance and security during system operation. The following are the results of the interviews and discussions.

*The results of the waste levy payment system design are complete, starting from the data collection stage for levy payers, the determination of levy rates, billing, payment, and recording. So far, our biggest challenge has been identifying levy payer data. The combination of these processes, coupled with a computerized system and tiered validation, makes the data more valid and comprehensive. The levy payer reports generated also help us monitor the profile and number of levy payers in real time. Then, with an integrated system, the process of adjusting rates in accordance with local regulations and preparing SKRD is more efficient. The Mandatory Retribution Receivables Report is also important in helping us monitor potential uncollected revenue . The digital payment mechanism with Bank Jatim, both VA and QRIS, can make it easier for WR, especially if there are automatic notifications that can remind WR. Ease of payment is the key to increasing retribution revenue. We hope that public participation in paying retribution will increase and have a positive impact on PAD. Integration with SIPD can simplify daily recording so that retribution receipt information is more accurate and timely. However, there will certainly still be challenges and obstacles in its implementation later on.*

Based on the interview results, the system design can be used as a reference for developing a fast, accurate, and secure computerized waste levy payment system. The

four proposed procedures have great potential to improve data accuracy, speed up administrative processes, facilitate payments, and increase financial transparency. The waste levy payment system design assists in WR data collection, monitors payments in real time, and generates numerous reports for management purposes. Although this system offers many benefits, there are several challenges that may arise, ranging from user adaptation to limited infrastructure. Therefore, it is necessary to conduct socialization for those liable for levies and provide ongoing training for DLH and UPT Persampahan officers to ensure smooth adoption of the system. A good waste fee payment system is expected to improve the accountability of public services. The accountability of public services has an impact on regional fees (Hirani & Alistraja, 2020). As for infrastructure, there must be appropriate annual budgeting for this project.

### **3.5. Implications for Local Own-Source Revenue (PAD)**

Overall, the designed system is expected to have a strong impact on increasing local own-source revenue. This is supported by more accurate mandatory levy data, efficient rate setting, ease of payment through digital channels, and transparent and real-time revenue recording, which are expected to provide good public services (Al-Dhaheri & Khan, 2022). The quality of public services can increase waste levy revenue (Nurkhikmah et al., 2022). In addition, the potential for leakage of retribution revenue can be minimized so that no retribution revenue is lost, and in fact, there may even be an increase in revenue in the long term. Furthermore, if compliance with levy payer obligations can be improved, the training process will become more optimal, and accountability in reporting will directly contribute to an increase in the volume of waste levy revenue, which is an important component of local own-source revenue..

## **4. Conclusion**

The design of the Waste Payment Levy System aims to provide an overview to the Malang Regency Environment Agency in order to resolve the issue of suboptimal waste levy revenue due to poorly systematized financial management. The waste payment levy system begins with the procedure for collecting levy payer, the procedure for determining waste levy rates, the procedure for billing and payment of waste levies, and the procedure for recording waste levies. The levy payer data collection procedure serves to record the entire profile of mandatory waste levy payers who will be registered in the system. Procedures for determining mandatory waste levy rates serves to determine the

mandatory waste levy rate set for mandatory waste levy payers in accordance with local regulations. Procedures for billing and payment of waste collection levy serves to provide bills to mandatory levy payers along with receipts. The waste levy recording procedure facilitates the recording or journaling of levy revenue into the government financial system. The results of the system design validation conducted jointly with the Malang Regency Environment Agency show that this waste payment levy system is appropriate in terms of functionality, non-functionality, and internal control. This waste payment levy system design can be used as a reference for developing digital applications by IT parties. Although there are challenges to implementation, the long-term benefits offered by this system, particularly in terms of increasing regional revenue and public accountability, outweigh any obstacles that may arise.

The implications of this study are that digitizing the waste levy payment system can accelerate administrative processes, increase the potential for local own-source revenue, and provide transparency in financial reporting. This study contributes to the development of a digital-based local levy payment system model that can be used as a reference for local governments in managing finances in a transparent, fast, and accurate. In addition, this research can serve as literature on the application of accounting information systems and good financial management in the public sector in Indonesia.

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