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CRITICAL AREAS ISSUES OF REGIONAL ROADS NETWORK FOR NORTH-EASTERN ROMANIA

BY

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Abstract. Evaluating the critical areas of roads network associated with regional or national natural hazards, highlights the decision management complexity, pointing out decision factors, associated attitudes and consequences. In the frame of worst case scenario for traffic communication sector, it is important to identify the best suitable alternative associated with emergency situations. The present study represents an analytical evaluation of the critical points identified along the road network from NE Region of Romania, customized for Iaşi City. The analysis focused on features like, Management System for Emergency Situations, natural hazards risks for Iasi, worst case scenario for traffic communication sector and specific critical points of roads network. The analysis intended to identify the consequences of natural hazards and associated measures for the decrease of casualties and damages. Main information sources were General Inspectorate for Emergency Situations and Regional Direction for Roads and Bridges as primary components of the Emergency Management System.

Keywords: natural hazard; management system; worst case scenario; critical points; Iaşi County.

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1. Introduction

Having a good overview on a City or Region critical areas is an extremely relevant component in terms of natural hazards and emergency situations management process. This type of information implies a complex evaluation of the correlations between hazard risk, potential measures and people behavior. In order to understand and evaluate the critical areas of the roads network it is useful to obtain information from the National Management System that administrates Emergency Situations. The details focused mainly on decision making process in the context of natural hazards, worst case scenario for traffic communication sector and identification of specific critical points of a road network. The main purpose of the analysis was to identify optimum measures for the management of natural hazards. (DeBlasio, 2002)

Road transportation network is an extended structure, composed of facilities, services and equipments, necessary for highways, roads and streets transportation. From constructive point of view, it includes soil exploitation and network planning, re(construction) and design of roads and intersections, signalizing and marking, maintenance and rehabilitation, works quality assurance, environmental protection and damage reduction, economic construction and exploitation.

In accordance with all major countries, the Romanian Government, along the project "*Risk Prevention and Management to Natural Disasters – Consultancy for Design and Implementation of a National Campaign for Public Awareness*", (World Bank, 2010) under the supervision and financial support from World Bank has implemented a National Strategy for the Management of Different Potential Natural Hazards. The strategy took into consideration several components like the analysis of informative level and public attitude towards emergency situations, analysis on hazards situation in Romania and risk factors, analysis of educational needs and institutional analysis. Based on the available documentation, can be established a general or particular intervention procedure in accordance with the context, gravity and situation. (Șerbănoiu A.Al, 2016)

The current analysis answers the need for a more extended information package on the management of hazards, filling in the general national strategies, with a customized evaluation of urban critical points or areas. (Șerbănoiu I., 2016)

2. National Management System for Emergency Situations – IGSU

National System for Emergency Situation Management is dealing with civil protection implying integration and correlation of different areas and

phases, from strategic and planning level until operational and interventional level.

The system is composed of temporary and permanent activity structures that include (IGSU, 2014):

1º *Emergency Committees*: national, ministerial, Bucharest and local;

2º *General Inspectorate for Emergency Situations*: transmits the decisions taken by the Government or National Committee to Central authorities and local government;

3º *Professional community public services for emergency*: emergency county inspectorates;

4º *Emergency Operations Center*: permanent or temporary, provides information before or at the time of an emergency;

5º *Commander action*: coordination unit for exceptional events.

The main authority responsible for the planning, management and coordination of information and public education belongs to the General Inspectorate for Emergency Situations (IGSU). As presented in Fig. 1, IGSU, started to activate from 2004, due to the fusion between two institutions, the General Inspectorate of Military Fireman Corporation and Civil Protection Headquarters. Currently it has under supervision 43 Local Operational Centers and 280 Operative Subunits.

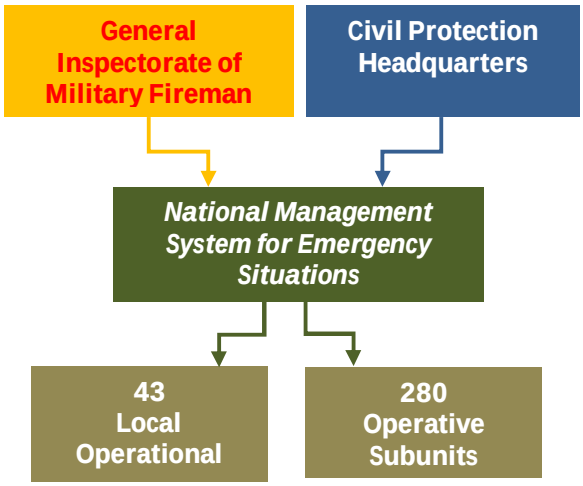

Fig. 1 − National Management System for Emergency Situations.

IGSU was created before Romania accession to the European Union and is a permanent communication network between public authorities and organizations, qualified for emergency management. This organization has the

infrastructure and resources necessary for intervention in emergency cases. It coordinates all the institutions involved in emergency management, as national contact point, and maintains a constant communication with international governmental and non-governmental organizations with responsibilities in the field.

Fig. 2 below presents local operational centers, active all around Romania territory, with a particular focus on Iaşi County.

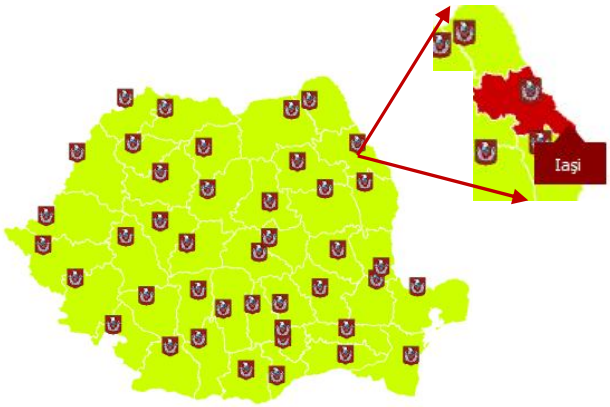

Fig. 2 − IGSU local operational centers (Wikipedia, 2014).

IGSU engagements refer to:

a) monitoring and evaluation of emergency causes;

b) population preventive information and education;

c) warning of local authorities about the possibility/imminence of an emergency;

d) persons search and rescue;

e) evacuation of persons or property endangered population by providing evacuation measures, installation displaced camps, participation in public transport of people and goods;

f) emergency medical assistance through SMURD modules;

g) providing own and borrowed equipments, materials and technologies for intervention;

h) firefighting;

i) decontamination of the population;

j) neutralizing of hazardous materials unexploded during previous military conflicts.

IGSU is being structured in several departments, each of them having a clear functionality. Fig. 3 below contains the institution flow-chart. Two of the

departments receive consistent attention, namely, Prevention Department and Department of Protection and Preventive Education of the Population. These two, according to their functionality, are presented in more detail below. The Prevention Department has a component named Disaster Prevention Division which deals in particular with technological and natural risks.

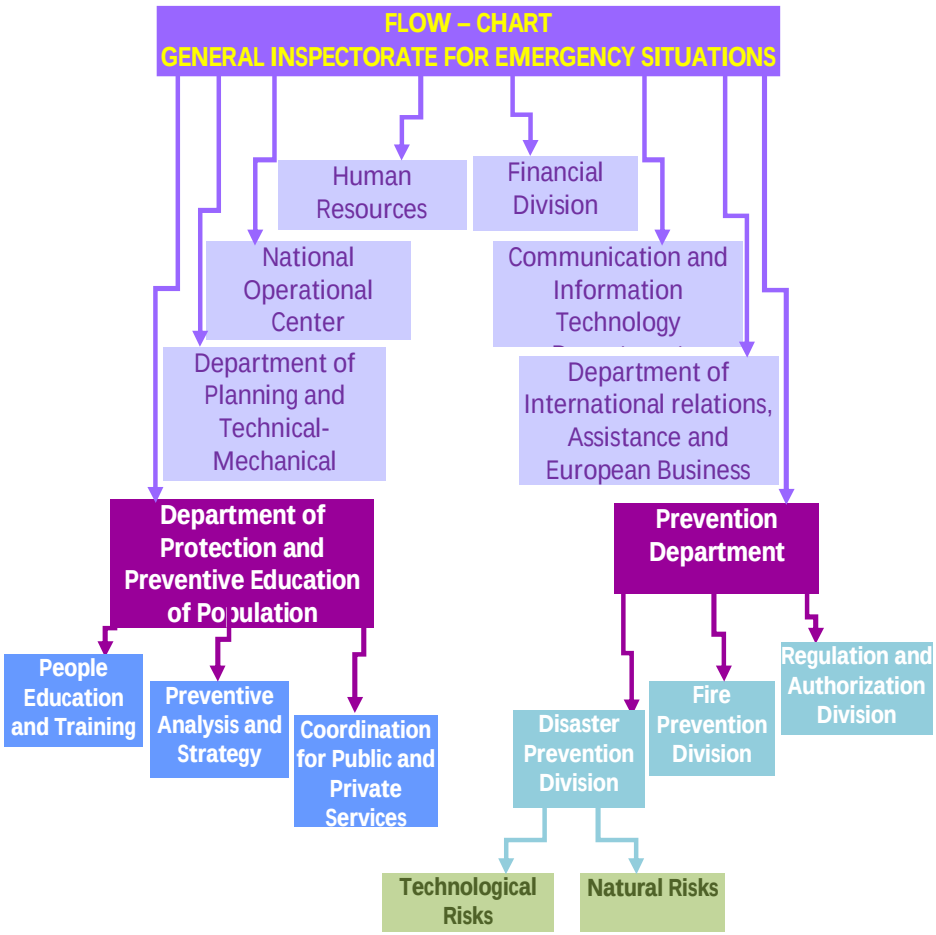

Fig. 3 − Flow-chart General Inspectorate for Emergency Situations (IGSU, 2014).

In case of a natural hazard is compulsory to have an efficient decision making organizational structure. As can be observed in figure 4, in case of a natural hazard, first of all IGSU is being notified by emergency phone 112, by any civil or administrative component. For the road communication network, the decision process implies, first a notification from IGSU to the National Company for Highways and National roads in Romania (CNADNR). At its turn

this organization notices the Regional Directions of Roads and Bridges (DRDP), making references on roads and bridges potentially damages by the hazard. DRDP with the jurisdiction in the affected area creates a Commission for Special Technical Revision of the Objective, which makes decisions on features like traffic restriction, weight restriction, traffic deviation or total closure of the traffic.

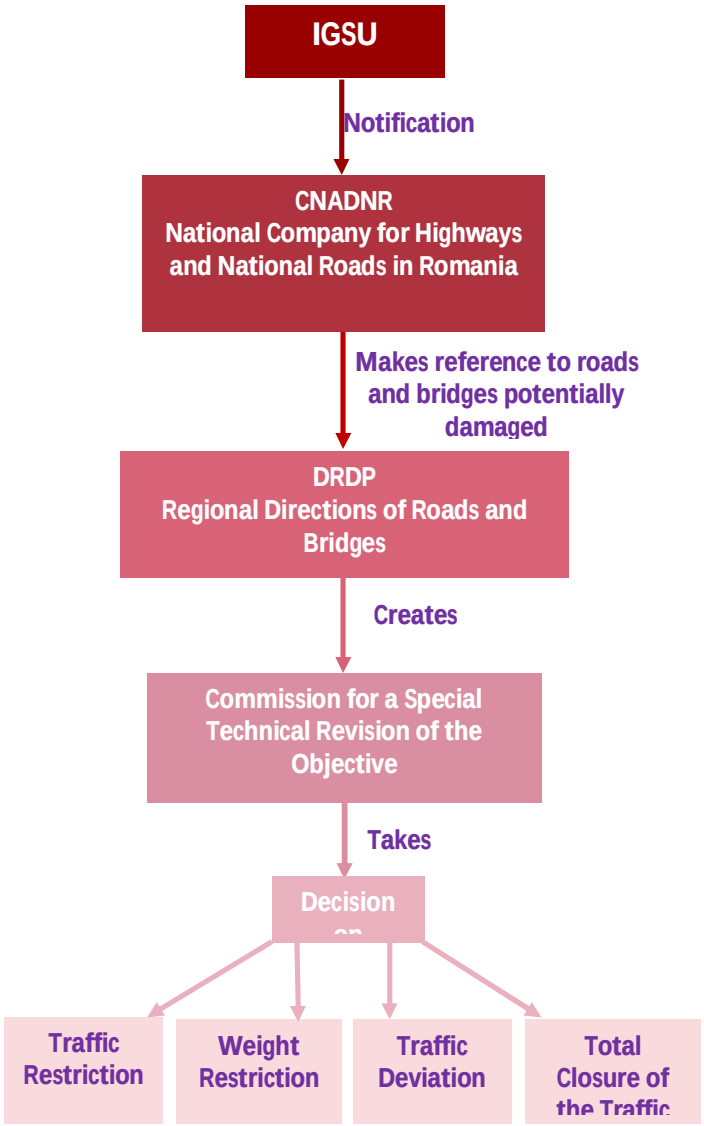

Fig. 4 − Decision taking diagram in case of natural hazards (IGSU, 2014).

3. Iaşi County and Moldova Areal

3.1. Socio – Economical Features

City of Iaşi is located in Moldavia Region of Romania, known as „The Cultural Capital of Romania", currently representing one of the leading centers of Romanian social, cultural, academic and artistic life. The town is characterized by a population of 290,422 residents, mostly numbered in the East of Romania, and fourth most numbered Romanian city, while the Metropolitan Area of Iasi is home of 382,484 residents. (Wikipedia, 2016)

From educational point of view, Iaşi has the oldest Romanian University and the first engineering school. Currently it hosts over 65,000 students in 5 public and 6 private universities in all areas of research.

The social and cultural life revolves around Vasile Alecsandri National Theater (the oldest in Romania), Moldova State Philharmonic, Opera House, Tătăraşi Athenaeum, Botanical Garden (the oldest and largest in Romania), Central University Library (the oldest in Romania), high quality cultural centers and festivals, an array of museums, memorial houses, religious and historical monuments.

Fig. 5 represents the maps of Iaşi County and the Regional Roads Network that links the city with the entire North-East Region of Romania.

Fig. 5 − Iaşi County location and Regional Roads Network (Wikipedia, 2016).

Iaşi County economy relies on service sector (education, health care, banking, research, culture, government and tourism), manufacturing sector (automotive, pharmaceutical industry, metallurgical production, textiles and

clothing, constructions, wine, preserved meat) and recently developed, information technology sector. This last one refers of Iasi as the host for several important international companies, such as Amazon, Bitdefender, Continental VDO, Embarcadero Technologies, Ness Technologies, Comodo Group, Bentley Systems, SCC, Capgemini or Pentalog.

From geographical point of view the City of Iaşi is situated on 7 surrounding hills, context which implies a wide diversity of natural hazards associated with soil sliding, earthquakes and flooding.

3.2. The Metropolitan Area of Iaşi County

Iaşi Metropolitan Area was constituted on 8 April 2004 with the main purpose of creating a better business environment, attracting more consistent investments and better coordination of environmental and infrastructure projects.

Fig. 6 − Components of Iaşi Metropolitan Area (Wikipedia, 2016).

This area includes Iasi municipality and 13 nearby communes (Fig. 6). One of the factors that mainly influenced the creation of this area was the recent trend of housing construction in areas outside the city, which lead to a high extension of the city.

3.3. Iaşi County and the North-East Development Region

In 1998, Romania's territory was divided into 8 development regions, which can be seen in Fig. 7. North-East Development Region is one of these regions and Iasi County is one of the six member cities in the region, next to: Bacău, Botoşani, Neamț, Suceava, Vaslui. The Delegate Agency of this Region

has no administrative powers, its purpose being project management and European Funds absorption.

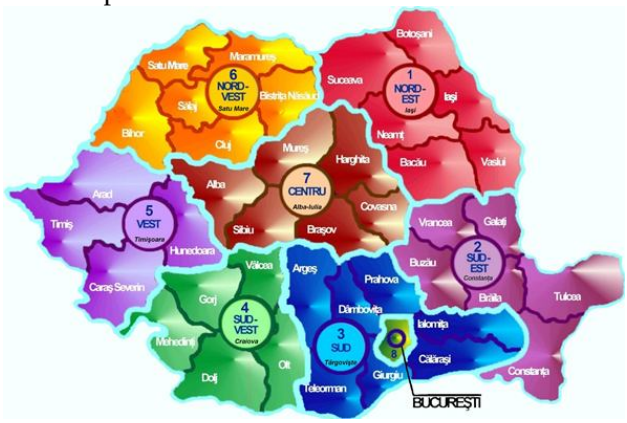

Fig. 7 – Regional dividing of Romania Territory (Wikipedia, 2016).

3.4. Risk Maps in Iaşi County

Due to the wide diversity of the local geography and the soil structure, starting from 2011 the County of Iasi Council has decided on a project for the creation of several risk maps associated with potential soil sliding, floods and earthquakes, for the areal of Iaşi City and 25 nearby Villages. The main objective of the project was to enable the Local Authorities to envisage potential preventive measures. The Council decided, until the finalization of risk maps, to block the release of General Urban Plans for 25 administrative units in Iaşi.

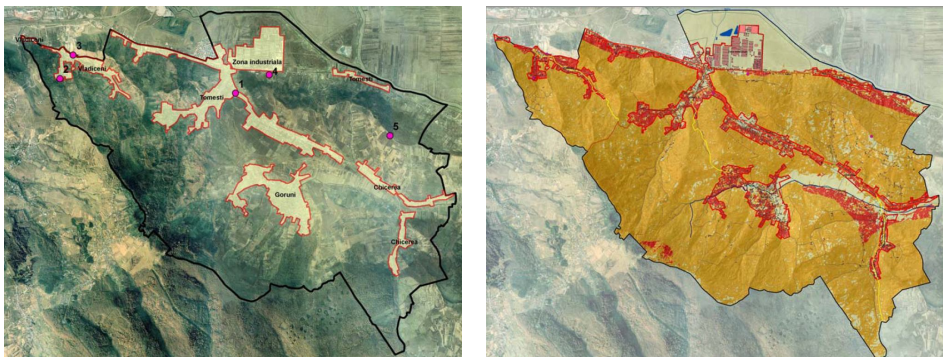

Fig. 8 – Risk maps for soil sliding in Tomeşti Village (Wikipedia, 2016).

Currently the risk maps are still in process of finalization, some of the nearby villages being already studied. For better understanding, can be

considered the particular case of Tomeşti Village. Situated in the SE of Iaşi County, Tomeşti geographic structure is composed of hilly forms in S with altitudes of 400 m, belonging to Central Moldavian Plate, while the rest of the Village belongs to Bahlui River Depression, with altitudes of 35,...,40m. While performing the analysis, have been identified a serial of soil sliding areas around Tomeşti, which are detailed in Fig. 8, in two different presentation forms.

3. Worst Case Scenario for Natural Hazards associated with Road Network in Iaşi County

Based on the information received from Regional Direction of Roads and Bridges, were considered the main „critical points" in Iaşi City, in case of a natural hazard, points that might be part of a worst case scenario for traffic communication sector. Following, can be observed a few images from specific bridges mentioned in Fig. 9 below.

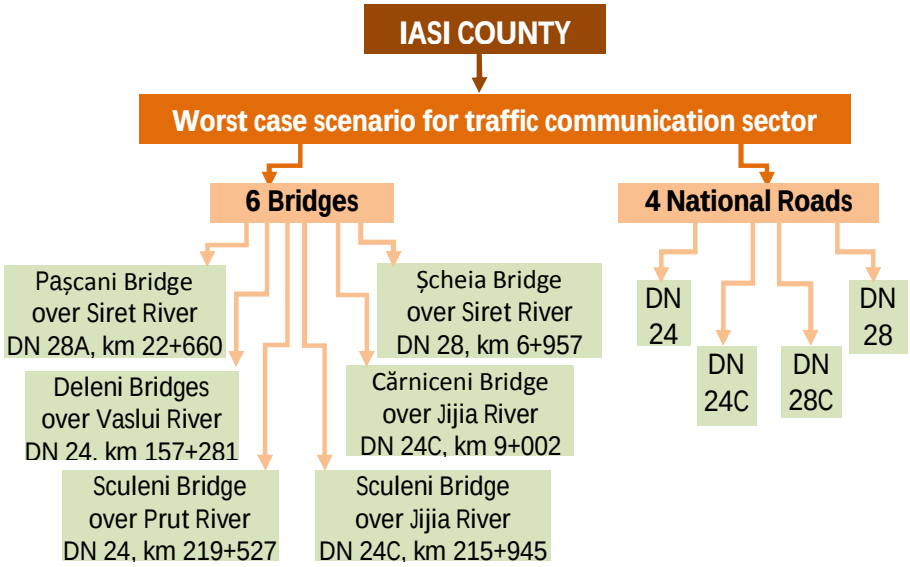

Fig. 9 – Worst Case Scenario for Roads Network.

The National Roads Network of Iaşi County totals a value of 346.82 km and can be observed highlighted in green in Fig. 10.

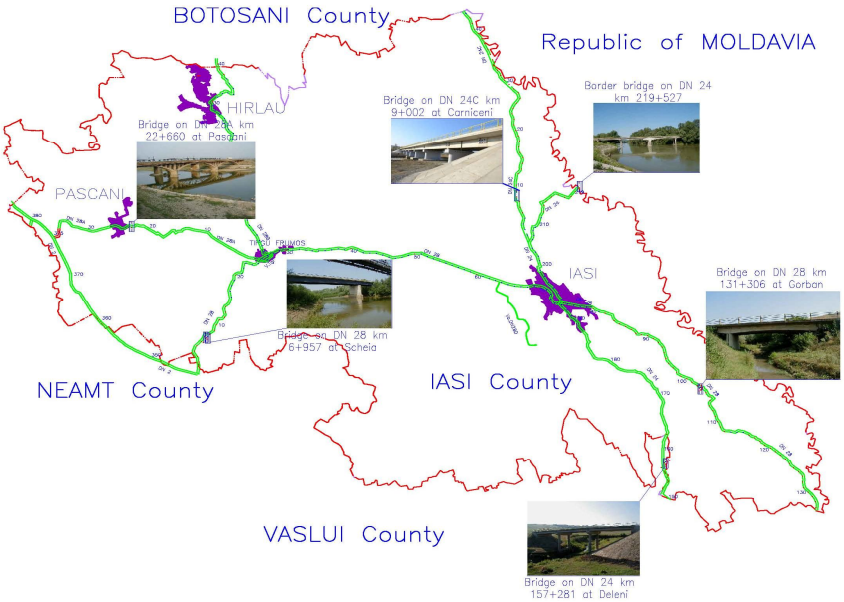

Fig. 10 – National Road Network for Iaşi County.

Fig 11 – Bridge on Route 28A km 22+ 660 over the Siret River in Paşcani.

Fig. 12 – Bridge on DN 28 km 6+957 over the Siret River in Scheia.

Fig. 13 – Bridge on DN 24 km 157+281 over the Vaslui River in Deleni.

Fig. 14 – Bridge on DN 28 km 131+306 over the Moşna RIVER in Gorban.

Fig. 15 – Bridge on DN 24 km 219+527 over the Prut River in Sculeni.

Fig. 16 – Bridge on DN 24C km 9+002 over the Jijia River in Cârniceni.

According to DRDP information source, in case of a natural hazard, the representatives are capable of intervening with different types of temporary components for bridges and roads, in order to give into usage the network as soon as possible. Following can be seen some images of the equipment used in case of hazard: temporary bridge and Pontoons Bridge.

a

b

Fig. 17 – Temporary bridge.

Fig.18 – Pontoons bridge (temporary army bridge).

5. Conclusions/Final Remarks

The Road Network is an important component of transport infrastructure and of terrestrial communication. It is composed of a visible part, the superstructure and a hidden part, the infrastructure, each of them with particularities and critical components,

Romania territory, NE Region included, is characterized by a diversity of geographic forms and foundation soils, which stand for complex evaluation and analysis in case of adequate preventive safety measures.

The main natural hazards for Romania refer to earthquakes, soil sliding and flooding.

Based on the information received from local representatives, can be considered that the Romanian authorities are technically prepared to manage emergency situations. Still exists the need for a proper education and preparing of population for this type of events, need for simulation exercises and knowledge transfer from more experienced partners.

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PROBLEMATICA ZONELOR CRITICE SPECIFICE REŢELEI DE DRUMURI REGIONALE DIN ZONA DE NORD-EST A ROMÂNIEI

(Rezumat)

Evaluarea zonelor critice din cadrul rețelei de drumuri, coroborată cu diversitatea hazardurilor naturale ce se pot manifesta la nivel național sau regional, subliniază complexitatea managementului decisional, importanța factorilor de decizie, atitudinile specifice şi consecințele aferente. În situația celui mai nefavorabil scenariu pentru sectorul comunicațiilor din trafic, este importantă identificarea celei mai bune alternative asociată situațiilor de urgență. Cercetarea de față reprezintă o evaluare analitică a punctelor critice specifice rețelei rutiere din Regiunea de NE a României, particularizate pentru Oraşul Iaşi. Analiza s-a axat pe elemente precum, Sistemul de Management al Situațiilor de Urgență, riscurile unor hazarde naturale în zona Iaşi, cel mai nefavorabil scenariu pentru sectorul comunicațiilor din trafic şi puncte critice specifice rețelei rutiere. Obiectivul studiului a fost identificarea consecințelor hazardurilor naturale şi a măsurilor aferente, necesare reducerii numărului de victime şi distrugerilor. Principalele surse informative au fost Inspectoratul General pentru Situații de Urgență şi Direcția Regională de Drumuri şi Poduri, ca reprezentante principale ale Sistemului de Manageriere a Situațiilor de Urgență.