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Submission date: 15-Mar-2024 10:29AM (UTC+0700)

Submission ID: 2320840193

File name: Shirleyana_et_al_2017_Planning_for_SPOS.pdf (805.41K)

Word count: 4753

Character count: 25998

Planning For Safe Public Open Space in Reconstruction Sites after Large-scale Disasters: Comparing Indonesia and Japan

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Introduction

Disasters caused by natural hazards are occurring more often, and the impacts become more severe and costly. While the impacts on developing countries are mostly on the high number of deaths and total people affected, the impacts on developed nations are on the associated damages on the built-environment. Hence it is important that countries, rich or poor, need to start reducing disaster risks and strengthening communities' resilience. When disasters strike, it is important to minimize the disturbances caused to the affected communities.

This study aims at reviewing the importance of providing Safe Public Open Space (SPOS) in relocation sites for reconstruction after vast and complex disasters. Reconsideration of SPOS is important as an efficient response when a disaster happened, and for providing community common ground for rehabilitation and reconstruction in post-disaster phase. Furthermore, as proposed by UN Habitat (2015) share of open spaces is also an indicator in providing safe, resilient, and sustainable human settlements.

This study is based on desk research literature review. Two case studies were selected from different resettlement sites: one from Indonesia and one from Japan. Japan and Indonesia are the two countries that are very vulnerable to geophysical disasters. Both countries have experienced large-scale disasters caused by earthquake and tsunami and conducted extensive rehabilitation and reconstructions following those disasters. The study results are expected to be the tool for post-disaster reconstruction, to consider public open space as a place to be provided to the community for reconstructing their lives.

This paper is structured as follow. Section 1 presents the aim, rationale, and methods of study. Section 2 outlines results of the literature review on the role of SPOS after disasters. Section 3 compares Indonesia and Japan. Section 4 gives the conclusion and recommendations for future studies.

The Role of Safe Public Open Space (SPOS) in Disaster

This section outlines results of the literature review on definitions of the concept of open space and the importance of providing safety from disasters, immediately following disasters as well as in the long term. The discussion examines definitions and characterisations from general to specific, from open space to safe open space, and finally Safe Public Open Space (SPOS).

Public Open Space

⁶The definition of public open space varies. Several researchers put open space in general as open areas, contrasting open space to built areas. According to Swanick et al. (2003), open space can be defined as green spaces which include park and greenways. There are many purposes of providing open space, e.g. the usage for diverse activities such as walking, talking and sitting and explicitly private activities in gardens and courtyards (Wolley 2003, Swanick et al. 2003).

Public open space, however, is the part of open space areas that is public. Carmona et al (2006) defined public open space as space open to public for free access. According to UN Habitat (2015), public open space is defined as the area of cities allocated for streets, boulevards, including walkways, sidewalks, and bicycle lanes as well as the area allocated for public parks, squares, green areas, public playground and open areas of public facilities. A public open space does not include open spaces which are privately owned. In this study, public open space refers to open areas for free public access, including e.g. parks, green areas and playgrounds.

In terms of function, public open space serves as cultural space, education space, and community focus activities (Woolley 2003), and offers a social learning opportunity (Shaftoe 2008). The need of being together to help and support each other has been recognized as an important role that public open space should provide. Public open space should be safe for people to meet, stay together, and give help to others (Pizzo 2013). In terms of disaster response, there is increasing attention to the role of public open space for disaster reconstruction purposes. Public open space becomes a refuge place, a temporary home to affected people who need to adapt to their new environment (Hossain 2014, Allan 2010). Hence, public open space creates a strong boundary for the community. It has a significant role in the community, especially its role for social interaction. Consequently, many diverse activities can happen in public open space, thus provoke the social gathering and social network within the community.

Safe Public Open Space (SPOS) after Disaster

For countries prone to earthquake disasters, it is important to learn how these types of disaster would affect the built environment especially ⁶ in public open spaces for people. The element of safety is also commonly disregarded in the planning process for public open space. Safety is important since in most cases the availability of public open space does not take all users into consideration. Planning for open space should be carefully considered, especially when people are relocated to resettlement area.

Manandhar and Joshi (2015) recognized the role of open space in the phase of pre-disaster and post-disaster recovery. In the pre-disaster phase, public open space gives social value and interaction, as well as community identity. For the post-disaster recovery phase, public open space functions as a place for temporary shelter where aid can be distributed. In the case of a major earthquake, public open space operates as a safe public place for refuge, temporary homes before people can adapt to their new environment, a place for gathering and shelter and for the distribution of goods and services (McGregor 1998, Middleton 2007 in Allan & Bryant 2010). Pizzo (2013) also emphasized the importance of open place as a first place for people to run to, amid the flocks of running people, where after that first aid help can be distributed, and they can stay together. It acts as a response to a disaster event and a common ground for reconstructing the affected community's living environment in the post-disaster phase.

The community social network is primarily needed especially for disaster resilience. Therefore, in context of disaster reconstruction it is important for urban planning to plan for public open space that assists in rebuilding the community after such catastrophes. Public open space has a significant role before and after the catastrophe, e.g. to gather the communities and distribution of information. Before disaster happen, public open space has a social value by offering places for people to meet, to gather, to interact with the community, or to have a social life. Immediately after disasters they function as a space for people to run to, to get first aid and to be offered temporary shelter (Manandhar & Joshi 2015).

After a disaster, people are relocated into a temporary shelter or relocation sites. Problems occur where people are reluctant to move to places where they lose social contact with their neighbours. Open space is one component of the urban system which could facilitate recovery after a disaster (Moehle 2009 in Hossain 2014). Thus it is necessary to provide a safe public open place for the community to rebuild their community network.

In public spaces escape and rescue routes need to be ensured in two routes as one route may be impassable in an emergency case (Senda 2015).

There are examples of how spaces have been used in context of disasters from many cities around the world. Some examples in Japan (Bryant & Allan 2011) showed the rehabilitation of open space to increase the quality of life in a traditional neighbourhood and give safety to its residents. The community in Kobe, after the Kobe earthquake in 1995, rehabilitated their alleys with signs of safety and developed several parks, especially pocket parks as networks. Parks were rehabilitated as community space to prepare for the next disaster. Each park has a unique design and is equipped with a water pump, a seat, some flat space, and tree planting for shelter.



Figure 1: Pocket parks as networks for disaster mitigation in Japan
Source: Allan (2010)

The awareness of the importance of public open space in disaster response is rising. In Chile, after the earthquake and tsunami in 2010, open space has also become an important aspect in the emergency response. The affected people occupied all available open space as their refuge place. Here, a potential of public open space as an asset for urban resilience was realized as it helped to absorb shocks and respond to changes after the disaster (Fuentes & Tastes 2015).

After the earthquake in Nepal 2015, planning for public open space has also become a priority. Every open space is regarded valuable after a major earthquake as portals for delivering aids. The public open space can be used for the humanitarian response, e.g. camps for displaced persons, logistics centres and distribution centres (Flagship 2 of the NRRC 2015). People acknowledged that the availability of these open spaces provided them immediate safety (Manandhar & Joshi 2015).

Research Design and Methods

The United Nations 3rd World Conference in Sendai in 2015 adopted the Sendai Framework for Disaster Risk Reduction 2015-2030. The framework aims to achieve the substantial reduction of disaster risk in relation to physical, social, cultural, economic and environmental assets. The framework tries to prevent new and reduce disaster risk and thus increase preparedness for response and recovery. The goal to prevent and reduce

disaster risk comes with four priorities: (1) Understanding disaster risk, (2) Strengthening disaster risk governance to manage disaster risk, (3) Investing in disaster risk reduction for resilience, (4) Enhancing disaster preparedness for effective response and to “Build Back Better” in recovering, rehabilitation, and reconstruction (UN 2015). Focusing on the priority of enhancing disaster preparedness and to build back better, this study intends to evaluate the public open space in relocation sites regarding the safety remarks. This is important to help to build back better in context of future planning for public open space in disaster reconstruction. Thus planners are provided a guideline to plan the required space.

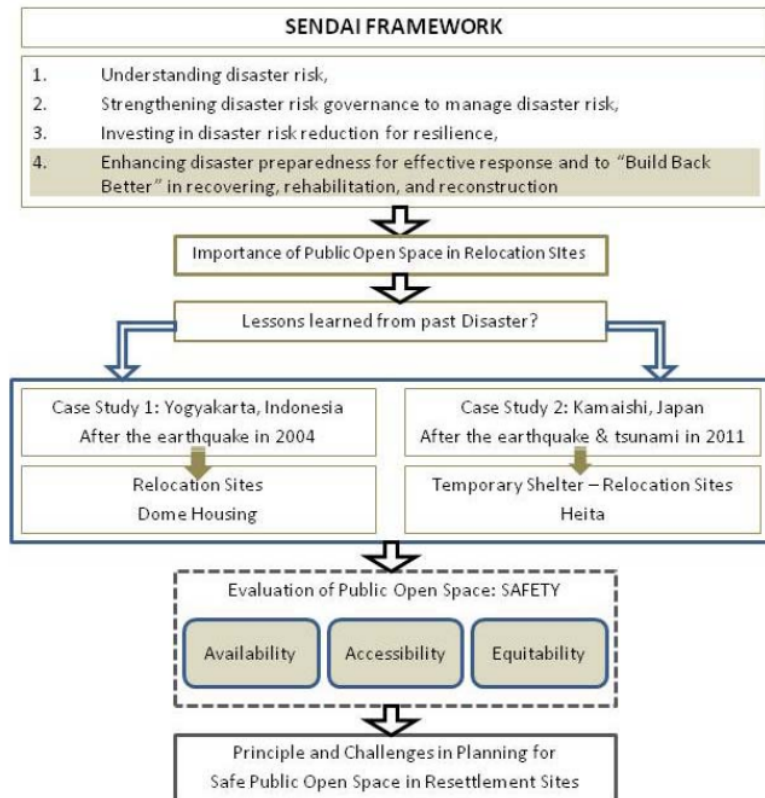


Figure 2: Conceptual Research Framework of the study
Source: own illustration

This research is designed as qualitative research, using a descriptive study that compares case studies in order to evaluate the existing plan for public open space and to further recommend guidelines in planning for safe public open space in relocation sites. This study collects data from various sources of the literature study and selects two case studies to evaluate existing public open space in relocation sites, one case from Indonesia and one from Japan. The compared case studies used are relocation sites after the earthquake in Yogyakarta in 2006 and after the earthquake and tsunami in Tohoku region, Japan in 2011. This study uses evaluation criteria focusing on disaster reconstruction as proposed by the Aceh Rehabilitation and Reconstruction Appraisal (ARRA). ARRA uses rapid appraisal and suggests evaluating space and services based on availability, accessibility, and equity and involvement. Availability focuses on available services and public awareness. Accessibility focuses on how the public accesses the space and the service. Equity and involvement focus on community involvement without discrimination.

Case Study of Indonesia and Japan

This section compares the implementation of Safe Public Open Space (SPOS) after large-scale disasters in Indonesia and Japan. Both countries have suffered continuous impacts from earthquakes and tsunamis and have progressed extensively in their efforts to build resilience.

Dome Housing, Yogyakarta, Indonesia

Yogyakarta, a city in Central Java Indonesia (Figure 3), was hit by an earthquake on Saturday, 27 May 2006. The earthquake in circa 6.3 magnitudes killed over 5,000 people and injured thousands. More than 100,000 homes were destroyed and around 200,000 were damaged (Suryandono & Wong 2012).



Figure 3: Location of Yogyakarta
Source: WorldAtlas (2015)

An NGO from the USA – DTWF (Dome for the World Foundation) donated for Ngelepen around 80 new buildings in a dome shape called Dome Housing project. Ngelepen is a village in Yogyakarta and had to be relocated because of landslides caused by the earthquake. The new resettlement site is called New Ngelepen which is one km away from the original village (Figure 4). Future residents participated in the housing constructions, but not in the design and plans. The dome houses consist of eleven or twelve blocks of houses that share electricity, public toilets, and pathways. The diameter of the house is seven meters, two stories, with the total area of 38 square meters. Public facilities available are a mosque, playground, kindergarten, health clinic and a cemetery. However, facilities for community activities are lacking. This is because the planners assumed in the construction process that public facilities were nearby. The children playground area is too small and located beside the cemetery. Most community activities happen on the streets.

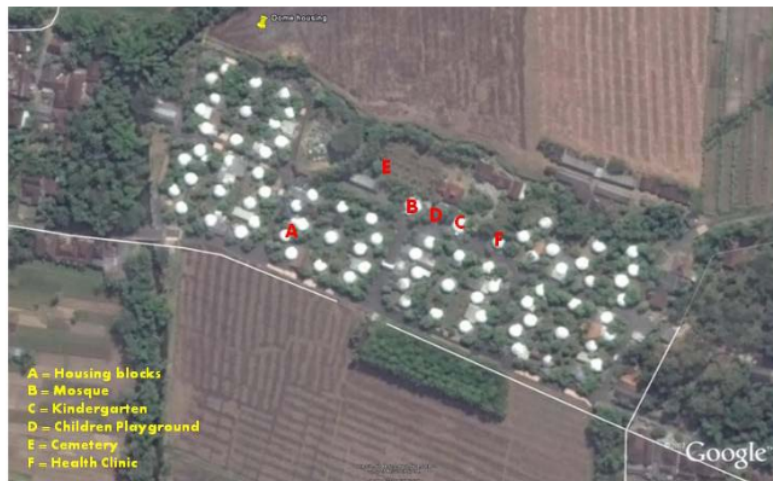


Figure 4: Dome Housing plan in New Ngelepen
Source: "Dome Yogyakarta". 7°48'49.79"S and 110°30'12.58"E. Modified from Google Earth. 24 June 2015. September 18, 2015.



Figure 5: Changes made by inhabitants of Dome Housing
Source: UGM & IRM (2009)

According to Saraswati (2007), after one-year occupancy, people liked to stay in the dome houses since they felt safe from the earthquake. However, the dome housing was perceived as not suitable for the Indonesian tropical climate. Therefore, many residents eventually made additional changes to the dome, such as additional eaves, canopy, and other functions (Saraswati 2007).

Marcillia and Ohno (2012) investigated the influence of social interaction between residents within three years occupancy. 34 residents out of 51 residents were interviewed. The results indicated that 57% wanted private approach pathways, 61% had not enough yards in the house for social gathering. The available terrace in front of the house should be altered as a guest room, but the limited space made this not possible

(Marcillia & Ohno 2012). Based on this investigation, the outdoor space was not enough for large gathering space. The only flat open space available was used for a cemetery. The inflexible design of the dome houses made the residents to use open space outside the houses for better social interaction. Housewives chat and children playing were found in the streets activities. The main street was even painted for a badminton court. Here, the function of social gathering that used to be available in the original place, was taking place on the street, though it was considerably dangerous. The discrepancies from the intended usages in the original plan and actual usages showed the insensitivity to the cultural needs (Marcillia & Ohno 2012).

Temporary houses, Heita, Kamaishi, Japan

The Great Eastern Japan Earthquake and Tohoku Tsunami have led to the loss of approximately 108,000 residencies. The Japanese Government quickly responded to this with multiple offers for transitional shelter according to the affected location (Shiozaki, et al. 2013).



Figure 6: Location of Kamaishi Japan
Source: The Economist (2015)

The Great East Japan Earthquake devastated Kamaishi City in Iwate Prefecture in Tohoku Region (Figure 6). The temporary housing in Kamaishi is located near Heita Athletic Park and its design is similar to the destroyed houses (Figure 7). According to a report of the [Japan International Cooperation Agency \(JICA\) on the reconstruction processes from large-scale disasters](#) (2013), there are 240 housing units and a temporary shopping district to support the inhabitants, comparable to a small town with functions to provide the residents services for daily lives, places for work, and places for offering physical and mental support (JICA 2013).



Figure 7: Heita Temporary Houses in Kamaishi Japan
Source: "Heita Kamaishi". 39°14'3.88"N and 141°53'11.27"E. Modified from Google Earth. 01 June 2015. September 26, 2015.



Figure 8: Support Hub location
Source: Examples of Initiatives Aimed at Reconstruction (2013)

There are two types of temporary houses, one with a wooden deck and one without (Ohno 2011). A support hub facility is given to prevent residents from isolation and to promote interaction between the elderly and the other members of the community (Figure 8). To make the optimum use of spaces, the temporary houses also have porches made of wooden decks so that the residents can sit in front of the houses and interact. Neighbours can meet each other in front of their houses and thus have a social relation. Besides the support hub as a welcome place, there is also a community place called "home for all", where the community can gather at night (Figure 9) (Worrall 2013). Here, the community participated in the design and construction process. There are also large outdoor spaces around the community centre which can be used as a children playground area.



Figure 9: Types of temporary housing (left, centre), Home for All (right)
Source: Ohno (2011) (left, centre); Sumner (2013) (right)

Discussion

Based on the two case studies above, this study compares the public open spaces available regarding the criteria of availability, accessibility and equity.

Availability

From the two case studies, the relocation sites are mostly in areas away from the possibility of danger. This makes the community feel safe. In both cases, meeting places are needed. In Japan, the community centre serves as a welcome place, support hub, and even for elderly. In Indonesia, public spaces and facilities available are a playground, mosque, and health clinic. This is related to different cultures and locations in Indonesia and Japan. The location of the community centre in Japan case is in the centre to ease access of the inhabitants.

In Yogyakarta, no space is allocated for community activities. There is no large public open space for gathering space. Thus, the social interaction happens on the streets. The children playground is considered too small and therefore children prefer to play on the streets. Furthermore, the need for social place, either in an outdoor or indoor community centre is important and has not been noticed by the local government. For the case of Heita in Japan, the community made porches between the shelters as shared space to meet their neighbours. Besides, they have a support hub as a welcome place and a different community centre. The outdoor area is also large enough for children playing.

The existence of public open space is, therefore, necessary, since it is a place for the community activities, and it is indeed a primary social need of the community. The disaster took not only their physical belonging but also their social, economic life they had before the disaster.

Disasters have a great impact on the social relation of the society. The availability of community centres can help to reduce the loss. This is why social ties are important in relocation sites. The social relations or social ties improve community resilience. Besides building construction the reconstruction of new place should consider social behaviour.

Shared space for the community can be recommended in two ways: an indoor community centre and outdoor public open space for the community. The indoor community centre should serve as a place for social activities, a health centre and needs to consider the elderly as the most emotionally and physically affected. Outdoor public open space is needed as an assembly point, a refuge for the community during the disaster and for temporary spaces for relocation.

Accessibility

Public facilities for the community in Yogyakarta are available nearby. Hence, they are easily accessible for all residents. However, the roads as an accessible place to all have taken over the need for real public open space. For instance, children use streets as a place to play badminton. In the case of Japan, the relocation site is surrounded by a large park and has big open spaces. The community centre is located in the middle to ease the access of people.

Public open space facilities should have an inclusive design to be accessible to everyone, since its importance in pre-disaster or post-disaster reconstruction. This also means to consider various stakeholders who will benefit from the new relocation sites, from children, youth, adults, elderly, even considering disabled people, which are often not mentioned in many cases for emergency escape ways.

The community awareness regarding safety routes and escape ways during disasters is also important, but often lacking in places that do not realize the earthquake and tsunami hazards. The survivors of the Indian

Ocean Tsunami 2004 mentioned that eye orientation regarding high buildings, sign, hill, etc. made them to react faster, to run away from the water, to go to a higher place, and follow the lock of people. Therefore, the escape routes need to be clear and visible to everyone (Fakhrurrazi 2010)

Equity

The community involvement is important as part of the reconstruction process. In Yogyakarta, the community participated in construction, but not in the housing plans. As a result, there is some incompatible design to the local culture and condition. Local residents therefore made some adjustment and use roads as an open area for community activities. This is in contrasting situation with the case study of Japan, where community participated in the planning process to ensure the social value between the residents.

To sustain a new area, it is suggested to support a community participation that helps to enhance self-belonging feelings. The community can also maintain the communal space. Since the case studies also shows cultural changes in relocation sites, thus it is important to provide the community an adaptable function of place, for example, public open place which can serve as sport facilities, a place for community gathering and even as a refuge place. This may end up in the open ended and flexible design by the community.

Conclusion

Enhancing disaster preparedness for effective response and to "Build Back Better" in recovering, rehabilitation, and reconstruction is one of the goals in Sendai Framework. The findings from the two case studies allow to draw the conclusion that the public open space is an important part in planning for relocation sites. It is one important element to build better new relocation sites for disaster risk mitigation, recovery, rehabilitation, and reconstruction. It needs to be easily accessible and to provide options for social activities of various users, like children, youth, adults, elderly, and disabled people. The more adaptable communal spaces are, the better can people use them concerning their needs. Since the beginning of planning regarding the scape's function and location, the affected community needs to be involved by the planners. This is necessary to ensure sustainability of the space and also increase community awareness for the availability and importance of this space. Social ties also help to build community resilience in the pre- and post- disaster phase. Therefore, every planning for macro scale of settlement in disaster prone area should take this matter into account.

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