Research Article

Integrated Smart Rescue Box Design With Information Systems as a Solution to Indonesian Disaster Emergency Response

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Abstract: This study uses the design method with a prototype research model. This is motivated by the fact that Indonesia is prone to natural disasters, so preparing for an effective and efficient disaster emergency response process is necessary. The resulting innovation is an intelligent rescue box prototype product integrated with an information system as a disaster emergency response solution, especially in meeting the basic emergency needs of post-disaster refugees. The effect will consist of two, and the first is the Smart rescue box (SRB), which provides the emergency needs of evacuees in one package to meet the electricity needs of refugees. There is a solar tracker system with real-time clock (RTC) data that is set as if it can follow the direction of the sun's movement for maximum absorption of sunlight. The second product is the SRB information system which is a disaster information system consisting of several useful features and a disaster education menu that can provide insights regarding disasters and disaster information that can be accessed easily. The measurement and observation test results show that the product has worked as expected, so it is feasible. The resulting product is still in the form of a prototype so that suggestions for further research can be further developed in terms of features and technology to become a complete product to facilitate the disaster emergency response process.

Keywords: Smart rescue box, Information System, Disaster emergency response, Solar tracker, Disaster Logistics

1. INTRODUCTION

Indonesia is a country that is very prone to disasters in the world. This was stated based on data from the United Nations Agency for International Strategy for Disaster Risk Reduction (UN-ISDR) (BNPB, no date). This cannot be denied because, geographically, Indonesia is located between four tectonic plates that meet each other and is in the Pacific Ring of Fire or Ring of Fire (Siagian et al., 2014). Disasters often occur, including volcanic eruptions, floods, tsunamis, landslides, earthquakes, etc. Natural disasters that occur have a direct impact on human survival. Therefore, there is a need for countermeasures to minimize the effect. Disaster response efforts are considered complex and highly uncertain.

Therefore, disaster emergency response efforts must be appropriately managed to obtain a faster, more effective, and more efficient response. Indonesia has regulated disaster management through Law No. 24 of 2007. However, in several natural disasters, the telecommunications network infrastructure and power sources are usually damaged or disconnected after the disaster. Under these circumstances, a communication crisis will occur to speed up the rescue

process and disrupt the coordination of the entire team with the command center. Media crews, victims' families, the paramedic team, the evacuation team from the National Disaster Management Agency (BNPB), and the National Search and Rescue Agency (BNPP) will also experience difficulties. Lack of good coordination will have an impact on disaster emergency response activities. One of them is assistance to victims of natural disasters. During the emergency response period, the usual problems included the uneven distribution of service to each post, accumulation of aid at specific points, shortages of certain commodities or vice versa, and too much assistance and not very useful (Rinawati et al., 2018).

In previous research, in the development of disaster technology, it prioritizes the victim's side, namely how to monitor the health of victims of natural disasters, such as in the research of Puput Dani Prasetyo Adi, 2013-2021 [15-19]. The research developed is the use of LoRa technology [20].

Mamuju Earthquake in West Sulawesi on January 15, 2021, had a magnitude of 6.2, illustrating the uneven distribution of logistical assistance. The comfortable refugees from two sub-districts in Majene Regency are starting to experience food difficulties because aid is only focused on Mamuju and does not reach Majene because their area is isolated due to the cut-off road access between the two districts after the earthquake (BBC News, 2021). Not to mention the power grid that was cut after the disaster resulted in the difficulty of long-distance communication. Another example was the Palu Donggala earthquake and tsunami on September 28, 2018, where all access to contacts, transportation, and other public facilities was nearly paralyzed. Some assistance from other regions tried to assist, but efforts to go to the two areas had access to them cut off. There is inequality in logistical assistance because volunteers, community organizations, and individuals do not coordinate well with local security forces (Martiyanti, 2018).

The cases above illustrate the need for an efficient and effective disaster management process. Emergency response and disaster management activities include the delivery of daily necessities such as medicine, food, clothing, and medical assistance. It is also necessary to disseminate disaster-related information that is updated and easily accessible to the public and related to the government. Based on these problems, an innovation was created as a disaster emergency response solution. In this case, they are meeting the emergency needs of refugees, managing logistics, and facilitating access to information related to needs. Therefore, the authors formulate it as a thesis as one of the requirements to obtain a bachelor's degree titled "Smart rescue box Integrated Information System as a Solution for Indonesia's Disaster Emergency Response." Disaster is a confluence of three elements: vulnerability, the threat of disaster, and capability that is triggered by an event (Undang-Undang RI Nomor 24 Tahun 2007). Disaster events are incidents or events, both natural and non-natural factors, for example, human factors, that can cause threats to the lives of living things and result in human casualties, loss of property, environmental damage, and psychological impacts.

Disaster emergency response is a series of activities that are carried out immediately when a disaster occurs to overcome the harmful consequences that

have arisen, including actions to rescue and evacuate victims, and property, fulfillment of basic needs, protection of refugee management, and rescue and recovery of infrastructure and facilities. In disaster management, coordination and handling are needed that are fast, precise, effective, and efficient so that casualties and property losses can be minimized. (Perka BNPB, 2012). Logistics is the management of the circulation of goods from the point of origin to the end of consumption to meet specific requests, for example, directed at consumers or companies. Types of goods in the logistics sector consist of physical objects such as food, building materials, animals, tools, and liquids. It's the same as transferring intangible (abstract) objects such as time, information, particles, and energy. (Li, 2014). Logistics management for disaster management is a series of processes consisting of planning, procurement, storage, distribution, transportation, and acceptance for a business carried out in the framework of setting standard logistics materials to implement disaster management (Iskaputri, Razak and Arifin, 2020).

The information system includes several components (users, personal computers, communication technology, and work mechanisms) that are processed (data as information) and intended to achieve a target or goal. (Kadir, 2003). Mobile Web is a system that aims to access data services via a wireless network using portable devices such as mobile phones/tablets, personal computers, and communication devices connected to a telecommunication network. The mobile web accessed via a mobile device needs to consider a mobile device such as a mobile phone with a screen with a limited size and various or some limitations in another mobile device (Subhansyah, 2005). A solar tracker is a tool/model that is used in a type of solar power plant that aims to provide maximum results in absorbing solar energy. You do this by facing the solar cell to follow the direction of sunlight. According to Nityasa (Nityasa, 2016), The solar tracker system is a solar panel propulsion system so that the position of the solar panel module can always be perpendicular to the direction of the incoming sunlight. Solar cells can convert sunlight into electrical energy using the photovoltaic principle. This photovoltaic effect is a condition where there is an electric voltage that arises because there is a connection between two electrodes that are connected to a solid or liquid system when they get light energy (Rizky, 2020).

The working principle of solar cells is to convert solar energy into electrical energy by solar cells by separating the point received by the P type and N type. After it becomes electrical energy, it is stored in the battery, which distributes the 220 V load. However, before distributing the load, the voltage and current are changed using an inverter from 12 V to 220 V AC. (Rizky, 2020). Arduino Uno is an ATmega328- based microcontroller board that consists of 14 digital input/output pins (of which six pins are PWM outputs), six pins as analog inputs, a USB connection, a clock speed of 16 MHz, an ICSP header, a power jack, and a reset button. This circuit board is powered by a USB cable when connected to a computer or from external power from an AC-DC adapter or battery (Rizky, 2020). A real-time clock (RTC) is a device that makes it possible to obtain an accurate timer because this module is equipped with a timing generator and a battery. RTC is a component module that can provide and store timing systems

such as seconds, minutes, hours, dates, months, and years for later use in various techniques related to real-time (Kurniawan and Taufik, 2021). The RTC module has five pins, including GND which will be connected to the ground, VCC, which will be connected to a 5V voltage source, SDA, which is the data pin; and SCL, which is the clock pin. (Kadir, 2015).

2. METHOD

This type of research is design research and uses a prototype design model. The resulting product consists of an intelligent rescue box and an innovative rescue box information system. The designed product is expected to provide disaster emergency response solutions in Indonesia, especially in meeting the basic needs of refugees in disaster locations. Figure 1 is a schematic overview of the intelligent rescue box. The SRB contains the emergency needs of refugees, which are distributed to disaster locations and are integrated with an information system as a means for the public to access information related to disaster updates that have occurred. At the disaster location, the admin immediately updates related to the disaster and manages disaster information, including requests for

logistics, equipment, and other assistance that will be displayed on the information system. Then the community can access information related to the disaster and can make donations or send volunteer assistance to the disaster location by logging in as a donor or volunteer user. Meanwhile, to request refugees, they must first log in as a beneficiary. Figure 2 is a flowchart of the working principle of the Smart Rescue Box, starting with sending SRB to the disaster location containing the emergency needs of refugees integrated with an information system as a source of updated disaster information and to meet the basic needs of refugees that the SRB has not met. Upon arrival at the disaster location, the admin then updates the information system regarding detailed disaster information and, of course, the needs of evacuees at the disaster location. If the disaster location, whether the logistical requirements, equipment, and volunteer assistance have not been met, the admin will update disaster information related to unmet needs and manage donations, equipment, and incoming volunteers. If the conditions of refugees have been met, the system will close the distribution of aid activities.
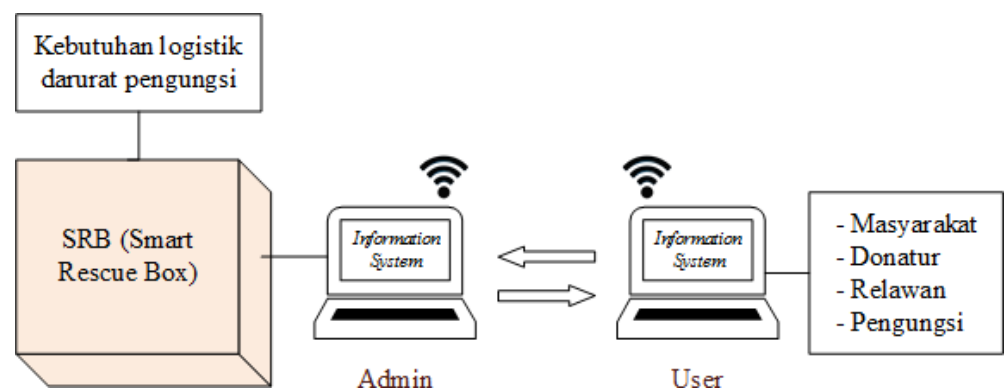

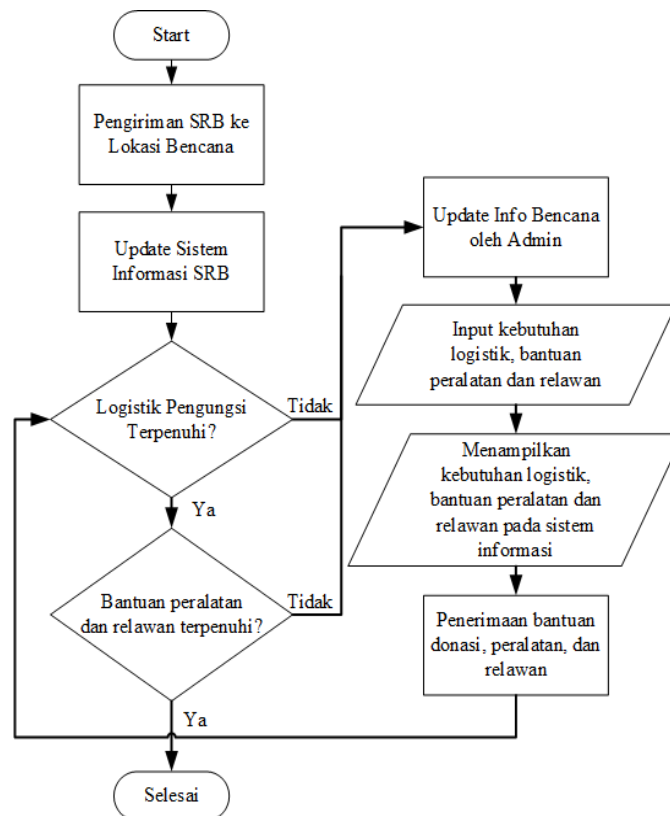**Figure 1**. Schematic Overview of Smart rescue box

Figure 2. Flowchart of the working principle of the Smart Rescue Box

Figure 3 is a 3D design of an intelligent rescue box in a closed and open box condition, accompanied by a description of the box's function. The plan was made using the SketchUp 2020 design application. The smart rescue box is designed as a cube with overall dimensions (LxWxH) of 80 cm. If the container is opened, it can form a table that the admin of the disaster emergency response information system or refugees can use. The package consists of several small cupboards for the emergency needs of refugees, which can be adjusted based on what is needed at the disaster site. The prototype box contains medicines, tents, blankets, and laptops to access information systems. There are also toys, drawing tools, and reading books for refugee children to ease post-disaster worries. The main part of the box has a two-way solar tracker as a refugee power source.

Based on Figure 4, the 3D design of a two-way solar tracker system using RTC data will be an alternative energy source for evacuees in disaster areas. The dimensions of the solar tracker are 65 cm x 35 cm x 18 cm. The solar tracker is designed to move in two directions as if it can follow the sun's movement for maximum absorption of sunlight. The AC synchronous motor on the solar tracker functions to drive the solar tracker. Based on Figure 5, the solar tracker hardware design is integrated/installed in one of the drawers (hardware drawer), measuring 50 cm x 35 cm x 25 cm in the smart rescue box. The hardware drawer contains the controller box, inverter, SCC, battery pack, and terminal cables.
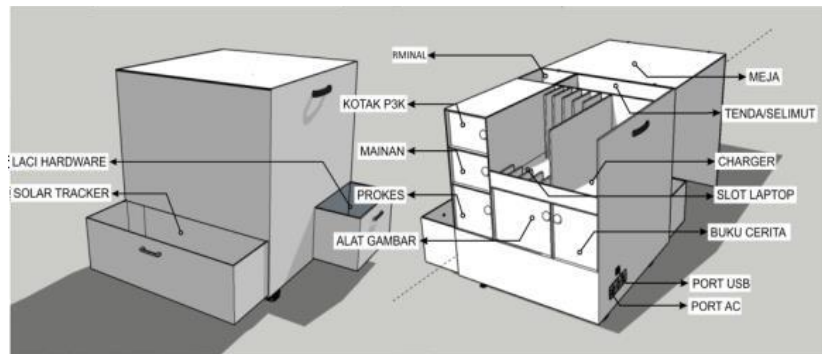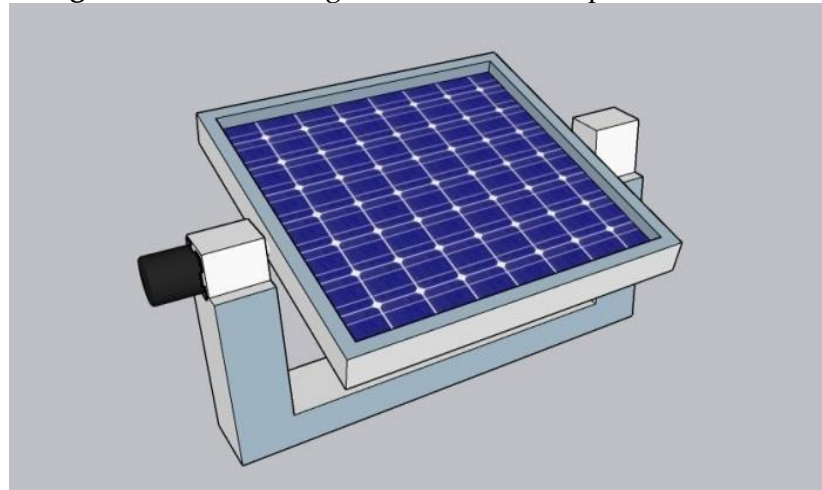
Figure 3. 3D Box Design for Closed and Open Conditions

Figure 4. Solar tracker design
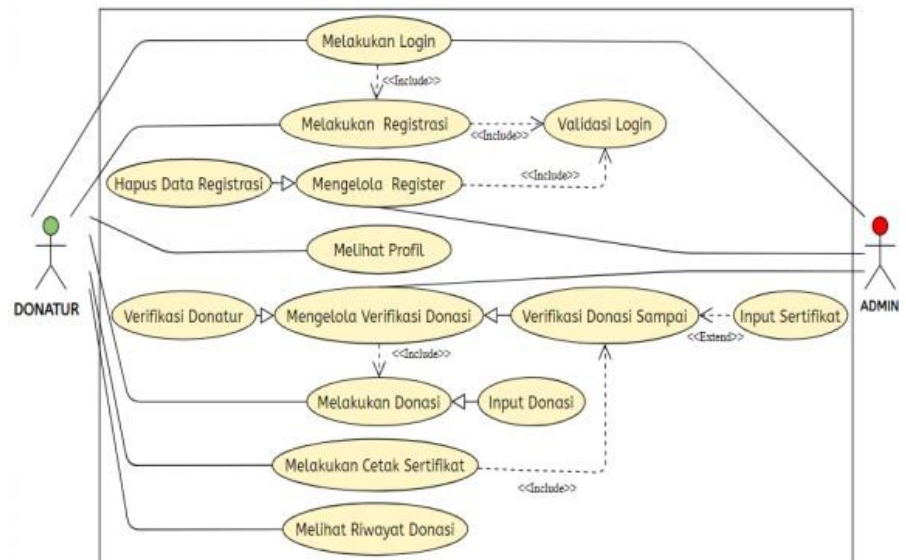

Figure 5. Hardware Drawer Design

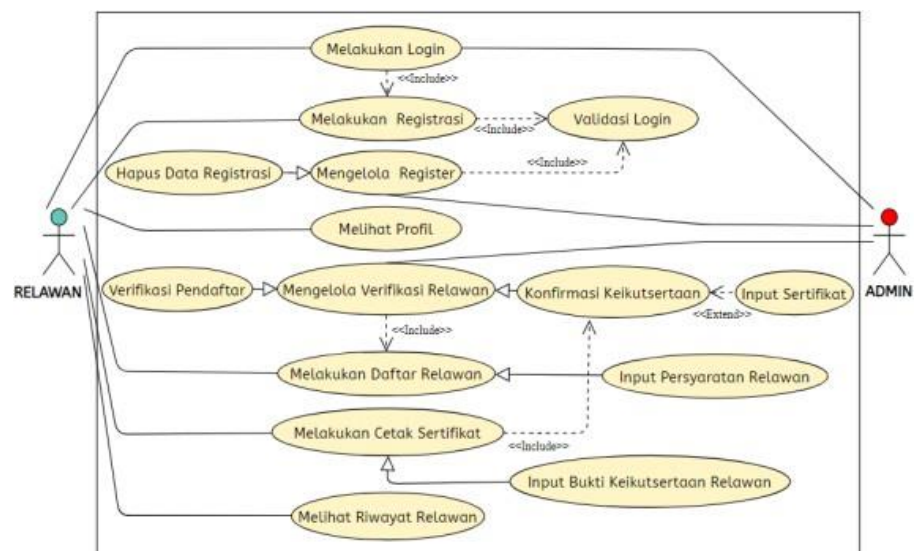**Figure 6.** Donor and admin use case diagram

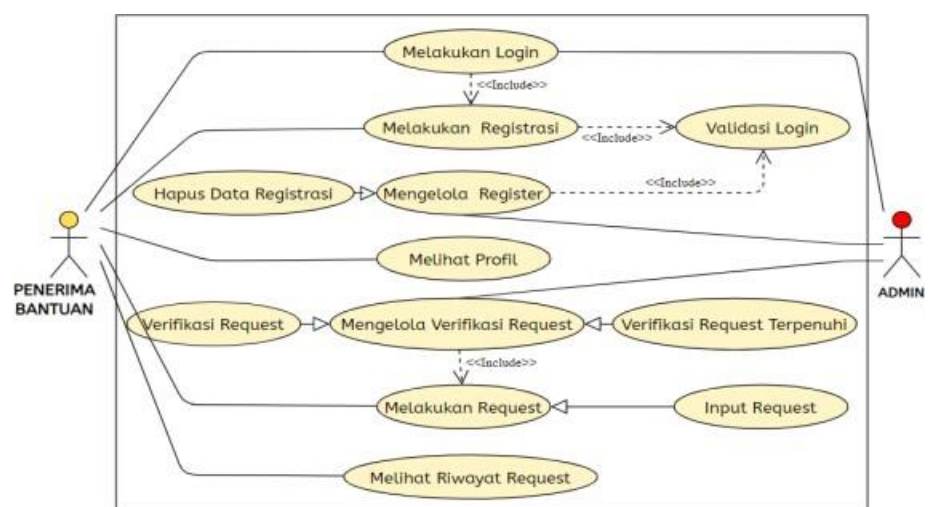**Figure 7.** Use case diagrams for volunteers and admins

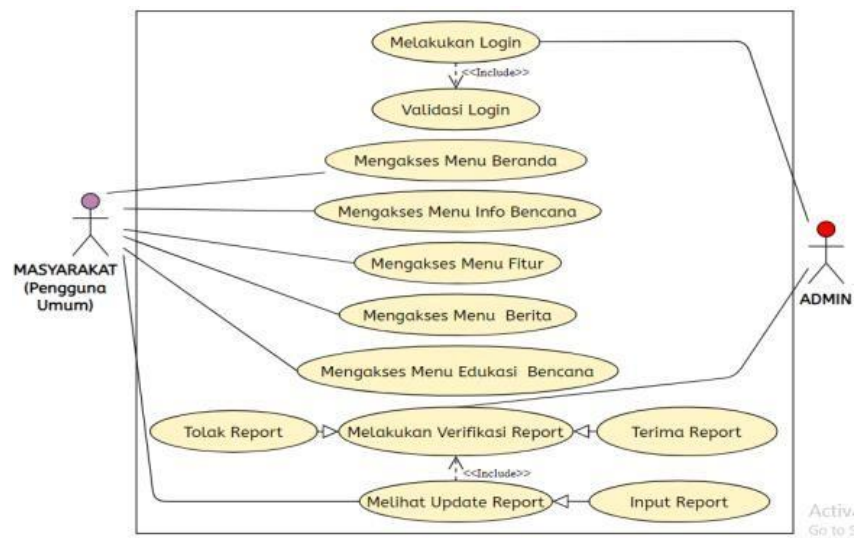**Figure 8.** Beneficiary and admin use case diagrams

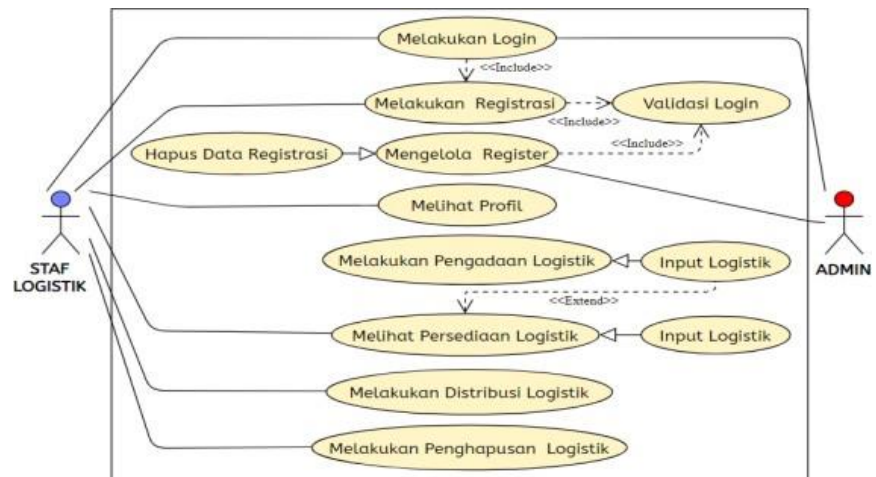**Figure 9.** Community and admin use case diagrams

Figure 10. Logistics and admin staff use case diagrams
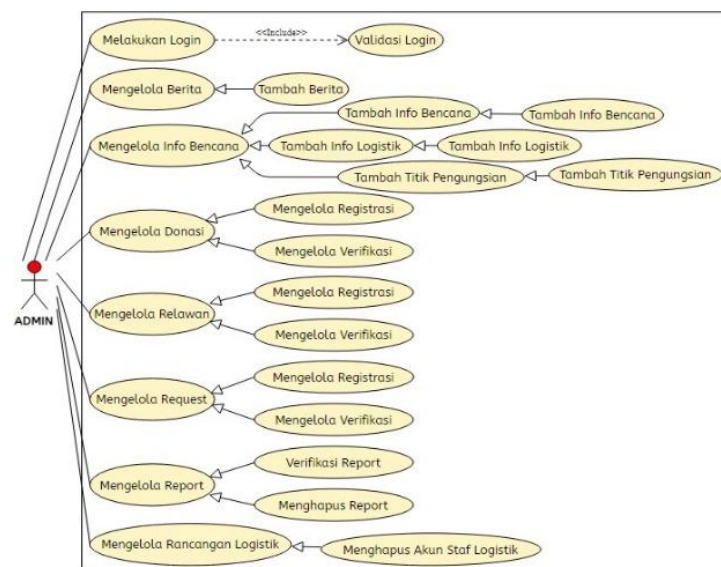
Figure 11. Admin use case diagrams

From the use case analysis diagram, it can be concluded through user stories, namely as follows:

1. Admin; is the person in charge of storing and managing data in information systems, be it data on the news menu, disaster info, logistics, donations, volunteers, and requests, and verifying data. The admin user is the party with authority over the information system's management.
2. Volunteer; is someone with the right to access the volunteer feature in the Information System. Can view profiles, register volunteers, view volunteer history, and receive volunteer certificates.
3. Donors are people who have the right to access the donation feature in the Information System. Can view profiles, make donations, view donation history, and receive donation certificates.
4. An aid Recipient; is a person who has the right to access the requested feature in the Information System. Can view profiles, make requests for logistics, equipment, or volunteer assistance, and view request history.
5. Logistics Staff; is the person who has the right to access the Logistics Management Feature. Namely features for recording logistics, logistics procurement, distribution,   and logistics elimination.
6. A community (General user); is a person who has the right to access the information system without having to log in. Communities can make reports related to disaster events or conditions that occur in the report feature.

3. RESULT AND DISCUSSION

The smart rescue box integrated with the information system is an innovation to provide emergency response solutions for Indonesian disasters, especially in meeting the basic needs of post-disaster refugees. This innovation resulted in two products: the smart rescue box and the smart rescue box information system. A smart rescue box (SRB) in Figure 12 is a box that will accommodate the basic emergency needs of evacuees. The SRB prototype was made using plywood with a thickness of 1.2 cm and 1.5 cm with overall dimensions of 80 cm x 80 cm x 80 cm. Figures 4.1 and 4.2 show the physical form of SRB made in a cube. In Figure 4.3, the physical condition of SRB in an open state can form a table that the disaster emergency response information system admin can use. The box consists of several small cupboards for the needs of refugees, such as medicines, tents, blankets, and laptops for admin needs to access information systems. There are also toys, drawing tools, and reading books for refugee children to ease post-disaster worries. Most notably in the box is a two-way solar tracker with RTC data as a refugee power source.

Moreover, The solar tracker system on the box functions to meet the electricity needs of evacuees at the disaster site. The solar tracker is designed to move in two directions as if following the sun's movement. Figure 13 shows a hardware drawer for installing the solar tracker system and a paneled drawer for storing the solar tracker in the box. A control box in the hardware drawer controls panel movements, SCC, which protects and automates battery charging. Battery to store power, inverter to convert DC from the battery into AC connected to the

terminal cable. The terminal cable can be used directly for lighting, charging and other needs.

Figure 12. SRB when a position is closed

Figure 13. Hardware Drawer and Solar tracker Drawer

Figure 14. Solar tracker two-way RTC data

Furthermore, The solar tracker system on the box functions to meet the electricity needs of evacuees at the disaster site. The solar tracker is designed to move in two directions as if following the sun's movement. The solar tracker is designed to proceed with the sun's movement to optimize light absorption on

solar panels. For the exercise of solar panels, use RTC data in Figure 14, which is set every hour (08.00-17.00), to change the degree of inclination on the panel so that it seems to follow the sun's movement. The drive on the panel uses an AC synchronous motor, and a switch functions to determine the initial start position on the panel. The solar panel used has a capacity of 20 WP (Watt Peek), and the calculation of the maximum power generated in a day during sunny conditions is 20 WP x 4 Hours (Charging Effective) to produce 80 Watts. So that it can be calculated that the load that can be used for 80 watts of power is 1 5 Watt lamp on for 2 hours, charging a laptop with 60 watts of power for 1 hour, and charging a cellphone with 10 watts of power for 1 hour, the total energy used is 80 watt.

The SRB Information system is a mobile web-based information system to facilitate logistics coordination. It serves as the primary source of information for all parties related to post-disaster management and the community at large, with several features that can be accessed in it. Some of the developed features include donation, request, volunteer, report, and logistics management features. There is also a disaster information menu for updated information related to disasters and logistical conditions available at the disaster location and a disaster education menu that provides disaster-related knowledge.

Figure 15. The logo of the SRB

An information system that is designed in the form of a circle with a combination of red and white has its meaning attached to the Indonesian flag. Then the blue and orange colors depict protection and preparedness, like the colors on the BNBP logo. In the center, there is an arrangement of letters SRB in the form of a cube which stands for Smart rescue box, and writing around the circle to clarify the logo. Figure 16 is the nav bar on the Website. The Nav Bar is part of the Website where menus on the Website are displayed. If one of the menus is clicked on the Nav Bar, the user will be taken to the relevant website page. The logo is to the left of the nav bar, and to the right is a collection of menus: the homepage, disaster info, features, news, disaster education, about us, and login.

Figure 16. Website Nav Bars

Figure 17. Website Footer

The Footer section is the "foot" part of this Website. The footer on the Website itself is a place to inform the copyright of the Website, additional links, and so on.

Figure 18. Display Home Menu

The home menu in Figure 18 is the display or website page, which is the page that is first displayed when the Website is accessed. On the home page is a map display with BPBD locations for all provinces, an explanation of the Website, news or article views, and a right-bar update report.
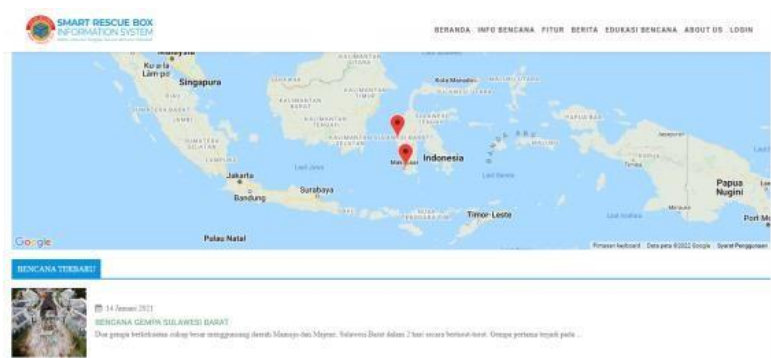

Figure 19. Disaster info menu display

The disaster info menu contains information on disasters currently happening in Indonesia. Displays maps containing points of disaster events; at the bottom is a list of disaster events.
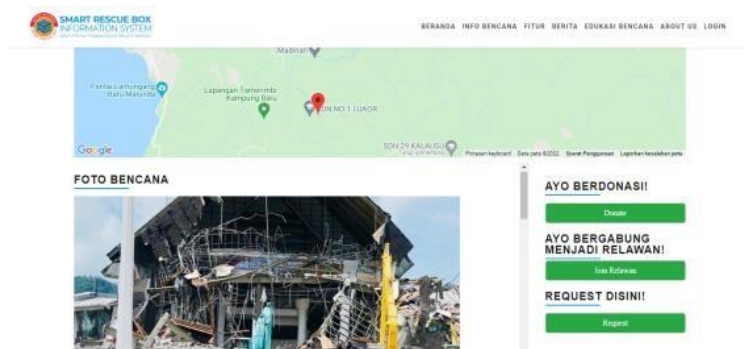
Figure 20. Disaster Details

Disaster details in Figure 20, namely the display when selecting one of the disaster events, details of the disaster will appear. Details of the disaster contain maps displaying post points, photos of the disaster, the number of incoming donations, statistics on victims and evacuees, logistical needs, and the suitable bars for making donations, volunteers, and requests. In Figure 21, The features menu displays the existing features of the SRB information system, which the public can easily access.
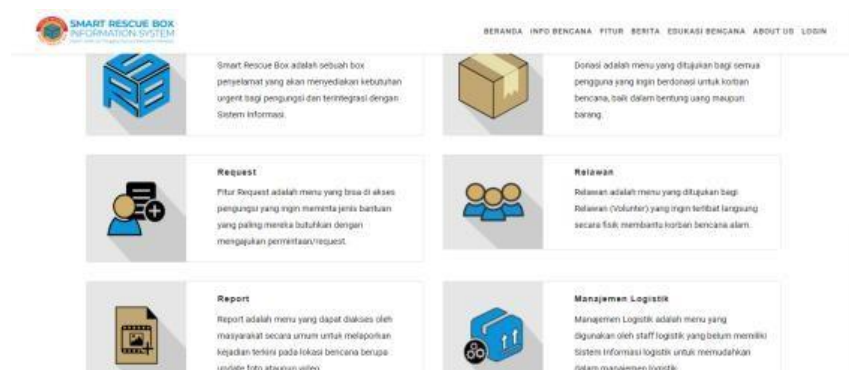

Figure 21. Display Feature Menu
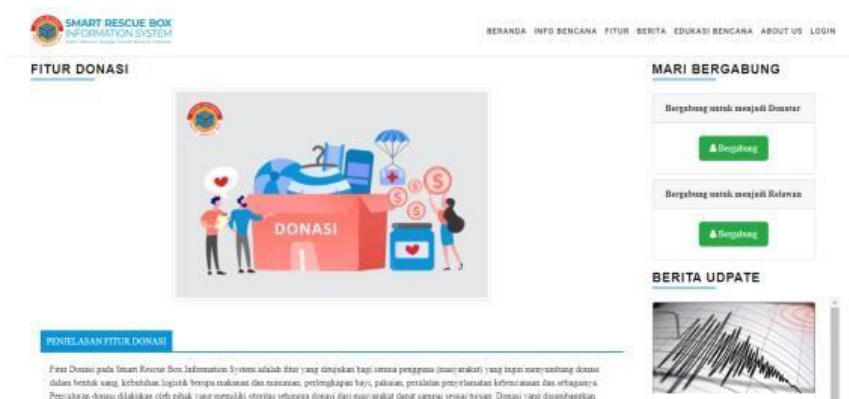

Figure 22. Details of the donation feature

Furthermore, in Figure 22, The details of the selected feature contain explanatory information about the quality. The details of the donation feature include an explanation of the donation feature, user requirements, a registration guide, a login guide, a guide to becoming a donor, and incoming donation updates. There is also a suitable bar.

Figure 23. News menu display

The news menu displays in Figure 23 updated news articles about events or developments in the disasters that have occurred. To read a news article, click on one of the news items on the news menu.
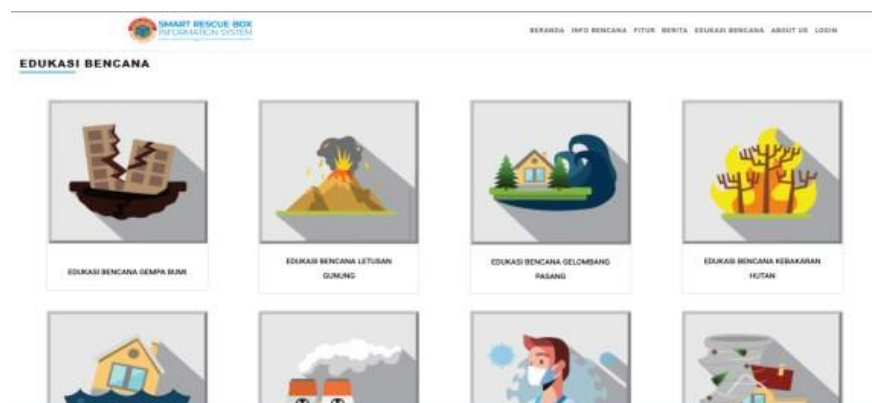

Figure 24. Menu display disaster education

The disaster education menu in Figure 24 contains information that provides disaster mitigation knowledge related to disasters that often occur in Indonesia. Among them are earthquakes, volcanic eruptions, tidal waves, forest fires, floods, nuclear, COVID-19, tornadoes, landslides, and tsunamis.
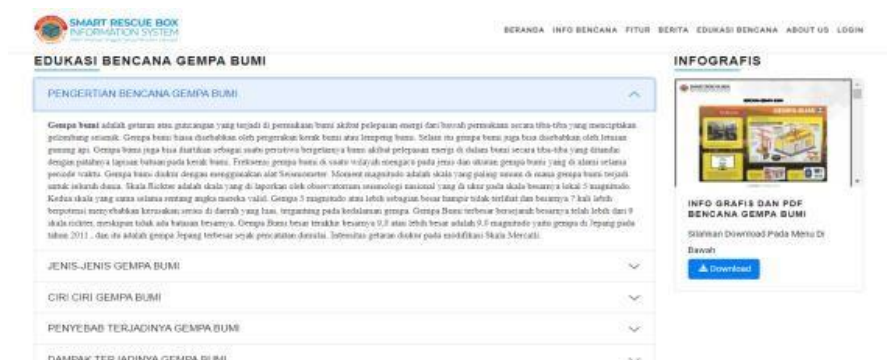

Figure 25. Display of education about the earthquake disaster

Moreover, In educational detail, when selecting a disaster icon, it displays explanation sub-chapters related to disasters such as understanding, types of disasters, characteristics of disasters, causes of their occurrence, impacts, and

how to deal with them and there are also infographics and PDF files that can be downloaded for study.
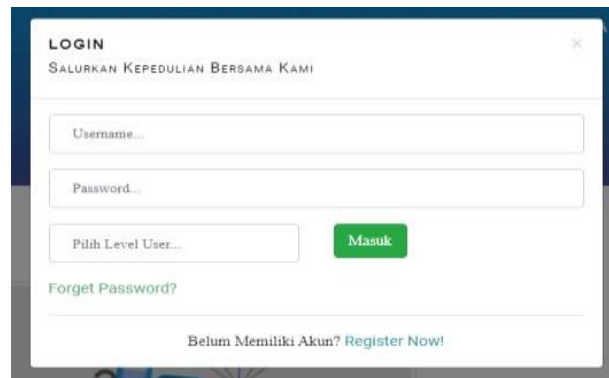

Figure 26. Display of the login menu

On the login, the menu is user access to enter the Dashboard according to the user level. A username and password are required to enter the Dashboard; if you don't have an account, you can register (Register Now!). Moreover, Features on the Website, among others as follows:

a) The Smart Rescue Box feature is a rescue box that provides urgent needs for evacuees and is integrated with the SRB Information System.

b) The Request feature is a feature that can be accessed by beneficiary/refugee users who wish to request the type of assistance they need most by submitting a request/request.

c) The report feature is a feature that the public can access in general to report current events at disaster locations in the form of photo or video updates.

d) The Donation feature is a feature that can be accessed by donor users, intended for all users who wish to donate/become donors during a disaster, both in cash and in kind.

e) The volunteer feature is a feature that can be accessed by Volunteer users and is intended for Volunteers who want to be directly physically involved in helping victims of natural disasters.

f) Logistics Management Features can be used by logistics staff users who do not yet have a logistics management information system.
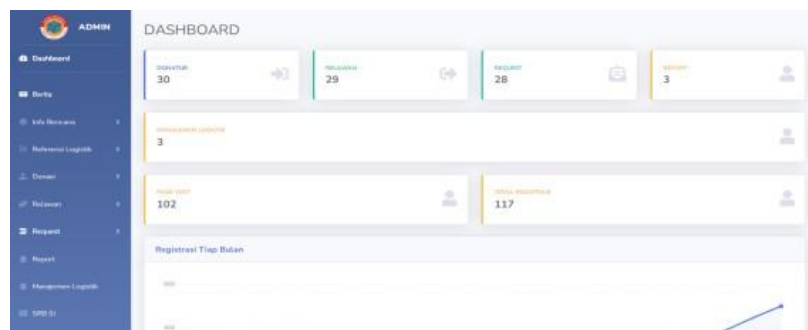

Figure 27. Display of the Admin Dashboard

The admin dashboard in figure 27 is the first display when a user logs in as an admin. The Admin user functions to manage all data in the information system, be it data on the news menu, disaster info, logistics, donations, volunteers, and requests. The admin user is the party with authority over the information system's management. Admin verifies data and recommendations from volunteers, donors, beneficiaries, and reports.

Figure 28. Dashboard request display

On the Dashboard request in Figure 28, a page appears when a user logs in as a beneficiary. Recipients of assistance can add requests by completing the requested data fields. On the left menu are profile settings, then request history, which records all activity asking for help, and a logout menu to exit the Dashboard.
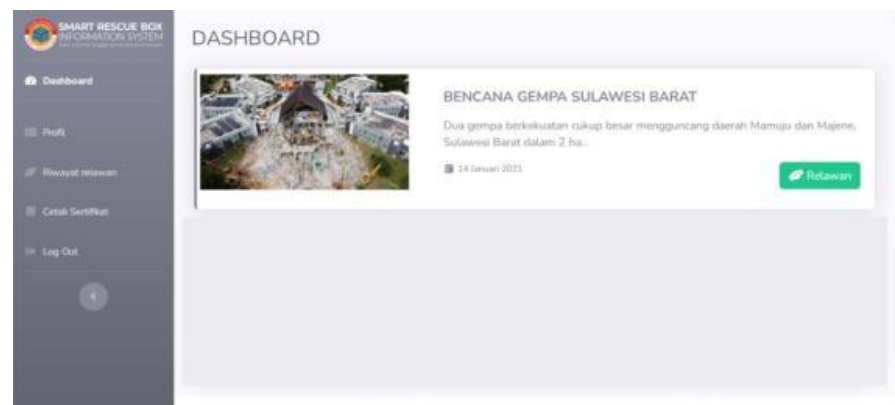
Figure 29. Display of the volunteer Dashboard

The volunteer dashboard in Figure 29 is a page that appears when a user logs in as a volunteer. When logged in as a volunteer, we can register to help at the disaster site by clicking the volunteer button for one of the existing disasters, then completing the requested data. On the left bar are a menu to set user profiles, the history of volunteers who record history as volunteers, print certificates as a tribute to volunteers who help at disaster sites, and a logout button to exit from the Dashboard menu.
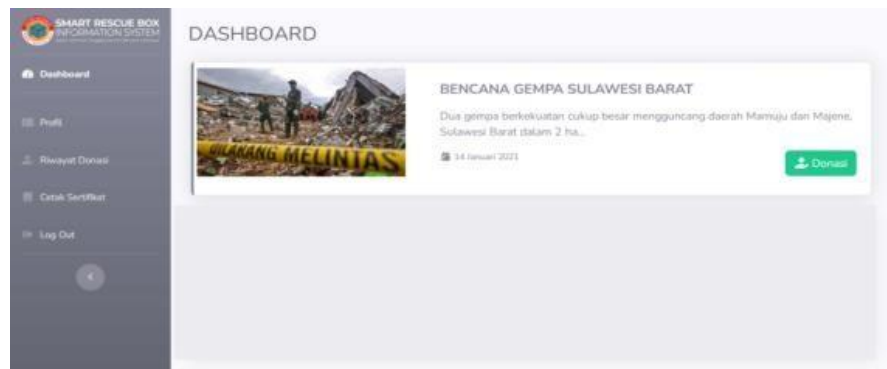
Figure 30. Donor Dashboard Display

The donor dashboard in Figure 30 is a page that appears when a user logs in as a donor. When logged in as a donor, we can assist in logistics and other assistance by clicking the donate button for one of the existing disasters, then completing the requested data. On the left bar is a menu for setting user profiles, donation history which records the history of donation distribution and monitors the progress of donations made, prints certificates as a tribute to donors who assist, and a logout button to exit the Dashboard menu.
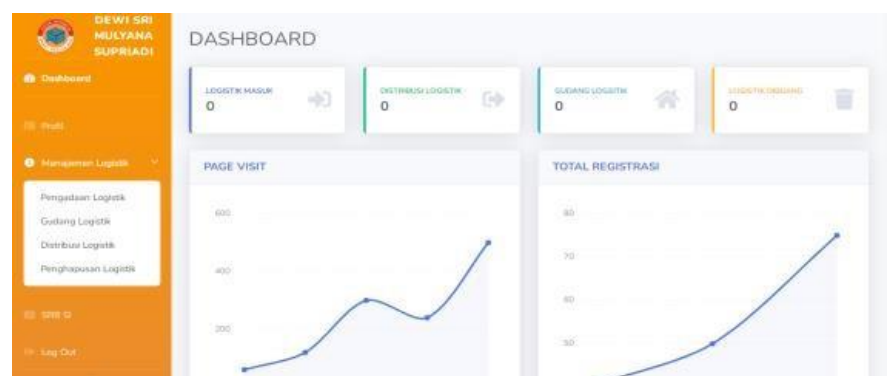
Gambar 31. Dashboard View Logistics Staff

The logistics staff dashboard in Figure 31 is a page that appears when a user logs in as a logistics staff. When logged in as a logistics staff, you can use features for logistics management. On the left bar is a menu for managing user profiles and a logistics management menu consisting of procurement, warehouse, distribution, and logistics elimination. SRB menu to go to the information system home menu and the logout button to exit the Dashboard view. Moreover, testing the designed product, namely the Smart rescue box integrated with information systems, uses three methods: system testing by measurement, direct observation/ observation, and black box testing.

Table 1. Degree Measurement Results Solar Panels

Waktu/Jam (WITA)	Derajat Referensi (°)	Derajat terukur (°)	% Kesalahan
07.00	25° (*start* awal)	25°	0%
08.00	30°	30°	0%
09.00	45°	44°	2,2%
10.00	60°	58°	3,3%
11.00	75°	73°	2,6%
12.00	90°	90°	0%
13.00	105°	104°	1%
14.00	120°	121°	0,9%
15.00	135°	132°	2,2%
16.00	150°	149°	0,6%
17.00	30°	30°	0%
18.00	25° (kembali ke posisi *start* awal)	25	0%

The test results show that on the designed solar tracker, the position of the module moves with the most significant error percentage of 3.3%, and the smallest is 0%. The degree difference between the position of the solar tracker module and the maximum reference degree is 3°, and the smallest is 0°. Thus it can be seen that the performance of the solar tracker is by the wishes; that is, it can position the module according to the direction of the incoming sunlight.

Table 2. Table of Voltage, Current, and Power Measurements Solar tracker

Waktu/Jam (WITA)	Derajat Terukur (°)	Tegangan (V)	Arus (A)	Daya (W)
08.00	30°	18,2	1,17	21,294
09.00	44°	18,45	1,14	21,033
10.00	58°	19,8	1,23	24,354
11.00	73°	19,58	1,35	26,433
12.00	90°	19,98	1,15	22,977
13.00	104°	20,5	1,34	27,47
14.00	121°	20,2	1,26	25,452
15.00	132°	20,17	1,19	24,0023
16.00	149°	18,31	1,08	19,7748
17.00	30°	18,05	1,13	20,566
Rata-rata		19,324	1,204	23,31866

Table 2 shows the data from the solar tracker's voltage, current, and power measurements. It can be seen The change in voltage at each test time. The highest voltage test was reached at a voltage of 20.5 V at 13.00 WITA, while the lowest voltage was 18.05 V at 17.00 WITA. The highest current test was achieved up to 1.35 A at 11.00 WITA, while the lowest current was 1.08 A at 16.00 WITA. Then the greatest power received by the solar tracker reached 27.47 Watt at 13.00 WITA, and the lowest power was 19.7748 Watt at 16.00 WITA. The average obtained from the results of measuring the voltage is 19.324 V, measuring the current is 1.204 A, and the power is 23.31866 Watt. Smart rescue box testing is carried out by directly observing the designed product's functionality. The functionality test results are several test items on the installation device. The test was carried out with eleven statement items to get the test results, where the results obtained if the percentage is F = 1, which means that the result of the functionality test is worth one, so it can be said that this tool is acceptable. Testing the smart rescue box Information System is carried out by directly observing the functioning of the Website using the black box testing method. The results obtained from the processes on the Website are successful by the designs made.

4. CONCLUSIONS

The product that has been successfully designed is a smart rescue box that is integrated with an information system as a disaster emergency response solution in Indonesia, especially in meeting post-disaster logistics needs. This research produced two products: the smart rescue box (SRB) and the SRB information system. SRB is a box that can provide for the emergency needs of evacuees at disaster sites, one of which is electricity. For the electricity needs of evacuees, a solar tracker system is designed to move with the sun's movement so that it is more optimal in absorbing sunlight. As for fulfilling other basic needs, it is processed in the features available on the smart rescue box information system. The SRB Information system is a disaster information system that aims to be a reference for information when a disaster occurs in Indonesia. It consists of several features: SRB features, Requests, Reports, Donations, Volunteers, and Logistics Management Features. There is also a disaster education menu that provides disaster-related knowledge. The test results show that the resulting product works as expected. In testing the performance of the solar tracker for the movement of the panel modules, even though it has an error of 3.3%, this is relatively small and still shows that the performance of the solar tracker has worked well. The results of voltage, current, and power tests also show that the performance of the solar tracker is working properly. In the smart rescue box test with 11 statement items, the expected results are by the test results, which means the product is feasible. Then the black box test for the information system, which consists of 12 test cases, also shows the expected results, which means the product is said to be feasible.

5. SUGGESTION

From this research, it still needs to be developed, so suggestions are needed to improve the system, the suggestions can be seen in the following points:

1. Making a smart rescue box in a real form by selecting materials that are lightweight and resistant in all conditions.
2. Selection of solar panels with a large WP capacity to meet the electricity needs of the evacuation sites.
3. Optimizing security systems in information systems to avoid the dangers of cybercrime.
4. Add relevant features in the dissemination of disaster information to facilitate disaster emergency response in Indonesia.
5. Expand cooperation with national agencies related to the disaster.

AUTHOR CONTRIBUTIONS

Conceptualization; Dewi Sri Mulyana Supriadi [D.S.M.S], Hendra Jaya [H.J], Yasser Abd. Djawat [Y.A.D], Jumadi Mabe Parenreng [J.M.P], methodology; [D.S.M.S], [H.J], [Y.A.D], [J.M.P], validation; [D.S.M.S], [H.J], [Y.A.D], [J.M.P], formal analysis; [D.S.M.S], [H.J], [Y.A.D], [J.M.P], investigation; [D.S.M.S], [H.J], [Y.A.D], [J.M.P], data curation; [D.S.M.S], [H.J], [Y.A.D], [J.M.P], writing—original draft preparation; [D.S.M.S], [H.J], [Y.A.D], [J.M.P], writing—review and editing; [D.S.M.S], [H.J], [Y.A.D], [J.M.P], visualization; [D.S.M.S], [H.J], [Y.A.D], [J.M.P], supervision project administration; [D.S.M.S], [H.J], [Y.A.D], [J.M.P], funding acquisition; [D.S.M.S], [H.J], [Y.A.D], [J.M.P], have read and agreed to the published version of the manuscript.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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