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D. GOVERNANCE AND SUSTAINABLE DEVELOPMENT

SAFETY STANDARDS OF EDUCATIONAL INSTITUTIONS – CASE STUDY OF THE HIGH SCHOOL IN BELGRADE

Borjan Brankov[22]; Marina Nenković-Riznić[23]; Mila Pucar[24]

Abstract

Based on the previously adopted strategies and laws on international and national, Serbia is approaching to the implementation of standards on the risk reduction and control of the climate change on the acceptable level. The cities could be considered a place with strong vulnerability, so the special attention must be provided in ensuring the resiliency of social infrastructure. Educational institutions are part of the secondary level of social protection in cities whose operation is necessary in terms of natural disasters.
The paper will present the methodology in the area of risk management and assessment of educational institutions on the case study of High school in Belgrade and answer the questions - how the functionality of the facility can be obtained/improved, based on the improvement of the safety standards and how the standards could incorporate parameters that could be recognizable in the existing building overview and use?

Key words: *Safety standards, educational institutions, resilience, cities, Belgrade*

Introduction

Urban resilience represents a relatively new topic in the area of urban and spatial planning, having in mind global nature and man-made potential hazards in the last 20 years. Hazards derived from the nature or anthropogenic factors can cause socioeconomic (possible human losses, damage to property and the economy including the destruction of infrastructure), and environmental repercussions [2].
Resilience from this urban point of view refers to the ability to absorb, adapt and respond to changes in an urban system [1], [2], [3]. More frequent extreme events such as floods, droughts, strong winds and very cold periods with increased snowfall require an examination of the vulnerability of settlements and the existing building stock in Serbia. Additionally, new adaptation models should be proposed

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for existing and newly constructed buildings, in order to withstand such challenges. A multidisciplinary approach is necessary for such proposals. Planners and architects are expected to expand their knowledge of the topic, as well as collaborate closer at the local and regional level [4]. Vulnerability of urban system is especially noticeable in the social infrastructure, within which schools and hospitals are of special importance, is an integral part of city resilience [5, 6].

The World Disasters Report 2017 and in 2018 states that there are increasing number people in urban areas in low- and middle-income nations are susceptible to high levels of risk generated by rapid urbanization, poor governance at the local level, unprecedented population growth, and poor health services [7]. There is a strong recommendation that all governments and humanitarian organizations should invest more in community resilience and local response capacities before disasters and other crises, and also to support for resilience building, including, where possible, through incorporating relevant activities into emergency operations, supporting National Societies to strengthen community resilience, and supporting the development of legislative and policy frameworks for climate-smart disaster risk management [8].

In terms of international strategy in the field of resilience and proven and further potential risks to built environment, the Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted in 2015 [9], which set long-term goals and assessed the effects of the previous Hyogo Framework (168 signatories, including Serbia) [9]. The Sendai framework also treats schools and hospitals as one of the most vulnerable infrastructure objects in cities and provides a set of measures for obtaining and improving existing resiliency. In the last 20 years, the territory of the Republic of Serbia has been directly threatened with risks of different origin - from anthropogenic (industrial, war, etc.) to natural (earthquakes, floods, etc.). The level of awareness of its citizens in terms of hazard has proven to be satisfactory, but that the system of responding to property security is still lower [10]. Considering that it is of utmost importance to properly address the risk assessment especially in school facilities.

Materials and methods

The well-being of population in special conditions caused by hazards can and must be preserved, among other, through the issue of critical infrastructure. Context of Europe has made, considering the legislative framework, the European Directive 2008/114/EC that defines critical infrastructure as an asset, system or part thereof located in the Member States that is essential for the maintenance of vital societal functions, health, safety, security, and the economic or social well-being of people, the disruption or destruction of which would have a significant impact on a Member State as a result of the failure to maintain those functions [11]. More important is the maintaining the specific social infrastructure in each country, on the base of the directive above, with its own national regulations that define these issues in more detail manner and more context related.

Although, hospitals are often featured as one of the most relevant parts of social infrastructure schools and other educational facilities also play an important role

during disasters, as they provide "lifeline" services that can minimize the impact of disasters on the community especially for longer periods of time [6, 12, 13, 14, 15]. Therefore an efficient disaster management is considered an essential way for schools to be part of and supply continuous services during disasters, even if the schools are directly affected by the disaster [16].

Schools as part of critical and dynamic infrastructure

The construction of schools represents a significant area of construction in total. Several factors are significant for their construction: climate conditions, disaster risks, available construction materials, cultural context, engineering and geological specific conditions etc. All of these factors directly or indirectly influence the later permanence and safety of school buildings to natural or anthropogenic influences. When the frequency and distribution of extreme climatic events is rising, school facilities become places exposed to earthquakes, fires, floods, landslides and other natural phenomena. A number of world-wide programs funded by the World Bank (WB), various United Nations projects, have been a drive for the better construction/adaptation of school facilities in accordance with the principles of risk reduction. In addition to preserving lives, enabling a sustainable economy and reducing damage to the facilities, determining the degree adaptability/durability in accordance with recommendations given through different methodologies can increase the security of not only the facilities, but the entire city as well [11]. Namely, a number of studies have found that in cases of natural disasters, school facilities (together with hospitals) have priority to be put into service, taking into account the fact that, in cases of incidents of catastrophe, their capacities are made available as centres for the placement of the disadvantaged population.

The vulnerabilities of a school differ based on the types of hazards and their expected intensities and frequencies of occurrence. Vulnerability categories can and should address the conditions of the building, its components and materials, the foundation, the ground composition, site characteristics and potential hazards posed by the surrounding environment [17]. When taken generally there are two perspectives in which vulnerability can be viewed: (1) the amount of damage caused to a system by a particular hazard (technical or engineering sciences oriented perspective – dominating the disaster risk perception), and (2) a state that exists within a system before it encounters a hazard (which uses vulnerability as a starting point for risk reduction) [18]. Methodology further considers ways for addressing the mentioned vulnerabilities.

Risk assessment in school facilities is conducted usually for four types of hazards: fires, floods, earthquakes and storm winds. Tools can be in different formats, from plain paper review to a set of indicators created to be manipulated for each area under analysis [19]. The information can be ranked to determine the importance and degree of preparation of the facility needed for possible disasters. Due to a question of technical preparedness and number of the personnel that conducts the safety check jointly with the question of financial matter, each risk and its detail can not be completely analysed. By focusing not only on awareness, but also funds for a

comprehensive risk assessment, institutions can channel funding and resources to the most vulnerable aspects in their regions.

Methodology presented by the International finance corporation ranks of risks up to 5 levels: 1) Very high risk - These risks are classified as primary or critical risks and require immediate attention. They most often have a high degree of probability of happening and the potential consequences are such that they must be treated as the highest priority. This can mean that strategies need to be developed to reduce or eliminate risks and reduce risks through planning and exercises for these types of hazard. Priority is given to planning for a specific case rather than a general approach; 2) High risk - These risks are recognized as significant. Their probability of occurrence may be more frequent or less possible, however, the consequences these products produce are more serious. Developing strategies to reduce and / or mitigate risk is carried out through general planning and exercises with the establishment of regular control and monitoring; 3) Medium risk - These risks are less significant and their effect is less intense in a shorter period of time. These risks should be monitored to see if they are adequately managed and it is important to take into account general risk response planning; 4) low risk - These risks have low likelihood of happening and consequences of a small impact; 5) very low risk – almost no impact at all. They need to be managed through lower-level planning and require a lower degree of monitoring and control (in case of a change in frequency and the extent of the operation of such risks must be reclassified) [20]. Risk assessment matrix combines above mentioned risk levels including the factors that describe the risk: human (deaths, injuries), physical (damage to buildings or equipment), Socia Cultural (disruption of the community), economic (cost of repair or replacement), environmental (loss of natural resources or habitats), physiological (lost continuities, hope etc.) and educational (disrupted services, quality and other). Impact severity includes the range of minor (1) to terminal (5) severities. Matrix can be made when multiplying the risk of hazard to probable severity, which can show the probability level of hazard occurring and its priority in school facility. Result for 1-8 is for low probability, 9-14 for medium and 15-25 is for high risk of happening with big impact on infrastructure and human casualties [20].

Different studies and good practices around the world show various spectres of impact and risk in school facilities ranging for building physical state to education o economic disruption. However when the methodology for schools is compared to HSI methodology used for hospital, the focus on the countries in development especially, considering Serbia among them, is focused on the three main pillars Structural safety, non-structural safety and emergency management [21]. These three pillars are directly responsible for the all other damages and risks that occur in the school facility. Other important advantage of this is that all three can be physically observed and check listed in the existing school facilities.

The City of Belgrade is one of the cities that has expressed a desire to take a systematic approach to addressing urban environmental challenges [4]. Having in mind that Serbia and its capital Belgrade have high number of existing schools with 50 years of usage or more with less safe safety measures in some aspects. In last 20 years number of schools that were built is still in a lot less comparing the usage of the old ones. Because of that focus of the safety methodology for safe schools in

Belgrade should focus on existing building and as a possible guide for new ones. Belgrade, as a capital of Serbia, has 87 state and 16 private high schools in its administrative area. Part of the included schools are specialized schools [22].

Safety index methodology in schools

Using methodology based firstly on the Hospital Safety Index (HSI) by Pan American Health Organization and later adapted for other social infrastructure, can significantly show weak points and improve resilience of educational facilities in emergency situations [21]. Evaluation through the safety index is a methodology for the fast and relatively economical evaluation of the functional capacity of a school. It can be used for small capacity buildings, but also can be used for assessing the numbers of facilities, for example for the facilities in whole country or similar. Usage of the safety index it not only easily estimates the functional capacity of a school during and after an emergency, but it also provides ranges that help authorities determine which schools most urgently need actions to improve their safety and functionality.

The evaluation is carried out using a basic group of criteria that is diversified into 2 forms: 1) general information of a school, and 2) the safe school checklist, divided into 4 modules: Module 1: Hazards affecting the safety of the school, the role of the school in an emergency and disaster management; Module 2: Structural safety; Module 3: Nonstructural safety; and Module 4: Emergency and Disaster Management. Each of these modules contains a set of questions for evaluation, whereby the risk is quantified based on the magnitude of impact on the safety and capacity of the educational facilities, as well as the probability of a risk occurring [21]. The structural safety of the school involves assessment of the type of structure and materials, and the previous exposure to natural and other hazards. Nonstructural Safety refers to Architectural safety, Infrastructural Protection, Access and Physical Security, Critical Systems and Equipment and Supplies. The Emergency and Disaster Management (the functional capacity) considers the level of preparedness of a school's organization, personnel and essential operations to provide patient services in response to an emergency or disaster [23].

The transformation to a more efficient future is a slow process which requires both major financial investments and time. It is therefore important that at the outset, the cooperation between the public, private and academic sectors is combined with the expertise in the use of state-of-the-art technologies [24]. One of the greatest challenges to retrofitting efforts is a lack of understanding of the excellent results it can produce. One very effective means of conveying the benefits of retrofitting is through demonstrations [17]. Structural and site assessments can be valuable learning experiences for school communities. Clearly indicating and explaining the weaknesses and strengths of the school buildings can provide useful criteria for evaluating homes and other buildings within the communities. The creation and dissemination of pictorial guidelines that illustrate these vulnerabilities and feature simple strengthening measures can help to spread hazard resilient building practices from the school into the communities in examples in Asian countries [17].

Focus on assessing the state of the school facility which is prior to any of hazardous events. In that sense the methodology and guide of the international finance corporation focus also on reacting in the specific hazardous event and HSI methodology shows the potential and weakness of the building prior to the extreme event and it necessary improvement.

Conclusion

Resilience of cities in times of increased disaster risk and possible measures of their adaptation to disasters often caused by climate change are based on the basic principles of quality design, building techniques, responsible managing and it also which includes a series of safety measures and actions that must be continually developed, adapted and applied in different fields. Multiple aspects of safety of schools, among others, include legislative, social, economic and technical, and require adequate managing due to numerous overlaps.

The primary challenge for the realization of safe schools is the inadequate existing infrastructure in many disaster prone areas and the lack of clearly defined obligations and liability mechanisms, as well as the lack of a risk assessment methodology. An additional problem is the lack of adequate regulation, strategic guidelines and ultimately the political will to address this type of problem. Also, in cases where risks are less likely to occur, the efficiency of the risk management services also decreases. In this regard, the risk factors as well as the responses to them are unique for each individual case. The risk characteristics are different and differentiate according to type, intensity and frequency. The degree of vulnerability and capacity of school facilities to respond to risks are also different. Taking into account these variables, a single set of instruments cannot be created or a unique methodology for risk management in school facilities. Although creating the methodology for specific facilities is nor simple nor money efficient it is highly recommendable to try to adapt the global and general methodologies to local context and local personal capacities which can result to better use and better disaster risk reduction in practice.

One important observation for the methodologies that appear on global levels including HSI methodology is the importance of including the specialist in the evaluation process. Although sometimes it is the case that structural engineers and other similar practices are not available in that numbers to cover all needed targeted facilities, making the guides or methodologies that are oversimplified to address the needs and means of school personnel and their capacity. Sometimes the result can be lack of attention for the biggest problems in buildings structural of non-structural safety. Considering that methodology proposed for Belgrade school facilities should be used with specialized personnel to prevent minor or major mistakes.

School disaster management is one of the most important parts of addressing the safety actions in school facilities in Belgrade. Awareness and adequate bodies in schools can improve and specifically address the future evaluation of the buildings, infrastructure and possible education of the students about their enrolment and behaving in case of hazardous events.

In this methodology, possible new parameters which were not included in standard evaluation should be taken into account, in order to establish correlation between hazards and the role of the school in the emergency and disaster management. In addition, the guidelines should be give also through the Action Plan in educational facilities.

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