International Journal of Architecture and Urban Development
Vol.6, No.3, Summer 2016

The Assessment of the Community Capacity on the Urban Vulnerability Based on Community Disaster Risk Management (CBDRM)

(Case Study : Yousef-Abad in Tehran)

[1*]Davood Kazemi, [2]Alireza Andalib

[1] Ph.D. in Urban Planning, Department of Art and Architecture, Science and Research Branch, Islamic Azad University, Tehran, Iran.
[2] Associate professor, Department of Art and Architecture, Science and Research Branch Islamic Azad University,Tehran, Iran.

Recieved 09.08.2015; Accepted 12.14.2015

ABSTRACT: Disaster Management and current approaches in this field in one hand only has focused to physical vulnerabilities and in the other hand has included consequential action to reduce vulnerability and improve physical preparation as well as resistance institutional insignificant during the disaster. Therefore, these approaches usually have ignored the capabilities and capacities of residents to reduce vulnerabilities and consequently losses and damage. While recent approaches have entered, the field of disaster management emphasized that at first vulnerability is beyond the physical vulnerabilities and second vulnerabilities have an inverse relationship with the resident's capacity in the face of disaster. So, community-based disaster risk management need to recognize indicators of vulnerability and community capacity and its relationship is essential. Accordingly, in the first step, the indicators of community capacity and community vulnerability are provided and in the second step based on these indicators, community capacity and vulnerability have been assessed. The assessment of community characters is based on GIS capabilities, spatial analysis tools and SPSS and correlation regression is used for analyzing the relationship of the variables. The results and findings of this research indicate that the vulnerability of urban areas is not only influenced by physical factors, but also social and organizational factors like community organizing and community educating have affected strongly the vulnerability.

Keywords: *Vulnerability, Capacity, Correlation, Factor analysis, Regression analysis*

INTRODUCTION

Current attitudes in the field of disaster management in developed countries and developing have been significant developments due to space and time circumstance.

Generally, in developed country, this changing attitude in disaster management as a process after the disaster, to reduce human losses in areas, guided to forecasting and prevention of disaster by pre-disaster planning and disaster reduction management. However, in developing countries this approach to disaster management due to structural and institutional weaknesses, is response planning and coping to disaster.

Although these actions, in turn, are an integral part of the planning process and disaster management, but it is not inclusive of all components of vulnerability. In addition, its consequential solutions are not profound impact on the vulnerabilities and losses caused by the hazards. While community-based disaster risk management (CBDRM[1]), define local residents as the heart of decision-making, planning, policy-making and implementation process of disaster management and disaster risk reduction.

Thus, implementation solutions in the field of Disaster Management mainly focused on the empowerment of residents in the area of Disaster Management and capacity building of local institutions to participate more and more people in the process , what is the current attitude Disaster Management have missed. Therefore, the main goal of this research is to measure the factors affecting the vulnerability of urban areas in disasters.

The objectives of the research in multi-axis have been developed:

Identify factors affecting vulnerability and the development of criteria and indicators;

Identify the impact of the components and the independent variables on the dependent variable and assessment method;

*Corresponding Author Email: *dkazemi@srbiau.ac.ir*

Assess the impact of each component on urban vulnerability.
According to these, research survey in one of the most integrated community in Tehran city, criteria and indexes of vulnerabilities and the community capacity is identified and the correlation between the two indices is reviewed.
At the end, it will be replied to the main question that whether the community capacity in the area of disaster and vulnerability caused by the hazard, there are a significant relationship or not. Therefore, the indicators and sub-indicators in these areas will be defined and then, based on these indicators the community capacity in order to cope with disaster will be assessed.
Finally, based on statistical analysis and GIS tools, a correlation between these two factors will be measured and the impact of each of the indicators on community capacity to prioritize implementation solutions and reduce the vulnerability of verified.

MATERIAL AND METHODS

The research methodology is based on several steps and focused on the goals and each one was used specific research methods. Therefore, this research steps include:
The concept of urban vulnerability;
Identify the factors affecting urban vulnerability;
Identify factors affecting the community capacity;
To develop indicators to assess the vulnerability and the factors affecting it;
Assess the impact of factors affecting the urban vulnerability.
In the first and second step, research methods are based on the study of background research and determining affecting factor on urban vulnerability based on literature review. In the third step, is based on using expert opinions on how to measure the variables presented and in the last step by analytical methods such as factor analysis and path analysis using SPSS, the vulnerability and affecting factors are measured.

Vulnerability

Vulnerability derives from the Latin word "vulnerary" (to be wounded) and describes the potential to be harmed, which means the sensitivity to a perturbation or stress(Downing, 1997). Beyond that, the vulnerability has been conceptualized in many ways depending on various research traditions (Table 1). Yet it is developed largely in those social sciences addressing environmental risks and hazards(Kasperson & Kasperson, 2001). In recent decades, the concept of vulnerability has been broadly employed in research on global environmental/climatic changes, disaster risk reduction, and social–ecological systems (Table 1). In particular, with the popularity of the human dimensions of climate change research, the focus of vulnerability has been gradually transformed from concerning the fragility of environmental system (i.e., physical vulnerability) to attaching importance to investigate the vulnerability of human society (i.e., social vulnerability)(Lei, Yue, Zhou, & Yin, 2014). Cutter et al. (2003) emphasized the social vulnerability and presented three key tenets in vulnerability research:
The exposure conditions that make people or places vulnerable

Table 1. Some definitions of vulnerability

Author(s)	Definitions
Downing et al. (1997)	Vulnerability means an environmental sensitivity. There are a number of factors related to vulnerability such as demographic, economic, social and technical factors, and the economic dependences(Downing, 1997).
Kasperson and Kasperson (2001, 2005)	Vulnerability is the flip side of resilience: when a social or ecological system loses resilience, it becomes vulnerable to change that previously could be absorbed.
Turner et al. (2003)	Vulnerability is the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or stress/stressor(Turner et al., 2003).
Cutter et al. (2003)	Social vulnerability is a measure of both the sensitivity of a population to natural hazards and its ability to respond to and recover from the impacts of hazards(Cutter, Boruff, & Shirley, 2003).
Wisner et al. (2004)	Vulnerability means the characteristics of a group or individual in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a hazard(Blaikie, Cannon, Davis, & Wisner, 2014).
Adger (2006)	The key parameters of vulnerability are the stress to which a system is exposed, its sensitivity, and its adaptive capacity (Adger, 2006).
Birkmann (2006)	Social vulnerability refers to the inability of people, organizations, and societies to withstand adverse impacts from multiple stressors to which they are exposed (Bollin, Hidajat, & Birkmann, 2006).
UNISDR (2009)	Vulnerability, the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard (UNISDR, 2009).
Zhou et al. (2010)	Vulnerability places stress on system's response to hazard or hazard potential, which determines the likelihood of loss from hazards. Exposure and sensitivity are two aspects of vulnerability (Zhou, Wan, & Jia, 2010).

to extreme natural events;
the societal resistance or resilience to hazards;
and the integration of potential exposures and societal resilience with a specific focus on particular regions (Cutter, Ash, & Emrich, 2014).
It is becoming clear that vulnerability is an unfavorable property of SESs, which unfolds in the interaction between human and nature, and it can be reduced by enhancing preparedness and promoting social learning.

Develop Factors of the Community Vulnerability

Developing the components of vulnerability based on community disaster risk management approach has been done. According to this attitude, people are the heart in the process of risk reduction, and operational .phases focusing on the skills and abilities of the community (Pandey & Okazaki, 2005).
Based on the findings vulnerability is not only physical aspects but also covers other aspects. The following factors to assess the urban vulnerability:
- Physical vulnerability, this aspect is centered on urban areas involving of physical and structural elements (Bollin et al., 2006; Gaillard, 2010; Pandey & Okazaki, 2005)
- Social and institutional vulnerability that these components, including of integrated community and existing of the activities of non-governmental organizations in community organizations and social characteristics of the community (Center, 2008; Pandey & Okazaki, 2005).
- Cognitive and awareness vulnerability: this component is based on community understanding and awareness of the disaster may be gained based on past experience (Center,2008).
- Attitude and motivation Vulnerability: intrinsic characteristics of the individual. Aspects such as religious beliefs, motivations and According to the each components for vulnerability assessment according to experts' opinion vulnerability criteria and indicators were developed. (Bollin et al., 2006; Twigg, 2009)
JICA studies to assess the physical vulnerability which has surveyed extensively earthquake scenarios in Tehran and its vulnerability.
Also for assessing other factors of the vulnerability, Data collect from questionnaires or statistical data derived from the statistical methods is used. (Table 2)

Develop factors of the Community Capacity

The concept of resilience, pattern from the local community plays the most important role. When speaking of local communities, a wide range of actors that play a role that is the most important functional value to identify and stable interaction between them. Community disaster risk management actors can be classified according to levels of functional (Fig. 1). The social layers plays an essential role in disaster management process and reduce or increase community capacity can have a significant role in the urban vulnerability. The three major goals of social development is considered in the wide range (Luna, 2001).
Promote potential residents and their capabilities;
Active participation of people through collaborative efforts in the process of change and development;
Promote the welfare of people.

Table 2. Criteria and indexes for measuring vulnerability

Criteria	Index	Questionary Questions
Physical vulnerability		JICA Study about Tehran vulnerability in front of earthquake
Social and institutional vulnerability	institutional vulnerability	Membership in the NGO and familiarity with their work on disaster management Specific programs to reduce the risk in the neighborhood from the organizations Rate of informing organizations about the earthquake and its aftermath Rate of awareness from organizations and institutions measures on disaster management ?
	Social vulnerability	Ethnic mix Duration of residence in the neighborhood The first action in the event of earthquake The importance of helping neighbors Distribution of age and sex groups Preparation to help each other through institutions Experience aid and relief in disaster
Cognitive and awareness vulnerability		Aware of the damage caused by the earthquake in the community Experiencing a disaster Awareness from the vulnerability of sex and age groups The probability of an earthquake on the people in the coming years
Attitude and motivation Vulnerability		The importance of religion and belief Hope to survive after the earthquake The role of institutions in creating incentives and psychological relief and post-earthquake The feeling of helping others in the community

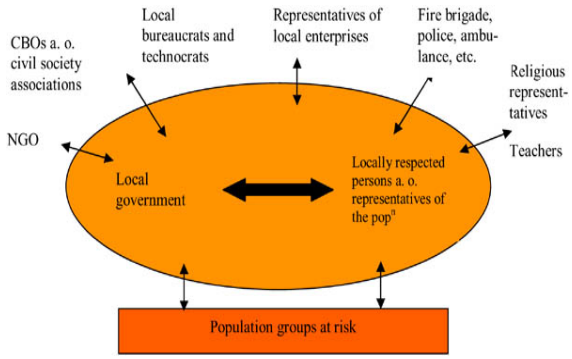

Fig. 1: the relationship between disaster risk management of community actors

Accordingly, the three areas to meet the social development in the field of disaster management as part of the development process, and contribute promoting the communities capacity are included: (Luna, 2009)
Community Education;
Community Organizing;

Community Resources and Disaster Risk Management

Community Education

Community education framework provides to Promote for potential residents and their ability. Community Education is a powerful force for social change to improve social welfare through forming new structures and power relations is achieved (Yodmani, 2001).

Community Education consists of three basic areas and based on these areas explain the indicators:

First, in the area of social values including, important social indicators such as justice, cooperation, sense of nationalism and altruism, sexual sensibilities and general knowledge in relation to understanding risk and its environment;

Secondly, in relation to the consciousness of what is happening in the environment around them;

Third power to enforce the social values and consciousness during the disaster such as skills, mobilizing forces disaster risk management planning, relief and aid and etc. (Table 3)

Community Organizing

Community organizing is the way people by mobilizing specific groups for discussion and debate about their common needs

Table 3. Criteria and indicators for measuring community capacity

Criteria	Index	Questionary Questions
Community Education	Social Value	The rate of resident cooperation during disaster. The information about effect of earthquake or another hazard on economic and social structure. The rate of nationalism and philanthropy during disaster. Information about community vulnerability in front of earthquake. Information about the rate of loses and victims during earthquake. Training to skill promoting to cope with disaster effect through related institutions. Experience of earthquake disaster. The probability of earthquake event and rate of loses in people's opinion.
	Participatory skill	Community skill in aid. Community skill in planning and aid management. Organization planning in skill promoting in disaster management. The rate of literacy.
Community Organizing	CBO[2]	The existing of CBOs in field of disaster management. Tendency to cooperation and involvement in CBOs activity.
	NGO[3]	The most vulnerable group in the community. The existing of NGOs in field of community. Cooperation and involvement in NGOs activity.
	Integrating Organization	Existing of multi-sector organization in field of community. The necessity of existing multi-sector organization to reduce earthquake risk in community on people's opinion.
Community Resources and Disaster Risk Management	Social Service	The robustness of existing infrastructure and social service during disaster. The information about existing social service during disaster. Expecting social service during disaster and their existing their quality.
	Social Economy	The vulnerability of livelihood and engagement structure against disaster. The required time for reconstruction of economic structure after disaster. House ownership. The rate of monthly income.

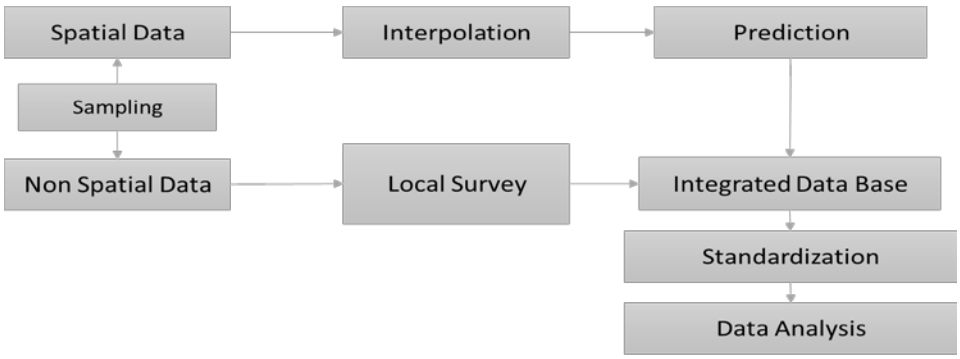

Fig. 2: the Method of preparation of Integrated Database

and expectations in a field. This is a process that involves the following steps may sometimes overlap or while a process is the need to repeat them: (Delica-Willison, 2011; Luna, 2009; Twigg, 2009)

Build integration and unity in the community;

Evaluation and Social Survey;

Diagnose problems;

Create meetings and assign tasks;

Assessment;

Feedback.

Finally, there is the need to create three categories of participatory organizations for strengthening public participation in disaster management activities and coordinate and harmonize these, which include: (Luna, 2009)

Community-based organizations: such as CBO and local councils;

Subject-based organizations: such as NGO and non-governmental organizations and relevant to disaster management activities;

Coordinating organizations: such as government agencies to coordinate activities at the macro level.

This indicator to measure the community and institutions capacity in the area of disaster management has been applied and indicates the existence of multi-sectoral coordinator institutions to monitor the activities of these organizations and the need to recognition of their existence. (Luna, 2009)

Community Resources and Disaster Risk Management

This indicator used to measure the amount of resources and social services, which are available in the community and people are aware of them. Community services is related to resident's knowledge of the disaster, the damage caused of it and also the quality of existing infrastructure in the field of disaster management. Among other resources available in the community that should be examined is the social economy. Situation of housing ownership status, monthly income, and opinions the people and their preparedness in the reproduction of social economy is one of the issues that is examined In general, criteria and indicators to measure community capacity in are described in detail (Table 3).

Case Study and Sampling

Yousef-Abad is one of the neighborhood in district 6 in Tehran. Based on census in 1390, the population of Yousef-Abad is 32985 people and includes 12823 householders. Respondents were surveyed households in the Yousef-Abad. Using field data collection and spatial analysis to study the social component index designed to measure the resiliency of the village was based on random sampling with sample size has been determined. Method of the data gathering and spatial analysis to study the community vulnerability and capacities index was based on random sampling with sample size has been determined.

Different ways of determining the size of the sample: One of the most widely used methods to determine the sample size is Cochran. The study population selected at the district level should be calculated based on the number of households and finally 350 sample points with a confidence level of 90% has been selected to assess the community indexes.

To each of the selected 350 is assigned unique code to integrating spatial data and non-spatial data and create integrated database for bellow applications:

Non-spatial data collection and surveys;.

Analysis of spatial analysis and spatial data mining.

RESULTS AND DISCUSSION

Data analysis is based on statistical concepts and statistical analysis software SPSS. To assess the correlation of data, multiple regression analysis, and path analysis is used to explain the relationship between dependent and independent variables (Table 5).

In this process, urban vulnerability and community capacity defined as dependent variables and each variable have specific independent variable. The target community is Yousef-Abad that is one of a neighborhood in the center of Tehran.

The Cronbach's alpha coefficient was used to assess the validity of the questionnaire was about 0.88 that's acceptable.

The overall process of data analysis is as below:

Table 4. Overall result of one simple T test – Community Capacity

Criteria		t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
						Lower	Lower
Potential Capacity	Community Education	62.950	347	.000	3.095	3.00	3.19
	Community Organizing	46.685	349	.000	2.291	2.19	2.39
	Community Resources and DRM	62.583	348	.000	2.983	2.89	3.08
Actual Capacity	Community Education	119.957	334	.000	4.472	4.40	4.54
	Community Organizing	75.362	349	.000	3.391	3.30	3.48
	Community Resources and DRM	64.739	349	.000	3.774	3.66	3.89
Community Capacity		89.632	334	.000	3.31	2.98	4.01

Table 5.Overall result of one simple T-test - Vulnerability

Criteria	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	
Organizational Vulnerability	100.597	339	.000	3.385	3.32	3.45
Physical Vulnerability	91.074	347	.000	4.310	4.22	4.40
Altitude Vulnerability	88.436	349	.000	2.197	2.15	2.25
Social Vulnerability	97.257	348	.000	2.115	2.07	2.16
Community Vulnerability	91.313	339	.000	3.01	2.12	3.852

Step 1: Interpolation

Based on the GIS capabilities in spatial analysis and according to geostatistical data, the questionnaire data, interpolate in case study region to assess the quality of indicators. This process will also provide data distribution and statistical analysis to predict them. The Fig. 2 shows the method of providing integrated database, based on spatial and non-spatial data.

All community capacity and vulnerability criteria were interpolated based on GIS capabilities. The important point is for precise measure of community capacity it is divided to two part:

Actual capacity;

Potential capacity.

For measuring community capacity and vulnerability, one simple T-test based on SPSS is used (Table 4 and Table 5).

Overall result shows community capacity and vulnerability in almost aspects are lower than average level (score 1= very high to 5= very low).

Another point shows potential capacity in the community is more than actual capacity and it means potential community capacity is in the average level, but actual community capacity is lower.

In total community capacity value is 3.31 and vulnerability value is 3.01 and they are higher than median and it means community doesn't have proper capacity to cope with disaster and its effect and it is vulnerable against disaster.

Sig value is less than 0.05 for one simple T-test and it means that average difference is proper and it can be generalized in all community.

With using of spatial analysis tools, actual and potential community capacity is interpolated in all neighborhood area. Fig. 2 shows the actual and potential community capacity and community vulnerability.

Step 2: Regression Analysis

Regression analysis results indicate that actual community organizing vulnerability and potential Community Resources and DRM has the greatest impact on vulnerability to disaster. For example, in the case of an increase of one unit of community education value, which means community vulnerability reduce the amount of 0.829 unit. This means that with promoting community capacity, community vulnerability is reduced more than other indicators. (Table 6)

It should be noted Community Resources and DRM Sig was higher 0.1 and it means it could not be generalized in the vulnerability equations. Therefore, the vulnerability equation is bellow:

V= Vulnerability

A= Potential Community Education

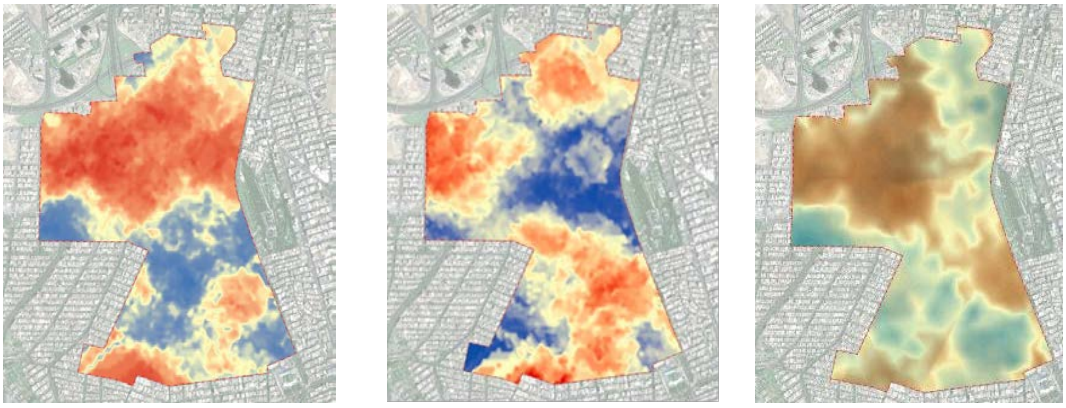

Fig. 3: Right Potential Capacity and middle Actual Capacity and left community vulnerability

B=Potential Community organizing
C= Actual Community Resources and DRM
D= Actual Community Education
E= Actual Community Organizing

According to the survey results in which vulnerability indicators and potential capability and capacity of the residents in the area have been founded all of these measures have showed the direct correlation between the decrease in capability and capacity, and increasing the community vulnerability.

The vulnerability of physical and organizational vulnerability have highest correlation with the community capacity of the residents in front of earthquake disaster. This is important, while the correlation with the community capacity and total vulnerability is about 0.806 that indicates a relatively high correlation between them. It should also be noted that the vulnerability coefficient ratio is about 0.643, which means that community capacities indexes change 64/3% of the variance of community vulnerability that is high ratio and a direct correlation between the two components of this research. Table 7 shows the correlation between community capacity value and community vulnerability components.

CONCLUSION

In contrast to prevailing attitudes about disaster management in the field of science and practice in developing countries, where vulnerability to earthquakes is usually taken only physical vulnerabilities, and offer implementing strategies for preparedness and prevention of severe disaster depends on the physical retrofitting.

Community-based disaster risk management of earthquake regarding other aspects of vulnerability would seriously criticize the prevailing attitudes in the field of disaster management.

This attitude explains different aspects of vulnerability, such as organizational, attitudinal, cognitive and social vulnerability to the earthquake and criticize the vulnerability assessment with only regard to physical Issues. On the other hand, CBDRM believes that reducing the vulnerability to disaster is not only physical strengthening against earthquake and with promoting community capacity deal with the disaster, reducing the vulnerability. CBDRM start reducing vulnerability from social levels and explains the participation methods to minimize vulnerabilities.

The results of the study indicate that the capability and capacity

Table 6 . Overall result of path analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
Constant		.718	.082		8.764	.000
Potential Capacity	Community Education	.104	.029	.192	3.618	.000
	Community Organizing	.068	.025	.123	2.745	.006
Actual Capacity	Community Resources and DRM[4]	.072	.026	.123	2.750	.006
	Community Education	.376	.021	.829	18.218	.000
	Community Organizing	.163	.047	.276	-3.455	.001

Table 7. Relation between community capacity and community vulnerability components

:	R	R Square	Adjusted R Square	Std. Error of the Estimate
Organizational Vulnerability	.548[a]	.300	.287	.525
Physical Vulnerability	.740[a]	.547	.539	.605
Altitude Vulnerability	.430[a]	.185	.170	.426
Social Vulnerability	.398[a]	.159	.143	.363
Community Vulnerability	.806[a]	.649	.643	.296

of the residents in the area of disaster is about 3.33 based on the Likert scale and measures taken in the questionnaire and the analysis of data is more than statistic medians. It's interesting to note in this regard that the capabilities and capacities of the residents in the area of potential is far higher than the actual capabilities and capacities of the residents.

In this study we followed deny or prove the hypothesis of a significant relationship between community capacities and vulnerabilities that according to the analytical processes of the following points should be noted:

Vulnerability is not only of the physical vulnerability but also it is involved by all aspects of a system. So The dimensions of vulnerability are widespread;

To reduce the communities vulnerability should increase community capacity and not only resisting physical factors.

Accordingly disaster Management process should focus not only on strengthening physical aspects but also other topics such as community education, community organizing in the form of non-governmental organizations and community-based ones, and other factors related to the community capacity should be considered.

ENDNOTES

1. Community Based Disaster Risk Management
2. Community based organization
3. Non-governmental organization
4. Disaster Risk Management

REFERENCES

Adger, W. N. (2006). Vulnerability. *Global environmental change,* 16(3), 268-281.

Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (2014). *At risk: natural hazards, people's vulnerability and disasters:* Routledge.

Bollin, C., Hidajat, R., & Birkmann, J. (2006). Community-based risk index: Pilot implementation in Indonesia. *Measuring vulnerability to natural hazards: Towards disaster resilient societies,* 271-289.

Center, A. D. P. (2008). Community-Based Disaster Risk Management.

Cutter, S. L., Ash, K. D., & Emrich, C. T. (2014). The geographies of community disaster resilience. *Global environmental change*, 29, 65-77.

Cutter, S. L., Boruff, B. J., & Shirley, W. L. (2003). Social vulnerability to environmental hazards. *Social science quarterly*, 84(2), 242-261.

Delica-Willison, Z. (2011). Community-Based Disaster Risk Management: Gaining Group in Hazard-Prone Communities in Asia. *Philippine Sociological Review*, 51.

Downing, A. (1997). *Accident costs in Indonesia: A review.* Paper presented at the International Conference on Road Safety, Andhra University, Visakhapatnam, India.

Gaillard, J.-C. (2010). Vulnerability, capacity and resilience: perspectives for climate and development policy. *Journal of International Development,* 22(2), 218-232.

Kasperson, R. E., & Kasperson, J. X. (2001). *Climate change, vulnerability, and social justice:* Stockholm Environment Institute Stockholm.

Lei, Y., Yue, Y., Zhou, H., & Yin, W. (2014). Rethinking the relationships of vulnerability, resilience, and adaptation from a disaster risk perspective. *Natural hazards*, 70(1), 609-627.

Luna, E. M. (2001). Disaster mitigation and preparedness: the case of NGOs in the Philippines. *Disasters,* 25(3), 216-226.

Luna, E. M. (2009). *Community development as an approach to reducing risks among flashflood-affected families in Albay, Philippines*. Retrieved from

Pandey, B., & Okazaki, K. (2005). Community-based disaster management: empowering communities to cope with disaster risks. *Regional Development Dialogue,* 26(2), 52.

Turner, B. L., Kasperson, R. E., Matson, P. A., McCarthy, J. J., Corell, R. W., Christensen, L., . . . Martello, M. L. (2003). A framework for vulnerability analysis in sustainability science. *Proceedings of the national academy of sciences*, 100(14), 8074-8079.

Twigg, J. (2009). Characteristics of a disaster-resilient community: a guidance note (version 2).

UNISDR. (2009). *Terminology on Disaster Risk Reduction United Nation International Startegy for Disaster Reduction.* Geneva, Switzerland: UNISDR.

Yodmani, S. (2001). *Disaster risk management and vulnerability reduction: Protecting the poor:* The Center.

Zhou, H., Wan, J., & Jia, H. (2010). Resilience to natural hazards: a geographic perspective. Natural hazards, 53(1), 21-41.