

# **A FRAMEWORK STUDY OF SITE SELECTION OF VOLUNTEER TRAINING CENTER AND EVACUATION CENTER FOR FLOOD DISASTER**

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## **Abstract**

This research studies the optimal site selection of volunteer training centers and evacuation centers for flood disaster in Thailand. As of our knowledge, there is no study about locating two types of the centers (volunteer training centers and evacuation centers) in the same network. We propose that the training centers should be located near river or sea near tourist attractions for a convenience to train skills relating to water such as kayak training and other water survival training and for promoting volunteering work to tourists. The evacuation center acts as a shelter and a volunteer center when the floods reached training center. Training centers will be assigned to an evacuation center. Conditions in the proposed model will integrate demand of victims, volunteering supply, and volunteer preference taking care of personnel management. Volunteers will continue volunteering if their preferences are satisfied. The objective of optimization model is to minimize the cost of the network while satisfy volunteer preference. A network design of training centers and evacuation centers integrating volunteer preference should bring significant difference to research field.

**Keywords:** Site selection, Volunteer preference, Volunteer and evacuation center, Optimization

## **1. INTRODUCTION**

Thailand is a peaceful country that has few disasters; and when they are occurred, most of them are related to water. For example, two big floods occurred in 1995 and 2011, which caused serious damage to the economy. Now, water management is one of the top concerns for Thai government policy (Church World Service Asia/Pacific, 2011). During the flood in 2011, many people came out as volunteers. But since they have never been trained, demands and supplies were mismatched and misplaced. One way to improve the problem is having volunteer preparation and management. Thailand needs a systematic volunteer management. Such program should teach survival and rescue skills and prepare volunteers during normal time. During the flood, it should manage and gather volunteers quickly to provide sufficient help to the affected

areas on time. Therefore, our study brings attention to two types of center for disaster management. They are volunteer training center and evacuation center.

First, a volunteer training center teaches volunteerism skills, team building, and mindset required for the task. Trainees will be taught how to row boat, swimming, and other problem solving skills. We surveyed volunteer training programs and found an interesting model of 1500 Miles Foundation. The training centers of this foundation are located near river or sea near tourist attractions. If a center is near river or sea, it is convenient to train kayaking skill and water survival skills. Location near tourist spots can attract tourists who might be interested to join volunteering. Trained volunteers can also provide water tour for the new coming volunteers; they are so-called “voluntour” (Youprom, 2013). Second, the other center is the evacuation center, which acts as shelter and a volunteer center when the floods reached training center. Evacuation center (such as existing public buildings) should be easily accessed by the affected areas (Chanta and Sangsawang, 2012). If flood occurs, training centers locating near river or sea are most likely to be flooded. Therefore, the centers should be able to relocate to somewhere else. We propose that they can move to an evacuation center that they are assigned to. We need to study international condition for setting up evacuation center. The locations of training and evacuation centers need to be known by the population. People will know where to go to during disaster time. Our study targets youth volunteers; therefore, locations of high schools and universities are taken into consideration.

Where should training centers and evacuation centers be optimally located? This is site selection problem. The choice of location is affected by costs and other factors such as geographical factors, (mountain, land height level, etc.), and seasonal storm. These factors are varied from region to region. Apart from cost, supply and demand, and geographic factors, we will later consider volunteer preference in a proposed model. This addition will provide more accuracy and realism in our optimization model. These two types of centers will response to each other’s needs. As of our knowledge, we have not seen any works related to site location to form a network of two different centers (volunteer training centers and evacuation centers) that integrate volunteer preference. This should bring a significance contribution to research field.

## **2. VOLUNTEERING – PERSONNEL ISSUES**

When we talk about volunteering, most of volunteer organization is non-profit organization (Falasca, 2009). All volunteers are willing to work for different reasons (Youprom, 2013; Meier and Stutzer, 2004; Zappala, 2000). Due to cost, supply, demand, and geographic factors in each country being in different conditions, each country needs to find a process that works for local needs. In Thailand, volunteer assignment is not managed effectively (Sunit and Win, 2005), especially when flood disaster occurred. Sometimes, evacuation center is too far for victims and volunteer training center still not have enough and cannot train people effectively (Youprom,

2013). When flood disaster arrived, there are many volunteers willing to help people in affected areas but there are few people who have skill and experience to help them (Sampson, 2006).

## **2.1 Set Back Element**

First of all many people working for non-profit organization will understand that the cost administration is one of the major concern since many if not most of the volunteer organization in Thailand are non-profit organization. The key different to note are as follow. Since the volunteer are indeed volunteer which mean that paying them will not be much of an issue. But with that in mind, most labor consumption task (that most organization tries to minimize profit by minimizing labor costs) has to turn into maximizing task completion by minimizing shortage. And while most key constraint of the paid work force only requires a task, the volunteer force requires a committed labor (Falasca, 2009).

## **2.2 Labor Shortage**

Labor pool are also a problem that need to be taken into consideration since normally the paid work force are consider to be sufficient according the nature of the task. The paid rate to undertake such task, the volunteer labor pool are extremely limited as it's determent by the size of the committed labor who willingly accepted the task themselves (Sampson, 2006). Thus, it always seem to be clinging at the bare minimum in time of peace with the number substantially risen in time of need, for example during the Thailand great flood in 2011 where the number of the committed exceed the number of the required task and thus become an idle asset.

With the limitation has been lift temporarily the most important asset will be to find the skilled labor to perform certain sensitive task which many of Thai volunteer organization still lack the way to suppurate these people from the majority of the crowd who volunteer.

## **2.3 Reason for Volunteerism**

Now, let's move on to discuss the aspect of the reason why people become volunteer as a matter of fact there are three major type of individual. The first type is the one many of us are always found operating in the volunteer camp site all the time. These kinds of people took on the task of volunteerism in pursuit of self-happiness. They want to do so because it helps people in need; and thus the happiness of the people they help becomes their happiness satisfying their inner realm of moral judgment of helping other human being.

This type of volunteer are further divided into two groups. The first one is the type that do it temporarily for experience or because their friend or relative do so and want to be part of something bigger. The second type is the so called hard core type. These group of people will do whatever it take to go where ever they are needed no matter the terrain, costs, or situation. These people do that because either the same reason as mention above or due to something deeper in their mind (Zappala, 2000), for example, family member used to receive help from volunteer work before, personal karma, self-redemption, inspire by the work of other or their personal idol etc.

Now back to the main categories of main type of volunteer. The second type of volunteer is the people who do so because they would otherwise receive the by-product of the volunteerism (Meier and Stutzer, 2004). This people does not enjoy the work of volunteer but doing so, for example, to improve their local public utilities, emergency situation that occurred near their residential area thus effecting their living standard, receive reward other than money in the emergency situation like food, shelter, medical supply or perhaps higher living standard or social privilege status in time of crisis.

The third type of volunteer is the force volunteer like an intern from the college student. The group of people needs to have volunteerism as part of job requirement or force into labor like a prisoner but they are still considered as volunteer due to the fact that they receive no payment in return but rather fulfillment of a certain requirement or as part of punishment.

## **2.4 Psychological Status**

The psychological status of the person who are willing to became volunteer also play the most pivotal role in the success and efficiency of the operation as the more willing and able body with high moral, sprit and determination are an invaluable resources and irreplaceable manpower.

## **2.5 Social Norm**

Social norm governing the society play a key major role in recruitment of volunteer as many people who become volunteer tend to do so due to the circumstance surrounding them by following the foot step of other in their community (Meier and Stutzer, 2004), family member or perhaps their idols. They do so because it is believe to be required or the right act to perform as a service to the community or society that they were raise up in. They do the act to repayment to the good will of their benefactor and the act of kindness to other in times of need and further hope that someday if the same situation might have befallen to them that they will be treated with the same kindness from fellow social member (Knutson, 2003).

## **2.6 Cultural Difference**

Cultural difference also determines the type of volunteer that can be enlisted the noticeable difference that can be seen differ from countries to countries. In this case the result is coming from the RHETSEN (Knutson, 2003) – the study of two group of university student one from California State University and the second group came from Bangkok University. The key differences in the behavior of these groups are obvious. Thai sample display a higher level of respond to a rhetorical sensitivity and rhetorical reflection while the U.S. group displays a higher level of noble self than the Thai group. What this meant is that Thai people are more relational supportive than pragmatic goal-seeking while the US tends to be more of a direct action type.

This could be problematic in the crisis situation, as we see it time and time again in Thailand that while it is good that many people donate money and goods to aiding charity or emergency camp, there is not much actual people on the ground to help resolve the actual problem. The opposite can be said to the U.S. sample side with the hurricane Catherine incident that while there

is plenty of helping hand, they were very limited in terms of supply and equipment until the real U.S. emergency team from FEMA showed up (reference can be found on this web page, Oregon Emergency Response System).

## **2.7 Mean of measurements of volunteer work**

There are five main elements that determent the amount of volunteer work. First is the *comparability* – are these work that the volunteer perform living up to the standard of organization or of other similar incident? The second is the *feasibility* – can these volunteer adapt to the task and to the local populace that they were helping to blend in with their language, food and tradition to feel as if they were part of the family or friend? The third is *cost effectiveness* – whether or not the amount of money spends worth the financial resource or not does it really help solve the problem? Fourth is *efficiency* to utilize the already existing resources or platform that they already have at their disposal to its fullest potential. And finally the *reliability* of the volunteer itself; can they really handle the task that was assigned to them, how efficiently they are at their task and are they really enjoy doing it? (UN, 2011)

## **3. FRAMEWORK OF STUDY**

### **3.1 Research Issues**

The functions and locations for evacuation centers and training centers are the main topic of research. The estimated cost of evacuation center and training center has to be examined. Other costs such as traveling expenses and volunteer expenses are needed to be identified. The conditions of selecting evacuation center location includes availability of resource, capacity size, geology and topography, and environmental and disease risks.

### **3.2 Method of Approach**

In this study, an optimization model is used to calculate the location of evacuation center and training center in a desired region, although some regions may have more than one center. The location candidates will be decided by evaluating the closeness to the location of supply and demand, as well as the condition of terrain and volunteers constraints. The staff supply is the number of students in universities and high schools in neighborhood. The demand is the number of people affected by the flood. The optimization program called IBM ILOG CPLEX will be used to find the best location for evacuation centers and training centers. The framework of model equations and constraints will be presented next.

### **3.3 Collecting Primary Data in Expert Interview**

We went to 1500 Miles Foundation training center in Nakhon Pathom and Rayong. We interviewed the volunteers and frontline leaders about the issue of finding volunteer seeds (volunteer trainees), evacuation center, and skill training. We observed the working of volunteer frontline.

### **3.4 Data Collection**

The number of students (potential volunteer) and tourists and population in possible affected areas in each province is collected from Thai government tourist website and other sites. We use criterion such as distance close to river, tourist sites and universities to select candidate locations. From the case study in Georgia, about 100,000 refugees went to 1,600 evacuation centers and the biggest evacuation center in its capital city holds 20,000 people. Temporary evacuation center can hold less people than permanent evacuation center. Our study chose temporary evacuation center because it is for volunteer nonprofit organization.

### **3.5 Infrastructure of Optimization Model**

The optimization of our model is different from previous works. The significance difference is we have two center types which are training center and evacuation center. They have a relationship that is unique. Evacuation center is like the main base and training center is its operational base. Another unique element is we considered volunteer preference into our model, whereas other studies only consider supply and demand of volunteer. The reason why our model includes cost, distance, and volunteer preference is because from our research and interview we conclude that these three factors are the main problem of volunteer center.

### **Function of Training Centers and Evacuation Centers**

Training center trains volunteers to be able to travel in the river by rowing kayak boat. It also teaches how to clear obstacles blocking water way, which commonly are water hyacinth and woods. During flood crisis, its target group is people that need help. It provides medical supplies and medic for common diseases such as dermatophytes, insect bites and life rescue. On the other hand, evacuation center serves as the support to serve households affected by the flood and main volunteer center in case the training center gets flooded (UNHCR, 2012). It needs residential area, water supply, toilet and other essential facilities for living.

### **Location Conditions of Training Centers and Evacuation Centers**

Training center is the place close to the river and flood area. Evacuation center should be 100 kilometers far from flood area. Evacuation center land height is at least 200 meters above sea level. According to a research the percentage of financial damages by flood for residential land is 14% for 0 meters elevation (Karamouz et al., 2009). So we need a high ground place for evacuation center location. Nan and Lamphun province in the northern region are good examples of evacuation center location. The evacuation center would be in a place easily accessible and safe. The candidate choices are existing public buildings, such as school, temple, or indoor stadium (Chanta and Sangsawang, 2012).

## Relationship between Two Centers

We will select location of evacuation center first. The training center should be within 100 kilometers radius of evacuation center. Because the transfer of supplies and refugee needs to be quick, the location between the two centers needs to be balanced.

Before flood disaster arrive, volunteer should follow and inform about flood disaster and prepare basic needs such food, water, medicine etc. During flood crisis, volunteer should rowing to refugee home for shipping medical supply and food and also help transfer refugee to evacuation center. Victims lack drinking water, food, clothing, and residential place. Victims may have disease related to dirty water.

## 3.6 Optimization Model for Northern Region of Thailand

Currently, we are focusing our work on the northern region of Thailand. We select the north region because it was the beginning point of the flood current in the past. Other five regions that will be worked on in the future include northeastern, western, central, eastern, and southern. Different regions have different causes of flooding. The northern region of Thailand has mountain as the main cause of flash flood originated from forest and high grounds. The central region of Thailand is affected by the low ground level compared to sea water. The southern region of Thailand has floods caused by seasonal storms. The Optimization model constraints include cost, distance, and volunteer preference. Volunteer preference will be consider at next stage.

### Decision Variables

Recommended locations of training center in each region

Recommended locations of evacuation center in each region

### Training Center Objectives

The equation for minimizing cost of training center

The equation for minimizing the distance of training centers to volunteer supply and demand

$$\text{Minimize } Z = \text{Total Distance to Universities} + \text{Total Distance to Schools} + \text{Total Distance to Tourist Site} + \text{Total Distance to Flood Area.}$$

### Training Center Constraints

Maximum distance far from river three kilometers (km)

Minimum tourist site close to center in 100 km is five tourist sites

### Evacuation Center Objectives

The equation for minimizing cost of evacuation center

The equation for maximizing the closeness of evacuation centers to training center

## Evacuation Center Constraints

Maximum distance from training center 150 km because it takes approximately three hours for water to reach

Minimum capacity for holding immigrants is 400 people

Minimum distance far from flood area is 100 km

Minimum land height from sea level 200 m

## 4. EXPECTED OUTCOME

The model focuses on flood disaster dividing into six regions. Each region considers minimizing the costs for training and evacuation centers and maximizing the closeness of training centers to volunteer supply and flood area. When flood disaster arrives, these centers will help victims; volunteers can be resourced and used effectively. In 2011, the government fund for flooding relief is 31,314,413 baht (Thaipublica, 2012). We can help reduce this number. The propose framework can solve the flood problem by the power of skilled volunteer who are trained beforehand.

## APPENDIX

Data collected from northern region of Thailand.

**Table 1:** No. of tourist and no. of population in province

	No. of population 2012*	No. of domestic tourist 2011**	No. of foreign tourist 2011**	Total of no. of tourist 2011**
<b>Chiang Rai</b>	1,200,423	244,800	69,600	314,400
<b>Chiang Mai</b>	1,655,642	241,500	163,200	404,700
<b>Phrae</b>	457,607	212,600	12,000	224,600
<b>Lampang</b>	756,811	196,900	27,600	224,500
<b>Uttaradit</b>	461,294	168,200	12,000	180,200
<b>Nan</b>	477,673	168,100	12,000	180,100
<b>Mae Hong Son</b>	244,356	58,800	230,400	290,100
<b>Phayao</b>	488,120	168,000	12,000	180,000
<b>Lamphun</b>	404,673	197,100	12,000	209,100

\* = Wikipedia, \*\* = Department of Tourism (2011)



**Table 2:** No. of students in university and schools

Province	Institute Name	No. of student 2011-2012 (Department of Education, 2012)
<b>Chiang Rai</b>	Mae Fah Luang University	8,958
	Chiang Rai Rajabhat University	18,169
	Rajamangala University of Technology Lanna , Chiang Rai Campus	2,298
		<b>29,425</b>
<b>Chiang Mai</b>	Chaing Mai Rajabhat University	24,794
	Maejo University	12,491
	Chiang Mai University	34,810
	North-Chiang Mai University	13
	Payap University	6,619
	Rajamangala University of Technology Lanna Chiang Mai	9,509
	Boromarajonani College of Nursing Chiang Mai	487
		<b>88,723</b>
<b>Phrae</b>	Maejo University Phrae Campus	1,959
		<b>1,959</b>
<b>Lampang</b>	Lampang Rajabhat University	9,216
	Thammasat University, Lampang Campus	939
	Institute of Physical Education Lampang	687
	Lampang Technical College	5,086
	Boromarajonani College of Nursing, Nakhon Lampang	485
	Lampang Polytechnic College	346
	Mae Moh EGAT College of Technology and Management	1,119
	Kaokha Industrial and Community Education College Lampang	1,403
		<b>19,281</b>
<b>Uttaradit</b>	Uttaradit Rajabhat University	10,110
	Praboromarajchanok Institute for Health Workforce Development	338
		<b>10,448</b>
<b>Nan</b>	None	
<b>Mae Hong Son</b>	Nawamintrachinee Maehongson Industrial and Community	906
		<b>906</b>
<b>Phayao</b>	None	
<b>Lamphun</b>	None	

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