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# **Designing a Fallen Tree Disaster Reporting Application Based on Mobile Android Case Study : Regional Disaster Management Agency (BPBD) Banyumas Regency**

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## **Abstract**

Banyumas Regency is prone to falling trees in the rainy season, reporting on fallen tree disasters is still not focused. The large number of social media used and the regent's complaint booth confuses the reporting process because it is not centralized in one system, making data recording difficult. The authorities in handling the fallen tree disaster are the Regional Disaster Management Agency (BPBD) of Banyumas district. With these problems, an android application was designed that functions to facilitate the process of reporting disasters from the community, as well as the process of recording fallen tree disaster data. The design stage uses the Waterfall method, testing uses UAT and black box testing. Testing is carried out by 3 users as users, namely the Community, Admin and Officers. Respondents from the community as many as 120 people, as many as 20 officers and admin as many as 3 people. The results of the UAT application test are very helpful for the disaster reporting process, the menu display is attractive, the application can be understood, the type of font size and color is easy to read, creating an account does not make it difficult for users and the application menu is in accordance with user needs. In black box testing, it was found that the application designed was very helpful with an average validation percentage of 98% for each menu.

Keywords: Android, Blackbox Testing, UAT Testing, Waterfall

## **Abstrak**

Kabupaten Banyumas rawan akan terjadinya pohon tumbang pada musim penghujan, pelaporan bencana pohon tumbang masih kurang terarah. Banyaknya media sosial yang digunakan dan lapak aduan bupati membingungkan proses pelaporan karena tidak terpusat pada satu sistem sehingga perekapan data pun sulit dilakukan. Adapun pihak yang berwenang dalam penanganan bencana pohon tumbang adalah Badan Penanggulangan Bencana Daerah (BPBD) kabupaten Banyumas. Dengan adanya permasalahan tersebut dirancanglah aplikasi android yang berfungsi untuk mempermudah proses pelaporan bencana dari masyarakat, serta proses perekapan data bencana pohon tumbang. Tahap perancangannya menggunakan metode Waterfall, pengujian menggunakan UAT dan blackbox testing. Pengujian dilakukan oleh 3 user sebagai pengguna yaitu Masyarakat, Admin dan Petugas. Responden dari masyarakat sebanyak 120 orang, petugas sebanyak 20 orang dan admin sebanyak 3 orang. Hasil pengujian UAT aplikasi sangat membantu proses pelaporan bencana, tampilan menu menarik, aplikasi dapat dipahami, jenis ukuran dan warna font sesuai mudah dibaca, pembuatan akun tidak menyulitkan pengguna dan menu aplikasi sesuai dengan kebutuhan pengguna. Pada pengujian black box testing didapatkan aplikasi yang dirancang sangat membantu dengan rata-rata persentase validasi setiap menu sebesar 98%.

Kata kunci: Android, Blackbox Testing, Pengujian UAT, Waterfall

# Designing a Fallen Tree Disaster Reporting Application Based on Mobile Android Case Study: Regional Disaster Management Agency (BPBD) Banyumas Regency

## 1. Introduction

Based on data from the National Disaster Management Agency (BNPB) on natural disasters in 2016 to 2021, Banyumas is a district in Central Java province with the 2nd highest risk of disaster in Central Java, which can be seen in table 1 below:

Table 1. BNPB Natural Disaster Data for 2016-2021[1]

No	County / City	Potential of Exposed Population (Soul)			Class	
		Total Population Exposed	Vulnerable Group			
			Vulnerable Age Group	Poor Resident	Disabled Resident	
1	Cilacap	1.653.202	269.976	482.104	7.592	Tall
2	Banyumas	1.452.358	246.139	378.934	6.512	Tall
3	Purbalingga	744.472	127.142	271.970	4.510	Tall
4	Banjarnegara	421.997	68.961	112.996	2.345	Tall
5	Kebumen	766.596	137.797	272.544	4.205	Tall
6	Purworejo	567.343	106.757	124.772	4.466	Tall
7	Wonosobo	238.373	39.094	74.413	919	Tall
8	Magelang	865.528	142.787	216.503	5.277	Tall
9	Boyolali	773.788	139.362	162.459	4.143	Tall
10	Klaten	1.120.124	202.971	353.047	5.239	Tall
11	Sukoharjo	862.481	135.174	185.650	3.415	Tall
12	Wonogiri	915.868	180.570	213.668	6.668	Tall
13	Karanganyar	846.139	139.022	176.323	4.008	Tall
14	Sragen	860.192	150.011	232.168	4.750	Tall
15	Grobogan	1.122.204	178.334	310.825	4.564	Tall
16	Blora	752.429	123.497	191.871	2.818	Tall
17	Rembang	582.475	84.652	213.173	2.851	Tall

From the data, it can be concluded that Banyumas regency is an area prone to disasters. One of the disasters in Banyumas regency that occurred a lot before the rainy season was the disaster of fallen trees. The disaster of fallen trees is very dangerous because it can damage property, objects can even cost lives. The proneness of falling tree disasters in the rainy season is caused by several factors such as large wind pressure, the movement of land in landslide-prone areas and the condition of trees that are old and weathered but have not been logged,

4 Data from the Regional Disaster Management Agency (BPBD) Banyumas regency. Fallen trees disasters increase every year. The data of fallen trees 8 can be seen in table 2 below:

Table 2. Data of Fallen Trees of Banyumas Regency (BPPD Kab. Banyumas)

Year	2016	2017	2018	2019	2020	2021
Number (Case)	20	30	32	26	40	27

Based on the data above, the number of disasters of fallen trees is increasing every year. This often occurs due to lack of monitoring from the relevant agencies and the process of submitting reports of fallen tree disasters that are still not directed. The number of media used to accommodate reporting of fallen tree cases such as telephones (BPBD call centers), social media (Whatsapp, Facebook, Instagram, Twitter, official websites) and regent complaints has caused the process of submitting reports has not been centralized. BPBD in handling the disaster of fallen trees is still difficult to know the location of the disaster accurately so it takes a long time to handle it. In addition, the process of solving disaster data is difficult because the reporting data is spread not in one media. The absence of special media that only handles reports of fallen tree disasters confuses the public in delivering reports quickly and accurately.

One of the technological developments that can be applied to this problem is by designing a fallen tree reporting application based on mobile android by utilizing QR codes. The utilization of QR Codes aims to speed up the process of conveying information. QR codes or *Quick Respond Codes* are an evolution of *two-dimensional barcodes*. QR codes can be accessed through mobile phones that have a QR code reader application by accessing the internet. The use of QR Codes in fallen tree reporting applications is useful to speed up the process of sending information which in this case is information about the tree to be uprooted such as the name of the tree, the age of the tree, the size of the tree and the location of the tree. By simply scanning the QR code attached to the tree, the data about the fallen tree will enter the application and will be sent to the BPBD which will be received via *mobile* android to be handled immediately by BPBD officers via *mobile* android. The process of solving disaster data can also be done through *mobile* android.

## 2. Method

The Research Stages at BPBD Banyumas Regency are depicted in the research waterfall method presented in figure 1.

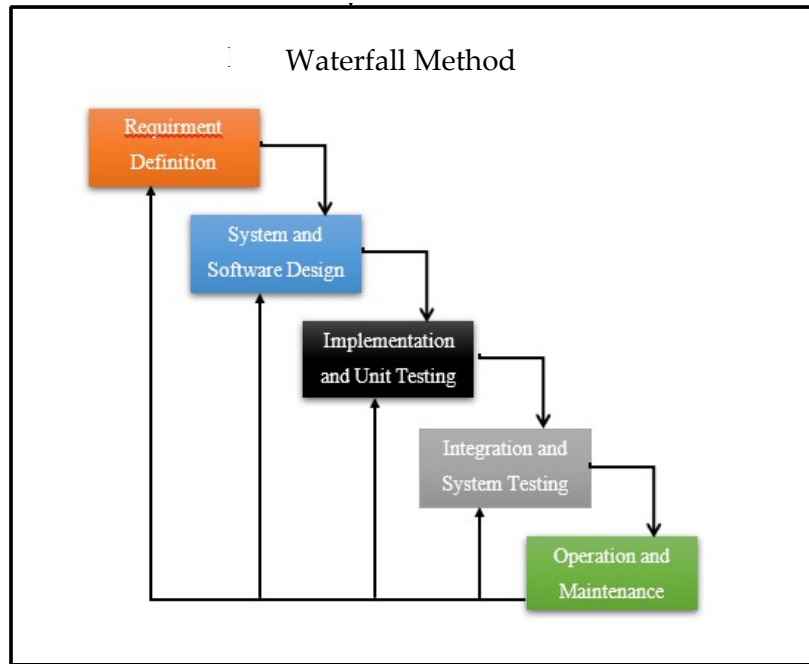


Figure 1. Waterfall Method

### 2.a. Application of waterfall method

The stages of the Waterfall method are as follows:

#### 2.b.1. Requirement Definition

At this stage, a needs analysis is carried out on how the android-based fallen tree disaster reporting application will be applied in the community and in BPBD. Needs analysis includes hardware, software and data (data on fallen tree disasters from BPBD in 2016-2021). Data collection is intended to obtain the right data so that it can answer the formulation of research problems. The collection of data is carried out in the following ways:

- Observation

At this stage, direct observations were carried out on the environment about the problem of falling tree disasters where currently the process of reporting fallen trees in Banyumas regency.

- Interview

At this stage, an interview was conducted to the Regional Disaster Management Agency (BPBD) of Banyumas regency. The interview data taken is about the data of cases of fallen tree disasters that occurred in Banyumas regency from 2016 to 2022. From the data of the case of the fallen tree disaster, an expansion will be carried out to find out the increase or decrease in the disaster of fallen trees in Banyumas regency.

- Documentation

At this stage, data on the 2010-2021 tree disaster was taken at BPBD Banyumas regency.

#### 2.b.2. System and Software Design

At this stage the design of the system is carried out. System design is built using UML (Unified Modeling Language) which supports object-based programming. In the system design will be adjusted to the needs of users in this case the BPBD Banyumas regency. The use of UML will facilitate the creation of a system and structured.

#### 2.b.3. Implementation and Unit Testing

At this stage, the application that will be made in the form of android both on the admin, community and officer side. The creation of the application can later be run on at least the android version of kitkat. The programming language used is the java programming language and uses android studio software as a tool.

#### 2.b.4. Integration and System Testing

At this stage, system testing is carried out to find out which system has been made in accordance with the planned and can function properly. This system testing is done with User Acceptance Test (UAT) and Blackbox Testing.

#### 2.b.5. Operation and Maintenance

At this stage, the system that has been completed in the trial can be used by the user. The users for this system are the community, admins and BPBD officers. All systems are in the form of android, while the community as a system user can report the disaster of fallen trees. The admin will run a system that serves to receive reports of fallen tree cases from the community and will forward it to the officer and can

conduct data on cases of fallen trees. For user officers can be used to receive reports, report hoax news and verify report data directly to the location. If there are changes to the needs of the system, repairs or maintenance will be carried out.

### 3. Results and Discussion

#### 3.a. Use Case System Diagram

Use case diagrams are used to describe functions and activities on the system that can be seen by actor (user). In this study, actor used there are 3, namely Community, Officer and Admin. The use case for the disaster reporting application of fallen trees is presented in figure 2 as follows:

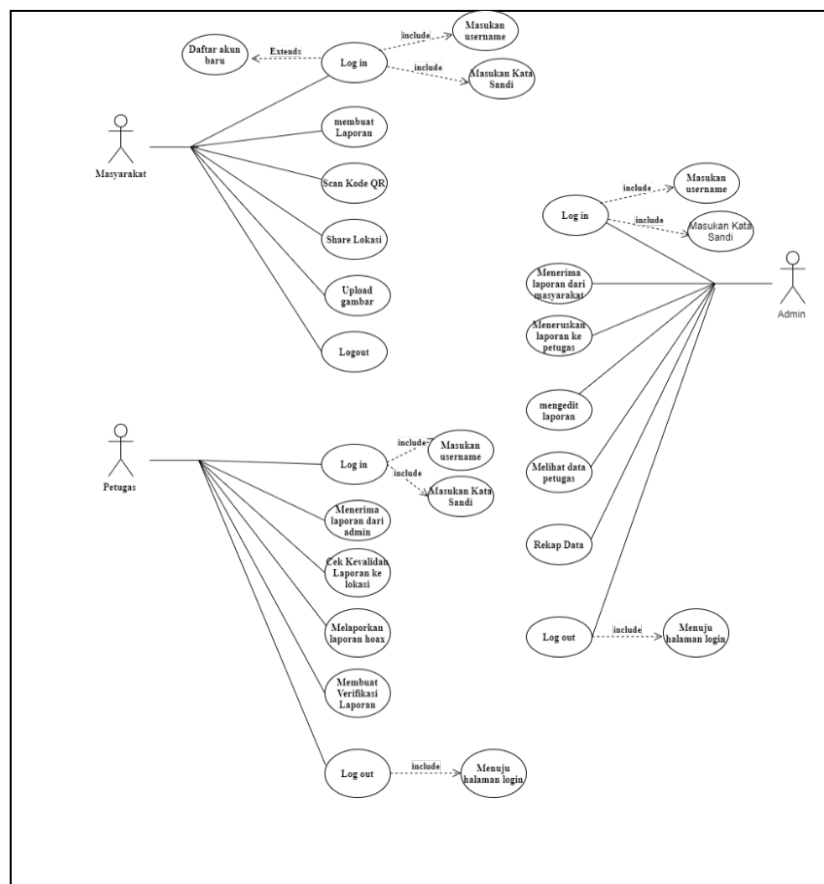


Figure 2. Use case of fallen tree disaster reporting application

#### 3.b. System Interface

Users in this study consisted of 3, namely the community, officers and admins. For each interface view of each user is different and will be adjusted to its functions and needs. System view that has been created as follows:

### 3.b.1. Community User Interface Page

Login and account registration views on the fallen tree reporting app for community complaints. This view is presented in figure 3.

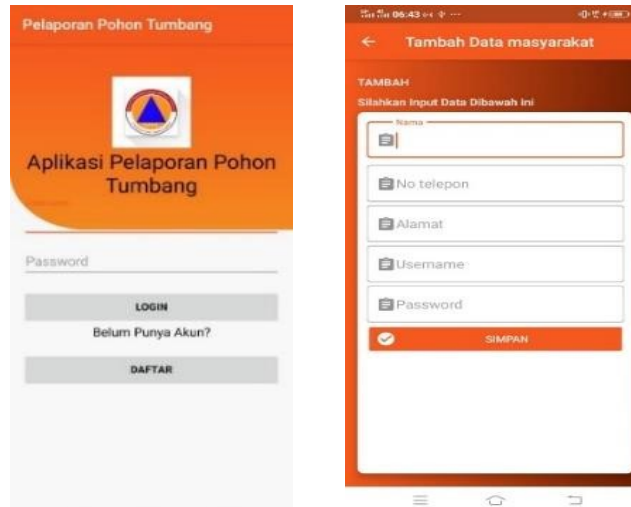


Figure 3. Login and account registration views for the public

The menu display of the fallen tree disaster reporting application on the community side consists of 4 menus, namely the Application Instruction for Use, Disaster Report, Notification and Sent Report. The display is presented in figure 4.

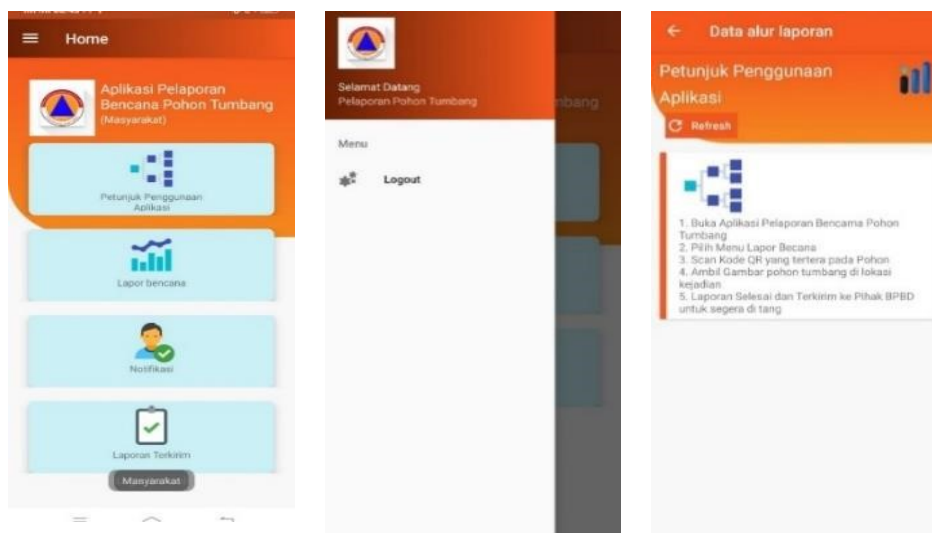


Figure 4. Display of all menus for community complaints

The appearance of the disaster report menu, on this menu the community can do disaster reporting of fallen trees by scanning a QR code, uploading an image and then filling in the chronology on the form and then click the report process. After that, the report created will be sent directly to the admin. The notification menu will be visible after the community



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reports the disaster of fallen trees. In the notification menu, you will see the QR code, date, hour, chronology and handling status. For the amount of damage, note, the parties involved will be filled after the officer verifies the disaster. In the notification menu, there is also a status in the report process. This view is presented in figure 5.

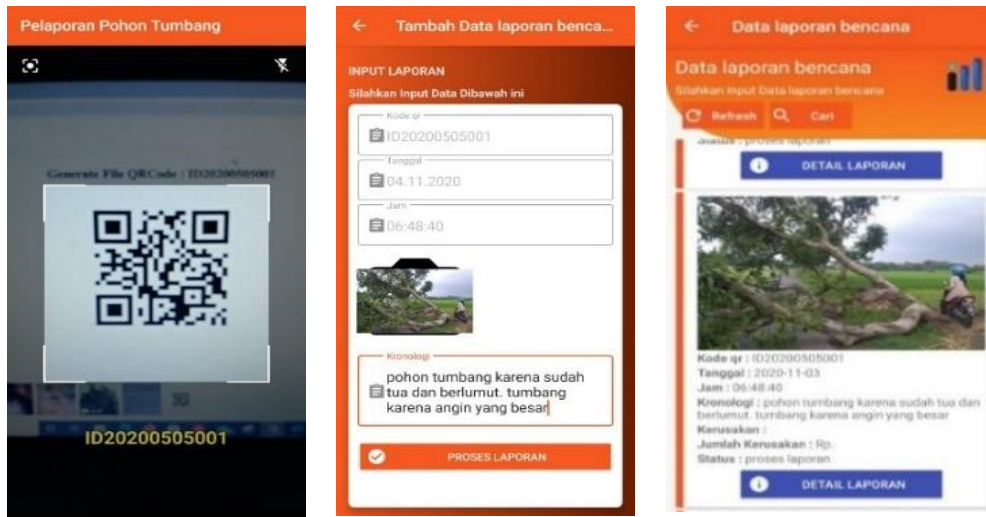


Figure 5. View of disaster report menus and notifications

The menu display of the sent report contains a list of disaster reporting history that has been completed. This view is presented in figure 6.

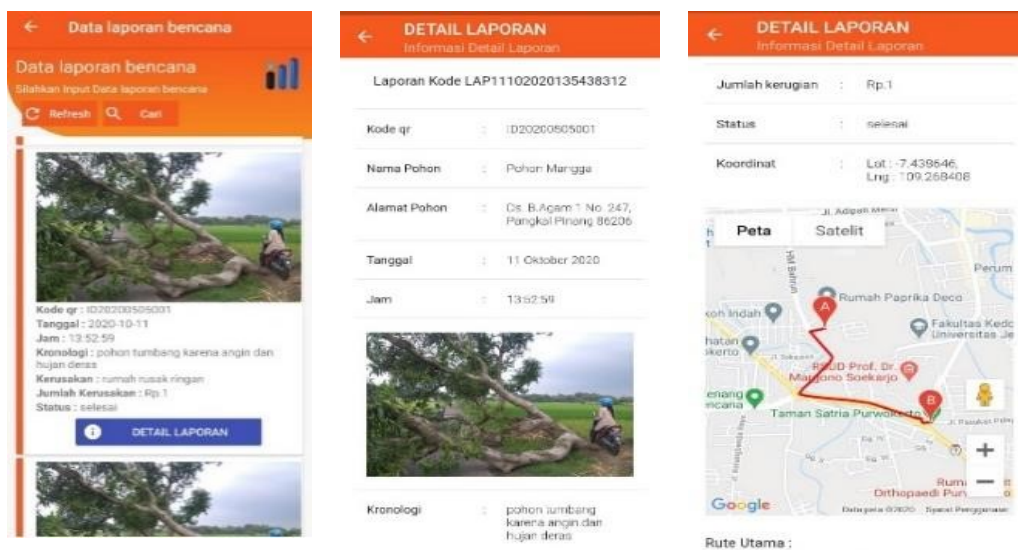


Figure 6. Sent report menu view and location map of fallen trees

### 3.b.2. Officer User Interface Page

The officer's login view, user username and password are created by the admin so that the officer cannot register his own account. The menu display on the officer's side consists of

3 menus, namely Notifications, Disaster Verification and Handling History. The display is presented in figure 7.

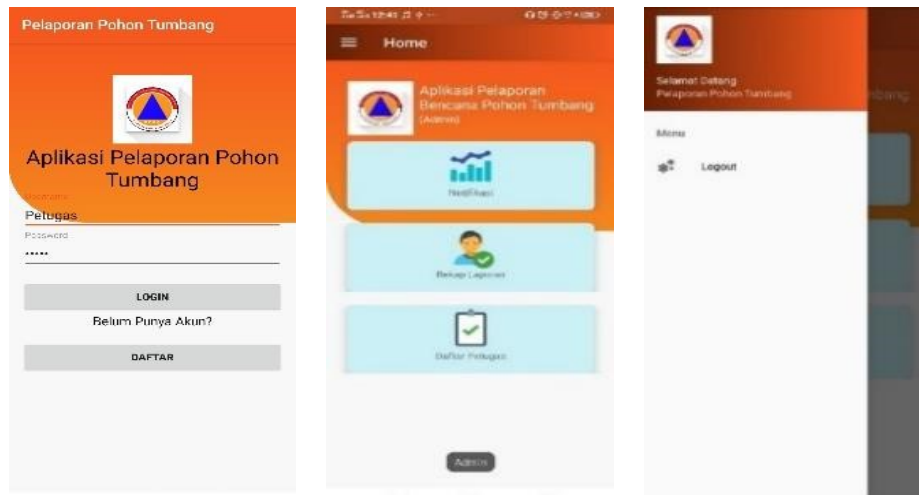


Figure 7. Officer login view and officer menu view

Officer notification display, officer notification is visible after the admin submits a community report to the officer. There are 2 actions that can be taken by officers for disaster management, namely the details of the report to see the entirety of the fallen tree info. Action to deal with disasters to approve handling efforts. To approve disaster management officers click deal with the disaster and click update on the action form. The view of the handling history menu, contains a history of handling the disaster of fallen trees carried out by officers. So it will be seen how many reports of fallen tree disasters have been handled, it will also be seen the location of the officers and the location of the disaster event. The display is presented in figure 8.

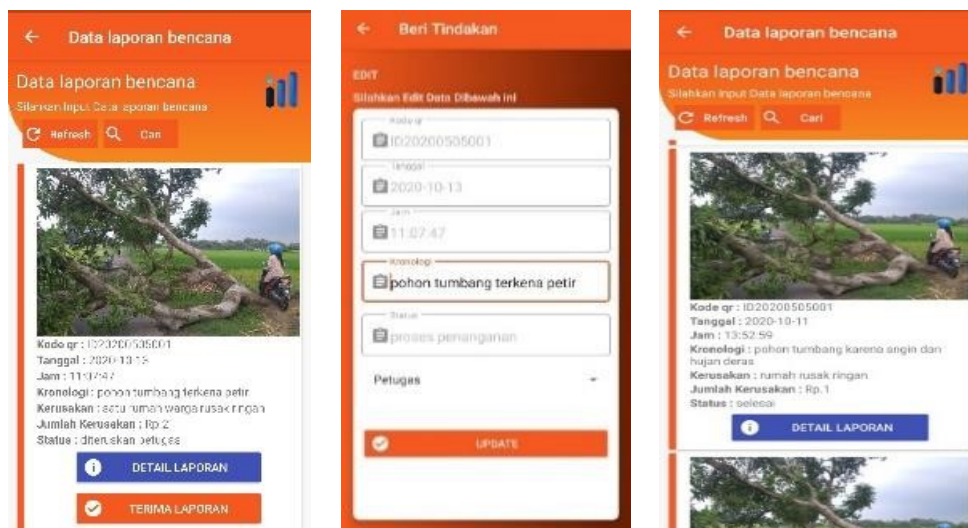


Figure 8. Officer notification menu view and Handling history menu

The view of the disaster verification menu, is a display that must be filled in by officers after handling the disaster at the scene. The officer must then fill in the chronology, damage and amount of loss and then click the update to complete the handling process. Verification data from the officer will enter the system. There is a hoax report menu to report invalid reports after checking to the disaster site. The display is presented in figure 9.

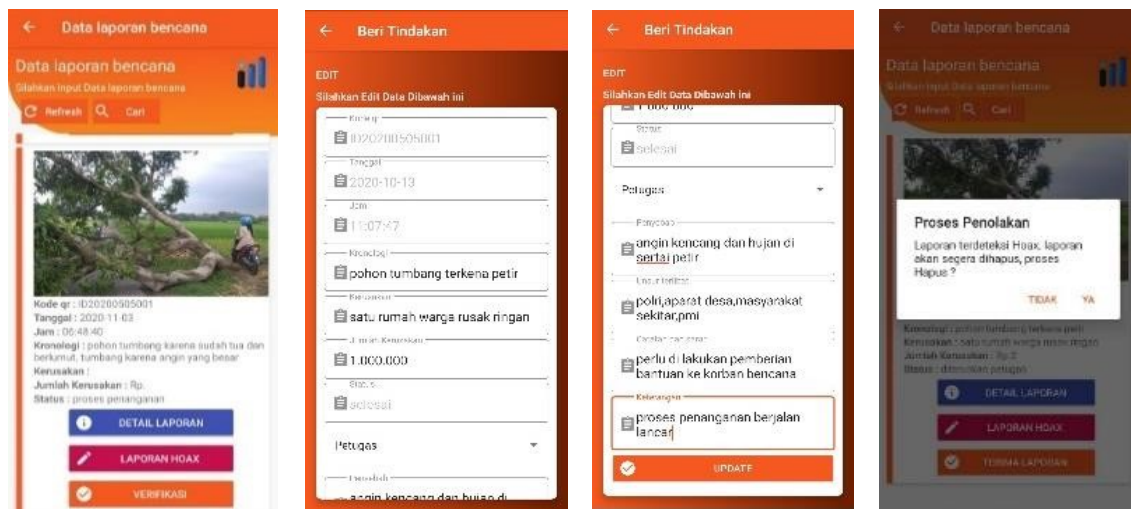


Figure 9. Disaster verification menu view

### 3.b.3. Admin User Interface page

Login view and admin menu, consisting of 3 menus, namely Notifications, Report Recap and Officer List. The display is presented in figure 10.

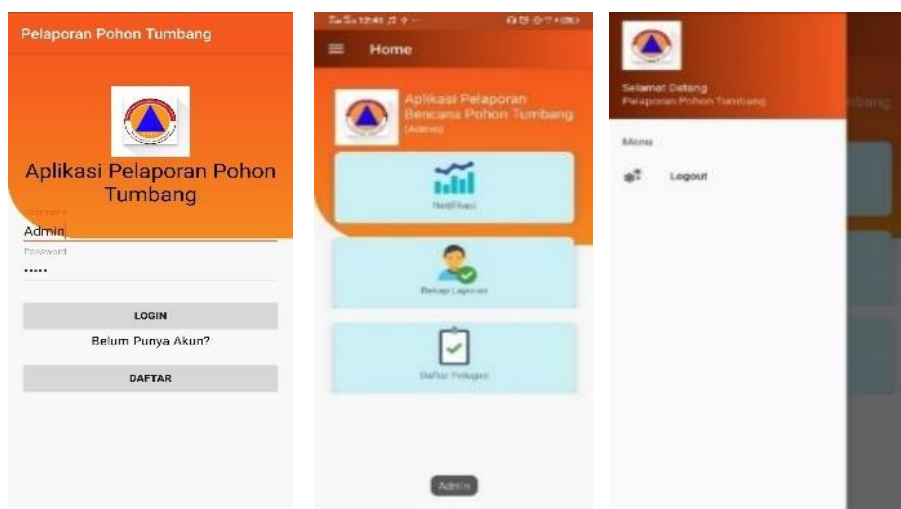


Figure 10. Admin login view and admin menu

Admin notification display, admin notification contains reports of fallen tree disasters sent by the community. Admin can only see notifications and cannot perform actions. The

officer's menu display contains the data of officers who have been registered in the system that will carry out the disaster management process to the scene. In this menu, admins can edit or delete. The display is presented in figure 11.

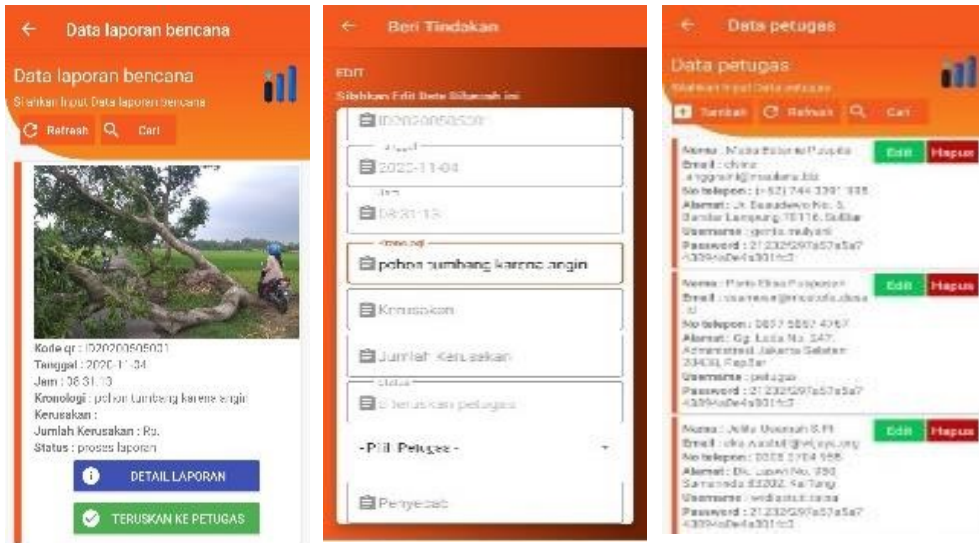


Figure 11. Admin notification view and officer list on the admin page

The recap view of the report, on this menu, admins can see data on fallen tree disasters that occur starting from the type of fallen tree, date, hour, photo of events, damage, the number of losses, handling status, and the names of fallen tree disaster officers and whistleblowers. Data on fallen tree disasters can be done and printed according to the needs of the admin. Data expansion can be done by filling in the date of the disaster of the fallen tree needed. A recap view of the report is presented in figure 12.

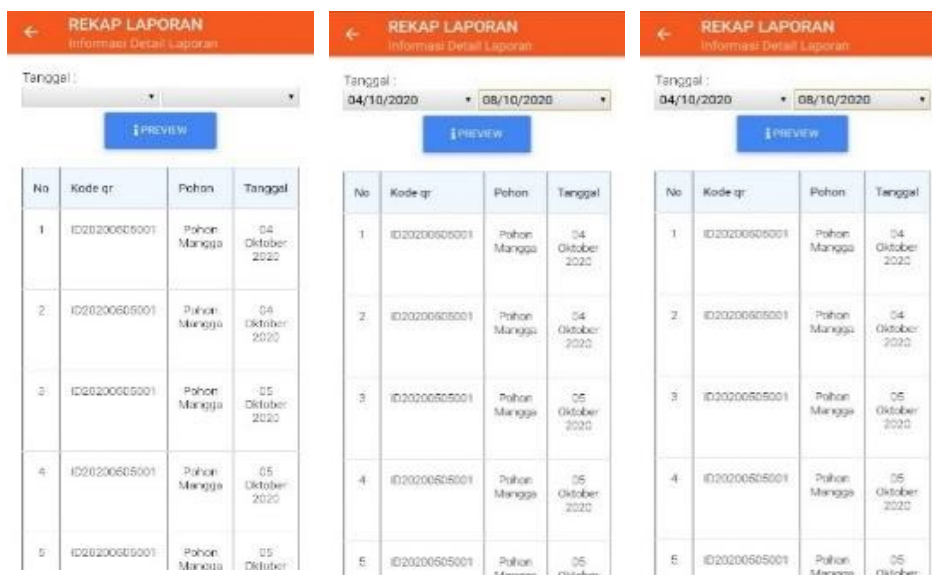


Figure 12. Recap view of reports of fallen trees disaster

### 3.c. Make a discussion

#### 3.c.1. System testing using Blackbox Testing

In community blackbox testing, the study used questionnaires for data retrieval using google form. This questionnaire was filled out by 120 residents from Banyumas. Uto test the application in the officer using a printed questionnaire filled out by 20 officers from BPBD. U wants to test the system on the admin side using a printed questionnaire filled out by 3 BPBD people. System test results with black box testing are presented in the following table:

Table 3. Testing applications from one community users

No.	User	Test activity	Expected results	Conclusion
1	Community	Click the application instructions menu	View the App instructions page	Valid
2		Click the disaster report menu	View disaster report pages	Valid
3		Click the QR code scan menu on the disaster report menu	Processing scanned QR codes	Valid
4		Click the image upload menu on the QR code scan menu	Displays an image of the tree to be uploaded	Valid
5		Click the report process button after uploading the image	Report sent to system	Valid
6		Click the notification menu	Displays the status of notifications that have been sent to the system	Valid
7		Click the sent report menu	Display the history of disaster reports that have been submitted	Valid

Table 4. Application testing from one user officers

No.	User	Test activity	Expected results	Conclusion
1	Officer	Click the notification menu	View notification pages	Valid
2		Click the details button in the notification menu	View report details	Valid
3		Click the receive report button in the notification menu	View action forms and report updates	Valid
4		Click the disaster verification menu	View the disaster verification menu page	Valid
5		Click the report details button in the disaster verification menu	View report details	Valid

6	Click the hoax report button in the disaster verification menu	View delete report actions	Valid
7	Click the verification button in the disaster verification menu	View action forms and report updates	Valid
8	Click the handling history menu	View all reports you've handled	Valid
9	Click the details button in the handling history menu	View report details	Valid

Table 5. Application testing from one user admins

No.	User	Test activity	Expected results	Conclusion
1	Admin	Click the notification menu	View notification pages	Valid
2		Click the details button in the notification menu	View report details	Valid
3		Click the forward button to task	View a form handling and updating reports	Valid
4		Click the report recap menu	Displays all incoming reports.	Valid
5		Click the preview button	View report data selected	Valid
6		Click the download button	Download a report data file in pdf form	Valid
7		Click the officer list menu	View menu pages	Valid
8		Click the edit button and delete it on the officer list menu	View edit actions and delete officer lists	Valid

After the trial was carried out by one of the user representatives from the community, from officers and admins, then testing was carried out on all respondents involved from the community, officers and admins. Testing is carried out on only the most important pages and features in the application. Data on the conclusion of the successful use of software features are presented in the following table:

Table 6. Conclusion of 120 respondents from the Society

No.	User	Testing activities	Expected results	Conclusion
1	Community	Login Process	Successful Login	80 %
2		Account Registration	Account Registration Successful	77,5%
3		Show the application instructions for use menu	Show the application instructions for use menu	80 %

4	click disaster report menu	click the disaster report menu successfully	79,2 %
5	Scan QR code	Scan QR code Succeed	78,3 %
6	Upload an image	Image Upload Successfully	78,3 %
7	Display the Sent menu	Displaying the Sent Successful menu	79,2%

Table 7. Conclusion of 20 respondents from the Officer

No.	User	Testing activities	Expected results	Conclusion
1	Officer	Login Process	Successful Login Process	100%
2		Account Registration	Account Registration Successful	100%
3		Testing menus on officers such as notification menus	Testing menus on officers such as notification menu Success	100%
4		Menu disaster verification	Disaster verification menu Succeeded	100%
5		Handling the history menu	Handling history menu Successfully	100%

Table 8. Conclusion of 3 respondents from Admin

No.	User	Testing activities	Expected results	Conclusion
1	Admin	Login Process	Successful Login Process	100%
2		Account registration	Account Registration Successful	100%
3		Notification menu	Successful notification menu	100%
4		Report recap	Recap of the Successful report	100%
5		Menu officer list	Menu officer list Succeeded	100%

### 3.c.2. UAT Testing

Furthermore, **User Acceptance Testing (UAT)** is a verification process that the solution made in the disaster reporting system of fallen trees is appropriate for users by using question surveys on google forms addressed to the Community, Officers and Admins so that it can be concluded that the application can be concluded. help the disaster reporting process, with the appearance of interesting menus, menus in the application can be understood, font types and sizes are easy to read, font colors are used accordingly, applications can be installed, account creation does not make it difficult for users and application menus designed according to user needs.

#### 4. Conclusion

The results of system testing with black box testing in the community with 120 respondents obtained from the results of table 6 an average of 78.93% was successful, some failures were due to the system still having bugs so that it was delayed and people were still not familiar with the system. Testing there officers with 20 respondents obtained from table 7 an average of 100% successful. Testing on the admin with 3 respondents, the results from table 8 are an average of 100% successful. UAT testing conducted on the Community, Officers and Admins can be concluded that the application helps the disaster reporting process

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