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RISK MANAGEMENT ANALYSIS IN A WORST CASE SCENARIO: AN URBAN EXAMPLE

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Abstract: *Risk Management in about safety, reduced consequences, customized strategies and perfect action plan. National or international level, it is important to have a strategy in case of risks fatidic manifestation. This implies information on regional specificities and vulnerabilities, understanding potential risks and managerial processes. In view of these aspects, the present paper focuses on the analysis of risk management considering a worst case urban scenario. It aims to find answers to questions related to urban potential to absorb shocks, resist, adapt and transform. In particular, a case study captures weaknesses of local transport infrastructure and provides basis for the design of risk management.*

Key words: *risk management, urban resilience, roads, bridges, strategy*

1. Introduction

The Risk Management is a topic of high interest and also subjected to high debates, since people all around the world are exposed to devastating natural disasters that show every time ”no one can`t mess with nature".

International statistics talk about a dramatic increase, by 93%, in the last 40 years, of risks but also for the number of people living in risky areas. Analyzing the incidence of natural disasters using satellite observation data, based on 40 years of exposure, have been identified six major natural hazards: earthquakes, volcanoes, tsunamis, tropical cyclone storm surge, tropical cyclone wind and floods.

The distribution of hazards around the world is inequitable, certain regions being more affected than others. Countries like USA or Japan restructured their policies, plans and strategies in risk management, invested time, effort and money to reduce the consequences of these phenomena. On the same trend, European Union (EU) also created joint strategies and action plans like Hyogo Framework for Action, *”Managing risks to achieve resilience*”, or a ten years plan on *”Building the resilience of nations and communities to disasters”*.

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Statistics mapping the hazard risk at national level situate Romania on a 82nd position, in a total of 173 countries, with high risk of natural disasters. According to the same source, Romania is placed on the 4th position in Europe regarding the natural hazard risk, surpassed only by Albania (38th position at Global Level), Serbia (66) and Greece (72).

Romania position in European ranking of exposure to hazards is confirmed by annual hazards manifestation, but mostly by several dark historic events of natural disasters, like May 1970 floods resulting in over 50 depths and significant economic looses or March 1977 Vrancea Earthquake, with over 1.500 depths and huge material looses[2].

2. Risk Management Approach in Romania

In the context of a significant increase of natural hazard risk, of a change in hazard typologies, manifestation and intensity, it is a real challenge for Romania to be prepared for hazards manifestations and to reduce at minimum all types of looses. As EU Member, Romania implemented several laws and strategies for risk management, like Decision 762/2008 for National Strategy for Emergency Situations Prevention, or became a contributory member of International Strategy for Disaster Reduction (ISDR) in order to implement Hyogo Framework for Action. These procedures purpose is to contribute to global disaster risk reduction movement and to build a stronger, more systematic and coherent "culture of prevention" in society as part of sustainable development [2].

The present paper recommends overcoming challenges and taking the opportunities related to an efficient communication with local authorities, specific institutions, professionals and citizens as key component in risk management. Main natural risks in Romania are the earthquakes, floods, drought, fires or soil sliding. Of these, the most significant risk is the earthquake. Due to previous experiences in earthquake disasters, Romania seismic activity is under constant supervision by National Institute of Research and Development for Earth Physics (INFP). In a 5 to 8 ranking of seismic risk, international statistics place Romania at level 6, while Vrancea Area is positioned at seismic risk level 7 [1].

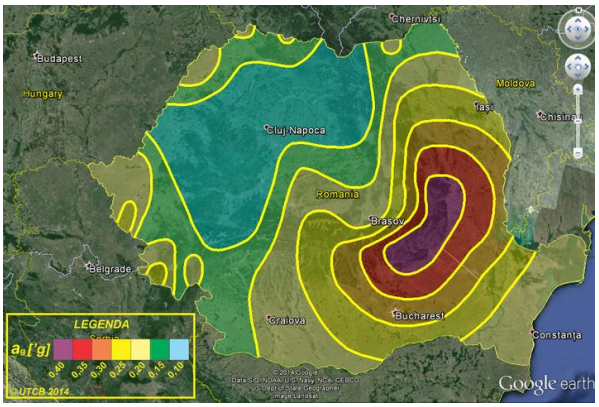

Fig. 1. *Map of seismic zoning according to P100-1/2013* [3]

Figure 1 presents the Map for Soil Acceleration Peak Value Zoning for Earthquakes in Romania, adapted by researchers from Research Centre for Earthquake Risk Evaluation from P100-1/2013 Code. This Standard describes the Seismic Zoning of Romania Territory in terms Peak Values of Soil Acceleration for Design, a_g, with Medium Recurrence Interval (IMR) of 225 years [1].

The urban example, considered for analysis and case study in the paper, is focused on City of Iasi which, according to the Map for Seismic Zoning, has a characteristic Value of Soil Acceleration, a_g=0.25g [1].

3. Urban Example: Risks Management Customized for Iasi Infrastructure Network

In order to underline the importance of a strategic risk management, the present paper describes a case study of Iasi City, with particular focus on an areal from the city centre, Podu Ros Intersection and Bahlui River Bay. The example focuses on seismic risk management.

Romanian legislation system provides a classification of the buildings based on the seismic risk point of view. The endangered buildings are being signalized with a “red bullet”. Most marked buildings integrate constructions built previous to 1977, using different standards and norms that gave little importance to earthquake action. 1977 is considered as reference year in Romania for construction sector since it marked the most significant earthquake registered in our country, with a high number of deaths, casualties and destructions, most of them due to inadequate construction procedures. Following that moment, the legislation in constructions changed so that engineering must calculate and design a building based on new criteria and coefficients, that take into consideration the seismic activity in our Country.

The City of Iasi still has a large number of buildings built previously to 1977 based on old standards, buildings that were affected by the earthquake, that are instable, that haven’t been properly rehabilitated. A significant number of buildings of this type are situated close to the most important traffic node, Podu Ros Bridge. In Figure 2 are identified with red color the areas with buildings constructed before 1977, with purple, Podu Ros and Nicolina Intersections. A number of 190 buildings, built in between 1870-1963, have been registered, following technical expertise, in class I of seismic risk. These buildings, marked with ”red dot” represent public danger and a significant risk of crashing in case of an earthquake, producing, according to expert, a large number of victims. First standards for anti-seismic design appeared in between 1963 and 1977, a low level design as compared with today’s requirements. Following 1977, the buildings were constructed based on improved design standards, later on, following 1990 to today, the standards evolved even more. Podu Ros Intersection has been considered for the case study since it is the most significant road intersection in the city, connecting the city centre with 5 large neighborhoods leading to city exists. More than this, a fail in accessing this intersection would mean breaking the connection with the city health and safety institutions, since all the hospitals are in the city centre. Another characteristic of the City, from strategic point of view, is that Bahlui River crosses a large area of Iasi, breaking the City in half. All connections between the two are made by bridges. In a

worst case scenario, failure of these bridges would mean isolation for half of City population, limited access for emergency units and delay in salvage operations and so on.

For these reasons, risk management means being aware of the weaknesses, knowing the strong points, creating alternatives, having timely reactions and creating a strategy for worst case scenario. The present paper describes a potential worst case scenario for the City of Iasi, underlining important failure points.

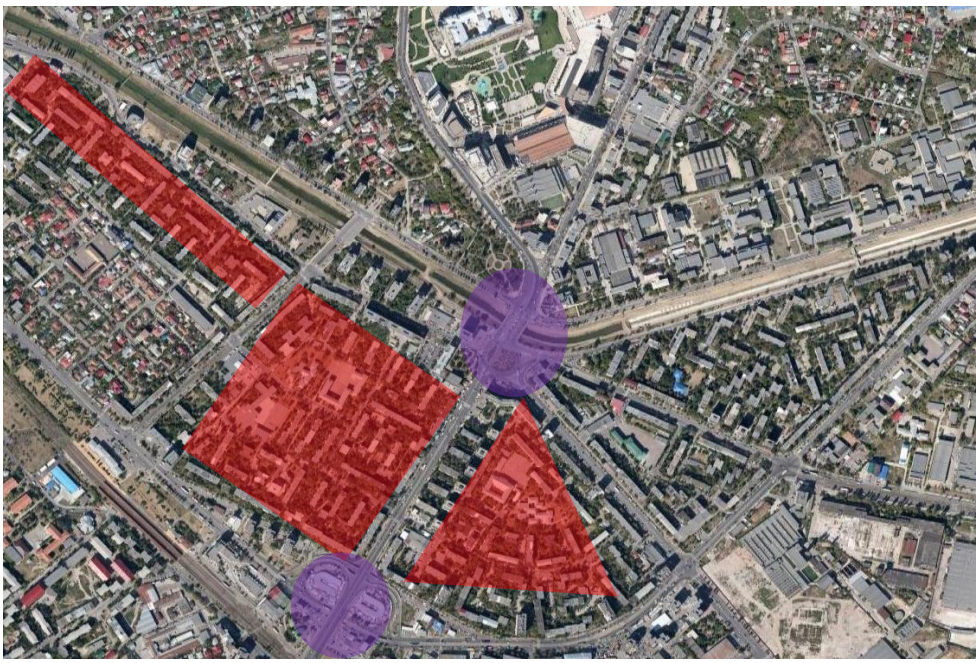

Fig. 2. *Podu Ros intersection in iasi (4)*

Bahlui River divides Iasi City in two parts, the central part and the part that is connected with 3 entrances in the city namely: Bucium, CUG, Ungheni.

In the last years the City developed greatly outside the old City areal. Still, main emergency services, hospitals and police are situated in the old part of the City, leaving the only few private hospitals with reduced capacity, low level of traffic facilities (Arcadia Hospital, Providenta Center) and no emergency services to the newly developed part of the city. The two parts of Iasi City are connected by several bridges, along Bahlui River, some of them only with pedestrian traffic, others cover also vehicle traffic. Of these, most significant, from capacity and traffic point of view, are the ones in Podu Ros and Tudor Vladimirescu. It is vital to preserve the functionality of these bridges in case of a hazard, since they provide access to medical assistance and emergency units.

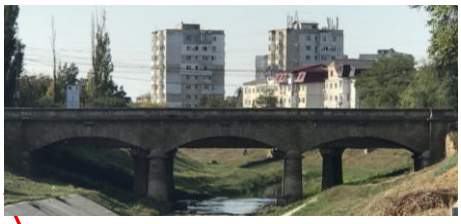

Fig.3 *Stone Bridge*

Fig.4 *Metalurgie Bridge*

Fig.5. *Pedestrian Bridge between Podu Ros and Alexandru*

Fig.6. *Tudor Vladimirescu Bridge*

Fig. 7 *Bahlui River Areal (5)*

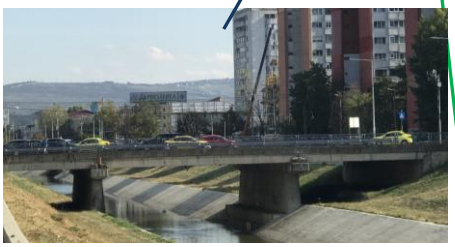

Fig.8. *Cantemir Bridge*

Fig.9. *Pedestrian Bridge between Podu Ros and Tudor*

Fig.10. *Podul Ros Bridge*

Figures 3 to 10 show Bahlui Biver Areal from Iasi City, accompanied by the positioning of main bridges, pedestrian and vehicle, which connect the two city parts.

Worst case scenario for Iasi City would imply, complementary to buildings collapse, destruction of transportation infrastructure, consisting in bridges crossing Bahlui River and associated roads. This would imply breakage of connections between the two city parts, impossibility to access Emergency Centers and salvage operators in a short time. More then this, as observed in Figure 2 and marked with red, in the areal close to Bahlui River are situated an extended number of real estates registered by the local administration as ”dangerous” due to considerations explained previously in the paper.

In a worst case scenario this area would suffer significant destructions, so that, it is important to facilitate access to this areal and not only.

4. Conclusions

International statistics on the incidence of natural disasters talk about a dramatic increase, by 93%, in the last 40 years, of risks but also in the number of people living in risky areas. In this context the risk management becomes a topic of high interest and also subjected to high debates. At international level (USA, Japan, EU) significant money and efforts have been invested in prevention measures, action plans and strategies. Romania, as EU member, follows the same trend in risk management, even more since our country is placed on the 4th position in Europe as related to hazard risk.

In view of our country main risks, the present paper focused on the most significant threat, the seismic risk, envisioning a worst case scenario for Iasi City. The main conclusion is that, based on the particularities of a city, it is important for the local authorities to customize an action plan in case of fatidic manifestation of a hazard. For the urban example under consideration, the worst case scenario would mean buildings collapse associated with destruction of transportation infrastructure (bridges crossing Bahlui River and associated roads). This would imply breakage of connections between the two city parts, impossibility to access Emergency Centers and salvage operators in due time.

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