Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 135 (2014) 178 – 183

Procedia
Social and Behavioral Sciences

CITIES 2013

Improving Resilience against Urban Fire Hazards through Environmental Design in Dense Urban Areas in Surabaya, Indonesia

Prananda Navitas*

Dept. of Urban and Regional Planning, Institut Teknologi Sepuluh Nopember, Surabaya 60111, Indonesia

Abstract

How the built environment is designed and built greatly affects its performance in providing livable spaces for its users. Having high population and building density, man-made disasters such as inundation and urban fire remain major threats to Surabaya, Indonesia's second largest city.This paper proposes an approach to improve an urban neighborhood's resilience against urban fires using a design matrix to describe the interaction between Lynch's urban design components and Cai and Wang's idea of Safety-based Urban Design.Paying attention to psychological safety, behavioral safety, defense for safety and safety against disaster in the design and planning of a neighborhood's paths, edges, nodes, districts and landmarks can improve disaster preparedness. A good environmental design can lower urban fire vulnerability, support mitigation efforts and increase disaster preparedness, and make a large difference in the response to an emergency situation. However, to improve overall resilience, both anthropogenic and bio-physic aspects that make up the environment must be acknowledged. Awareness against urban fires must be raised as the physical environment is shaped one component at a time.

Peer-review under responsibility of the Cities International Seminar Committee.

Keywords: urban fire; vulnerability; environmental design; safety-based urban design

* Corresponding author. Tel.: +62-813-478-66680; fax: +62-31-592-2425.
E-mail address: prananda.navitas@gmail.com

Peer-review under responsibility of the Cities International Seminar Committee.
doi:10.1016/j.sbspro.2014.07.344

1. Introduction

Uncontrolled fire remains one of the major causes of death and property damage in today's society (Poerbo, 1998, Schneid and Collins, 2001). Some of the well-known urban fires are the Chicago, Boston, and Baltimore fires that occurred in 1871, 1872, and 1904 respectively (Rosen, 1986). A fire outbreak in a densely built urban area can easily propagate to adjacent buildings one after another. Fire occurrences are responsible for extensive damage on the urban environment and the cause of numerous fatalities (Himoto and Tanaka, 2008).

Though Surabaya is not prone to any natural disasters, the structural processes that accelerate urbanization expose the city to man-made disasters such as inundation and urban fires. The Surabaya Fire Department (SFD) has recorded 4,460 cases between 1996 and 2011, claiming 70 casualties, injuring 179 people, and causing a total of IDR 430,849,500,000.- (approx. USD 37,866,559.44) in property damage. Most of the fires in Surabaya are caused by electrical malfunction. The SFD has classified the 31 districts in Surabaya into five fire risk categories: very high risk, high risk, medium, low risk, and very low risk. In creating these categories, the SFD took the following factors into consideration: population density, building density, fire occurrence data, building/structural conditions, land use intensity, and water availability.

Most parts of Surabaya fall into the very low risk to medium risk categories. The western part of Surabaya is mostly very low risk because population and building density in the area are still low. Medium risk areas are concentrated around the eastern part of Surabaya. Only three districts in the city fall into the very high risk category: Pakis, Ploso, and Tambakrejo.

1.1. Disaster Management and Environmental Design

Disaster Management or Emergency Management is understood as a set of inter-connected activities to reduce risk and describing post-disaster strategies towards recovery (Ali and Novogradec, 2008, Dahl, 2011, Khan et al., 2008, Navitas, 2013). The approach includes strategies and activities during the following stages of a disaster or an emergency situation:

- **Pre-disaster** (mitigation and disaster preparedness) – though mitigation and preparedness seem very similar, mitigation relates to activities or measures in avoiding a disaster, or minimizing the damage it causes. Preparedness, on the other hand, contains all activities and measures in case a disaster strikes;
- **During a disaster** (response) – the activities carried out during response are the measures taken during the course of a disaster, or directly after it strikes. The measures here are aimed at reducing casualties and prevent further damages;
- **Post-disaster** (recovery) – once a disaster has seized to occur, efforts to repair the damages and restore the environment to its pre-disaster state can take place. This stage is also known as the 'bounce back' stage.

The activities contained in the stages above are inter-connected to form a cycle because experiences from each stage become input to prepare for further disasters. Documented response experiences will provide valuable input for better mitigation and preparedness which in turn will result in better response.