

THEORETICAL FOUNDATIONS RELATED TO NATURAL DISASTERS AND MEASURING THE RESILIENCE OF THE COMMUNITIES BEFORE DISASTERS HAPPEN- ESTABLISHING PROPOSAL VARIABLES

Aleksandar Ivanov, Dr.Sc

*Assistant professor, Faculty of Security – Skopje,
aivanov@fb.uklo.edu.mk.*

Vladimir Cvetkovič, Dr. Sc

*Teaching Assistant, The Academy of Criminalistics and Police studies, Belgrade, Serbia,
vladimirkpa@gmail.com.*

Srna Sudar

*PhD Student, Faculty of Security – Skopje,
Director of the Regional Environmental Centre in Montenegro, srnass@gmail.com*

Abstract

Design/methodology/approach

The paper is looking for the answer to the fundamental question of natural disasters and their unimpeded existence in spite of man's preferences, their characteristics, some theoretical observations about their consequences, the suitable models for Natural Disaster Management, and, in the end, the Model for measuring the Resilience of the Community according to the place it presents.

The paper is divided into 6 parts: 1. Introduction that observes the basic theoretical ground for the material in the paper followed by the four major parts: 2. Natural disasters; 3. Consequences from Natural disasters; 4. Natural disasters Management; 5. Some considerations about determination of the Variables for measuring the resilience based on the location; 6. The model for measuring the resilience according to the place; and 7. Final observations and recommendations.

The paper follows the qualitative approach. It is based on Literature review the Authors have made i.e. the overview of the theoretical findings on the basic questions and conceptual determination of the meaning of Natural disasters, the consequences of them, their management, and the proposed variables for measuring the resilience according to the model mentioned giving, at the same time, some personal concrete suggestions for amending it.

Findings

Scientific review of the knowledge related to Natural disasters and the proposal of an amended model for determining variables about measuring resilience of the communities according to the place.

Research limitations/implications:

The presented model for determination of the resilience of the communities according to the place should be implemented designing a questionnaire and a conducted

survey. Not having the necessary practical data is, according to us, research limitation. However, this proposal should open a debate in order to formulate a model that will be applicable in the contemporary societies (at least on regional level).

Key words: Natural disaster; Community; Resilience; Sustainability;

Introduction

The environment of the planet Earth originates from a unique combination of factors that created different types of land areas and living forms. The activity of the meteorological, geophysical and hydrological factors are characterized by variation of different amplitude and frequencies which can cause serious annihilation of the equilibrium of a particular ecosystem. The events that cause disasters might occur at the crossroads between the natural hazards and the human society. They can be also the result of the combination and interdependence between the strength of those events on one side but, also by having a vulnerable, unprepared social community on the other. (Cheval, 2012)

There is no doubt that the population living in the particular micro territory has a particular relevance with its knowledge, willingness to share (for the purpose of protecting their own property and their own family), the participation in the preparations as well as in taking part into the activities for the recovery of certain communities from the consequences of a particular disaster.

As far as the Balkans is concerned, i.e. which natural disasters might happen in the future, the authors expect that the biggest chance have earthquakes, droughts and floods. For some regions the most probable natural hazards are the hurricanes and the storms, for some it is the landslides, and for some avalanches and the volcanic eruptions. If you ask the residents of these areas (the Balkans) whether they are expecting these natural disasters to happen they will answer affirmatively. However, the practice shows that in spite of the expectations of these disasters to happen, for example the floods that frequently occur, remains the fact and the strong impression that our societies are vulnerable to these events to the extent to which they can change the living conditions in the most catastrophic way. The basic question remains open: To what extent we can cope with the consequences of the natural disasters and at what cost? How much resistant we are (and not only vulnerable) to the natural disasters, i.e. to what extent we might remain invulnerable if we continue to live in the endangered area? If the saying "victory is based on good preparation" is true, then the preparations for dealing with the consequences of natural disasters are of crucial importance.

About Natural Disasters

A serious systematic way of studying the natural disasters and catastrophes caused by them, as well as possibilities to manage their implications, are approximately about half a century old. The research history of natural disasters since its inception until today has been elaborated to the finest details as evidenced by many papers in this area (see eg. Fritz, 1961; Kreps, 1984; Quarantelli, 1988, 1999; Schorr, 1987, Wright и Rossi, 1981). There have always been attempts of the humanity to handle the consequences from the natural disasters. In the course of time, four paradigms have been cleared: the paradigm of engineering, the paradigm of development, the paradigm of behaviour and the paradigm of complexity (Mileti, 1999:67) The main questions and answers to the mentioned paradigms

were: **the paradigm of engineering** (until 1950 г.) – which are the physical reasons concerning the magnitude and the frequency of the natural disasters and how to ensure the protection against the most damaging consequences? The answer lies in the scientific approach to the weather forecasts and the large structures that are built in order to defend from the natural disasters, especially those who have hydro meteorological origin; **the paradigm of behaviour (1950-1970 AD)** - Why did natural disasters cause death and economic damages in the developed countries and how through the change of the human behaviour people would reduce the effects from the disasters? The answer lies in the improvement of short-term warnings and the long-term planning of land construction, according to which, people may avoid the standpoint that is inadequate for natural disasters; **the paradigm of development** (1970-1990 г.) - why people in less developed countries suffer longer from natural disasters and who are the current, the historical as well as the socio-economic reasons for such situation? The answer lies in the increased vulnerability of man when natural disasters are in question. It contributes to the little, insignificant economic development and political dependency; and **The paradigm of complexity** (from 1990 to this day) – the impact of natural disasters can be reduced in a sustainable way in the future, especially concerning the world's poorest layers of population. In reference to the question of how in the future, in a sustainable way, we can reduce the impact of natural disasters, the answer lies in giving significance to the interaction between nature and society, and improvement of long-term management of natural disasters in accordance with local needs (Smith & Petley, 1991:42).

Quarantelli (Quarantelli, 2005:339), specifically explains the current paradigm regarding the exploration of natural disasters based on two basic ideas. The first one is that elements are inherent social manifestations, while the second one is that they are rooted in the social structure in a manner that they maintain the processes of social change. One of the most important researchers in this area, Alexander (1993) identifies six approaches to the study of natural hazards: a geographical one, an anthropological, sociological, developmental, medical and technical one. The most dominant approaches in the study of natural disasters, particularly after the World War II, have been the geographical and the sociological approach. The geographical approach to the study of natural hazards focuses on interaction that occurs between man and his environment, while the sociological one begins with the assumption that disasters are social events reflecting the lifestyle and the social structure of communities.

When talking about the hazards in theoretical connotation, we must bear in mind that the hazard is closely related to the theoretical understanding of the risks as phenomena. However, the terms risk and hazard are used interchangeably and inconsistently. The various interpretations are the result of the fact that among the managers of Emergency Situations, the managers of risks, people who are doing the urban and the rural planning, the insurance specialists, the meaning of a word has evolved and these terms are now being used in many different ways. According to Pine (Pine, стр. 5) these definitions in its meaning can not even be in conflict. For example, he says that it was not uncommon for the concept of risk to be used informally in terms of an opportunity for a specific profit or simply as an opportunity, while for him in the part related to the Risk Management the meaning is always negative (cited by Jardine и Hrudley). The risk for happening of a disaster is clearly described in terms of probability of occurrence of a particular event within a defined period of time, such as five, ten, or twenty years, or it is marked as a high risk. Pine goes on saying that the risk has a meaning as a hazard (undesirable exposure to harm / injury) trouble (voluntary exposure to injury /

ab), investment (business enterprise) and opportunity (positive connotation - it's worth to try something if it has the potential of making profit). Into a business context the concept relates to the calculation of probability, yet it is primarily associated with uncertainty (Pine, pp. 5-6). It is indisputable that the two terms can not be entirely equalized, however, due to the fact that theoretical background of risks is significantly close to the notion of hazard.

The consequences of natural disasters

The overcoming of the capacity for dealing with the consequences is what makes a specific natural disaster - a catastrophe. Hence, the bigger the capacity and the resilience of the community to deal with the consequences of a certain disaster – the smaller the probability to get an event the form of a catastrophe. The assessment of the role of the communities in different contexts is subject to the research of numerous scientists. About the consequences for the community and the need of being able to assess the consequences speaks Lindell (Lindell & Prater, 2003) and suggests three primary reasons for this: first, the necessary information whether it is necessary other parties to provide assistance; secondly, determination of whether certain segments of the community are affected by the disaster to a greater degree; and thirdly, planners could develop projections for the degree, the possibility and the probability of occurrence of particular catastrophe and those projections to adapt to the design of the space and the infrastructure.

When talking about natural disasters, we are talking about different potential threat to the fundamental variables of the social life of man. This potential for threat depends on the aggregate state of the natural disaster, for example a gas, liquid or solid one. The range of threats defines the number of threatened social units (eg. number of men, homes and businesses), then the probability of occurrence of a particular event, for which the historical experience and the scientific data also play a crucial role.

There is no doubt that the disturbance in the normal way of life, especially contained in the material basis of the contemporary living, creates numerous consequences for human life in the community.

The consequences of natural disasters and catastrophes caused by them are numerous and different. They are, of course, related to the complex nature of man as a psychological, physical and social being. Thus, the disruption of any of these qualities can be understood as a consequence. We're talking about the physical consequences of the disasters (dead, injured persons and damage to property), practices of limiting the consequences of accidents (practice of protecting the community, practices of land use patterns and practices of building), further social consequences from the disasters (psychosocial, socio-demographic, socio-economic and socio-political implications) (Lindell & Prater, 2003, ctp. 177-181)

Stages of Natural disasters management

The people will never be fully protected against natural disasters, for a simple reason that it is very hard, often impossible to know where and when is going to happen the next one (Blaikie, Cannon, Davis, & Wisner, 1994:53). It may be added that this fact of natural disaster can be qualified as "divine". However, in the science and in practice natural disasters are no longer just an "act of God", but also events that are created as a result of human behaviour.

However, what could be done is to learn from the past events and consequently to plan and undertake preparations for appropriate responses in the case of an event of this type. The researchers that deal with the scientific area in managing natural disasters suggest different theoretical foundations and frameworks. This approach makes the definition of management unclear and leads to numerous misunderstandings. However, the analysis of numerous scientific papers about the disasters has made clear that there is a consensus on the reference model for integrated management with natural disasters based on the following phases:

1. *1. Mitigation and preparation of the problem (activities undertaken before the manifestation of a particular natural disaster);*
2. *2. Answer to the problem (activities undertaken during and immediately after the disaster); and*
3. *3. Recovery (activities that follow after the occurrence of a natural disaster).* (Hwacha, 2005; Mansor et al., 2004; McEntire et al., 2002; Hensgen et al., 2003; Faulkner, 2001; Henderson, 2004; Shaluf et al., 2003).

The mentioned phases are inclusive and multidimensional because they are significantly interrelated and intertwined.

In regard to the origin and the manner of endangering, many aspects are important, such as:

- 1) The risk of occurrence of the phenomenon;
- 2) The resistance of the community, i.e. the willingness to bear these risks of a particular type;
- 3) The capacity of the competent authorities (the required versus the one that is available at the moment);
- 4) The damages, as well as the additional endangerment; and
- 5) The Quality of the overall response in the accidents and disasters that happened in the past. (Иванов, 2013, стр. 135).

Some thoughts on setting standards and variables to measure the resistance of the community

The term resilience for the first time is used by Holling in 1973, describing him as: *a measure of the sustainability of the system and its capacity to absorb changes and disturbances while maintaining the existing relations among important variables which characterise particular national territory.* The existence of the natural environment of the human on one, and the socio- economic context on the other hand, are the both general starting points from which the resistance of a particular community is established and defined of their interactive cause - consequential dependency. As part of this effort of writing about resilience we accept the definition of Cutter et al. According to him: *the resilience is defined as the capacity of the system to absorb disturbances, and the same immediately to be able to reorganize later in an entirely functional system* (Cutter, и др., 2008, стр. 599). (I dr. at all, no, za zhal, ne mozhev da go vnesam!)

In theory familiar approaches for determining the resilience of the communities against natural disasters, are known, especially in the purpose of avoiding a catastrophe. Consulting several authors (Klein et al., 2003; Cumming et al., 2005; Berkes et al., 2003; Plummer and Armitage, 2007) Cutter (Cutter) lists several known models. Thus, he cites the concept of Panarchy framework which is described as a hierarchical structure in which the natural and human systems have been interconnected in continuous adaptive cycles of

growth, accumulation, renewal and restructuring. These cycles are happening in certain ecological, temporal and spatial frames of movement and generally occupy very small part of both time and space, taken in general. Within this business model and the processes are interconnected in time and space (Cutter, et al., 2008, pp. види повеќе 601-602). (vidi poveke see more!) In theory resilience has two qualities that are referred to as explanations: the quality which is innate / typical on one hand; and quality that is adaptable (which means flexibility in responding to events during a particular catastrophe) on the other. Within these explanations of exceptional importance are: the infrastructure - its strength, the surplus of funds, resourcefulness and the rapid - reducing the probability of failures (Bruneau, et al., 19).

The resilience of the community is uninterruptedly associated with the general state of the environmental welfare as with the treatment of its resources. Hence the concept of sustainable development is central theme in the studies and considerations for the resilience. Within the framework of the concept of natural disasters, the sustainability is defined as an ability for "tolerating and overcoming the damage, the decreased productivity as well as the decreased quality of life from in extreme events without significant assistance from outside" (Cutter, и др., 2008, стр. 601). According to Wisner, the environment that practices unsustainable practices can suffer major damage.

To identify and measure the resilience of a particular community we have to determine variables for such measurement. Unquestionably that the social wealth, taken as a whole, is one of the most important variables for determining the resilience of natural disasters and other causes (eg human negligence). The social wealth, expressed as a gross domestic product has an exceptional importance because it speaks of the capacities of a certain society. For example, in Macedonia in the XX century are registered five major floods in the years: 1916, 1935, 1937, 1962 and 1979. In 1979 the assessment is that the amount of the damages from the floods are 10% of the national income of the Republic, which is exceptional for any society, and therefore definitely we can assume that the resilience of that particular community has been exceeded. Most common variables that have an essential importance for the community economic regard are: *the savings, the average net income per employee, the total social wealth, GDP and the gross national income*. In this sense, can be assumed that Japan would not handle so "elegantly" with the Fukushima disaster, one of the greatest catastrophes in humanity, if it had not been one of the most developed countries in the world in an economic sense. The earthquake in Haiti that occurred earlier on January 12, 2010, manifests that. The example of Chile is also very impressive. Namely, in Chile regularly happen earthquakes with a magnitude of 7, 8 degrees on the Richter scale and maybe more. However, the resilience of Chile is extremely high for these natural disasters and can be said that the system is functioning there completely and without interruptions.

Regarding the determination of the resilience of exceptional importance is the temporal distribution of the events, in the case of accidents. For example, the hurricanes or earthquakes require immediate response without delay. In this sense, we have to establish the variables for resilience that are of significant importance for the evacuation plans, the level of aseismicity of the existing buildings, shelters and so on. Some other accidents, such as the increase of sea levels, droughts, diseases, hunger do not require an immediate and rapid response such as the earthquakes. In these cases, the indicators will be different, such as for example, constructed irrigation systems, drainage canals, level of workability

of the soil taken against the soil erosion, the rate of immunization of the population and so on.

Model of measuring the resilience according to the place/location

The conditions preceding a particular natural event, which may have led to catastrophe, presents the starting point of this model. They result from the specific physical and determined multilayered processes that take place within the social, natural and constructed environmental systems. The conditions that precede include inherent resilience and inherent vulnerability (Cutter, и др., 2008, стр. 602). There are several characteristics that influence the vulnerability, or only the resilience of a particular community. On the other hand, there are certain social characteristics that influence both the vulnerability and the resilience of a particular community (socio-economic status, education and state of insurance, for example).

The previous conditions (prior to the accident) combined with the characteristics of a hazardous event result in immediate effects. These features include (frequency, duration, intensity, size, initial volume of the event), which in turn affect the reliability with respect of the type of danger and the location of the investigated area.

The overall hazard from happening to a disaster represents a calculation of the following variables: the conditions that precede the event, its characteristics, and the risks for handling. The overall local impact could be driven depending on the capacity for admission. The reception capacity (absorptive capacity) the ability of the community to suffer the implications of a particular event using predetermined answers for facing/dealing.

Community capacity might be exceeded in two ways: firstly, if the hazardous event is so big that exceeded the local capacities; and secondly, if the event is less catastrophic, yet the existing capacities for response are insufficient for dealing with the impact, and therefore the capacity of the community coming in condition that goes beyond its capacities creating conditions for disaster.

The degree of recovery can be high and low, with the prospect of tendency between these maximal levels. In fact, if the capacity of the community does not overcome, automatically one can expect a higher level of recovery. The level of recovery on one hand, and the acquired knowledge through potentially adaptable process of resilience on the other, influence the situation in the social, the natural and the constructed ecosystems and also affects the anticipated, previous state before the event had happened. For example, if after a landslide we do not replant wood surfaces, the probability of occurrence for a new landslide is higher, thus affecting the current reaction to cause negative tendencies and future expectations.

Most techniques for assessment are quantitative and use selective indicators, et. as associated variables, because it is often difficult to determine the resilience in absolute number without the comparative analysis that would be done to confirm the results. In order a particular characteristic to be considered as an indicator it should possess some features, such as: validity, sensitivity, reliability, verifiability, range, availability, accessibility, simplicity and relevance(Cutter, и др., 2008, стр. 603. Цитирано според: Birkman, 2006b, de Leon and Carlos, 2006). (citirano spored quoted from!) When we establish the indicators for resilience in fact we seek answer to the questions: a resilience of what and resilience to what? As Cutter (Cutter and all) says,the conditions that determine the resilience are dynamic and they ultimately change in a sense of spacel, social

and temporal terms. A society could be resilient to environmental hazards in a time scale (e.g. transient phenomenon such as bad weather) as a result of measures taken to mitigate the effects, but also not to be resistant to other (eg durable processes such as the climate change).

Below we present a table with variables, that should be, we consider, determined in order to precisely determine the resilience of a particular community. In the second column are the proposals for improvement, according to us, of Cutter, while in the third column are our own suggestions. We believe that by appropriate quantification and measurement of the values related to these variables substantial data can be obtained in order to assess the resilience.

Of course, the above mentioned variables are subjects to discuss in science. In a practical sense these variables need to pose questions that should be answered.

Table 1 Proposed variables for determining the degree of resilience of the communities according to the space.

Dimension	Draft variables according to Cutter¹ (Cutter, и др., 2008, стр. 604)	Our proposal for amendment
Environmental	<ul style="list-style-type: none"> - Area Of swamps and lost of them; - Rates of erosion - % Of impermeable land; - Biodiversity; - # constructions along the coast for defense 	<ul style="list-style-type: none"> - Total area of the respected space; - Climate conditions; - A history of natural disasters; - Processed surface; - Area covered by forests; - Totally renewable water;
Social	<ul style="list-style-type: none"> - The demographic (age, race, gender, employment, social status); - Social networks and social incorporation; - Relationships community values; - Religious organizations; 	<ul style="list-style-type: none"> - Degree of urbanization of the area (percentage of urban and rural population); - Density of population; - Political system;
Economic	<ul style="list-style-type: none"> - Employment rate; - Poverty threshold; - Social wealth; - Finances of the Municipal Organization / taxes rate income. 	<ul style="list-style-type: none"> - Gross savings of the population expressed as a percentage of GDP; - Gross domestic product per capita; - Distribution of equality of distribution of social wealth Gini index).²
Institutional	<ul style="list-style-type: none"> - Participation in the programs to reduce the hazards; - Plans for reducing the hazards; 	-

¹Преземена колона.

²<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2172rank.html#sz>(пристапено на 02.03.2016).

	<ul style="list-style-type: none"> - Emergency services; - Urban planning and building standards; - Plans for emergencies; - Mutually connected in network; - Continuity of operational plans. 	
infrastructural	<ul style="list-style-type: none"> - Key roads and critical infrastructure; - Transport network; - Inventories and age of residents; - Trade and they production facilities. 	<ul style="list-style-type: none"> - Telephone connections (Fixed and mobile lines).³ - Number of internet connections;⁴ - Radio frequencies;
social competence	<ul style="list-style-type: none"> - Local understanding of the concept of risk; - Services of giving advice; - Lack of psihopatologies (drugs, alcohol, domestic violence); 	<ul style="list-style-type: none"> - Active NGOs trained in assistance, disasters, accidents and catastrophes;
Technical and scientific technological development⁵		<ul style="list-style-type: none"> - Degree of application and practical Using of GIS; - Availability of laser technologies for measuring the earth's surface and other geological processes; - Stations for monitoring in all regions of the Earth;

7. Concluding Observations

The usual way of life of man today is increasingly linked with the calculation of risks, as well as to the probability of occurrence of certain events. The technical - technological development of mankind, slowly but steadily suppresses the factor - man. As society ever more we think that someone else will do the job and is going to "clean up our backyard". Under cleaning the backyard here we suggest on the healthy preparedness and the expectation for the probability that unwanted events causing consequences for the life of humans –may easily happen.

Natural disasters as uncontrollable, and more recently, events which are increasingly associated with the way of the life of man, have happened and will continue to do so. It remains to us to be prepared to face the consequences without losing a significant portion of our quality of life. In either case we have to be familiar (people, for instance, that make decisions and those who execute them) with the actual situation related to the fact that we are exposed to hazards. We also need to establish how much we are able to recover after a

³[https://www.cia.gov/library/publications/the-world-factbook/rankorder/2151rank.html#sz\(02.03.2016\)](https://www.cia.gov/library/publications/the-world-factbook/rankorder/2151rank.html#sz(02.03.2016)).

⁴<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2184rank.html#sz> (пристапено на 02.03.2016). (accessed on March, 02, 2016)

⁵Ново предложена варијалба од авторите на овој труд. (a brand new variable suggested by the authors of this paper)

specific event. The global community in the decade behind us with the Kyoto Protocol dedicated itself to vulnerability or its reduction thus stressing the importance of these hazards.

In the paper we call on active scientific discussion about the consequences of the natural disasters/accidents/hazards in terms of: physical injury, practices of a preparedness to respond to dangerous situations, social consequences, psychosocial consequences, socio-demographic, socio-economic, political and other types of consequences for the life of man as a psychosomatic and a social being.

The planning of the way how to react during an event of disaster caused by natural hazards/accidents, the involvement of the local community, the spatial planning, the educational level of the population in the community in terms of responding to natural disasters causing catastrophes, represent essential elements that proportionally affect the resilience to these unwanted events.

In terms of practical implications, we believe that the brand new proposal variable called "Scientific technical - technological" is going to support and extend the draft measurement system on the resilience proposed by Cutter et al.. Thus it will support reliability of measurement of the resilience in a particular community. We also believe that the amendments within the other variables (environmental, economic, social, infrastructural and social competence) are going to contribute to building a higher model of measurement.

Next we must, on the basis of this model, prepare a questionnaire in which all these "general" or "specific" set of facts will be built into thus bringing them by a practical and longitudinal survey in a situation of measurement. In this way its findings and derived from them conclusions and recommendations will contribute to increase the resilience of the local communities. And there is no other choice for us. Natural disasters continually happen and will happen in future.

BIBLIOGRAPHY

- Bruneau, M., Chang, S., Eguchi, R., Lee, G., O'Rourke, T., Reinhorn, A., . . . von Winterfeldt, D. (19, 4). A framewrok to quantitatively asses and enhance the seismic resilience of communities. *Earthquake Spectra*, стр. 733-752.
- Cheval, S. (2012). *Natural Disasters*. (S. Cheval, Ур.) Rijeka: InTech.
- Cutter, S. L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., & Webb, J. (2008, July 29). A place-based model for understanding community resilience to natural disasters. *Global Environmental Change*, стр. 601.
- Dilley, M. R. (2005). *Natural Disaster Hotspots: A Global Risk Analysis*. Washington, D.C.: World Bank.
- Jha, K. M. (2010). Natural and Antropogenic Disasters: An Overview. Bo K. M. Jha (Ур.), *Natural and Antropogenic Disasters (Vulnerability, Preparedness and Mitigation)*. New Delhi: Springer & Capitol Publishing Company.
- Lindell, M. K., & Prater, C. S. (2003, November 1). Assessing Community Impacts of Natural Disasters. *Natural Hazards Review*, 4, стр. 176-185.
doi:10.1061/(ASCE)1527-6988(2003)4:4(176)
- Marlene, B. C. (2007). *Notable Natural Disasters*. California: Salem Press, Inc.
- Mijalković, S., & Cvetković, V. (2013). Vulnerability of critical infrastructure by natural disasters. In Z. Keković, D. Čaleta, Ž. Kešetović, & Z. Jeftić (Eds.), *National critical infrastructure protection, regional perspective* (pp. 91-102). Belgrade: University of Belgrade – Faculty of Security Studies
Institute for Corporative Security Studies, Ljubljana.
- Pine, J. C. (2009). *Natural Jazards Analysis Reduction the impact of Disasters*. Boca Raton; London; New York: CRC Press Taylor & Francis Group.
- Pissano, F. (1997). *The International decade for Natural Disaster Reduction (IDNDR): A safer world for the twenty-first century*. (Spiteri, Ур.) Rotterdam, Netherlands: A.A. Balkema.
- Roy, A. (1982). Suicide in chronic schizophrenia. *British Journal of Psychiatry*,, 171-177.
- Stoltman, J. L. (2007). *International Perspectives on Natural Disasters: Occurrence, Mitigation, and Consequences*. Dordrecht: Published by Springer .O. Box 17, 3300 AA .
- Todorović, Z. (2009). *Institucija ekološke bezbednosti*. Beograd : “Zadužbina Andrejević“ .
- Ацески, И. (2000). *Социјална екологија*. Скопје: Филозофски факултет – Скопје.
- Дуцић, В. М. (н.д.). Географски фактори настанка шумских пожара у Делиблатској пешчари. *Глобус*, 38(32), стр. 275-290.
- Иванов, А. (2013). *Заштитата на животната средина во остварување на безбедноста во Република Македонија (теоретски, нормативни и институционални аспекти)*. Скопје: Факултет за безбедност - Скопје.
- Лазаревски, П., Горгон, Н., & Талески, М. (2010). *Национална платформа на Република Македонија за намалување на ризици од несреќи и од катастрофи*. Скопје: Центар за управување со кризи.
- Малиш Саздовска, М. (2010). Еколошка безбедност – состојби и предизвици. *Безбедност, еколошка безбендост и предизвиците на Република Македонија* (стр. 199). Скопје: Факултет за безбедност – Скопје.