A Study of Place Attachment to Mosques as an Evacuation Shelter Building

L Vivita¹, Husaini², R Anggraini³, C Dewi⁴
¹Student of Engineering Doctoral Program, Universitas Syiah Kuala, Darussalam, Banda Aceh, Indonesia
²Mechanical and Industrial Engineering Department, Universitas Syiah Kuala, Darussalam, Banda Aceh, Indonesia
³Civil Engineering Department, Universitas Syiah Kuala, Darussalam, Banda Aceh, Indonesia
⁴Architecture Engineering Department, Universitas Syiah Kuala, Darussalam, Banda Aceh, Indonesia

E-mail: lolavivita@yahoo.com

Abstract. The city of Banda Aceh has a geological location that is prone to earthquakes and tsunamis. In 2004, the tsunami damaged the city structure, and many victims died. When the tsunami struck the area, a mosque was used as an evacuation building. Its scatter existence in residential areas made it easy to reach, but several mosques could not be used as an evacuation building. The purpose of this study was to explore the function of mosques as tsunami evacuation building through place attachment studies using qualitative methods and depth interviews to identify public attachment factors. To measure place attachment, this research used three variables, i.e. socio-demographic, environmental experience, and familiarity with the place. This study also used the space forming variables, which include meaning, function, and form to see the public attachment to a mosque as an evacuation shelter building. The results showed that place attachment to a mosque was influenced by its meaning as a sacred place. The majority of people in Banda Aceh are Muslim and have Islamic cultural backgrounds. People's routine activities form strong bonds to a mosque. Acehnese culture to glorify guests is reflected in mosque building design by exploring open walls, ease of accessibility, and spread presence in residential areas. These cultural characteristics strengthen the opportunity to make mosques as tsunami evacuation shelter buildings in Banda Aceh.

1. Introduction

Banda Aceh is the capital of the Indonesian Province of Aceh with an area of +61.36 km². Geologically, Banda Aceh at the meeting of the Euroasia Plate and Australia is ±130 km from the western coastline, so it is prone to tsunamis (Spatial Plan of Banda Aceh City 2009-2029). On December 26, 2004 at 07.58 of West Indonesian Time, Banda Aceh suffered an earthquake with a magnitude of 9.3, which caused a tsunami as high as 10-15m and resulted in the damage of the most of territory [1], [2] with fatalities of ±160,000 people [3]. On April 11, 2012 an earthquake measuring 8.6 on the Richter scale struck the city. Although it did not cause tsunami, people still evacuated to safety place (high land and building), when the tsunami struck, the mosque was used as an evacuation shelter building, this was confirmed by some researchers [4] an [5].
The mosques spread in residential areas makes them easy to reach, although some mosques cannot be used as evacuation shelter buildings, especially in areas with high tsunami threat potential such as in Meuraxa and Kuta Raja Districts. The function of mosque in Banda Aceh is as a meeting place/deliberation, social activities, the celebration of Islamic holidays, study / dayah, preaching, and protection, so automatically, people have a strong attachment to the mosque. Attachment is the emotional impact of a place where people are attracted to emotional and cultural ties [7]. Site attachment is one of the dimensions of sensitivity to place and positive emotional bonds that develop between place and individual [8]. Attachment to a place is the inner bond of a person or society to a specific place [9]. This inner bond can bring emotional feelings and functional dependence on the place. Feelings of dependence will be awakened if someone knows them well and feels that the place is very meaningful [10]. Experience and memories will create meaning in place [11]. He explained that not only the place itself is significant, but the experience of the place can also create meaning. The meaning is often related to 3 (three) important things, namely self, other people, and the meaning of the environment itself [12].

Aside from being a place of worship, a mosque as a public building is also used as an evacuation shelter. Public buildings that have met the structure and construction requirements can be used as evacuation protection buildings. This additional function confirms that each evacuation protection building is a multi-functional building [4]. Buildings to be used as evacuation shelters must have a public function or a function-oriented to public services. Examples are mosques, schools [1], hotels, restaurants, government offices, parliament buildings [6], conference center buildings, shopping centers [1], sports centers, parking lots, and markets. The purpose of this study was to explore the attachment of a place to the mosque as a tsunami evacuation protection building in Banda Aceh.

2. Method

2.1. Place Attachment

This study uses qualitative methods through direct interviews to identify the factors of community attachment to mosques, especially its function as an evacuation shelter building. The selection of respondents was carried out randomly without having to determine the object and place of the interview, so that information gathering was obtained from various levels of society. Interview questions include:

1. In the case of a tsunami disaster, what evacuation building is chosen? Vertically or horizontally? why?
2. If vertical evacuation is carried out, what function of the building will be chosen and why?
3. When choosing a mosque as a vertical evacuation, what factors make a mosque suitable and comfortable to use as an evacuation building?
4. With regard to the phenomenon of several mosques surviving during the 2004 tsunami, what factors do you think caused the mosque to survive?
5. Is there anything else that can strengthen the function of the mosque as an evacuation site other than the factors of meaning, function and form of the mosque itself?

The five questions above was broken down into other questions while the interview process was underway. The purpose was to extract detail information from the respondents so that important data could be obtained in this study. To measure place attachment, the variables used are socio-demographic, environmental experience, and familiarity with the place. This is explained by [13] in research on the attachment of places, emotional feelings, and functional feelings were used to measure the level of one's attachment to a place. The attachment of a place is influenced by:

1. Socio-demographic characteristics [14]; [12]; [15];
2. Environmental experience, including the type of involvement of people with place [15];
3. Degree of familiarity with places [16];
4. Culture [17];
5. The place itself.
A place is a space that is related to human relations to the physical environment, individual and group activities, concept or meaning [19], [20] as well as cultural processes [14]. Space and place are interconnected, where the physical aspects of space are considered important based on the values given by humans to the place [21]. The place can provide comfort for its users or even vice versa. The comfort of a place, both physically and psychologically, is one of the important elements for humans to carry out activities in a physical environment. Comfort will trigger a person's feelings towards the atmosphere they experience in carrying out their activities [22]. Differences in the characteristics of communities with respect to places have their own concept of attachment. The physical characteristics of the environment do not only distinguish places, but they also affect people's perceptions of meaning [7]. This is explained by [23] who states that the concept of attachment to a place in eastern cultures, especially Indonesia, must consider local perspectives so that researchers can understand the local characteristics of natives in forming their attachment to the place.

The meaning of a place is a concept that transforms space into a place with special behavior and sensory characteristics of certain people [7]. Spatial perception arises because of interactions in the cognitive dimension (form) so that environmental elements can be known and used as directions. Interactions on the dimensions of behavior (function) are used for activities and functional relationships between humans and the environment. The meaning of a place (meaning) has descriptive and emotional aspects of environmental experience, which means that the concept of a place meaning is a psychological and physical concept [7]. Physical parameters that affect the meaning of a place are size, scale, component, diversity, texture, decor, color, smell, noise, and temperature. The way people communicate with places is influenced by identity, history, happiness, mystery, convenience, beauty, security, vitality, and memories [24]. Place identity is the concept of an individual's emotional attachment to a place or environment. Place identity is supported by physical dimensions and social environment [25]. A place can be identified if it can encourage people to stay longer and connect with one another. The identified place has a real picture, and people know where and when to be there [26]. This is related to the ability of the place to awaken the human senses through quality so as to make it different from others [27].

The concept of a place identity basically reviews the relationship between who and where we are and how our local environment (including geographical location, cultural traditions, cultural heritage, etc.) affects our lives [28]. In Banda Aceh, the majority of the population is Muslim with inherent Islamic cultural traditions, so that a mosque is widely used in social activities.
2.2. Requirements of earthquake and tsunami resistant building
With its function as a tsunami protection building, a mosque must meet the requirements of earthquake and tsunami resistant buildings as determined by the Directorate General of Human Settlements on Technical Guidelines for Houses and Buildings that are Earthquake Resistant Buildings:
1. Located on stable ground;
2. Has a simple and symmetrical plan;
3. Continuous foundation without interruption;
4. The area of the wall 12 m2 mounted column;
5. The circular beam is bound rigidly with a column;
6. Building framework is firm and rigid;
7. Using dry wood as a construction easel;
8. Light wall material and fastened column;
9. Material of brick / brick wall is not broken and sounds loud when mixed;
10. Correct composition of species / mix;
11. Has a bond between components (structural / non-structural).
Evacuation protection buildings are defined as buildings that function as tsunami evacuation destinations. In some literature, they are also referred to as rescue buildings [1], [29], and vertical protection buildings [6]. This study also used the Spatial Dimensions of Meaning, Function, and Form to see the community's attachment to a mosque as an evacuation protection building. This is as explained by [18] where the theory of "attitude / behavior" defines three dimensions of place, namely the meaning of place (emotional dimension); the shape of place (cognitive dimension); and place function (behavioral dimension) [18]. Place dimension is shown in Figure 1.

2.3. Requirements of evacuation shelter building
An important point in determining evacuation protection buildings is that buildings can withstand disasters and have a floor height above the level of a tsunami inundation. Evacuation shelter building requirements are:
1. The structure of the building is not damaged and can function as a temporary shelter;
2. Evacuation floors must be higher than wave height;
3. Its function can be attached to public buildings such as mosques, schools, meeting centers, shopping centers, sports centers, parking lots and markets [29], hotels, restaurants, government buildings, parliament buildings [6];
4. Design and capacity that can accommodate many people;
5. Location or ease of access horizontally;
6. Easy access vertically;
7. Good security.

3. Results and discussion
Based on field interviews, community attachment to mosques was influenced by differences in age, environmental experience, and familiarity with places. The number of respondents was 20 people and resided in Banda Aceh. The selection of respondents was random to obtain various information. Respondents were between 20 - 70 years of age, and they were lecturers, doctors, college students, housewives, civil servants and private employees with a percentage of 60% women and 40% men. Table 1 shows the public attachment to a mosque as a tsunami evacuation shelter building in Banda Aceh.
Table 1. Public attachment to a mosque as an evacuation shelter building.

| Variables of Place Attachment | Public Attachment to a Mosque as an Evacuation Shelter Building |
|-------------------------------|---------------------------------------------------------------|
| **Socio-Demography (Age-Years):** |                                                                  |
| 20 ≤ 30                       | 1. The hard and sturdy shape of a mosque giving the impression of security |
|                               | 1. The meaning of mosque as a sacred place                     |
| 31 ≤ 50                       | 2. The hard and sturdy shape of a mosque giving the impression of security |
|                               | 1. The meaning of mosque as a sacred place                     |
| ≥ 50                          | 2. Accessibility to the first floor (place to prayer) is not too high, so easy to do the routine worship |
|                               | 3. Easy to reach from living home                              |
| **Environmental Experience:**  |                                                                  |
| Direct tsunami victims        | 1. The meaning of mosque as a sacred place and the history of survival mosque at tsunami disaster |
|                               | 2. Available accessibility to the upper floor                   |
|                               | 3. Easy to reach from living home                              |
|                               | 4. The building façade is unique and easily recognizable       |
| Indirect tsunami victims      | 1. The hard and sturdy shape of a mosque giving the impression of security |
|                               | 2. Easy to reach from living home                              |
| **Familiarity With The Place:**|                                                                  |
| Frequent activities at a mosque | 1. The meaning of mosque as a sacred place                      |
|                               | 2. Worship consistency brings intimacy to a mosque             |
| Rarely activities at a mosque | 1. The hard and sturdy shape of a mosque giving the impression of security |
|                               | 2. Easy to reach from living home                              |

This research used variables such as socio-demographic, environmental experience, and familiarity with place to see attachment of place where these three variables became indicators of public attachment in the mosque as a tsunami evacuation protection building based on spatial dimensions that included meaning, function and form. Respondents have experienced being directly and indirectly affected by the tsunami, where familiarity with the mosque was assessed based on whether or not they frequently carried out activities at the mosque. The interview results showed respondents aged 20 ≤ 30 years chose the mosque as an evacuation place because of the form factor which visually gave a high, sturdy and strong impression especially if the columns / pillars of the building could be properly exposed, while respondents aged 31 ≥ 50 years preferred the mosque because the meaning / value contained in the mosque as a sacred building. In addition, the ease of accessing both horizontally and vertically is also one of the considerations when they chose the mosque because of limitations in their motor systems. The experience of direct and indirect tsunami victims had a different attachment. Some chose the mosque because it meant a sacred place for them,
they were sure that being in the mosque would provide calm and security, and they were resigned themselves and sincere to all possibilities that would occur.

However, some respondents actually chose to evacuate horizontally by looking for a higher place such as mountains or hills, but if they had to evacuate to the mosque, the mosque must be high, strong, and sturdy. This is due to trauma from the events they experienced. Respondents who often performed religious activities in the mosque have a strong bond with the mosque, so they chose the mosque because it was a sacred place. Overall, the place attachment variable that greatly affected the community selection of a mosque as an evacuation place is "familiarity with the place." This is due to the religious activities carried out routinely and continuously in the mosque so that high faith evoked the meaning of the mosque as a sacred building that could provide comfort and safety in it.

4. Summary
Place attachment to a mosque as a tsunami evacuation shelter building was strongly influenced by its meaning as a sacred place because the majority of people in Banda Aceh are Muslim and have an Islamic cultural background. The worship routine activities of people created a very strong bond to a mosque. The tradition and social life of the people in Banda Aceh are those of the call to prayer during disasters such as the earthquake and tsunami. The behavior of people going to the mosque when the call to prayer is an opportunity to make the call to prayer as a siren so that people evacuate to the mosque because psychologically, the sound of the call to prayer can provide calm and comfort. Acehnese culture to glorify guests is reflected in mosque building design by exploring open walls, ease of accessibility, and spread presence in residential areas so that it is easy to reach when a disaster occurs. These cultural characteristics strengthen the opportunity to make mosque as a tsunami evacuation shelter building in Banda Aceh.

5. References
[1] JICA BAPPENAS Provincial Government of Nanggroe Aceh Darussalam 2005 The Study on the Urgent Rehabilitation and Reconstruction Support Program for Aceh Province and Affected Areas in North Sumatra
[2] Lavigne F, Paris R, Grancher D, Wassmer P, Brunstein D, Vautier F, Leone F, Flohic F, Coster B, Gunawan T, Gomez C, Setiawan A, and Cahyadi R 2009 Reconstruction of Tsunami Inland Propagation on December 26, 2004 in Banda Aceh, Indonesia, through field investigations Pure Appl. Geophys 166 259–281
[3] Frankenber E, Gillespie T, Preston S, Sikoki B, and ThomasD 2011 Mortality, the family and the Indian Ocean Tsunami Econ. J. 121 162–182
[4] Budiario A 2006 Evacuation Shelter Building Planning for Tsunami-prone Area: a Case Study of Meulaboh City, Indonesia The Netherland International Institute For Geo-Information Science and Earth Observation Enschede 1-112
[5] McCaughey J W, Mundir I, Daly P, Mahdi S and Patt A 2017 Trust and distrust of tsunami vertical evacuation buildings: Extending protection motivation theory to examine choices under social influence submitted to Journal of Disaster Risk Reduction 24 462-473
[6] Eisner R. and NTHMP 2001 Designing for Tsunamis Background Papers. US National Tsunami Hazard Mitigation Program Steering Committee Sacramento 205
[7] Hashemnezhad H, Heidari A A and Hoseini P M 2013 Sense of Place and Place Attachment submitted to Journal of Architecture and Urban Development 3 5-12
[8] Steadman C R 2003 Is it really just a social construction: The contribution of the physical environment to sense of place Society and Natural Resources 16 671-685
[9] Hidalgo M C and Hernandez B 2001 Place Attachment: Conceptual and Empirical Questions submitted to Journal of Environmental Psychology 19 331-352
[10] Stokols D and Shumaker S A 1981 People in places: A transactional view of settings. In Harvey, J. H. (Ed.). Cognition social behaviour and the environment Hillsdal NJ. Lawrence Erlbaum Assoc.
[11] Manzo L C 2005 For better or worse: Exploring multiple dimensions of place meaning: submitted to Journal of Environmental Psychology 25 67–86
[12] Gustafson P 2001 Meanings of Place: Everyday Experience and Theoretical Conceptualizations submitted to Journal of Environmental Psychology 21 (1) 5–16 and Roots and Routes Exploring the Relationship between Place Attachmentand Mobility Environment and Behavior 33(5) 667–86
[13] Heryanto B, Ihsan and Natalia V V 2012 City identity and place attachment submitted to Journal of Engineering Faculty 6 3
[14] Altman I and Low S M 1992 Place attachment New York Plenum Press
[15] Williams D R and Roggenbuck J W 1989 Measuring place attachment: Some preliminary results. Paper presented at the Outdoor Planning and Management NRPA Symposium on Leisure Research San Antonio TX.
[16] Fried M 1963 Grieving for a lost home, in The urban condition: people and policy in the Metropolis Duhl J L Editor New York Basic Books, Inc. 151-171
[17] Tuan Y F 1974 Topophilia: A study of environmental perception, attitudes, and values Englewood Cliffs NJ Prentice-Hall
[18] Jorgensen B S and Stedman R C 2001 Sense of place as an attitude: Lakeshore owners attitudes toward their properties submitted to Journal of Environmental Psychology 21 233-248
[19] Canter D 1977 The psychology of place The Architectural Press Ltd.
[20] Smaldone D, Harris C and Sanyal N 2005 An exploration of place as a process: The case of Jackson Hole, WY submitted to Journal of Environmental Psychology 25 397-414
[21] Zakariya K, Mohyuddin A, and Yaman M 2007 Refining tourist’s place experience through placemaking: Concepts and correlations submitted to Journal of Diversity in Organisations, Communities & Nations 4 249-257
[22] Lynch K 1960 The image of the city Mass MIT Press
[23] Sudrajat I 2012 Conceptualizing a framework for research on place in Indonesia. SAPPK. ITB (unpublished)
[24] Steele F 1981 The sense of place CBI Publishing Company, Inc.
[25] Twigger-Ross C L and Uzzell D L 1996 Place and identity processes submitted to Journal of Environmental Psychology 16 205–220
[26] Yuen B 2003 Searching for place identity in Singapore Habitat International 29 197-214
[27] Shamsuddin S and Ujang N 2008 Making places: The role of attachment in creating the sense of place for traditional streets in Malaysia, Habitat International 32 399-409
[28] Fisher J J 2006 Creating Place Identity: It’s Part of Human Nature, Course Description of Place, Identity and Difference, Built Environment Geography
[29] Bappenas 2005 Master Plan for the Rehabilitation and Reconstruction of the Regions and Communities of the Province of Nanggroe Aceh Darussalam and the Island of Nias, Province of North Sumatera