

APPROACHES TO RISK AND VULNERABILITY ASSESSMENT CAUSED BY EXTREME WEATHER EVENTS

Mária Lusková*

ABSTRAKT

Pochopenie a hodnotenie charakteru zraniteľnosti spoločnosti v prípade extrémneho počasia je základnou informáciou nevyhnutnou pre znižovanie rizika a prípravu na nepriaznivé udalosti spôsobené extrémnym počasím. Článok prezentuje kľúčové faktory zraniteľnosti, vývoj koncepcií zraniteľnosti a model zameraný na hodnotenie zraniteľnosti a kapacity spoločnosti (CVCA) model. V závere sa konštatuje, že všeobecná metodológia zameraná na meranie zraniteľnosti spoločnosti v dôsledku extrémneho počasia zatiaľ nie je stále dostatočne vyvinutá.

Kľúčové slová: zraniteľnosť, extrémne počasie, riziko, kapacita, spoločnosť.

ABSTRACT

Understanding and assessing the nature of societal vulnerability to extreme weather events is a basic information necessary for improving risk reduction and preparedness to extreme weather events. The paper is dealing with brief presentation of the core factors of vulnerability, development of vulnerability concepts and the Community-Wide Vulnerability and Capacity Assessment Model. In conclusion it is stated that a common methodology to measure vulnerability to extreme weather events is not still sufficiently developed.

Key words: vulnerability, extreme weather, risk, capacity, community.

1 INTRODUCTION

Assessing and measuring vulnerability in the context of extreme weather events requires foremost a clear understanding of the vulnerability concepts.

* Mária Lusková, Ing. PhD., Fakulta bezpečnostného inžinierstva, Žilinská univerzita v Žiline, ul. 1 mája 32, 010 26 Žilina, tel.: 041 513 6766, e-mail: maria.luskova@fsi.uniza.sk

The concept of vulnerability has been discussed and continuously developed over the past four decades especially in the fields of development geography, hazard and disaster risk research and climate change science. This term is used very loosely depending on an individual's background and the context within which it is used.

Various scientific communities and stakeholders define vulnerability differently. According to Birkmann (2013), the current literature encompasses more than 30 different definitions, concepts and methods to systematize vulnerability [2].

One of the best known definitions of vulnerability was formulated by United Nations International Strategy for Disaster reduction that defines vulnerability as the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard [5].

It provides also comment that there are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management. Vulnerability varies significantly within a community and over time [5].

2 CORE FACTORS OF VULNERABILITY

The newer vulnerability assessments do not solely focus only on one specific aspect, e.g. susceptibility but they address various factors of vulnerability and their interplay such as linkages among exposure, susceptibility, coping and adaptation. In this context the vulnerability can be defined as a function of three elements:

- exposure to extreme weather events,
- susceptibility to change,
- capacity to adapt to that change.

Systems that are highly exposed, susceptible and less able to adapt are vulnerable (see Fig. 1) [1].

Exposure is the presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural assets in places that could be adversely affected [3].

Susceptibility (sometimes also called sensitivity or fragility) characterizes the predisposition and likelihood to suffer harm when a hazard strikes a community or a system is exposed. Susceptibility is revealed within physical, social, environmental, cultural and institutional dimensions. Even if a community or system is exposed to hazard, this does not necessarily mean that it is high susceptible, since susceptibility refers primarily to the conditions of the community or the system exposed. Susceptibility generally describes deficits and problematic conditions that might

manifest themselves through people's defencelessness due to poverty or the lack of awareness about risks [2].

Adaptive capacity is the combination of the strengths, attributes, and resources available to an individual, community, society, or organization that can be used to prepare for and undertake actions to reduce adverse impacts, moderate harm, or exploit beneficial opportunities [3].

3 EXTENSION OF VULNERABILITY CONCEPTS

The concept of vulnerability has been continuously widened and broadened towards a more comprehensive approach encompassing susceptibility, exposure, coping capacity and adaptive capacity, as well as different thematic areas, such as physical, social, economic, environmental and institutional vulnerability. Figure 1 illustrates extension of the vulnerability concept that contributed to improving the vulnerability understanding.

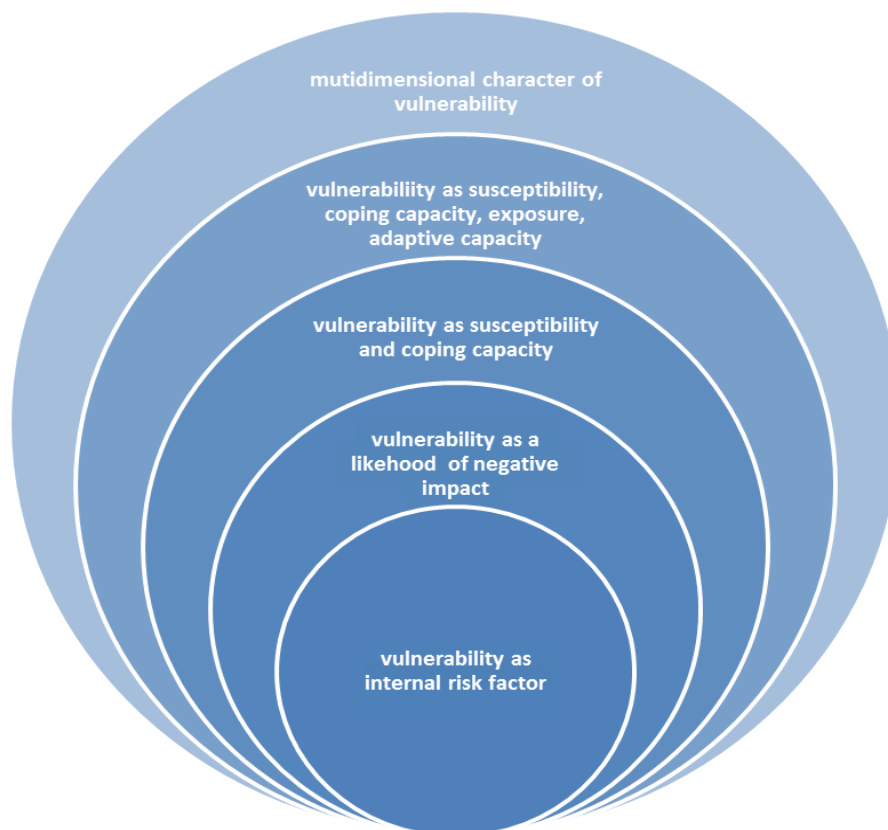


Figure 1 Key spheres of vulnerability (adopted according to [2])

Nearly all concepts of vulnerability in disaster risk research view vulnerability as an „internal side of risk“ and the conditions of the exposed subject or object (its susceptibility) at risk are seen as core characteristics of vulnerability (inner circle in Figure 1).

An extension of this view is definition of vulnerability as the likelihood of injury, death, loss and disruption of livelihood in extreme event and this second sphere of vulnerability is associated with human likelihood of death, injury and loss.

The third circle is associated with the „dualistic structure of vulnerability“ focusing on susceptibility and coping and response capacities of individuals or communities exposed to adverse consequences.

The fourth circle represents extension of the vulnerability from a double structure to a multi-structure focusing on exposure, susceptibility, coping capacity, adaptive capacity.

The last fifth circle underlines the necessity to consider various dimensions of vulnerability, such as physical, economic, social, institutional and environmental characteristics.

4 CVCA MODEL (COMMUNITY-WIDE VULNERABILITY AND CAPACITY ASSESSMENT)

The impacts of extreme weather events do not affect everyone in the same way. Special attention must be paid especially to the most vulnerable groups of people who are usually highly exposed, susceptible and less able to adapt to the occurred situation.

The aim of the CVCA model is to help crisis managers to better understand and so to meet the needs of vulnerable population in emergency situations. This model focuses on the population of a community with the objective to answer the following three questions [4]:

1. Who are the community's most vulnerable people?
2. Where do they generally reside?
3. What is their capacity to respond or recover?

This model consists of 18 steps (Figure 2). A brief description of the single steps of this model is given.

At the beginning a Planning Team, consisting of a multi-disciplinary team of experts that gather relevant up-to-date information according to set parameters, is established (1, 2, 3). This team defines and maps the general population (4), identifies and maps high-density populated areas that usually include the most vulnerable habitations (5). Then the municipality map is divided into operational sectors what enables better understanding and actions during emergency situations (6).

The CVCA Model

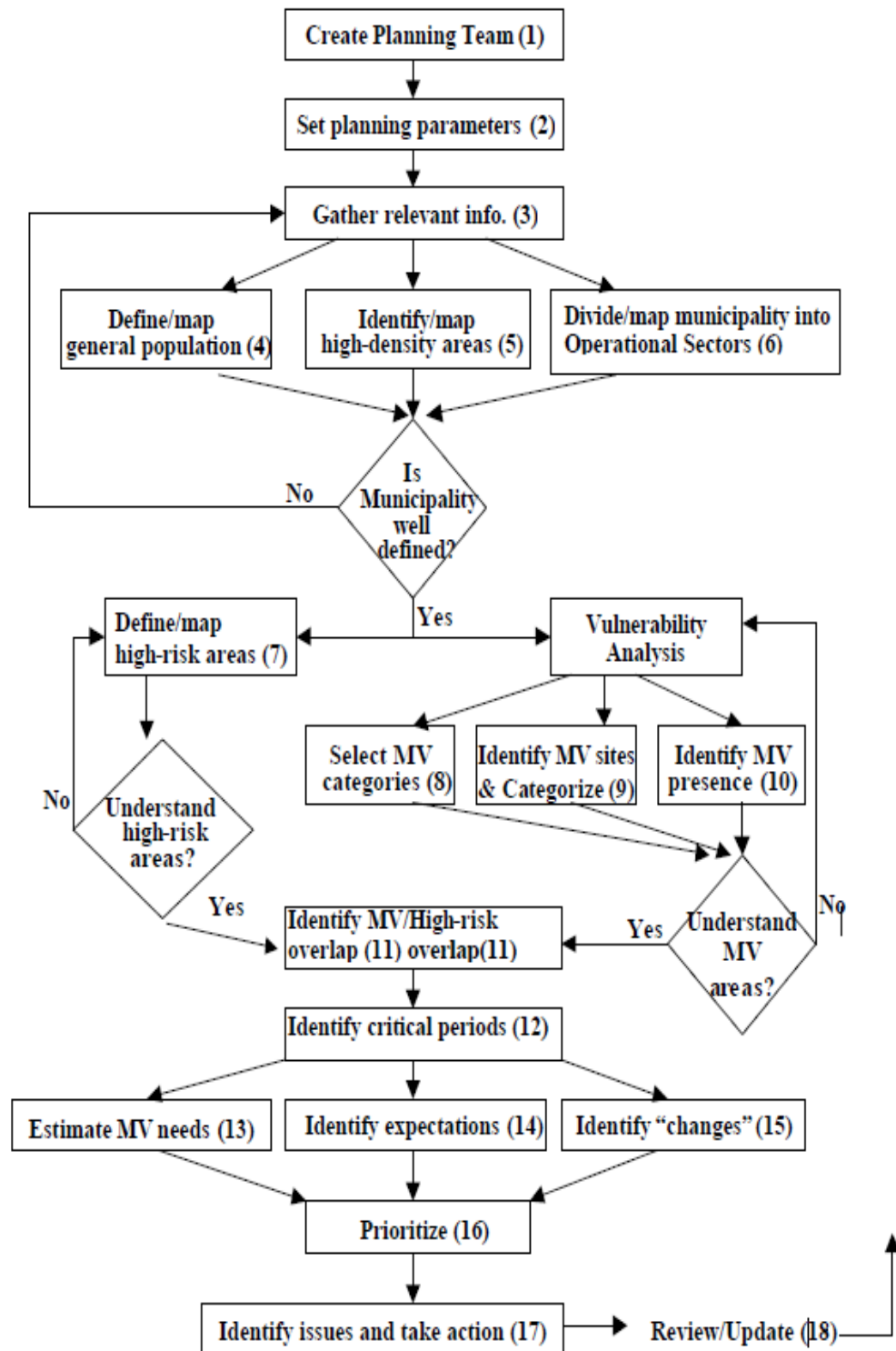


Figure 1 The CVCA model [4]

Another step includes defining and mapping high-risk municipality areas based on the set criteria and considering natural hazards and human-induced hazards (7). Then the vulnerability analysis consisting of three steps is realized. It includes identification of the population groups that are deemed to be the most vulnerable to disasters (8), identification, categorization and mapping the sites related to the most vulnerable groups (9), identification and mapping areas where the most vulnerable groups have numerous presences (10). Another step is identification of intersection of the most vulnerable groups, sites and high-risk areas that results in the markings of the high risk areas (11). Then the identification of critical periods when each group is particularly vulnerable is realized (12). Understanding and setting the emergency needs of the most vulnerable groups in case of emergencies is contained in another step (13). Then a list of the general expectations by vulnerable groups is created (14). Due to population movement it is important to capture the changes in the presence or vulnerability of the most vulnerable groups during a day and night (15). Then the assignment of priority to each municipality sector is realized (16). This priority is considered during planning, response and recovery process. Because the people and their capacity undergo changes it is always necessary to consider further related issues, groups, actions, resources (17). The CVCA process requires to be reviewed once a year minimum (18).

5 CONCLUSION

Measuring vulnerability includes quantitative and qualitative methods to describe and operationalize vulnerability. In literature there are numerous initiatives to measure and assess societal vulnerability but there is still no consistent set of metrics used to assess the vulnerability to extreme weather events and natural hazards and these initiatives usually lack a systematic and transparent approach. Because a common methodology to measure vulnerability to disasters is not still sufficiently developed, it is necessary to concentrate on research how to measure vulnerability to be usable for improving risk reduction and preparedness to natural hazards and how to improve and adjust existing indicator approaches for specific purposes.

This paper was elaborated within the project VEGA 1/0175/14 Identifikácia činiteľov a indikátorov zmien bezpečnostnej situácie v bezpečnostnom prostredí pre potreby projektovania preventívnych stratégií a ich financovanie.

REFERENCES

- [1] Allen Consulting Group. 2005. Climate Change, Risk and Vulnerability. Report to the Australian Greenhouse Office, Department of the Environment and Heritage. Published by the Australian Greenhouse Office, in the Department of the Environment and Heritage. ISBN: 1 920840 94 X.

- [2] Birkmann, J. 2013. Measuring vulnerability to natural hazards: towards disaster resilient societies. United Nations university Press. Tokyo. Japan. ISBN 978-92-808-1202-2
- [3] IPCC. 2012. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Special Report of the Intergovernmental Panel on Climate Change. Field C.B., Barros V., Stocker T.F., Dahe Q., Dokken D.J., Elbi K.L., Mastrandrea M.D., Mach K.J. Cambridge University Press. ISBN 978-1-107-02506-6. [cit. 13 January, 2015].
Available at: https://www.ipcc.ch/pdf/special-reports/srex/SREX_Full_Report.pdf
- [4] Kuban, R., MacKenzie-Carey, H. 2001. Community-wide Vulnerability and Capacity Assessment (CVCA). HER MAJESTY THE QUEEN IN RIGHT OF CANADA (2001). [cit. 13 March, 2015]. Available at: <http://pegasusemc.com/pdf/CVCAreport.pdf>
- [5] UN/ISDR. 2009. Terminology on Disaster Risk Reduction. Available at: http://www.unisdr.org/files/7817_UNISDRTerminologyEnglish.pdf

Článok recenzovali dvaja nezávislí recenzenti.



EDUCATION • SECURITY • SAFETY

www.esecportal.eu



EUROPEAN JOURNAL OF SECURITY & SAFETY

www.esecportal.eu/journal