

GEOGRAPHIC INFORMATION SYSTEM IN REGIONAL ASSET MANAGEMENT AT BPKAD OF PALEMBANG CITY

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Abstract

Background: BPKAD Palembang City as a government agency for managing regional assets, which data on land and building asset management is still in the form of tabular documents. The process of visualizing land and building asset data can be represented through a Geographic Information System (GIS) for easy information and realizing transparent and serving government governance. Problem Formulation: (1) How is the implementation of web-based GIS in the management of regional assets in Palembang City, and (2) How is the level of effectiveness of web-based GIS in regional asset management in BPKAD Palembang City. Research objectives: (1) Provide information, monitoring and supervision to the government, especially BPKAD Palembang City on the classification and mapping of regional assets, and (2) Measure the level of effectiveness of GIS implementation in the management of regional assets. Research stages: Planning, Analysis, Design, Implementation, Testing and Integration, Survey. The final result is a Geographic Information System product that provides easy information, monitoring, and supervision for the Palembang City BPKAD with an effectiveness rate of 81%

1.0 INTRODUCTION

Palembang City Regional Asset Management is regulated in Palembang City Mayor Regulation number 73 of 2016 which states that the Regional Financial and Asset Management Agency (BPKAD) is an implementing element of Government Affairs in the Financial and Regional Asset Management Sector [1]. In the Mayor's Regulation (Perwali), it can be seen that regional assets are very important to be managed in addition to having economic, commercial and exchange value, regional assets can also be used to increase regional income. Regional income will increase if regional assets are managed and monitored properly, otherwise poor regional asset management will cause legal impacts in the form of loss of assets, disputes, misuse of asset functions, and cause regional assets to have no economic, commercial and exchange value. The problem that often occurs in asset management in government is the misuse by certain parties who violate the rules and budget.

Land and buildings are part of regional assets managed by BPKAD of Palembang City and the data are tabular. In Geographic Information Systems (GIS) tabular data can be converted into spatial and non-spatial data (attributes) so that the coordinates of the points can be known. GIS makes it easier to map regional assets with visualization of land, buildings, locations and attributes of the regional assets. Thus it will be easier to carry out supervision and monitoring in its management. Asset mapping is not only an inventory but must also have a valid legal side so as to minimize claimants from other parties. The location of regional assets must also have a correlation with the Regional Spatial Plan (RTRW), so that regional assets owned by the Regional Government of South Sumatra Province provide high economic value.

The current condition is that BPKAD of Palembang City does not yet have management of regional asset data in the form of web-based mapping. Meanwhile, in supporting the operational management of regional assets, mapping is always needed to see the perspective of assets spread across the city of Palembang. Meanwhile, in an effort to monitor and collect data on regional assets, BPKAD carries out a field inventory and tabulation in Microsoft Excel by inserting several attributes such as location information, year, building condition, status, and other aspects related to regional assets. The obstacle that occurs is that users have difficulty in visualizing regional assets under certain conditions and the search for regional asset data cannot be carried out in real-time. So it can be concluded that the formulation of the problem in this study is (1) How is the implementation of a web-based geographic information system in the management of regional assets in Palembang City, and (2) How is the level of effectiveness of a web-based geographic information system in managing regional assets at BPKAD of Palembang City.

The specific objectives of the research carried out are (1) Providing information, monitoring and supervision to the government, especially BPKAD of Palembang City on the classification and mapping of regional assets as one of the factors to increase economic value, commercial and exchange rates that encourage an increase in regional income through the Web-based Geographic Information System on Regional Assets, and (2) Measuring the effectiveness of the implementation of a Web-based Geographic Information System in the management of Regional Assets at BPKAD Palembang City. While the limitations of the study include (1) the data on regional assets that are processed include land and building assets, (2) the subdistrict that is observed in the regional asset data collection is Ilir Barat 1 Subdistrict, Palembang City, (3) the attributes used in the mapping are public attributes consisting of coordinate points, location, front-side-back view of assets, (4) Development of map assets using googleMap and tools with the Bootstrap framework, (5) System development method following the System Development Life Cycle (SDLC) flow, and (6) System testing carried out with Blackbox Testing.

Several studies have been conducted related to web-based mapping, including the development of GIS to see the potential of agricultural land in the Yogyakarta area, where based on the results shown by mapping, 25.4% of the area in Yogyakarta has the potential to be very suitable for planting rice, 16% is suitable for planting rice. for planting peanuts, and 2% are suitable for growing corn [2]. Another research is the implementation of web-based mapping for groundwater potential zoning using AHP [3] which produces 6 parameters in determining water potential, namely infiltration rate, straightness density, rainfall, land cover, drainage density, slope slope. The results of the mapping are categorized into 4 categories of groundwater potential, they are 26% very low, 30% low, 21% good and 23% superior. Another study [4] to assess disaster factors in the Delta State through web-based mapping by measuring the level of flooding, erosion, oil spills, sea level rise and so on. The final result is a topographical mapping that represents the potential for disasters and mitigation efforts against these disasters. From previous studies, no one has raised regional assets as a web-based mapping domain. So that the research carried out has a value that supports renewability in government governance in the city of Palembang.

2.0 THEORETICAL

2.1. Regional Asset

According to the Decree of the Ministry of Internal Affairs Number 7 of 2012 the definition of regional assets is all regional assets, both purchased or obtained at the expense of the regional budget and income derived from other legitimate acquisitions, both movable and immovable and their parts or which are certain units that can be valued, counted, measured or weighed include animals and plants except money and other securities [5].

The regional asset management procedures include (1) Asset Inventory, (2) Legal Audit, (3) Asset Valuation. a work process to conduct an assessment of the land assets of the controlled area, (4) Asset Optimization, (5) Supervision and Control [6].

2.2. Geographic Information System

Geographic Information System (GIS) is a special information system that manages data that has spatial information. The definition of Geographic Information System according to ESRI (Environmental System Research Institute) is an organized collection of computer hardware, computer software, geographic data and personnel designed to efficiently obtain, store, update, manipulate, analyze and display all forms geographically referenced information [7]. The GIS System (Subsystem) component consists of [8]:

1. Input

Collect and prepare spatial or attribute data from various data sources. The data used must be converted into an appropriate digital format. The conversion process is known as the digitizing process. One technique to convert analog data into digital data is to use a digitizer machine, including on-screen digitizing models of shooting data (both aerial photos and satellite photos) through scanning [9].

2. Manipulation

Data manipulation is the process of editing the data that has been entered, this is done to adjust the type of data to suit the system to be created, such as scale equalization, changing the projection system, and generalization [10].

3. Data Management

This stage includes all activities related to data processing (storing, organizing, managing, and analyzing data) into a permanent storage system, such as a file server system or database server according to system requirements [11].

4. Query

An information search method to answer questions posed by GIS users. In a GIS with a file server system, queries can be used with the help of a compiler or interpreter used in developing the system, while for a GIS with a database server system, SQL (structured query language) can be used in the certain DBMS.

5. Spatial Analysis and Attribute

The function of spatial analysis is the operation performed on spatial data and the function of attribute analysis is the function of processing attribute data, which is data that does not related to spatial aspect [7].

6. Visualization

Presentation of results in the form of new information on existing database data both in softcopy and in hardcopy form such as in the form of maps (map attributes and data attributes), tables, or graphs.

2.3. System Development Life Cycle (SDLC)

SDLC is a cycle used in the creation or development of information systems that aim to solve problems effectively. In another sense, SDLC is a work stage that aims to produce a high-quality system that is in accordance with the purpose of the customer for which the system is made. SDLC is a framework that contains the steps that must be taken to process the development of a software. This system contains a complete plan for developing, maintaining, and replacing specific software [12].

SDLC is used to build an information system so that it can run as expected. SDLC (Systems Development Life Cycle) or Systems Life Cycle, in systems engineering and software engineering, is the process of creating and modifying systems and the models and methodologies used to develop those systems. This concept generally refers to a computer or information system. SDLC is also a pattern taken to develop a software system, which consists of the following stages: planning, analysis, design, implementation, testing and maintenance [13].

2.4. Blackbox Testing

Blackbox testing (blackbox testing) is one of the software testing methods that focuses on the functionality side, especially on application input and output (whether it is in accordance with what is expected or not). The testing phase is one of the stages that must exist in a system development life cycle [14]. Black Box Testing is a test that focuses on the functional

specifications of the software, the tester can define a collection of input conditions and perform tests on the program's functional specifications.

3.0 METHODOLOGY

The location of the research was carried out in the city of Palembang with the limitation of Ilir Barat 1 Sub-district through the partner of the Palembang City Regional Financial and Asset Management Agency (BPKAD). The data taken are regional asset data, these are land and buildings. The attributes used in mapping data assets are asset category, region representative, asset name, asset number, area (m²), year of procurement, address, status, certificate number, longitude and latitude. As for the output of the geographic information system in the form of the legal status of assets, the value of asset information and information on the distribution of assets. The system development in this research is the System Development Life Cycle (SDLC), with the following stages:

1. **Planning** This stage is carried out with an initial data survey, through data collection by (1) Observing the condition of the Palembang City BPKAD partners in managing and inventorying land and building assets, (2) Interviewing several parties related to the process of data collection and inventory of land and building assets. building, (3) Literature Study through reviewing previous research related to web-based mapping and Geographic Information Systems.
2. **Analysis** At the analysis stage, by examining spatial and non-spatial data on BPKAD partners. For spatial data in the form of an administrative map of the Ilir Barat 1 sub-district which was obtained from Bappeda/ Bakosurtanal/ Geospatial Information Agency (BIG). For non-spatial data in the form of regional asset data consisting of land and buildings.
3. **Design** The design model used to build an information system for mapping Palembang City Regional Assets uses an Object Oriented Design (OOD) approach with Unified Modeling Language (UML) modeling. The system designed through UML consists of Use Case Diagrams, Class Diagrams, Activity Diagrams and Sequence Diagrams.
4. **Implementation** Implementation with preprocessing and digitizing processes for spatial data. Meanwhile, for non-spatial data, it is done by classifying information from the distribution of regional assets. The coding implementation is done using web-based programming languages, including HTML, CSS, JavaScript, and PHP.
5. **Testing and Integration** The results of the spatial and non-spatial data are integrated with the system application that has been built, where the output produced is a map of the classification of land and building assets in the city of Palembang. The test is carried out using Blackbox Testing which involves stakeholder, which are staff and executive in BPKAD of Palembang City. Technically the stakeholder in the testing process will be given a test scenario to see the quality of the system from the functional aspect
6. **Survey** This stage is carried out to measure the level of effectiveness of the system implemented to partners. Technically, the questionnaire instrument was given to several parties who use the geographic information system of Palembang City's regional assets, which is expected to provide input and improve quality in the future by measuring the effectiveness of the system implemented.

4.0 RESULTS AND DISCUSSION

4.1. Planning

The planning process with initial data collection on the condition of land and building asset data in the city of Palembang which consists of the categories of UPTD Diknas, Puskesmas / Pustu, Assets of Sub-district Ilir Barat 1. Table 1 shows data on land and building assets:

Table 1. Land and Building Asset in Sub-district Ilir Barat 1, Palembang City

No	Item Type / Item Name	Number		Area (M ²)	...	Status
		Item Code	Register			
UPTD DIKNAS						
1	Kampung	01.01.01.01.001	0001	6.735,00	...	Right of Use

No	Item Type / Item Name	Number		Area (M2)	...	Status
		Item Code	Register			
2	Land and Building for Education and Training (School)	01.01.11.04.002	0001	13.232,00	...	Right of Use
3	Land and Building for Education and Training (School)	01.01.11.04.002	0001	3.000,00	...	Right of Use
4	Land and Building for Education and Training (School)	01.01.11.04.002	0001	1.800,00	...	Right of Use
5	Land and Building for Education and Training (School)	01.01.11.04.002	0001	8.541,00	...	Right of Use
6	Land and Building for Education and Training (School)	01.01.11.04.002	0001	1.500,00	...	Right of Use
7	Land and Building for Education and Training (School)	01.01.11.04.002	0001	3.150,00	...	Right of Use
...
56	Land and Building of Government Office	01.01.01.04.001	000002	259	...	Right of Use

Based on the data in table 1 above, it shows that land and building assets spread in Sub-district Ilir Barat 1 are 56 data, with land assets totaling 30 data and building assets totaling 26 data. In the research conducted, the scope is limited to Sub-district Ilir Barat 1 which consists of 26 Ilir Village, Bukit Baru Village, Bukit Lama Village, Demang Lebar Daun Village, Lorok Pakjo Village, Siring Agung Village. The tabulated data above becomes the basis for analysis and design at the next stage.

4.2. Analysis

In this stage, problem analysis and proposed system are carried out. Technically the problems that occur in the running system are:

1. Data processing of land and building assets at BPKAD Palembang City is only through excel tabulation, with the updating process not carried out regularly so that the existing data tends to be inconsistent with the current conditions in the field
2. There is no land and building asset management that can visually provide an overview of the classification of regional asset status

In order to solve the problems above, it is necessary to design a proposed system to be built. Figure 1 is the workflow of the system built:

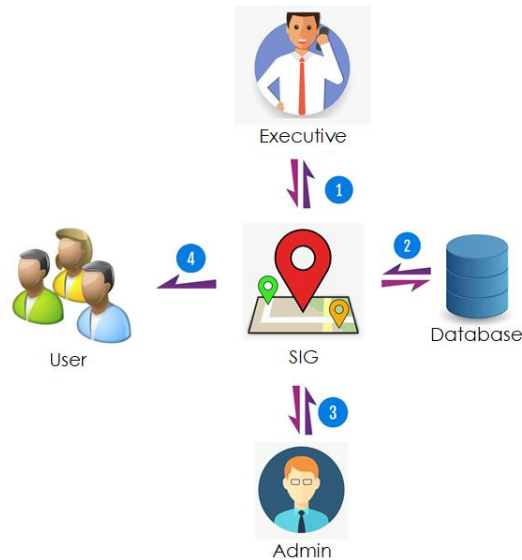


Figure 1. Proposed Geographic Information System Workflow

The following is an explanation of Figure 1 above:

1. The executive receives information from the distribution of land and building asset management in the city of Palembang and sends a request for the data needed during the data search process
2. The data in the Geographic Information System is integrated with the database as a storage medium for land and building assets
3. Admin as input data on land and building assets, both spatial and non-spatial data
4. General users as the BPKAD Palembang City staff who receive information from the Geographic Information System that was built.

4.3. Design

Based on the results of the analysis carried out in the previous stage, the design is carried out using UML which begins with use case diagram modeling consisting of (1) Actor Description, (2) Use Case Diagram, and (3) Use Case Definition. Table 2 below is a description of the actors of the Geographic Information System that was built, consisting of Executive, Admin and User:

Tabel 2. Actor Description of Regional Asset Geographic Information System

No	Nama Aktor	Deskripsi Aktor
1	Executive	Is a user who has access rights to obtain public and private information from Geographic Information System data. The executive is in charge of validating the correctness of the data that has been uploaded by the admin
2	Admin	Is a user in charge of inputting data, such as spatial and non-spatial data, account data, website management
3	User	Is a common user who receives public information from the System

The following figure 2 is a use case diagram of the system being built, which consists of 5 use cases, namely login, spatial data management, non-spatial data management, public information and private information:

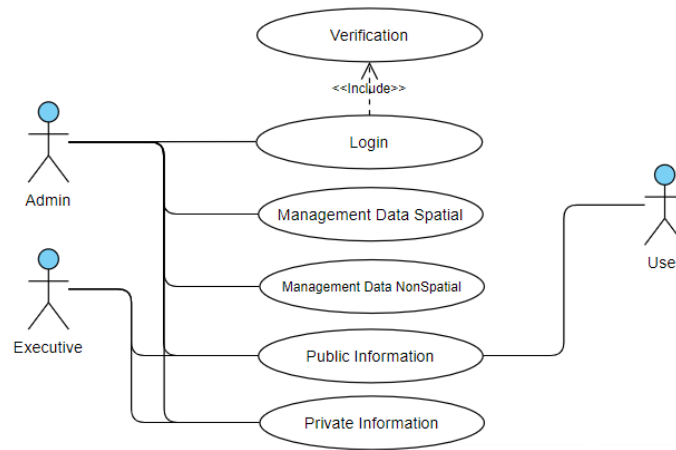


Figure 2. Use Case Diagram of Regional Asset Geographic Information System

As detailed, table 3 is the explanation of the Use Case in Figure 2 which provides an explanation of the action-reaction use case scenario between the actor and the system:

Table 3. Use Case Scenario

No	Use Case Name	Use Case Scenario	
		Actor Action	System Reaction
1	Login	1. Input Username and Password 2. Click Login Button	3. Validate User Data 4. If data is valid then Main Menu appear 5. If data is not valid then stay in Login Menu
2	Management Data Spatial	1. Input Data Spatial to the System 2. Click Save / Update / Delete button	3. Validate data input 4. If data valid then data executed as instruction given 5. If data is not valid then pop up "Data is not valid" appears
3	Management Data Non Spatial	1. Input Data Spatial to the System 2. Click Save / Update / Delete button	3. Validate data input 4. If data valid then data executed as instruction given 5. If data is not valid then pop up "Data is not valid" appears
4	Public Information	1. Fill the need of data in the search box to be shown 2. Click Search Button	3. System search the data as match to the its data index.

No	Use Case Name	Use Case Scenario	
		Actor Action	System Reaction
			4. If data is found the will be shown to the screen 5. If data is not found the will not be shown to the screen
5	Private Information	1. Fill the need of data in the search box to be shown 2. Click Search Button	3. System will verify the user whether executive or common user 4. If the Executive then system will search the data then will be appeared to the screen 5. If the common user then data will not be appeared to the screen

The class diagram design is shown in Figure 3 below, which consists of 3 main classes, namely the user class, the Asset class, the category class, and the Map class:

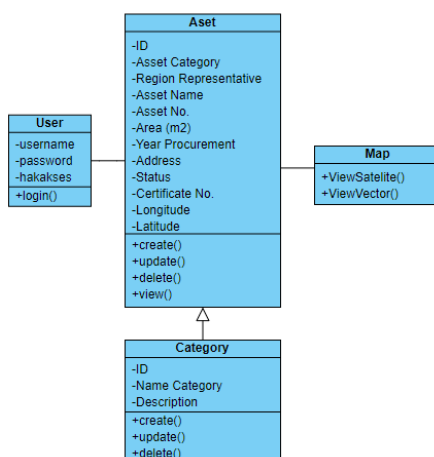


Figure 3. Class Diagram of Regional Asset Geographic Information System

Database design with the name db_asset which consists of 3 main tables, namely the tb_user table, the tb_asset table and the tb_category table. Tables 4, 5 and 6 show in detail the design of the constructed table:

Table 4. tb_user Design

No	Field	Type Data	Length	Desc
1	Username	Varchar	20	Primary Key
2	Password	Varchar	20	
3	Hak_Akses	Varchar	25	

Table 5. tb_asset Design

No	Field	Type Data	Length	Desc
1	ID	Varchar	10	Primary Key
2	Asset_Category	Varchar	20	
3	Region_Representative	Varchar	50	
4	Asset_Name	Varchar	35	
5	Asset_No	Integer	10	
6	Area	Integer	15	

No	Field	Type Data	Length	Desc
7	Year_Procurement	Integer	4	
8	Address	Varchar	40	
9	Status	Varchar	30	
10	Certificate_no	Integer	15	
11	Longitude	Decimal	10	
12	Latitude	Decimal	10	

Table 6. tb_category Design

No	Field	Type Data	Length	Desc
1	ID	Varchar	20	Primary Key
2	Name_category	Varchar	50	
3	Description	Varchar	50	

1.4. Implementation and Testing

The coding results are represented by the interface that facilitates communication between the user and the system. Figure 6 shows the main menu display of the Geographic Information System that was built where the user can see the dashboard of assets contained in the system. Users can see how many land and building assets are recorded in the system, also users can see the status and percentage of assets with the categories "Good Assets" and "Assets Under Repair".

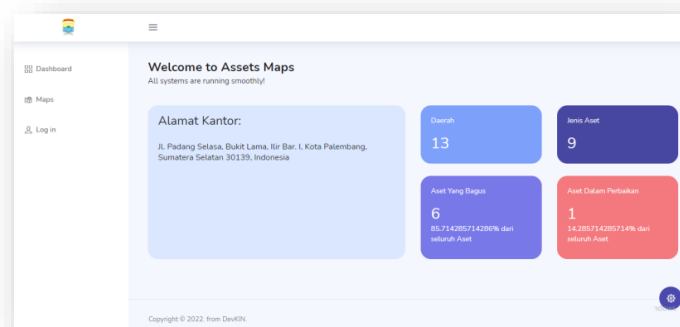


Figure 4. Main Menu

Figure 7 shows the display of the asset management menu, where users can add, edit, delete and display the inputted land and building assets. In the asset management menu there are 12 parameters consisting of 'ID', 'Asset Category', 'Region Representative', 'Asset Name', 'Asset Number', 'Area', 'Year Procurement', 'Address', 'Status', 'Certificate Number', 'Longitude' and 'Latitude'.

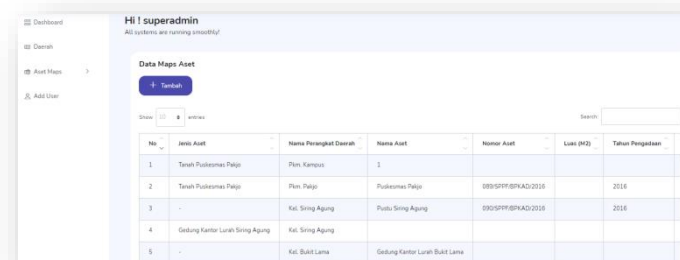


Figure 5. Asset Management Menu

The asset mapping display menu shown in Figure 8 displays a map of Sub-district Ilir Barat I, where when an asset search is carried out it will display the land and building data in question.

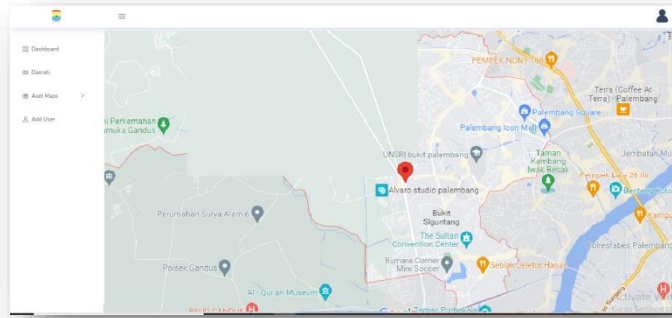


Figure 6. Asset Mapping Menu

In order to ensure that the implemented system runs well, testing is carried out with Black Box Testing. In the testing process, BPKAD of Palembang City as a user is given a test scenario to see how functional aspects are running. Table 7 shows the results of the Black Box Testing of the system built.

Table 7. Black Box Testing Result

No	Testing Scenario	Testing Target	Testing Result	Status
1	Login using valid username	A pop up appears and opens the main menu	A pop up appears and opens the main menu	OK
2	Login using invalid username	A pop up "fill with the correct data" appears and returns to the login page	Return to the login page and a notification of an error filling in the username appears	OK
3	Asset Data Searching	Appears the location need	Appears the location need	OK
4	Spatial Data Filling	System could save the data	System could save the data	OK

To measure the effectiveness of the system built for BPKAD of Palembang City, an assessment was carried out with a questionnaire instrument that was given to consisting of 20 lists of questions. Questionnaires were conducted to 10 participants consisting of leaders and staff of the land and building asset unit in BPKAD of Palembang City. From the results of the distribution of the instrument, an average effectiveness level of 81% consists of 4 assessment variables, namely (1) Ease of Use, (2) Problem Solving, (3) Informative, and (4) Complexity. Table 8 shows the percentage details of each of the assessment variables.

Table 8. Percentage of Effectiveness Rate

No	Effectiveness Aspect	Percentage
1	Ease of Use	83%
2	Solving the Problem	78%
3	Informative	88%
4	Complexity	75%
The Average of Effectiveness Rate		81%

5.0 CONCLUSION

5.1. Conclusion

The Geographic Information System in mapping the assets of the land and building area provides easy information, monitoring and supervision to BPKAD of Palembang City on the classification of the status of land and building assets. In terms of the level of effectiveness of the system implemented at BPKAD of Palembang City, the percentage of effectiveness was

81%, which consisted of the ease of use aspect of 83%, the Problem Solving aspect of 78%, the Informative aspect of 88% and the Complexity aspect of 75%.

5.2. Suggestion

As a suggestion for the development of the sustainability of the geographic information system implemented at BPKAD of Palembang City, it can be viewed from 2 aspects, these are (1) Development of a mapping scope that targets all sub-districts in Palembang City; (2) Development of asset boundaries excluding land and buildings. With the development of sustainability through these 2 aspects, it is hoped that there will be a government governance system that is transparent and serves the community.

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