

DESIGN OF LOGISTICS INFORMATION SYSTEM FOR DISASTER RELIEF OPERATIONS

by

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ABSTRACT

Management of logistics system in disaster relief is an integrated approach in managing the disaster relief items, and certainly involves many different actors but the disaster relief activities must be well-coordinate. Thus, the information system is very important think for the activity of emergency response and disaster relief. With good information systems, the disaster relief can be done as quickly and as precisely as possible. This research focused on the design of logistics information system that can support disaster relief emergency response activities which is included the activities of delivery the medicines and medical personnel, equipment and special rescue teams, as well as food and drink into the distribution center of areas that affected by the disaster. The final results obtained from this research are the information systems can be used to planning the logistics of disaster relief as well as to support the distribution of disaster relief goods. The information systems that built on this research can provide information about: (1) description of the population consisted of the total population, the number of inhabitants, adult population, and the number of residents with disabilities; (2) description of resources that contains information about the transportation that can be used to distribute the disaster relief goods; (3) information about the inventory status of tents, food, medical equipment, and sanitary items; (4) A map of the region which contains information about ground transportation routes (main road can be used), the route a railway track, the location of facilities such as hospitals, as well as information about the location of the provincial unit for disaster response coordination (BPBD - regional disaster management agency).

KEYWORDS

Information Systems, Logistic Information System, Disaster Relief, GIS

INTRODUCTION

Indonesia located at the confluence of active plate tectonics, surrounded by the mountains and with tropic weather, the temperate area that made partly the region vulnerable to natural disasters. The number of disaster victims in Indonesia is quite high compared to other countries. The latest data has shown any increase, in terms of a kind of disastrous, the total of losses, and the number of casualties.

Based on the data that was successfully managed by the National Agency for Disaster Management Republic of Indonesia (BNPB) obtained statistical data regarding the recap of the disaster in Indonesia that occurred in 2007 and 2008. Based on that data, can be concluded that disaster occurring most frequently is the flood to as much as 40% (152 events), then the hurricane disaster as much as 20% (75 events), a landslide of 15% (56 events) and floods with landslides 12% (45 events). The most frequent disaster happened in 2008 was the flooding at 38 % (495 events), then disastrous drought at 15% (198 events) and fires at 14% (189 events). Based on the incidence of disasters in Indonesia at 2007 and 2008, it can be concluded that the disaster that occurred most often is flood, when seen from the percentage decline in 2008 than in 2007 (from 40% to 38%) but when viewed from the frequency of occurrences happen an increase (of 152 events into 495 events). Then the humanitarian responds should be well managed. There are two main streams of humanitarian logistics responds: continuous aid work and disaster relief (Yang et.al., 2011)

Disaster relief operations engage a large number and variety of actors, each with different missions and interests (Balcik et.al., 2010). A disaster relief operation basically arises from the belief that human life in fact is very valuable. Their life and living as the fundamental rights of every human being has the implication that all disaster relief measures must be taken in order to prevent or relieve human suffering. Disaster relief operations certainly need a good and effective management. Consideration the service level of fulfillment the emergency goods will be the most important variable in the fulfillment of emergency goods at the disaster site.

The implementation of disaster relief operations requires an alignment between organizational readiness and the adoption of fundamental logistics components, namely standardized tools and processes, traceability through adapted information systems, and appropriate competencies within the organization (Gatignon et al., 2010).

The role of information systems become very important to support the activity of emergency response and disaster relief operations which includes the delivery of medicines and medical personnel activities, distribute the equipment and special rescue teams, as well as food and drink into the distribution center of the affected areas can be done as quickly and as precisely as possible. Disaster relief operations should be supported by an adequate information system and is expected to be able to:

- Improve the ability of disaster logistics planning for all disaster relief mechanism, both at central and regional level at all stages of the disaster relief operations.
- Support the implementation of the emergency goods distribution activities.
- Provide the complete and actual information to all parties that concerned with disaster relief operations both in Indonesia as well as in foreign countries through global network facilities.

To answer these problem, there is need to design the logistics management information system disaster relief operations using GIS (Geographic Information System), because GIS are enables automated decision making such as resource matching and route finding for resource distribution (Chen et, al., 2011)

RESEARCH METHODOLOGY

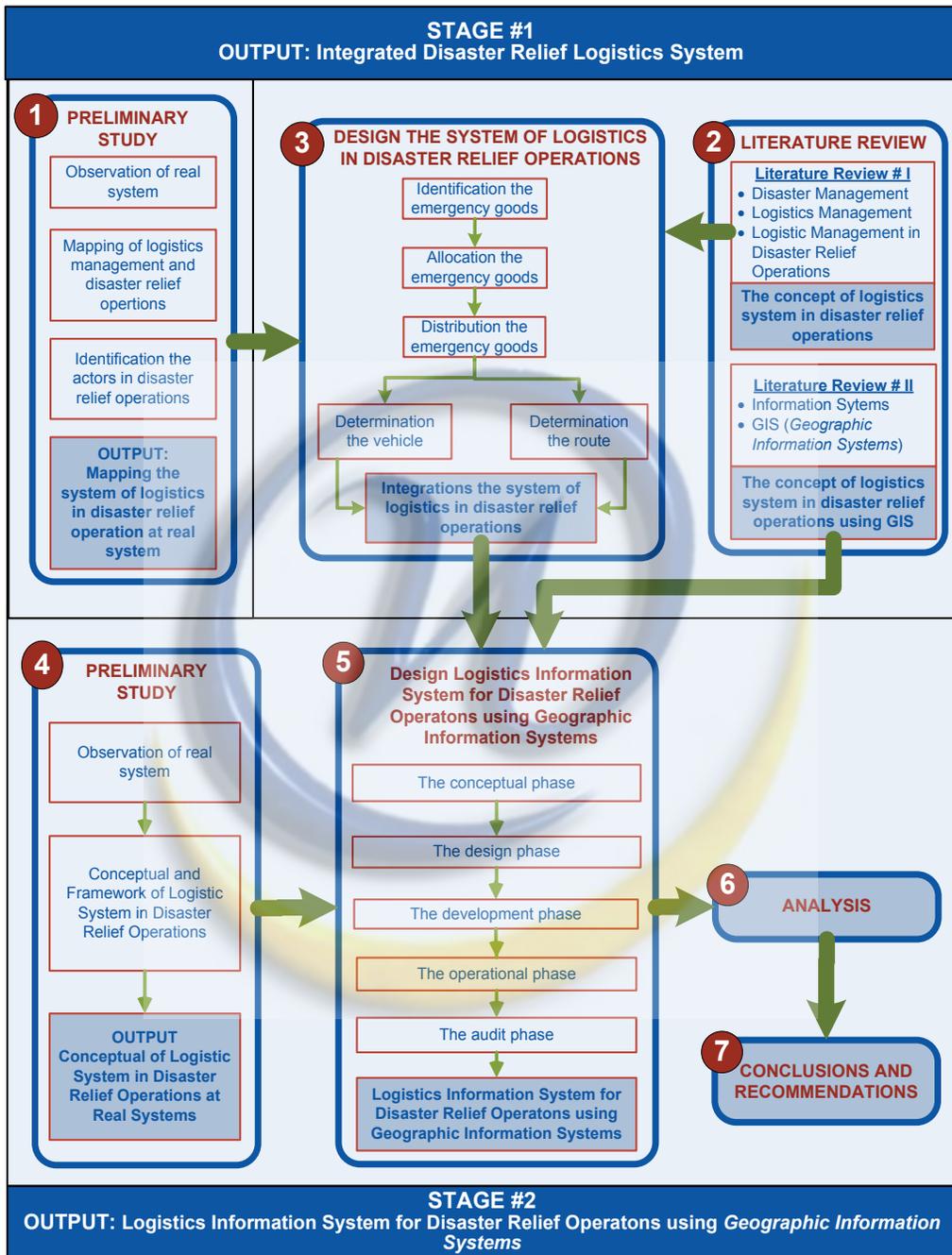
This research consist of two stages following with 7 steps, there are: (1) Preliminary study I, (2) Literature review, (3) Design the system of logistics in disaster relief operations, (4) Preliminary study II, (5) Design logistics information system for disaster relief operations using Geographic Information Systems (GIS), (6) Analysis, (7) Conclusions and recommendations. The flowchart of the research is illustrated schematically in Figure. 1.

On the first stage, this research will be conducting about the design of integrations the system of logistics in disaster relief operations. The design started by identification the emergency goods activities, than following by allocation the emergency goods activities, distribution the emergency goods, and the last is determination and assignment the vehicle and the routing to distribute the emergency goods.

Mapping the current conditions of the information system in disaster relief operations is the initial steps should be done on designing the integrations system of logistics in disaster relief operations. This mapping process generates a preliminary study about disaster relief logistics system in Indonesia as well as the identification of the actors on the disaster relief operations in Indonesia. The output of this stage is a model to allocate and distribute the emergency goods to support the disaster relief operations.

On the second stage, this research will be conducting about the design of integrations the system of logistics in disaster relief operations using the Geographic Information Systems (GIS). This stage consist of fifth phases, thus are: the conceptual phase, design phase, development phase, operational phase and the audit phase. The output of this second stage is the information system that can used to planning the disaster logistics to support the disaster relief operations and to support the activities of distribution emergency goods while the disaster occurred.

FIGURE 1
THE FLOWCHART OF THE RESEARCH

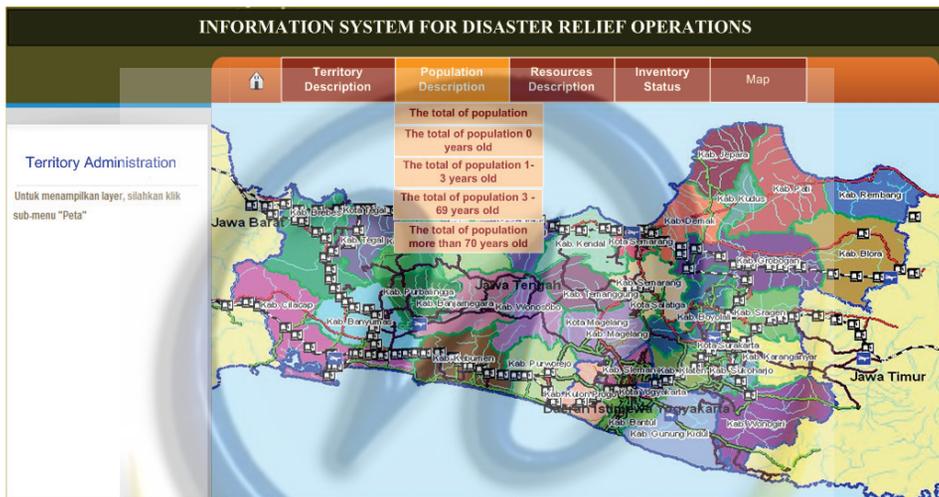


RESULTS

The final results obtained on this research is the information systems can be used for planning the logistics of disaster relief as well as to support the implementation the distribution of disaster relief items. The information systems consist of fifth submenu, thus are menu of territory description, population description, resource description, inventory status and map.

Sub menu of territory description gives the information about the territory, (i.e the total of area). The information system for population description gives the information about the population distribution by ages, into the following age categories: 0 years old, 1–3 years old, 3–69 years' old, and more than 70 years' old. The capture of information system for population description is shown in Figure. 2.

FIGURE 2
THE CAPTURE OF INFORMATION SYSTEM FOR “POPULATION DESCRIPTION”



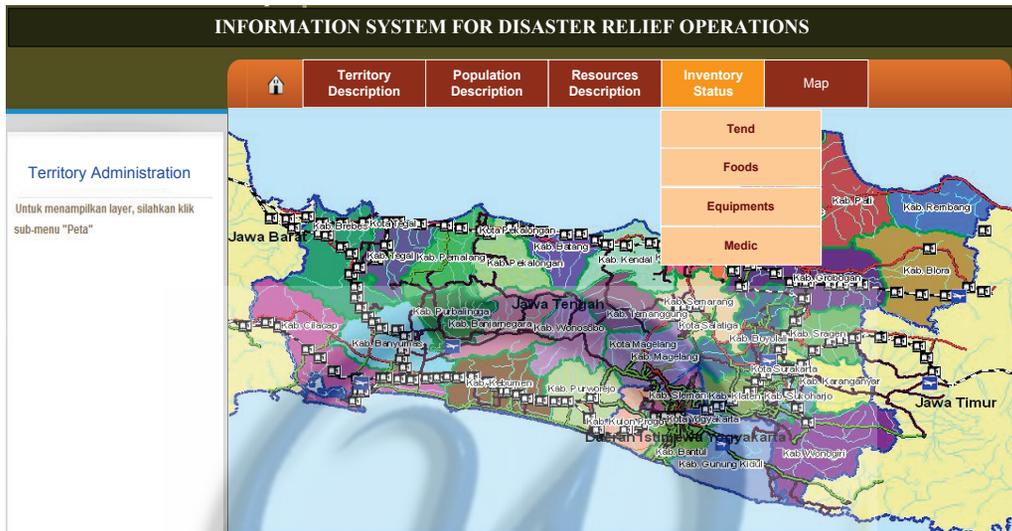
The information system for population description gives the information about vehicle that can be used to distribute the emergency goods to the disaster area. The capture of information system for resources description is shown in Figure. 3.

FIGURE 3
THE CAPTURE OF INFORMATION SYSTEM FOR “RESOURCES DESCRIPTION”



The information system for inventory status gives the information about the availability of equipments and food that ready to deliver to the disaster area to elevate the victims suffering. The capture of information system for inventory status is shown in Figure. 4.

FIGURE 4
THE CAPTURE OF INFORMATION SYSTEM FOR “INVENTORY STATUS”



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