

The Usage Urgency of Information Technology toward the Distribution Management of Disaster Relief Logistics for Mountain Eruption Evacuees with Disaster Relief Operations (DROs) Approach

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Abstract—Various disasters that occurred either in Indonesia or in other countries have shown the necessity to pay more attention to people who are affected by the disaster. The problems that are often faced by people who are affected by the impacts of natural disasters such as having unequal access, discrimination, forced relocation, violence related to sexual and gender, loss of documentation, unsafe settlement, and various matters that related to property compensation. One of the major natural disasters with a huge number of evacuees was the eruption of the Mount Agung eruption in Karangasem District, Bali. This study investigates the strategies that have been implemented by Indonesian Government as well as examines what the Logistics Assistance Distribution Theory says to manage the aids distribution.

Keywords—*disaster; information technology; logistics assistance distribution; Disaster Relief Operations (DROs) approach*

I. INTRODUCTION

Various disasters that occurred either in Indonesia or in other countries have shown the necessity to pay more attention to people who affected by the disaster. The problems that are often faced by people who affected by the impacts of natural disasters such as having unequal access, discrimination, forced relocation, violence related to sexual and gender, loss of documentation, unsafe settlement, and various matters that related to property compensation. Disaster-affected communities are often forced to leave their homes or residences due to damage of their homes due to disasters. Therefore, the most dominant impact on a disaster that occurs is displaced victims [1]. Evacuees are people or groups of people who are forced to leave their homes for an uncertain period of time as a result of the adverse effects of the disaster [2].

One of the major natural disasters with a huge number of evacuees was the eruption of the Mount Agung eruption in Karangasem District, Bali. In 2017, the activities of Mount Agung were active again, with increased seismic and roar.

Normal status is raised to alert. Residents around Mount Agung also began to be evacuated. The peak, on September 22, 2017, the status of Mount Agung was raised from standby to alert. The intensity of volcanic earthquakes occurs hundreds of times until October 2017. Phreatic eruptions also occur around the mountain. Until it finally bursts of volcanic ash up to 7.5 kilometers to the north-northeast, southeast, and south-southwest. On July 2, 2018, Mount Agung again released its magma spill. The eruption was recorded up to 3 times with the height of the ash column reaching 2,000 meters above the top of the crater. This eruption was accompanied by a 2 km incandescent lava which caused a fire around the peaks and slopes of the mountain. The number of evacuees in November 2017 displaced temporarily more than 40,000 people who have evacuated independently since 25 November 2017. A total of 22 villages have the potential to be affected by eruptions after they have been declared alert status of Mount Agung. According to Sutopo, the Head of the BNPB Information and Public Relations Center, there were around 90,000 to 100,000 people in the village and had to be evacuated. Then the second Eruption in July 2018 recorded 2,731 people displaced in 28 evacuees' points in the Karangasem and Gianyar regencies, Bali.

One of the strategic aspects to protect evacuees and guaranteeing their needs in the event of a disaster is related to the process of aid distribution, especially logistics assistance. Efforts to fulfill their basic needs are closely related to the aid distribution process since evacuee needed will be hampered or problematic if aid distribution management does not work well. Logistics Assistance Distribution is a system of distribution or distribution of logistical assistance in the context of disaster management from the area of origin to the intended target destination. The handling of evacuees, especially in the issue of distribution of aid, becomes a very important and vulnerable issue for various problems that occur, because each disaster has a variety of characteristics. Therefore, the government has tried to make laws and regulations that regulate and guarantee the health of evacuees. In Law No. 24 of 2007 explained in Article 6, point c, it is explained that the government is responsible and

guarantees the fulfillment of the rights of communities and evacuees that affected by disasters fairly and in accordance with minimum service standards. In the event of a disaster, the government must at least be able to meet the needs of evacuees, which include clean water and sanitation needs; food; clothing; health services; psychosocial services; and shelter and shelter [2].

There were various problems in the implementation of the aid distribution in several disasters, including the handling of the earthquake disaster in the city of Padang, West Sumatra in 2009. Coverage from *kompas.com* explained that according to Padang City DPRD that was handling disasters in Padang City, coordination was very lacking. The direction of the policymaker is weak and never checks directly into the field. The mayor is busy receiving guests, other officials are only crowded at the Main Post, each time there were only meeting and they never going to the field. Data collection is also not optimal, as a result one family only gets two cans of rice milk, three packs of noodles and one can of canned fish. In addition to the problem of coordination of transportation problems, it is also an obstacle as explained by the Deputy Governor of West Sumatra, Marlis Rahman, as Deputy of the West Sumatra Disaster Management Unit, said transportation constraints are a source of chaos in aid distribution in the affected districts/cities [3].

Another problem that arises in the aid distribution process is related to the logistics distribution information system. According to Huda the existing information systems usually cannot help to show the real need of the victim in natural disasters including the location conditions which where the exact position that must be assisted first and where donors should be distributed to avoid commotion due to inequality in the distribution of aid materials [4]. As a result of this lack of information, interested parties (donors) usually provide or distribute assistance to the disaster area where they know the victims, therefore, that remote places, that far from communication media often do not receive any assistance. In addition, websites that are built that can be accessed by the community usually do not update their data, so donors are often wrong to send their assistance. Websites that are built should have a decision support system to determine where donors should be given their assistance. Based on these conditions, researchers are interested in conducting in-depth research related to various main problems that occur in managing the distribution of logistics assistance for the Mount Agung eruption in Karangasem District, Bali. Considering the impact of the problem which is very safe where the number of evacuees saved must be able to meet their needs in a timely manner, right location, right on target, right quality, right quantity and as needed. The problem statement is as follows:

- How is the implementation management of logistics assistance distribution from the command post (main post) to the evacuation site?
- What is the recommendation of the management model for logistics assistance distribution from the command post (main post) to the evacuation site?

II. LITERATURE REVIEW

A. *Dialogue on Logistics Assistance Distribution Theory*

The problem in the distribution of disaster assistance is indeed quite complex and continues to grow, on the other hand, the management concept of aid distribution has not been found much because of the dynamic context of disaster and has diverse characteristics. Nevertheless, there is a concept that can be used as an approach to analyze the problems and find solutions in aid distribution. The concept is often used in the business sector, that called as Supply Chain Management (SCM). Levi, et al. defines Supply Chain Management as an approach used to achieve efficient integration of suppliers, manufacturers, distributors, retailers, and customers [5]. This means that goods are produced in the right amount, at the right time, and in the right place with the aim of achieving a minimum overall cost of the system and also achieving the desired service level. Then Pires et al. defines Supply Chain Management as a network of suppliers, manufacturing, assembly, distribution, and logistics facilities that form purchasing functions from the material, the transformation of materials into semi-finished goods and finished products, and distribution processes of products to customers [6].

The concept is used to distribute goods in the business sector to send or process the distribution of goods from producers to consumers. The concept can be used as an approach to sending assistance from outside the disaster area to a disaster area, but needs to be adapted to disaster conditions that are different from the conditions in the business sector. Therefore, disaster management do not use the term SCM, but use the term DROs (Disaster Relief Operations). Activities between SCM and DROs have almost the same characteristics as those described by Sheu in Pujawan et al. [7].

“One of the most important issues in Disaster Relief Operations (DROs) has been the logistics/supply chain activities. Logistics in DRO context include such activities as assessing demand, procuring goods, determining priorities as well as receiving, sorting, storing, tracing and tracking deliveries. Using the analogy of commercial logistics, we can classify logistical activities into inbound logistics, that is the process of acquiring supplies from multiple suppliers to the distribution channel and the outbound logistics that delivers supplies from the distribution center to the affected areas “.

The context of aid distribution during disaster emergencies is very different from the condition of the distribution of goods from producers to costumers. There are at least four very different conditions in the process of distributing aid with the distribution of goods including the parties involved, related networks, the demand process of goods, and the supply process of goods.

B. *The Management Concept in the Context of the Evacuees Distribution Assistance*

Management aspect is the most important and main things that must be prepared and carried out in the process of distributing logistics and equipment for evacuees at the evacuation site. This is because the process of distributing logistics and equipment to evacuees must be fast, on time,

effective, benefits and objectives. The word management comes from ancient French, *management*, which means the art to carry out and regulate. According to Robbins and Coulter management is the process of coordinating work activities so that the work is resolved efficiently and effectively with and through other people [8]. Whereas according to Lewis et al. management as: "the process of administering and coordinating resources effectively and efficiently in order to achieve the goals of the organization" [9]. Completing the definition above GR Terry in Hasibuan defines management as a distinctive process consisting of planning, directing and controlling actions taken to determine and achieve predetermined goals through the use of human resources and resources other sources. In Indonesia there are five disaster management models, namely the Disaster management continuum model; Pre-during-post disaster model; Contract-expand model; Disaster risk reduction framework [10].

C. Adapting the concept of Supply Chain Management (SCM) to Disaster Relief Operations (DROs)

One of the most important issues in Disaster Management Operations (DROs) is logistical / supply chain activities. Logistics in the context of DROs includes activities such as assessing demand, procuring goods, determining priorities and receiving, sorting, storing, tracking and tracking shipments. Using the analogy of commercial logistics, it can classify logistics activities into the concept of aid distribution, namely the process of obtaining assistance and then sending or distributing aid to the affected areas. The different characteristics of commercial supply chains and DROs require different ways and different management focus. Distribution activities in the private sector aim to achieve competitive advantage in the market with the principle of efficiency, quality, speed or responsiveness. In contrast, DROs are intended to reduce the impact of disasters and reduce the suffering of evacuees [11]. There are several principles and become important principles in the process of distributing aid, such as:

- Information visibility
- Coordination.
- Accountability
- Professionalism

III. METHODOLOGY

This study implemented narrative review approach. This approach is suitable for the study that investigating and summarizing literatures about the management on aids distribution theory and examining the strategies that has been implemented by Indonesian Government to manage the disasters.

IV. RESULTS AND DISCUSSION

A. The Implementation of Logistics Distribution Management from the Command Post (Main Post) to the Evacuation Site

The implementation of Logistics management refers to Perka No. 10 of 2012 as a guideline for Management of Logistics Assistance in Disaster Emergency Status. In this case, the local government, especially the BPBD, should have a contingency plan related to the issue of logistical assistance because in the initial stages of logistics management assistance preparations and planning are carried out so that the organization. The preparation phase is carried out during pre-disaster where resources will be mapped and can be known about the availability of logistics, warehouses and human resources that can be mobilized. SK GDP was formed in the logistics sector led by Mr. Subandi who came from the OPD equipment section. At the time of being appointed as the head of the logistics sector, there were no maps of the aspects of logistics, warehousing and human resources that could be mobilized. The impact of the absence of the preparatory process is that the resources that are owned are not known, do not form logistics clauses, and cannot know the parties that can be invited to cooperate and coordinate in managing logistics assistance.

The second stage is planning and organization, this stage becomes very important because the process of identifying and analyzing evacuees' needs is carried out at this stage. Analysis of evacuees' needs is very important because it is related to basic needs of evacuees that must be fulfilled. If they do not have data on basic needs of evacuees, the service to evacuees, especially the issue of distribution of logistical assistance, it will become problematic. This stage was also not carried out before by the logistics sector, so that when forming the logistics sector, the head of the logistics sector did not yet have data on the analysis of evacuee needs. The logistics sector distributes aid in accordance with the assistance that comes, this condition can cause the assistance provided is not in accordance with the needs of evacuees. The Logistics Sector at the Ampo Land GDP Command Post is assisted by several sections, they are the Receipt Section, the Aid Storage Section, the Aid Distribution Section, the Back-Office Section and the Warehouse Security Section. The section was only formed after the logistics sector was running for two days, this happened since the head of the logistics department did not know for sure the sections needed and the lack of resources that could be mobilized. Even though the logistical organization has been regulated in Regulation No. 10 of 2012 that can be developed according to needs of evacuees.

The next step is acceptance, the main task in this section is to record the amount and quality of logistics from various sources, then they have to select and match logistical assistance according to the priority scale of needs and store logistics in an easy place. The first obstacle that occurred when the implementation in the logistics department was the issue of types and units of assistance. The reception officer on duty only records the assistance that comes without being made the standard unit that he/she used, even the assistance that comes is recorded manually. Therefore, the data on assistance receipt

cannot be summed together since the units that used are different as well as manual recording. Even though the data on the amount of aid that comes become very important since the resources are owned so that they can be immediately shared and distributed to the evacuee camps. In addition, the problem of poor assistance in data collection has resulted in low accountability of assistance. The second problem is the limited resources, the recording section only has two people so no one selects and matches the logistical assistance that comes. In addition, there are also no human resources who can carry out the task of storing logistics. The impact of these problems is that assistance that comes cannot be qualified and the storage warehouse becomes messy with unregulated assistance

The fourth step is transportation, at this stage the most basic problem is data about evacuee necessity and the assessments that DROs used to provide aid. Data on evacuee needs that are less valid has an impact on the provision of assistance which can be less effective. In addition, the amount of assistance is still limited and must be shared equally among all evacuees becomes the main problem when providing assistance that is not in accordance with the requests of evacuees. Some evacuees who were not given assistance in accordance with what had been proposed are protested and forced to get what they wanted.

B. Recommended Management Model of Logistics Assistance from the Command Post (Main Post) to the Evacuation Site

The concept of Disaster Relief Operations (DROs) is an approach that adopts the concept of SCM but it has different objectives. The concept of DROs is intended to reduce the impact of disasters and reduce the suffering of evacuees [11]. The concept of DROs has four important principles that must be considered in order to minimize the problems that occur in the process of distribution of logistical assistance, those principles are; the first one is information visibility. Information visibility is related to the accuracy of the data that evacuees needed as well as the ability to see the logistics inventory they have. The second is coordination, coordination in the DROs process requires a more assertive and stronger leadership with the aim of directing the organizations involved them to be able to play a role in accordance with their respective goals and roles. Third is accountability, serious efforts need to be made to ensure that any assistance provided has been well distributed and reported in a transparent manner. The fourth is professionalism, which is a SOP (Standard Operational Procedure) in the process of distribution of assistance and adhered where all HR involved in it. Based on the description of the problems that occur in the process of distribution of logistical assistance, as well as referring to the concept of DROs, the authors compile and make recommendations for a model for the distribution of logistical assistance to the evacuation site.

Technical problems which often occur when the logistics sector does not yet have readiness in implementing aid receipts and management of assistance. These technical problems are like organizational management in the field of logistics where there is no division of duties in carry out logistics. The emergence of every officer involved in the logistics sector does

not have the necessary functions or competencies needed. Furthermore, at this stage the important thing to do is good planning and preparation. Stocks include mapping capacity activities, creating and developing logistics clusters, establishing logistical response units, establishing cooperation and coordination agreements. The activities in planning activities are the identification and analysis of evacuee needs. The division of tasks and activities carried out in the field of logistics include activation, reception, storage, transportation and distribution. The aid management and distribution management model stated as follows:

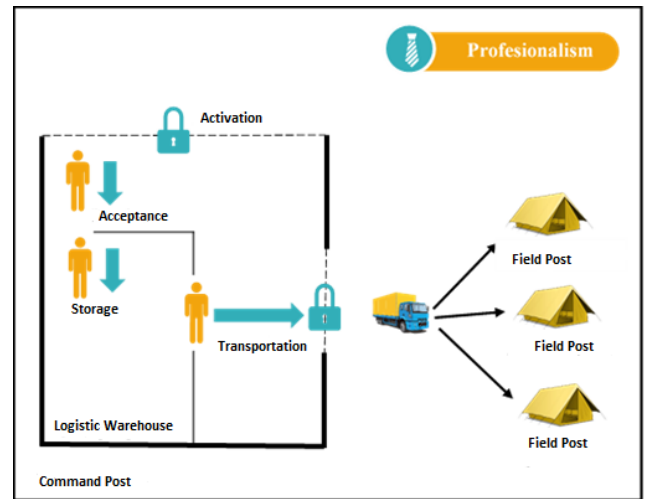


Fig. 1. Flow of aid management and distribution model.

In the process above, from the first phase until distribution phase plays a very strategic role and has a systemic impact. The conditions that occur in this process are also very uncertain where incoming assistance cannot be predicted, the amount of goods coming out to be distributed and the intensity is quite high. In this process, a fast data collection is needed so that the incoming assistance data can be known in an update. The data will also be published in real time so that the accountability of assistance can be known to all those who have helped. Therefore, the government can utilize information technology that is developing at this time to facilitate data collection and accountability of assistance. The era of disruption now that the government, especially BNPB, must be able to respond to the needs of evacuees and the assistance that has been received by the government quickly and in real time. The technology used is almost identical to the use of technology in the private sector such as points of sale (POS).

V. CONCLUSION

- It is necessary to make a technology-based information system that is connected to the website related to data collection, both received and distributed. In this system, various logistical aid items and units of the goods have been inputted so that the recipient of the assistance will only press the name of the item and the amount will automatically be recorded and published on the website. The conditions of aid in and out that are so fast will

cause new problems if the model of recording or recap aid is still manual and out.

- It is necessary to create Integration between IDP data and the number of evacuees' needs in the form of a website so that all stakeholders involved in the aid distribution process can update the dynamics of evacuee needs and achieve fulfillment of evacuee needs.

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