

# The Design Planning Budget Needs of Refugees Toward Disaster Using Spatial Analysis of Buffer Zone

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## ABSTRACT

*Natural disasters such as have become an inseparable part of Indonesian society, since the tsunami disaster in Aceh until the eruption of Mount Merapi, as well as cold lava which is still over an area that was actually not a river. Needs urgent and we must give attention at the moment of disaster. Specifically, in this case Mount Merapi disaster-related, namely the effort to evacuate the people who will be affected by the eruption of the volcano. Obviously, the handling of these refugees will bring up other needs can be anticipated, so the refugees can be saved and their health is maintained. That is, handling and anticipating the impact of disasters needs to be managed properly, such disasters associated with the eruption of the Merapi volcano. Before the eruption of small and larger still be known / predicted by scientists about the range of lava that will flow into place anywhere. This, the basis for designing a software to analyze the needs of disaster mitigation required have been predicted for a moment. This design will locate any area that will be affected, by obtaining predictions in advance about the reach of eruption / lava is going to happen. The technique used to localize the affected area, using spatial analysis techniques in the buffer zone of GIS software, and will be further processed to determine the immediate urgent needs of the budget done.*

**Keywords:** *prediction, distance range, spatial techniques, analysis of the buffer zone, the budget needs*

## 1. INTRODUCTION

So many the disaster in Indonesia requires all levels of society, organizations, and government should always be vigilant and increase alertness in the face of the disaster. Especially the disaster volcanic eruptions predictable, so that all forms of saving early can be prepared.

As is, it is known that in Indonesia there are about 129 Mt of Fire and in 2006 up to 2008. Some of them showed increased activity of the alert status to alert as Mount Merapi, Mount Dieng Mount Slamet in Central Java, Mount Semeru, Mount Kelud and Mount Bromo in East Java, volcano, Mount Guntur in West Java, Mount Krakatau in Lampung and Banten, Mount Kerinci in Jambi, Mount Talang in West Sumatra, Mount Soputan, Mount Karangetang, Mount Lokon in North Sulawesi, South Sumatra Gunung Dempo, Mount Ibu in North Maluku and Mount Batu Tara in the East. Even Mount Merapi on 13 May to 21 June 2006 is in Status Watch [4].

Given the number of regions in Indonesia that has the active trim volcano and location of these areas is generally far from urban areas (villages), beside the availability of supporting infrastructure in each area can not accommodate all the needs of society.

Government officials who are in difficulty because the region still has no way of good data management, especially in the inventory of infrastructure and populated areas. As a result of these difficulties, there is often the disaster Mount trim which has been predicted to reach areas can not be shunned by society because of lack of coordination and poor information on population data are immediately evacuated.

Disaster mitigation should be able to serve as the basis in solving the problems of disaster by making coordination and a management of population information. The existence of complete information about the the disaster stricken area residents will be very helpful in preparing for his safety in the event of the disaster. Coordination based on the data obtained will realize what needs to hasten the implementation, coordination sometimes this can not be materialized due to lack of early information about the geography and population of a the disaster area.

Necessity, managing geographic and demographic data are things to think about because the data obtained then becomes the basis for decision making at the highest level of government, that is regarding the budget the disaster. One way this problem can use spatial analysis that is part of the concept of geographic information systems.

## 2. DISASTER MANAGEMENT

The study of the disaster indicated by the presence of two major paradigms, that is the paradigm of behavior (behavioral paradigm) and structural paradigms. The first paradigm dominated the study of the disaster in the 1950s that was characterized by a technocratic approach that among others, appear in the disciplines of geology, morphology and seismology that favor the monitoring and hazard prediction. Hazard-centered paradigm is embedded in modern capitalist discourse, which looks from the perspective that nature is a separate part of the human being and is a commodity that can be managed with the approach to knowledge and modern administration. Because many the disaster occur in developing countries, the disaster is considered as part of modern life that does not lead to vulnerability and hazard. [10]

The information about the condition of the disaster that may arise related to this problem [9], that is

- a. Scale the disaster impact
  - i. How many people are affected at the time, how large vulnerable groups that exist and how many are at risk based on assessment of the likely development of the problem?
  - ii. How large the affected area ?
- b. Information about the Disaster Area  
Existing facilities:
  - i. For warehouse / storage of goods.
  - ii. For temporary residence or office.
  - iii. For Transport
  - iv. For refugee camps

Problems of coordination in disaster management is a difficult thing to do. Because usually the decision making process will lead to the rules and regulations. All areas of responsibility to try to coordinate with each other, but the incompleteness of data and lack of facilities and infrastructure needs that have led to the failure of a decision taken, causing delays in the handling of the refugee the disaster.

Here are the problems that arise when the volcano trim in Yogyakarta, which is clearly seen many problems arise that comes from incomplete data owned and impact of assistance do not optimum. Here are key questions that often arise at the time of the disaster, such as [11]

### Key Questions

- a. On what legal basis the establishment of the disaster coordinator ?
- b. How appropriate leadership style adopted by governmental agencies and public institutions on the uncoordinated phase ?
- c. Who has the right decisions in the health sector in times of emergency ?
- d. How is the provision of technical data and information ?
- e. How does the system of coordination between government agencies, private and public ?
- f. How is the division of authority and responsibility to handle the disaster between Ministry of Health Central, Provincial Health Office, and District Health Office in the era of decentralization ?
- g. How does the current financial system defined national emergency and the area ?
- h. Where the source of financing for future the disaster ?
- i. How can the disaster team so well coordinated ?
- j. What is the role of central government in the disaster management ?
- k. How to volunteer management ?

With more and martinet disaster management activities, it takes no small amount of operational funds. Another example of problems that arise, which Bantul Health Service tried to get disaster funds (not suspects) to the local government, but was asked to make detailed plans in advance.

The problem above is only a fraction of the problems that arise, meaning that need quick information and data analysis problems can be anticipated early on. So that, the need for any settlement of the problem has also been prepared before

the refugees arrived in refugee camps and also has prepared everything related to the possibility of events that will occur.

The disaster led to the need to prepare a budget that fit the needs of problems in the field. Financing also came into focus the difficulty of handling refugees are not recorded properly due to operational requirements that need to be provided on time and on target for the refugees. For example, can be seen in the the disaster eruption of Mount Merapi today, where there are 289,613 registered refugees each day requires USD 4.34 billion for the three meals a day. It does not include other emergency needs.[6]

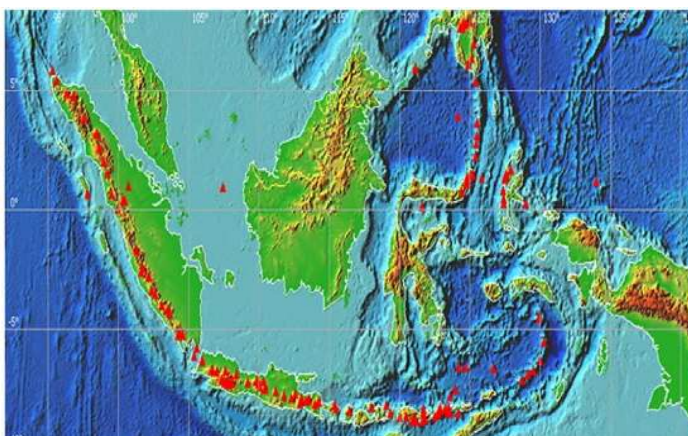
### 3. LEAD-DISASTER NEEDS LIST

The disaster requires good planning-related the disaster or better known as disaster recovery planning (DRP), DRP is to minimize risk and optimize the sustainability of the entity in the face of the disaster risk, so that the DRP should be well prepared and planned. One of the things that need to be prepared before the the disaster is the need to come, where do all the needs of the refugees. Like, the increased activity of Mount Merapi in Yogyakarta in May last year that caused all the zone approximately 20 km declared unsafe.

This caused the large number of refugees in a number of new refugee point. Therefore, the needs of the refugees is increasing. While the distribution of aid in the evacuation of each point is still lacking and not coordinated. To facilitate the distribution of aid following is a list of refugee needs in the most posts at the time [7] :

- a. UPN Posko Condong Catur  
Requirements : underwear, blankets and baby powder.
- b. Command Post Maguwoharjo Stadium  
Requirements : bucket, scoop, lingerie, pacifiers, and pampers for the elderly people.
- c. Hail Region, Bridge Krasak  
Requirements : mask, baby formula, kitchen equipment,
- d. Posko Kentungan  
Requirements : milk for babies aged 1 month (1 person) and milk toddlers (55 people).
- e. JEC Command Post  
Need medical personnel and medicines, bathing equipment, baby formula, drinking water
- f. Posko UKDW  
Need blankets and bed mats.

### 4. GEOGRAPHIC INFORMATION SYSTEMS (GIS)



Source: Directorate of Volcanology and Geological Hazard Mitigation, Bandung 2006  
Figure 1 : Distribution Map of Volcano in Indonesia

the island of Sumatra, Java, Bali and Nusa Tenggara on one circuit to the north through the Banda Sea and northern part of Sulawesi Island. This belt stretches with a length to reach approximately 7000 kilometers with a variety of character forms and volcanic eruptions

GIS is a field of study is a relatively new science that can be used by the varied disciplines that develop very quickly. Based on the International GIS Dictionary or an international directory of GIS, understanding of GIS is a computer system for capturing, managing, Integrating, manipulating, analyzing and displaying the which the data is spatially referenced to the Earth. One of the functions of GIS is very important is the ability to analyze data, especially spatial data and then presenting it in the form of spatial information following a data attribute.

The points red triangles in Figure 1. above is an image forming volcanic belt extending from the island of Sumatra, Java, Bali and Nusa Tenggara on one circuit to the north through the Banda Sea and northern part of Sulawesi Island. This belt stretches with a length to reach approximately 7000 kilometers with a variety of character forms and volcanic eruptions

**MODEL ANDA DATA SHAPE**

One model represents the data used in geographic information systems in question, that is using vector data model which has the function of displaying, placing, and storing spatial data using dots, lines or curves, or polygons and their attributes, such as in figure 2. The basic shape of this spatial data representation within the system vector data model, defined by two-dimensional Cartesian coordinate system (x, y). In the vector spatial data model, the lines or curves (arc or arcs) is a set of un ordered points are connected. While the area or polygon is also stored as data sets or objects (eg points) but with a note that the starting point and end point coordinates of the polygon has the same value (closed polygon perfect).

As for support-related non-spatial data is necessary to represent a descriptive data, that is numerical data, tabulation, and descriptions that have a relationship as non-spatial data with spatial data. The forms of descriptive data can be grouped in to three groups that have a specific format:

- a. Formulir and list in the form of a list with the format: code, alphabetik, alpha numeric codes and numbers.
- b. Report complete with the format: word, sentence, and other information.
- c. Information picture (graphic) form: words, numbers, description guide coverage area, the information symbol.

Furthermore, this descriptive data as the data to manage the database management, as in figure 2.

Here are the functions of spatial analysis can be done to represent the combined spatial data and non-spatial, that is:

- a. Proximity Analysis  
 Analysis of geographic proximity is a based on the distance between the layers. Inproximity analysis GIS using a process called buffering, that is building the supporting layer around the layer within a certain distance to determine the close relationship between the properties of existing parts
- b. Function Zone  
 Zone function is to produce a grid theme or a table with output value is a function of input cell values in a value-grid themes and their relationships with other cells in the same zone of cartography.
- c. Neighborhood function  
 Neighborhood Function using Buffering technique s. This function produces a new spatial data shaped polygons or areas with a certain distance from the input spatial data

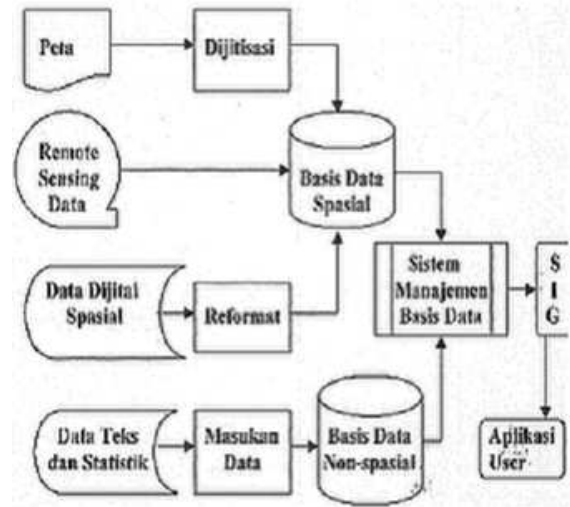


Figure 2 : Database Management

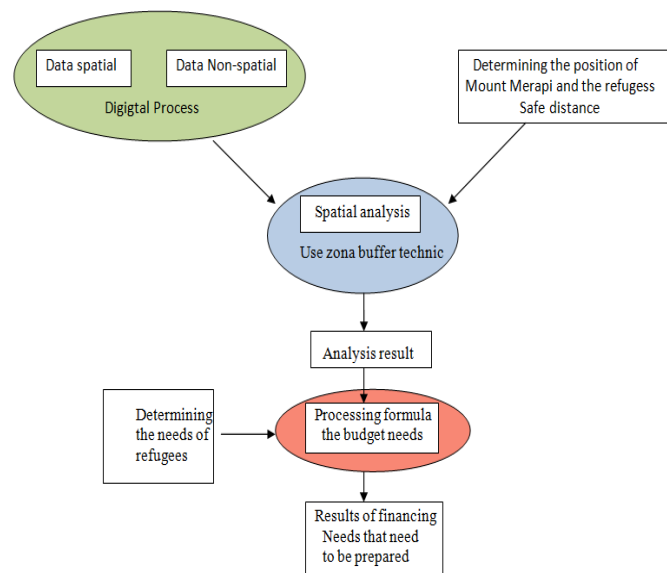
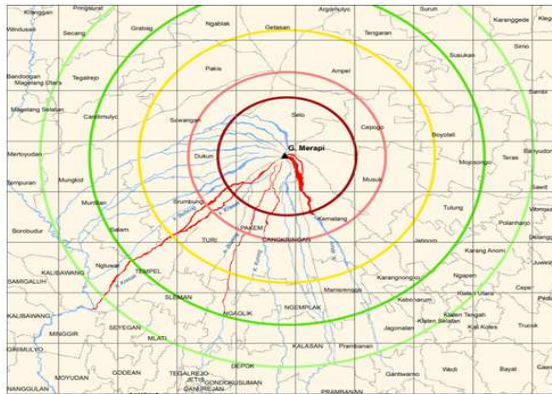


Figure 3 : Design State of Planning

**5. THE DESIGN PLANNING**

At the design stage of planning will be established linkage of all resources owned, including spatial data and non-spatial; software support to implement a geographic information system, and a number of formulas tailored to the needs of the conditions at the time. The following figure 3. about the integrated resource. A more detailed explanation about the design phase of planning, that is :

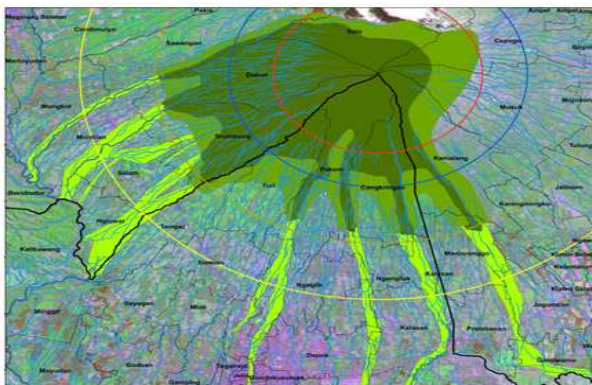


Information : red has been hit by cold lava;  
 blue is not affected by cold lava

Figure 4 : Lahar Hazard Map of the threat of cold Mount Merapi Yogyakarta Sleman district

based on geographical information system, that is determines the location of Mount Merapi and equipment will be with drawn as far as a radius that is considered safe by the parties BVMBG. So that, will produce a database that covers all areas of Mount Merapi area affected (analysis result).

- d. Next, set a standard requirement which is generally done in case of a the disaster. The need in question, for example to determine the number of trucks and capacity that will bring the disaster refugees, mile age from the disaster area to a safe area, the amount of fuel oil for the transportation process. Another thing that needs to be done in determining the needs, that is the provision of shelter the refugees who have been prepared based on the assumption that the data will be received, such as the amount of food / beverage for baby, children, seniors, to adults (made priorities), bedding, and for the purpose of bathing, and etc.



Information : regional forbidden;  
 hazard area-1;  
 hazard area-2

Figure 6 : Hazard risk maps of Mount Merapi Sleman, Magelang and Klaten

## 6. TECHNICAL DATA USE OF BUFFER ZONES

The following figure shows the affected data model Merapi, where the position of the the disaster is determined and its location along the radius of the desired drawn according to information from the BVMBG, as shown in Figure 7. At the time of spatial data covering the area the disaster-prone areas, there will also be raised from the the relevant database. The figure describes, the visible red circle is the desired radius by BVMBG safe for residents to evacuate immediately. Whereas, some predicted areas affected by lava, it must be brought to the location that had been prepared (a symbol of green house) located outside the red circle. Database that are in a

- a. Non-spatial data and spatial previously had to be made by local or central government. Typically, the minimum data recorded in this case about the state of geography; distance from Mount Merapi somewhere; demography including the level of local community life. The data was then digitized to be readable by software-based geographic information system and entering the database.
- b. The data that determines a safe distance from Mount Merapi which obtained by from the Agency for Volcanology and Geological Hazard Mitigation (BVMBG), will greatly assist in determining the radius of the area to be affected by mountain the disaster Merapi.
- c. Into two groups of data from digital processes and information safe distance radius of the affected area Merapi, it will then be analyzed using the technique of buffer zones and software

Formula in question is the need to process automatically the basic prices of every need, as explained earlier with the calculation of population data from each area to be affected by the disaster as determined by the radius BVMBG

This calculation formula will generate data that needs to be prepared at any time by local government, given the development of the disaster radius at any time subject to change. So the data covering areas to be affected by the disaster will also change.

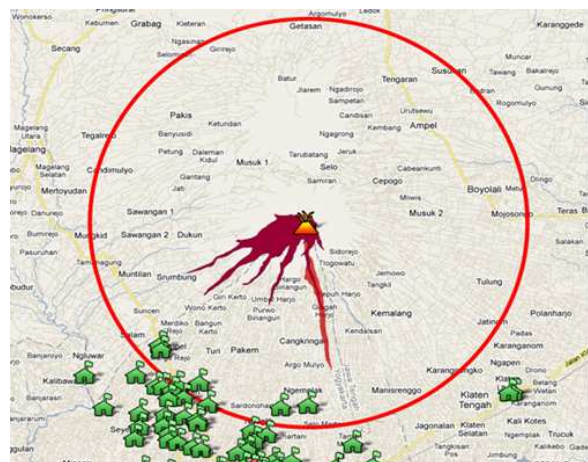


Figure 7 : safe distance based on the radius of BVMBG

circle in ototmatis will bring up the condition of its inhabitants, so that the data is immediately processed in the formula used for calculating the budget requirement. The result will be immediately followed up the local government.

While the data needs to be processed can be done by taking the results from the these databases to put in the formula provided in accordance with standard requirements. The following simple example database structure that will be formulated, that is:

Table 1 : Disaster Affected Areas

ID-Region
Area Name
Safe Distance
Distance to Place of Displacement
Number of Days in Displacement
Population
Toddlers (0-5):
Seniors (60-90):
Children (6-12):
Teens (13-20):
Adults (21-59):

Table 2 : Base Price Requirement

ID-Needs
Food-Beverage
Baby milk: USD
Baby Food: USD
Kids Meals: USD
Food Adolescent / Adult: USD
Mineral water: USD
Equipment
Blanket: USD
Mat: USD
Transportation
Trucks: USD
Fuel Oil: USD
Driver / day / week / month: USD

Table 3 : Formula Price Total Budget Requirement

ID-Region :
ID-Needs :
Area Name :
Safe Distance : X km
Number of Days in Displacement : Y days
Population
Toddlers (0-5) : USD [W x {base price of food / drink}] * Y
Seniors (60-90) : USD [W x {base price of food / drink}] * Y
Children (6-12) : USD [W x {base price of food / drink}] * Y
Teens (13-20) : USD [W x {base price of food / drink}] * Y
Adults (21-59) : USD [W x {base price of food / drink}] * Y
Transportation
Number of Trucks : USD [The population / capacity truck (conditioned for round-trip)]
Total Gasoline : USD [travel time per truck] * Mileage

The three tables above relate one another, where the table table : disaster-affected areas and tables : the base price are related requirements will be a table : formula price total budget requirement. The result of this formula, would be a recommendation for the parties involved to perform an action.

## 7. CONCLUSION

Based on data obtained by on the amount of the budget needs to be done, it is no longer expected to occur a delay in responding to the disaster Mount trim. Because, very clear conditions trim volcano could have been predicted before, so that forwardness of the authorities / local governments can take action immediately about the technical things that happen in their respective regions. Budget while also seems clear, given the predictions by BVMBG which have been obtained previously can be mapped using GIS and formulated according to field conditions at the time.

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