Sustainable Cities and Society 7 (2013) 25–36

Contents lists available at SciVerse ScienceDirect

Sustainable Cities and Society

journal homepage: www.elsevier.com/locate/scs

Developing a fuzzy AHP model to evaluate environmental sustainability from the perspective of Secured by Design scheme—A case study

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ARTICLE INFO

Keywords:
Secured by Design (SBD) scheme
Environmental sustainability
Fuzzy analytic hierarchy process (FAHP)
Region 17 of Tehran

ABSTRACT

In environmental security, Secured by Design (SBD) is one of the most important schemes which promote environmental sustainability in cities with prevention and reduction actions such as increase natural surveillance determine the specific definition of urban spaces and create a sense of ownership and responsibility in citizens. This paper discusses a model for evaluating environmental security from the perspective of SBD scheme and investigates the extent to which crime and fear of crime are integrated within environmental sustainability.

For this purpose a hierarchical model with four levels suggested. This model decomposes the main principles of SBD scheme to localized criteria and sub criteria which influence it. These factors later prioritized using pairwise comparison logic and fuzzy group analytic hierarchy process (AHP) method and the relative importance of each factor on achieving environmental security determined.

In addition the proposed model has been used to calculate the overall rating of quadratic areas in region 17 of Tehran based on their environmental sustainability. Also, using the calculation results, strategies were suggested separately for each SBD principle in order to reduce urban crime and improve the environmental sustainability of the studied area.

Results showed that the area 4 and area 1 have the highest and lowest environmental security rate respectively. Finally this paper argues that SBD as an initiative is useful to assist in achieving environmental security and development of environmental sustainability.

1. Introduction

Safety and security have been significant issues throughout history, from early prehistoric cave-dwelling societies to medieval and modern cities (P. Cozens, 2008).

Nowadays crime as a part of our life is caused a lot of considerable difficulties for cities. SBD scheme as a solution for achieving security is a practical application of new opportunity theories of crime such as Routine Activity Theory, Rational Choice Theory and Pattern Theory.

The influence of SBD is certainly obvious in the recent appearance of ideas regarding the synergies between security and environmental sustainability. Indeed, residents of crime-prone areas often experience some of the most extreme environmental difficulties. A sustainable community must therefore be one that is defined as safe, perceives itself to be safe and is considered by others to be safe. Undoubtedly, for achieving the development of 'urban environmentalism' for the 21st century, the standardization of SBD concepts in designing processes could avoid the repetition of some of the 'unsustainable' design failures of the recent past.

There are some notable commonalities between the concepts of sustainable development and SBD which require exploration. Furthermore, a combination of both approaches, it is argued, may represent the emergence of a 'sustainable urban environmentalism' for the planning, design, management and maintenance of the urban landscape. Its input with regard to understanding the 'ecology of crime' in the urban place will strengthen sustainable development, environmental criminology and the fields of planning and urban design.

Efficient use of environment in city designing and planning can reduce criminality potentials of areas. In order to measure how safe the people feel, a poll was done by social department of police in 2008 in eight big cities of Iran. The poll shows that 81% of residents feel unsafe, some was due to environmental reasons ("Islamic Republic of Iran Police News Center"). A poll conducted by statistics center of university students, about safe feeling of residents of Tehran, in 2010, also agrees that 60–80% of people feel unsafe about presence of addicts, street disturbances, blackmailing, and other urban crimes.

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2210-6707/$ – see front matter.
http://dx.doi.org/10.1016/j.scs.2012.10.001

Tehran metropolis as the capital of Iran, is a densely and populated city with high rate of deteriorated areas. Statistics show that there is a meaningful relationship between different districts and kind and repetition of crimes in Tehran, so that these districts can be categorized based on city safety (Rezvan, 2007).

In some districts unsafety is more likely due to environmental, social, economic and even occupational reasons. One of these areas is region 3 of district 17 in Tehran, which suffers from high population density, aggregation of deteriorated and compact areas, multiplicity of cross-regional land use, separation of the area by two railways (Tehran-Tabriz and Tehran-South), etc. Mentioned limitations along with other relevant factors have created numerous problems such as low level of environmental security in the area and feeling of insecurity among residents.

The remainder of this paper is organized as follows. Section 2 describes the role of urban security in environmental sustainability, aims and principles of SBD scheme and evolution of environmental crime prevention researches. Section 3 provides a brief introduction to the case study including environmental security condition and the role of environmental pollutions in crime commitment. Section 4 suggests a model for evaluating environmental security; the basics of FAHP and the stages of the application of the FAHP technique in prioritizing the factors affecting environmental security is also described. Finally the results of previous section investigate in Section 5 and some guidelines are presented for each area of the case study.

This article is based on the decisions of municipality of district 17 of Tehran for reducing urban crime through physical interventions and crime prevention activities. The background of this research is based on the common works of the municipality and the research center of police in Tehran.

2. Conceptual framework

2.1. Crime and environmental sustainability

The connection between crime or fear of crime and environmental sustainability is based on some limited information. Despite various beliefs on the essential criteria for sustainability, in several viewpoints, security is considered as one of these criteria. In addition, it is argued that crime and the fear of crime have been synergistically integrated within the frameworks for environmental sustainability.

In a sustainable urban environment it is essential that the inhabitants should not have cause for fear for their personal safety and the safety of their possessions (P. Cozens, 2008). So it is obvious that the proper design and effective use of the built environment can lead to a reduction in the fear of crime and the incidence of crime, and to an improvement in the environmental sustainability.

A form of sustainable urban development that incorporates SBD measures may go some way toward the development of what might be defined as a 'Sustainable Urban Environmentalism'. A review of the literature clearly indicates that crime and fear of crime can seriously undermine the broader aims of environmental sustainability.

Moreover, a recent study has highlighted crime as a major factor influencing sustainability. The design and management of the built environment can clearly facilitate or hinder opportunities for crime and deviant behavior (P. Cozens, 2008). The effect of the built environment on crime and sustainability indicates that its design and modification can be used as an effective planning tool.

Reducing opportunities for crime and the fear of crime in urban spaces can therefore contribute toward the creation and maintenance of safer, vibrant and more sustainable communities, and it is now widely recognized that sustainable communities must therefore possess low levels of both crime and the fear of crime (P. Cozens et al., 2009).

A sustainable community must be one that is defined as safe, perceives itself to be safe and is considered by others to be safe (P. Cozens, 2002). Indeed, sustainability will not achieve its full potential unless the citizens of that city fear for their personal safety and the safety of their livelihood.

P. Cozens (2007) argues that "A city is an ecosystem and within the city, crime and the fear of crime are interwoven within this ecosystem. The study of both environmental criminology and the 'ecology of crime' arguably warrant consideration as a central component of urban sustainability."

One of the fundamental aspects of achieving sustainable urban environment is that it should not pose any fear or threat to the inhabitants. Moreover, the reduction of threats to personal well-being and the environment are the objectives commonly associated with the idea of sustainability.

Moreover, in a community, two factor of crime and fear of crime can effectively reduce the rate of environmental sustainability; consequently, more tough steps have to be taken in order to reduce crime and fear of crime within a community (P. Cozens, 2007).

Furthermore, crime and the fear of crime have the potential to erode and reduce existing levels of sustainability within a community. Urban sustainability must therefore include more explicitly measures for crime(s) and the fear of crime.

Clearly, crime, violence and anti-social behavior are potent indicators of sustainability and threats to public welfare and well-being. An 'unsustainable' community is commonly characterized by images of poverty, homelessness and high levels of crime fear of crime and anti-social behavior (P.M. Cozens, 2008). Consequently, development of a more holistic form of urban sustainability can lead to reducing opportunities for crime and criminal activities. A review of development of viewpoint on the relationship between crime and environmental sustainability between 1862 and 2008 is provided in Table 1.

2.2. An introduction to SBD scheme

Secured by Design is a UK based initiative which was devised in 1989, with the aim of countering the rise in household burglary, reducing crime through the design of the environment and encouraging urban designers to design out crime at the planning stage (Armitage, 2004). It includes both the Developers' Award and licensed products which aims to reduce crime through the design of the environment. SBD also aims to achieve security for the building shell and to introduce appropriate internal and external design features that facilitate natural surveillance and create a sense of ownership and responsibility, in order to deter criminal and anti-social behavior within the cartilage of the business.

Research shows that residents living on Secured by Design developments are half as likely to be burgled, two and a half times less likely to suffer vehicle crime. SBD developments also show a 25% reduction of criminal damage (Schneider & Kitchen, 2002).

New opportunity theories of crime and crime prevention measures such as Routine Activity Theory, Rational Choice Theory and Pattern Theory affected largely on the principles of SBD. These theories assume that crime is a response to opportunity, therefore removing the opportunity can reduce crime. An emphasis is also placed upon the role of the environment in creating or impeding these opportunities. The principles of SBD fall largely into the following categories.

2.2.1. Physical security

SBD sets standards of physical security for each property and its boundaries (Armitage & Monchuk, 2009). The aim is to combine