特別寄稿

# International natural disaster communications : an exploratory study of signage for tsunami, earth quake and flood in Japan and Thailand

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## Abstract

　　This is an exploratory research conducted to study international natural disaster communications especially Japanese and Thai people's opinion about signage for natural disasters which are tsunami, earth quake and flood. In addition, this research examines the use of color, shapes, symbol (pictorial) and text of natural disasters signage. This research used a pilot survey of 145 Japanese respondents and explored further investigation by interviewing 20 Thai people who have real hands-on experiences during tsunami, earth quake and flood in Thailand.

　　The findings indicated that the warning signage that most of Japanese respondents prefer was a red triangle sign with symbol and text on it. For evacuation signage, most of Japanese respondents preferred a green circle (close to square) sign with symbol and text on it. The result supports previous data that green is the color that most people think will guide them to safety locations. However, from the results of the interviews, evacuation signage that most of the Thai interviewees preferred was a yellow triangle sign with symbol and text on it. Thus, the results could be the ground for future research which was recommended to further investigate on the most effective design of signage for natural disasters across cultures. The further examine of whether or not to standardize or localize the design of signage for natural disasters was recommended.

## Introduction

　　In recent years, many countries around the world has been hit with a series of natural disasters, from earthquakes in Haiti and Asia, Hurricane Katrina in New Orleans, tsunami in Indonesia and earthquake and tsunami in Japan (Carnegie Mellon University, 2014).

　　As a consequence of global environment crisis which caused from climate change and global warming, many countries have to face with natural disasters. As well as Thailand experienced the great consequences of global warming such as tsunami at the south, or flood in 2011 badly damaged Thailand and caused a tragic loss of life. During tsunami hit Thailand, thousands have lost both their assets and their livelihoods. Flooding in 2011 caused the problems

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to 65 provinces, which mean that more than 4 million of residents were affected from the disasters (Department of Disaster Prevention and Mitigation, 2012).

Moreover, on Monday 5th May 2014, the earthquake in the northern part of Thailand ruins many important places both private and public sectors such as people residents, temples, schools, universities, hospitals, hotels, factories, dams, bridges, roads and causes 2 deaths (National News Bureau of Thailand, 2014).

According to the above information, it already proved that one disaster could damage human race widely and seriously. Hence, most of sectors both public and private organizations should be aware of the issues and co-ordinate each other to find the best solution when the disaster occurred. It is said that "Readiness and preparedness of people is very important when experiencing with any disaster" (Pee Guay, 2010). As same as the communication sector, it is a part of important sector that can save people's life because the faster and clearer people know about the real situation, the quicker and more precise they can find the ways to handle with a disaster.

Fukuda (2008) suggested a "multi-platform system" for cross-media publicity in risk communication, since people have various lifestyles and their level of media literacy also varies. Different kind of media can correspond to people in various needs.

Therefore, to response to the various needs in various social contexts, it is vital to carefully utilize the use of "sign" (in various form and message) as one of the media in risk communication. The effective natural hazard warning system must be designed which included the design of signage. As shown in previous study by Aucote, Miner, and Dahlhaus (2012):

> Warning signs are used in many cultures to inform the public that a danger is present and how to avoid this danger. Failure to adhere to warning signs can have adverse consequences that may result in serious injury or death. Understanding the factors related to adherence to behaviors promoted by warning signs is essential to assist in the protection of the general public. (p. 523)

Aucote, Miner, and Dahlhaus (2012) investigated attention and comprehension of warning signs, as well as beliefs relating to non-adherence of the signage. It was found that, while most participants could correctly identify the danger in the area and had noticed the warning signage, less than half of the participants could correctly interpret the signage.

There are some guidelines of design for tsunami signage from the report called "New Zealand national tsunami signage recommendations for CDEM Groups (Civil Defense Emergency Management)" in March 2007 report by the Institute of Geological and Nuclear Sciences (Tsunami Working Group Signage Subcommittee, 2007) and from, the International tsunami warning center, UNESCO stated that

"By designating a national standard for signage consistency and placement across New Zealand, it hopes to maximize recognition and understanding by both national travelers and international tourists." (UNESCO, 2014, para.3).

The International tsunami warning center (UNESCO, 2014, para.4) also showed the examples of sign which are wildly used recently in Japan as shown in figure 1-3 below
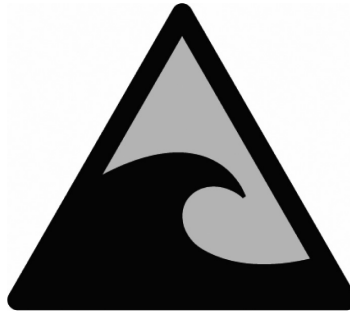


*Figure 1*. Tsunami hazrd zone sign (in yellow & black)



*Figure 2*. Tsunami evacuation area sign (in green & white)



*Figure 3.* Tsunami evacuation area sign (in green & white)

Therefore, recently around beaches in Thailand, there are tsunami warning and evacuation signs that adopted the recommended design from "New Zealand national tsunami signage recommendations for CDEM Groups (Civil Defense Emergency Management)" such as the example in figure 4 below here.

*Figure 4.* Tsunami warning and evacuation signage (in blue & white) in Thailand
(Chaiboon, P., personal photograph, n.d)

However, Blees and Mak (2012) stated that symbols developed in one culture may not have the same meaning for people from other cultures. They compared the comprehension of Dutch and Chinese participants of 30 pictorials from a series of 'universal' disaster pictorials by Dutch designers. Their results showed that Dutch participants showed a better comprehension of the pictorials than Chinese, indicating that the designers probably used conventions more familiar to Dutch than to Chinese people. Blees and Mak (2012) concluded:

> The interpretation of symbols does differ across cultures, but there are enough similarities to be able to compare the meanings given by people with different backgrounds and take them into account when designing pictorials for a culturally diverse target group. (p. 715)

Moreover, another previous research finding (Imsuwansakorn, 2013) found that there are some difficulties in hazard communications through hazard signs and symbols (or pictorial) in Thailand. During the crisis time that people have to make the best decision, signs and symbols were not being used effectively.

Furthermore, from this research's investigation and observation, there is no recent solid academic evidence that the designs would generally work effectively for the international natural disaster communications and the specific population groups such as Thai and other tourists such as Japanese who are main visitors to Thailand. Both Thailand and Japan recently have experienced few natural disasters as featured in the World Risk Report (2013) from 173 countries worldwide, Thailand was ranked 80 (in the medium risk group) and Japan was ranked 158 (in the high risk group). There is still an uncertainty of which kind of sign should be the most effective sign to help save life in the disasters and crisis situations in both countries.

Therefore, this pilot research is conducted for further development of signage for the recent natural disasters which are tsunami, earth quake and flood.

### Research Objectives

1. To explore the international natural disaster communications especially about warning and evacuation signage.
2. To explore Japanese and Thai people's opinion about color, shapes, symbol (pictorial) and text of natural disasters warning and evacuation signage.
3. To collect a basic data as a ground for an ongoing research on international natural disaster communications.

### Literature Review

#### Risk communication

According to The FAO/WHO report, <u>The Application of Risk Communication to Food Standards and Safety Matters</u>, "Risk communication" is defined as:

"Risk communication is the exchange of information and opinions concerning risk and risk-related factors among risk assessors, risk managers, consumers, and other interested parties" (Belloc, n.d.)

"Risk communication can involve two related messages, "Watch out!" or "Don't worry." Risk communication, whether designed to mobilize citizens to take protective measures (e.g., "better strengthen the levy") or stop worrying (e.g., "irradiated food is safe to eat"), involves similar elements. These are: 1) the dissemination of information, 2) persuasion to take some action, and 3) the provision of assistance in taking the desired action" (Belloc, n.d., para.2).

Belloc (n.d.) also stated "Elements of Effective Risk Communication" as:

"Transmission of scientific knowledge alone is insufficient for proper risk communication. Scientific knowledge <u>should not</u> be considered as flawless, value-free, and unbiased. Nor should scientific knowledge be considered as <u>the only</u> criteria for technology adoption. Technology policy, however, <u>should be science based.</u> Transmission of scientific knowledge, therefore, is a necessary component of risk communication.

Essential aspects of proper risk communication, as described in the FAO/WHO report, include: *Knowing the audience*. The audience should be analyzed to understand their knowledge and opinions regarding the new technology. Listening to all interested parties is a critical element of this task" (Belloc, n.d., para.26-27).

#### Psychological effect of Colors

Johann Wolfgang von Goethe, the German poet, artist, and politician from 1810, published 'Theory of Colors'. It contains an interesting point which he found that different colors have various effects on mood and emotion:

YELLOW
In its highest purity it always carries with it the nature of brightness, and has a serene,

gay, softly exciting character.

BLUE

This color has a peculiar and almost indescribable effect on the eye. As a hue it is powerful — but it is on the negative side, and in its highest purity is, as it were, a stimulating negation. Its appearance, then, is a kind of contradiction between excitement and repose.

RED

The effect of this color is as peculiar as its nature. It conveys an impression of gravity and dignity, and at the same time of grace and attractiveness.

GREEN

The eye experiences a distinctly grateful impression from this color. If the two elementary colors are mixed in perfect equality so that neither predominates, the eye and the mind repose on the result of this junction as upon a simple color. The beholder has neither the wish nor the power to imagine a state beyond it. (Popova, 2014, para.1-4)

### The color and shape usage for warning and prohibited sign

Warning and prohibited sign is known as basic safety system which leads to visible communication. When it comes to dangerous and emergency situation, the sign will be the first aid for people as has been shown (Stocksigns, 2010).

Safety signs and signals contain information or instruction about life safety with some symbols, colors, lights or sounds. Additionally, they can be either verbal language or sign language. Warning signs is combination of visible shapes, colors, symbols and text. The signs are divided to several types, depending on conveyed messages, communicated under the specific controlled form (Stocksigns, 2010). As shown in Stocksigns (2010), signboards, including fire safety signs, are designed as shown in Table 1:

Table 1 shows color, shape and description of signs.

| Color | Meaning and objectives | Command and information | Shape and description of sign |
|---|---|---|---|
| Red | Prohibiting and warning | To stop dangerous behavior or stop immediately. To tell when faced unsafe, machine. To escape | A red circle with a line from the upper-left to lower right, approximately 35% of the total area. There are black picture on a white background. |
| Yellow | Warning | To be careful and safe, keep an eye on it. | A triangle with a black exclamation on a yellow background which is at least 50% of the area. |
| Blue | Command | To indicate specific behavior such as telling to wear protecting equipment | A circle with a white face on blue background which is at least 50% of total area. |
| Green | Emergency escape, first aid without the danger | To show exit way | A rectangle or square with a white person running on green background which is at least 50% of total area. |
| Red (Firefighting sign) | Equipment for fire fighting | To indicate and show direction | A rectangle or square with a white fire extinguisher on a red background which is at least 50% of total area. |

### The impact on the safety signs for employees

Stocksigns (2010) said that many companies have used safety signs with the U.K. standard of BS5378 and BS5499 which will be changed soon according to ISO 7010. Every country in EU was approved sign regulations to be necessary for working place on June 2, 1992. They support to meet the sign standard which all signs work in the same way. The Health and Safety (Safety Signs and Signals) Regulations 1996 has been launched and adopted since April 1, 1996. The regulations have covered several instructions about health and safety including the meaning of signs such as fire warning sign, chemical warning sign and escape sign. Stocksigns (2010) affirmed that The Health and Safety (Safety Signs and Signals) Regulations 1996 has helped reduce risk of life and belonging for employees while working. Moreover, the regulation has forced employers to install necessary signs and educate their employees.

### The symbol and text usage for warning sign

Previous study investigated whether different warning designs, specifically those with symbols, affect compliance or agreement rates. The highest rate of compliance occurred with the verbal (text) plus pictographs (symbols) condition. The results suggested that the addition of symbols to a text warning will increase obedient rates (Jaynes & Boles, 1990).

Research Methodology

There were two data collection methods; one was conducted to collect pilot survey from 145 respondents. Respondents were Japanese university students in Tokyo which most of them had experienced in the natural disasters.

Another data collection was the interviews of those who had real hands-on experiences during the natural disasters, this research used group interview on 3 key target groups (total of 20 Thai people who themselves had direct experienced in flood, earth quake and tsunami) each group contained 6-8 Thai interviewees. Participants were given a set of signage and were asked which sign is the most suitable for evacuation sign during the disasters.

Results

Survey results

Japanese opinion about warning sign for disasters (flood, tsunami, and earthquake)

Table 2 shows the opinion about what shape of the warning sign for disasters should be.

|  | Frequency | Percentage |
| --- | --- | --- |
| **Triangle** | **101** | **69.70** |
| Square | 21 | 14.50 |
| Circle | 22 | 15.20 |

Table 3 shows the opinion about what color of the warning sign for disasters should be.

|  | Frequency | Percentage |
| --- | --- | --- |
| **Red** | **94** | **65.30** |
| Yellow | 38 | 26.40 |
| Green | 5 | 3.50 |
| Blue | 7 | 4.90 |

Table 4 shows the opinion about text and symbol on warning sign.

|  | Frequency | Percentage |
| --- | --- | --- |
| Text only on warning sign | 5 | 3.40 |
| Symbol only on warning sign | 7 | 4.80 |
| **Both text and symbol on warning sign** | **133** | **91.70** |

<u>Japanese opinion about evacuation sign for disasters (flood, tsunami, and earthquake)</u>

Table 5 shows the opinion about what shape the evacuation sign for disasters should be.

|  | Frequency | Percentage |
|---|---|---|
| Triangle | 44 | 30.30 |
| Square | 48 | 33.10 |
| **Circle** | **53** | **36.60** |

Table 6 shows the opinion about what color the evacuation sign for disasters should be.

|  | Frequency | Percentage |
|---|---|---|
| Red | 22 | 15.20 |
| Yellow | 23 | 15.90 |
| **Green** | **76** | **52.40** |
| Blue | 24 | 16.60 |

Table 7 shows the opinion about text and symbol on evacuation sign.

|  | Frequency | Percentage |
|---|---|---|
| Text only on evacuation sign | 2 | 1.40 |
| Symbol only on evacuation sign | 25 | 17.20 |
| **Both text and symbol on evacuation sign** | **116** | **81.10** |

## Interview results

Tables below show the results of three group interviews (total of 20 Thai interviewees) when they were asked their opinions about what kind of shape, color, text and symbol for the evacuation sign were the most effective for flood, earthquake and tsunami respectively.

Table 8 shows the results from the opinion about shape, color, text and symbol for the evacuation sign for "flood"

| Interviewee# | Shape | Color | Text or symbol or both text & symbol |
|---|---|---|---|
| No. 1 | Square | Red | Both text and symbol |
| No. 2 | Circle | Yellow | Both text and symbol |
| No. 3 | Triangle | Yellow | Both text and symbol |
| No. 4 | Square | Yellow | Both text and symbol |
| No. 5 | Triangle | Yellow | Both text and symbol |
| No. 6 | Triangle | Red | Both text and symbol |
| No. 7 | Triangle | Red | Both text and symbol |
| No. 8 | Square | Red | Both text and symbol |

Table 9 shows the results from the opinion about shape, color, text and symbol for the evacuation sign for "earthquake"

| Interviewee# | Shape | Color | Text or symbol or both text & symbol |
|---|---|---|---|
| No. 1 | Triangle | Yellow | Both text and symbol |
| No. 2 | Triangle | Yellow | Both text and symbol |
| No. 3 | Triangle | Yellow | Both text and symbol |
| No. 4 | Square | Red | Both text and symbol |
| No. 5 | Triangle | Red | Both text and symbol |
| No. 6 | Triangle | Red | Both text and symbol |

Table 10 shows the results from the opinion about shape, color, text and symbol for the evacuation sign for "tsunami"

| Interviewee# | Shape | Color | Text or symbol or both text & symbol |
|---|---|---|---|
| No. 1 | Square | Yellow | Both text and symbol |
| No. 2 | Square | Green | Both text and symbol |
| No. 3 | Square | Yellow | Both text and symbol |
| No. 4 | Square | Yellow | Both text and symbol |
| No. 5 | Square | Yellow | Both text and symbol |
| No. 6 | Triangle | Yellow | Both text and symbol |

### Discussion

For warning sign, Japanese respondents preferred "triangle" shape which supports the previous data from Stocksign (2010) and Imsuwansakorn (2013). Most of them preferred "red" for warning sign as "red" indicates the attractiveness according to Popova (2014).

For evacuation sign, most Japanese respondents preferred color "green" which replicated with previous information from Stocksign (2010) and Imsuwansakorn (2013) that "green" is the color that show exit way and people think green will guide them to the safe locations. However, from the results of the in-depth interviews, the color of evacuation sign that most of the Thai interviewees preferred is "yellow".

The interpretation of "yellow" for evacuation sign of Thai interviewees (they were 20 people who had a direct experience in the recent disasters in Thailand) may be that "yellow" is a bright as Popova (2014) wrote that "yellow" always shows the nature of brightness. And "yellow" may be better visible color than "green", therefore when a disaster occur, they may related the attribute of brightness of "yellow" that can help visibility for the panic attack during the disaster. "Yellow" could inform people immediately to the safe direction.

Also "green" on evacuation signage in Thailand are rarely seen since in the past the country is not used to major disasters before so Thailand is still in the developing stage of

disaster communication and management. This may be because Thailand is not affected by the natural disasters as much as Japan according to World Risk Report (2013), Thailand was ranked as less risk of natural disaster than Japan. Japan may have an advance management of disaster communications and "green" is also widely used on the evacuation signage in Japan.

For the discussion about the symbol and text usage for warning and evacuation sign, the results from Japanese survey showed that the warning and evacuation sign should have both text and symbol together. Moreover, the result from the Thai interviews showed that the evacuation sign should have both text and symbol together. Both results have positive connotation to the previous finding that the addition of symbols to a text warning will increase obedient rates (Jaynes & Boles, 1990).

### Future research recommendations

The results of this present research could be the ground for future study on the development of the most effective color for warning and evacuation signage for natural disasters in different situation in various target groups. Different populations may interpret the meaning of sign differently, for example local people interpret the meaning of sign differently from tourists or visitors who are not familiar with the local area. As Aucote et al. (2012) found that when compared to the locals, visitors were much more likely to misinterpret the warning signs.

The above evidences from this research showed that it is still unclear which color should be used for the warning and evacuation sign and be the most effective one. This research also found that only very few respondents preferred "blue" as a color for tsunami warning or evacuation sign even though "blue" is the color that was already being used in several countries since it was recommended by Tsunami Working Group Signage Subcommittee (2007), New Zealand national tsunami signage recommendations for CDEM Groups. The problem is more complicate when it comes to the different target groups from different social context. Thus, it is vital to investigate further whether or not to standardize or localize the design of signage for natural disasters in different populations.

This research suggested further investigation by using quantitative methods or experiment research design to further analyze the larger amount of respondents to get to know more about the audiences. This would also emphasize on what Belloc (n.d) cited that "the essential aspects of proper risk communication: *Knowing the audience*. The audience should be analyzed to understand their knowledge and opinions regarding the new technology. Listening to all interested parties is a critical element of this task" (Belloc, n.d., para.26-27).

### Conclusion

Results from pilot survey based on Japanese respondents indicated that people's opinions about signage in communications for natural disasters are as follows:

- Warning signage that most people preferred was a red triangle sign with symbol

and text on it.

- ■ Evacuation signage, most people preferred a green circle (close to square) sign with symbol and text on it.

However, the result of opinion about the color of the evacuation sign from the Thai interviews is different; most of the Thai interviewees preferred yellow triangle sign with symbol and text on it. Therefore, this is an evident that there is still a need to further identify the most effective color for natural disaster sign in the international context. The further examine of whether or not to standardize or localize the design of signage for natural disasters is recommended.

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