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SPECIFIC FEATURES OF ENVIRONMENT RISK MANAGEMENT IN EMERGING TERRITORIAL STRUCTURES

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Abstract: The purpose of this study is to identify the management system of environment risks in distinct territorial structures, viewed as emerging structures, born as a result of the complex ties between development hubs and the surrounding areas. The research covered two case studies, Craiova and Galați, heavily industrialized economic hubs during Communism; as a result of their polarization capacity, these centers determined the functional structure of the surrounding space and brought about major imbalances in the relations between the elements of the territorial system, which require specific patterns of action, adapted to the ever-steeper dynamics of metropolitan spaces. The status they acquired, both during the Communist period and at present, meant that economic ventures developed in a short time span exceeded the capacity to adapt of the other components of the territorial system, and that the environment felt a heavy impact of industrialization. Identifying the specific features of environment risk management at the level of regional-scale development hubs was achieved by means of detailed analyses in the metropolitan areas of the cities of Craiova and Galați, systems typical of the heavy concentration of economic ventures, which exert an outstanding pressure on the environment. A model for the management of environment risks was created, based on a hierarchization of the risks and a set of suggestions for improvement and prevention, which would ensure a sustainable development of emerging territorial structures.

Keywords: environment risks, pollution, territorial management, territorial dynamics, emerging structures

1. INTRODUCTION

The development of the ties between large cities and the environment led to the emergence of territorial entities, with a pronounced dynamics of socio-economic processes, which requires specific territorial management strategies. In specialized literature, various names are given to these emergent structures, the most comprehensive and used being that of metropolitan area.

The pronounced dynamics of the urbanization process led to the strengthening of territorial ties between urban structures and the natural environment, fed by the polarizing center constantly demanding space for economic activities, for recreation and habitat. The development of these territorial ties led to a territorial complexity that individualizes spaces under the influence by large cities as structures with a particular set of socio-economic dynamics that are considered emergent. The high pressure exerted on the environment by these emergent structures determines the creation of new territorial management systems, meant to take a global approach on these malfunctions within the definiteness ties between them (Robu & Macoveanu, 2009; Ianoş et al., 2009; Damian et al., 2010; Braghină et al., 2010; Peptenatu et al., 2010) and reduce unbalances determined by the accelerated restructuring of some territorial structures (Nasseri et al., 2009; Nejadkoorki et al., 2010, Priadi et al., 2011, Braghină et al., 2011).

The tightening of relations between the polarizing center and subordinate systems leads to continuous functional restructuring and, as a result, to rising pressure, that should be analyzed and monitored in a manner respective to new challenges (Newman, 2006; Secu et al., 2008; Gavrilescu, 2009; Roshan et al., 2010; Mrkajic et al., 2010; Ferencz & Balog, 2010; Picu, 2009; Petrişor et al., 2010. In studies dedicated to the governance of territories, management systems are frequently elaborated, with the aim of providing optimal functionality to the

territorial system, under conditions of constant and pronounced dynamics.

The necessity to apply territorial management models comes from the difficulties identified in the global approach on imbalances of the environment of emergent structures. The absence of administrative systems overlapping emergent structures means that the decision-making impulses, meant to optimize ties between parts of territorial systems, are mitigated by the absence of common strategies. Territorial management models in which special attention is given to the decisional component allow for the appropriate orientation of decisional impulses and the securing of results expected by factors of decision.

The efficiency of environment management models is determined by how the imbalance between the economic and the environmental elements is perceived, in terms of institutions, as well as in terms of the demographic element (Sjöberg, 2007).

In numerous specialized studies, the characteristics of emergent systems are tackled in terms of the complex relations between large cities and subordinate systems (Rutkauskas, 2008; Kavaliauskas, 2008; Peptenatu et al., 2009). The build-up of relations leads to a constant restructuring of space and to a constant pressure on the natural environment (Popescu et al., 2009; Cullingworth & Nadin, 2006; Basbas & Nikolaou, 2009). The same idea comes up in studies concerning territorial governance, which emphasize the need for institutionalized structures to manage relations between the elements of emergent territorial structures (Ianoş, 2004; Dragomir et al., 2009).

Building management models characteristic of emergent structures, resulting from interactions between the polarizing center and the zone of influence, is influenced by how the imbalance between the economic and the environmental components is perceived, in terms of institutions, as well as in terms of the demographic component. The importance of the degree of information in terms of demographic and decisional components is underlined by numerous specialized studies (Alam et al., 2007; Obire et al., 2008).

The development of the urbanization process in emergent territorial structures led to an ever increasing territorial complexity and increasing pressure on the natural environment (Bhattacharyya & Kapil, 2010; Haynes et al., (2007); O'Sullivan, 2010).

Analysis of emergent territorial systems pointed out elevated pressure on surface waters (due to discharge of domestic and industrial waste water) and on the air along the main structuring axes, which amass economic activities and new residential spaces (Bebbington & Williams, 2008; Vinke-de Kruijf et al., 2009).

The forced industrialization determined a series of chain processes, urbanization being among the most significant, which, in turn, generated increasing consumption and pollution of waters and air pollution as a result of traffic and economic activities (Giri et al., 2007).

The responsible approach to environment issues is an important task for decision factors, in the complex process of elaborating integrated development directions for urban system of regional significance (Ianoş et al., 2009; Naghibi & Shirmohammadi, 2008; Naddafi et al., 2006; Ranade, 2007).

The concentration of economic activities and the importance of these cities in polycentric regional networks, compels decision factors to elaborate efficient strategies for the management of environmental hazards, their peculiarity being determined by the contradictory dynamic of these territorial systems after 1990.

The environment hazard is the result of the interaction between two major components of territorial systems, the environment component and the human factor, manifesting itself as major functional imbalances, which endanger the realization of development goals (Chen, 2009).

2. MATERIALS AND METHODS

The building of the management model for environment hazards in emergent structures followed several steps: separating the metropolitan area around development poles Craiova and Galați, identifying environment hazards, evaluating and ranking them, identifying interested factors, the treatment of environment hazards (Fig. 4).

Considering the fact that the city of Galați does not have a metropolitan area, the delimitation of the emergent space was carried out based on a set of aggregate indicators based on the following criteria: the convergence of transport systems, economic development, demographic characteristics and the socio-cultural criterion (Pintilii et al., 2008). As for the city of Craiova, research targeted the metropolitan area statutory through the Decision of the Craiova Local Council no. 297/27.11.2008, which under bill 350/2001 concerning organization of the ground and urbanism sanctioned the association of the following townships: Mischii, Breasta, Gherceşti, Simnicu de Sus, Pieleşti, Predeşti, Teasc, Murgaşi and Pleşoi.

The analysis of imbalances in metropolitan areas was based on data recorded in county

environment agencies and on data recorded by the research team in spots considered vulnerable. During March-May 2011, water samples were taken from the discharge areas of industrial and waste waters inside the analyzed space. Based on them, the extent in which the industrialization process contributed to the pollution of waters was determined.

A special attention was given to malfunctions determined by daily population movements, between the cities of Craiova and Galați and their areas of influence. Through field research, the areas affected by pollution with suspended dust particles determined by intense traffic have been delimitated. Likewise, through field research, areas presenting a risk of phonic and epidemiological pollution have been identified.

According to Law no. 310/2004, appendix 11, the quality of waters in Romania has been rated on five quality classes, depending on hydromorphological and physical-chemical biological parameters and polluting emissions exhausted. Quality class I (very good state) contains waters that show no alterations of the values of physical-chemical and hydromorphological quality elements. Quality class II (good state) contains waters that display low values of alteration caused by anthropic activities. Quality class III (moderate state) implies consistent alterations of water quality determined by anthropic interventions. Quality class IV (poor) contains waters considerably altered by anthropic intervention. Quality class V (very poor) displays major spoilages of biological and physical-chemical parameters.

In the elaboration of environment management models, a special attention was given to international standards in this field. A useful tool in creating risk management models is the ISO 31000 Standard and *The ISO 73 Guide*, published in 2009, which establish the fundamental principles in the management of risks, as well as the necessity for a systemic approach as an efficient means of reduction of imbalances resulted from major alterations in terms of some components.

The territorial management model, which provides an efficient management of territorial imbalances, was completed by a decisional component, fundamental in the elaboration of a pragmatic model, useful to decision factors (Peptenatu et al., 2009). Likewise, an analysis of the European legal context provided by a series of bills was performed, the most important of which being: Council Directive 96/62/CEE concerning the evaluation and the management of the quality of air in the environment, Council Directive 1999/30/CE concerning border values for sulfur dioxide, nitrogen dioxide, suspended dust particles and lead in the air of the environment (Decision 2001/44/CE, Directive of the European Parliament and Council 2000/69/CE concerning border values for benzene and carbon monoxide in surrounding air, Directive of the European Parliament and Council 2002/3/CE concerning ozone in the air of the environment, Council Directive 75/440/CEE concerning the quality of surface waters, Council Directive 80/68/CEE concerning the protection of groundwaters against pollution caused by certain dangerous substances, Directive no. 2006/12/CE concerning waste.

3. RESULTS

In terms of the metropolitan areas studies, the following types of risks have been identified: the risk of water pollution, the risk of air pollution, the risk of soil pollution, epidemiological risks and geomorphologic risks.

The risk of surface water pollution is elevated in the metropolitan areas studied due to the economic activities developed here. In the Craiova metropolitan area, the biggest polluters are on the Işalnița and Podari industrial platforms, where large quantities of industrial waters from the Doljchim chemical plant are discharged from, the CET-I Işalnița thermal power station, as well as waste waters from the city of Craiova discharged in the river Jiu.

The quantification of the risk of water pollution has been performed by comparing physico-chemical analyses recorded at Işalnița and Podari stations. In table no. 1, the transition of surface waters from quality category I to quality category II due to the discharge of polluted waters (due to discharge of industrial waters from the Doljchim chemical plant, the CET-I Işalnița thermal power plant and waste waters) can be noticed. The Işalnița-Breasta area records high pollution with ammonia, nitrates and phosphates. In the area of the ash pits of CET II Craiova, the values for fixed residues, sulfates, suspensions and iron exceed accepted limits (APM, 2009).

Analyses of water samples taken from around the city of Craiova have revealed values exceeding the limits of the maximum accepted concentration (MAC) of nitrates: Motoci-116 mg/l, Işalnița-126 mg/l, Bratovoiesti-99 mg/l, Breasta-89 mg/l, Coțofeni-129 mg/l, Ghercesti-95 mg/l, Malu Mare-142 mg/l, Podari-171 mg/l, Cosoveni-72 mg/l, Simnic-130 mg/l. These values exceeded are determined by the prolonged action of the impact factors represented by the operation of certain industrial installations with toxic emissions, as well as the disposal of significant quantities of wastes.

In the Galați metropolitan area, the main

pollutant is ArcelorMittal, who discharges industrial waters in the Siret via the two ponds, Cătuşa and Soldana, and the Mălina pond. Following analysis of water samples taken near industrial units in the Galaţi metropolitan area, Fe and Cd values outside the limits of the MAC have been identified (Table 2).

The risk of air pollution is high in the two metropolitan areas due to economic activities located here and to the road infrastructure, which is unable to absorb intense the traffic generated by daily movement between the polarizing center and the metropolitan area.

In the Craiova metropolitan area, in the Breasta and Işalniţa area, values outside the MAC limits are frequently recorded for SO_2 and suspended dust particles. Field research led to the delimitation of the area affected by suspended dust particles from cinder yards and ash pits of thermal power stations in. The most affected settlements are: Şimnicul de Sus, Şimnicul de Jos, Işalniţa, Albeşti, Dudoviceşti, Izvoru Rece, Rovine, Obedin, Cotu, Breasta, Cernele. Elevated value points are also generated by intense traffic (Cernele, Izvoru Rece).

In the Galaţi metropolitan area, the following areas of elevated risk of air pollution with suspended dust particles have been identified: the ArcelorMittal area, Vânători, Şendreni, Smârdan and Movileni (Fig. 2).

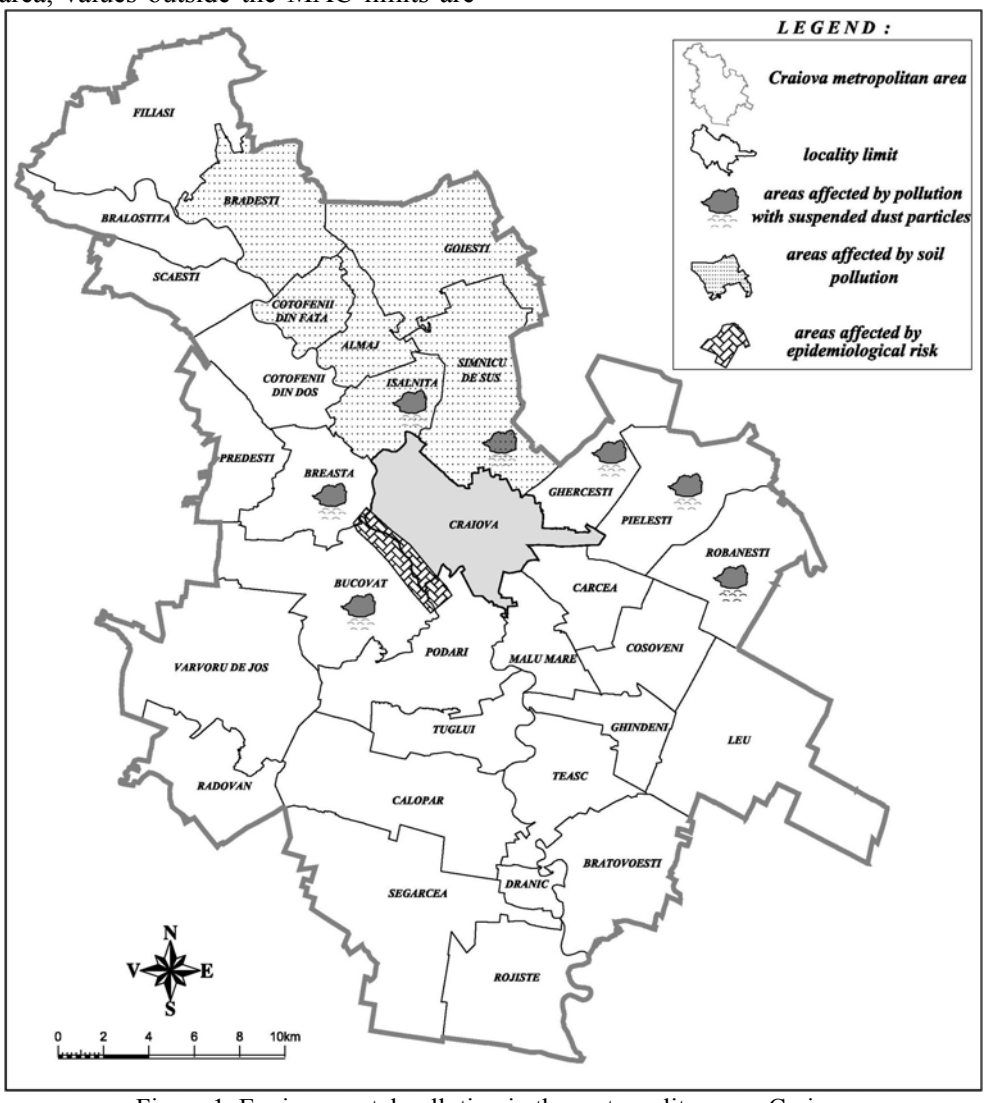

Figure 1. Environmental pollution in the metropolitan area Craiova

Table 1. Quality of waters in the river Jiu in urban space area

Station	Quality category	Annual average								
		pH	O_2diz mg/l	RF mg/l	Cl^- mg/l	NH_4 mg/l	CCO-Mn Mg/l	CBO_5 Mg/l	NO_3 Mg/l	NO_2^-
Işalniţa	I	7,6	9,3	231	34	0,4	5,3	2,7	3,6	0,01
Podari	II	7,7	8,0	343	46	0,7	6,6	3,5	4,4	0,035

Source of data: Dolj Environment Protection Agency, 2008

Table 2. Concentration of heavy metals (mg/dm^3)

Sample location	Pb	Cd	Co	Fe	Zn	Cr
Sample 1 Brateş	0,000	0,0017	0,000	0,564	0,000	0,000
Sample 2 Brateş	0,000	0,0039	0,000	1,201	0,000	0,000
Sample 1 Cătuţa	0,000	0,0020	0,000	0,699	0,000	0,000
Sample 2 Cătuţa	0,000	0,0039	0,000	0,623	0,000	0,000
Sample 3 Cătuţa	0,000	0,0039	0,000	0,596	0,019	0,000
Sample 1 Mălina	0,020	0,0039	0,000	0,400	0,000	0,016
Sample 1 Smârdan	0,021	0,0033	0,000	0,523	0,000	0,000
Sample 1 Movileni	0,018	0,0033	0,000	0,458	0,000	0,000
Sample 1 Şendreni	0,021	0,0039	0,000	0,695	0,021	0,000
Sample 1 Vânători	0,000	0,0017	0,000	0,491	0,000	0,000

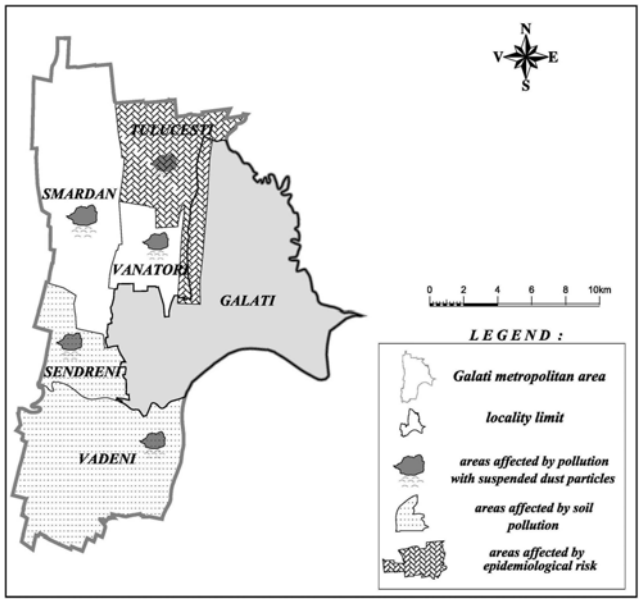

Figure 2. Environmental pollution in the metropolitan area Galati

Soil pollution is a direct consequence of the intensification of polluting economic activities within emergent territorial structures. Samples collected from the area of the Ecological Dump for Urban Waste Mofleni, cinder yards and ash pits belonging to S.C. Complex Energetic Craiova S.E. Isalnita and Complex Energetic Craiova I (in the Craiova metropolitan area), as well as in the Mălina Nord and Mălina Sud areas (in the Galaţi metropolitan area) have revealed values outside the MAC limits for heavy metals (Cu, Pb, Zn si Cd).

The risk of sound pollution has been identified in the area of industrial platforms (the Işalniţa and Industrială Est industrial platforms in the Craiova metropolitan area, and the Arcelor Mittal platform in the Galaţi metropolitan area) and along the main access routes to the polarizing center of the metropolitan area. Intense traffic recorded at main access points (from Filiaşi, Pieleşti, Calafat and Bechet to Craiova and from Movileni and Vânători to Galaţi) determine elevated noise values.

The risk of pollution with city wastes is determined by the catching systems for municipal waste, which are not treating the material collected before depositing it (the Mofleni Dump - Craiova, the Tirighina Dump-Galaţi), which leads to pollution in wide areas with unpleasant smells, the dislodging of light materials and infiltrations to the phreatic by the wind (Dolj Environment Protection Agency, Galati Environment Protection Agency).

Epidemiologic risks have been evaluated on the basis of field research observations. In both metropolitan areas unorganized animal waste dumps have been identified, regular pest holes. In the Galaţi metropolitan area, such a dump was identified on the bank of the river Brateş and in the Craiova metropolitan area, in the grasslands of the river Jiu. Inadequately set up landfills contribute to the amplification of epidemiological risks. The best example is the Tirighina landfill, located in the close vicinity of some commercial spaces, which concentrate a large number of customers every day (Fig. 3).


Figure 3. Localization of commercial spaces near the Tirighina landfill

The evaluation of environmental risks in emergent territorial, in the two emergent territorial structures, shows the necessity to build territorial management models respective of the new realities of these highly dynamic territorial systems. The management model must be implemented starting from

the principle of a global vision on environmental hazards, more accurately, the implementation should be performed in terms of the entire emergent structure.

Territorial management strategies characteristic to emergent structures must consider the rethinking of the institutional system so that decisional impulses are efficient and in accordance with the context provided in terms of over-systems. For an efficient management of environmental hazards we suggest two types of territorial organization of the implementation process for the management model: management through hierarchical decision-making levels and through polycentric structures.

Territorial management through hierarchical decisional structures is a model that is frequently used at European level, accommodating various levels of jurisdiction (Chiriac, 2009). This means of institutional restructuring, also called multi-level, tested within the European territorial management system, can be extrapolated at a microscale to the level of any emergent territorial structure. The basic principal of this management system implies the decentralization of responsibilities to inferior levels, with central coordination structures having both coordination and monitoring responsibilities. Territorial management of metropolitan areas through polycentric structures involves the delocalization of decision and monitoring responsibilities to local territorial systems.

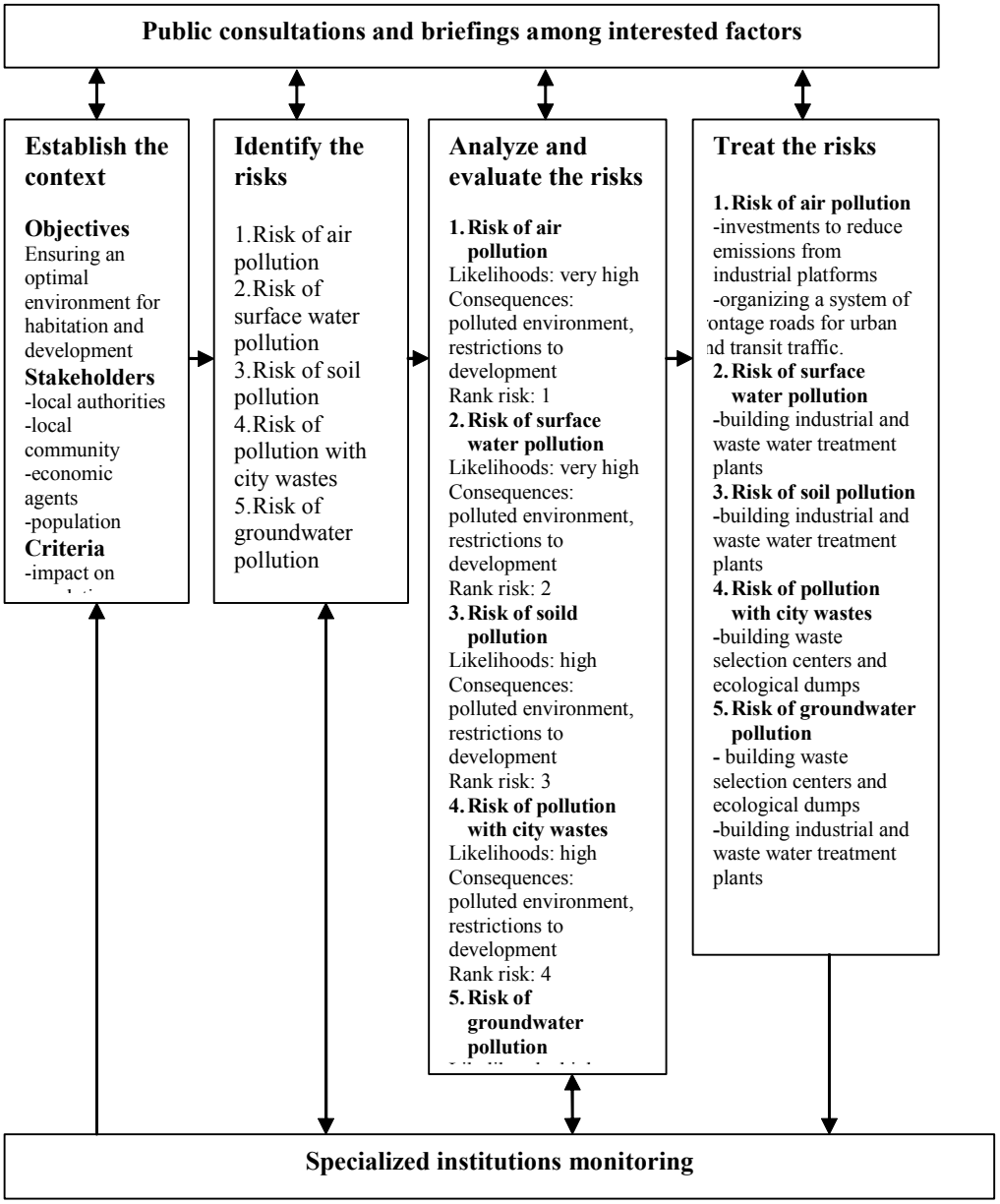

Figure 4. The distinctiveness of the environment management model in the Craiova development hub. Source: Peptenatu et al., 2011

Territorial management of emergent structures requires specific territorial organization measures, demanding a delocalization of institutions based on the principle of more decision centers operating coordinately (Peptenatu et al., 2011)

The creation of the management model for environmental hazards implied a ranking of the environment hazards from the two emergent structures. The ranking criteria for environment risks include the impact of human health (weight 3) and development restrictions (weight 2), criteria based on which proceeding priorities for an optimal management of environmental hazards are determined. To each environment issues identified a score from 1 (the lowest) to 10 (the highest) has been allocated. Based on aggregate values, the environment management model for the Galați and Craiova metropolitan areas has been generated (Fig. 4).

Detailed analyses performed in some representative emergent structures shows that the effects of the development of economic activities is experienced today by the components of the natural environment, highly affected by the rapid industrialization and the spectacular rise in the number of inhabitants.

4. DISCUSSIONS

The intensification of relations between large cities and their influence zones determined the emergence of a territorial structure with distinctive functional characteristics. The different dynamics of relations between components of this territorial system prompts functional fractures to threaten the proper operation of the territorial system as a whole. Such functional fractures are transparent between the pronounced economic development in emergent structures and the capacity of the management system to provide adequate protection to the environment.

Imbalances in relations between components of emergent territorial systems are determined by: relocation of industrial activities to the urban proximities, emergence of new residential spaces in the influence zone, disposal of wastes in spaces.

The creation of environment risk management models must consider the scale of existing and potential imbalances (Ianos, et al., 2009; Fekete, 2006), whose efficiency is greatly influenced by community involvement through briefings and consultations through all stages of the implementation process.

The study of emergent territorial structures indicates a high pressure on sensitive elements of the natural environment, such as surface waters. The small size of waste treatment plants of lack there of, with polluted waters being discharged directly into the hydrographic network, represents a cause for the pressure exerted on surface waters. The importance of the analysis of these elements comes up in numerous specialized studies (Vafaeinezhad et al., 2010; Nouri et al., 2010).

The superior dynamics of relations between elements of emergent territorial systems require territorial management models that observe the decisional component, in which the orientation of decisional responses leads to the result anticipated by decision-makers (Ghinea & Gavrilescu, 2010; Vinke-de Kruijf et al., 2009).

The management of environment risks presents a series of characteristics due to the complexity of the environments affected by the concentration of human activity, a complexity which also determines multiple uncertainties (Băbuț & Moraru, 2006; Băbuț & Moraru 2002).

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REFERENCES

Alam, M.D.J.B, Muyen, Z., Islam, M.R., Islam, S., Mamun, M., 2007. *Water quality parameters alongrivers.* Int. J. Environ. Sci. Tech., 4 (1), 159-167.

Basbas, S. & Nikolaou, K., 2009. *An approach for the estimation of traffic noise cost in Thessaloniki.* Journal of Environmental Protection and Ecology 10(1), 232–243.

Băbuț, G. & Moraru, R., 2002. *Environmental risk characterisation principles.* Proceedings of the 6th Conference on Environment and Mineral Processing, part. I, VŠB-TU Ostrava, Cehia, 17-21.

Băbuț, G. & Moraru, R., 2006. *General framework for the environmental risk management* (*Cadrul general al managementului riscului de mediu*, Buletinul, AGIR), 3, 103-107.

Bebbington, A. & Williams, M., 2008. *Water and Mining Conflicts in Peru.* Mountain Research and Development, 28(3-4), 190-195.

Bhattacharyya, K.G. & Kapil, N., 2010. *Impact of urbanization on the quality of water in a natural reservoir: a case study with the Deepor Beel in Guwahati city, India.* Water and Environment Journal, 24, 83–96.

Braghină, C., Peptenatu, D., Constantinescu, Ș., Pintilii, R.D. & Drăghici, C., 2010. *The pressure*

exerted on the natural environment in the open pit exploitation areas in Oltenia. Carpathian Journal of Earth and Environmental Sciences, 5(1), 33–40.

Braghină C, Peptenatu D, Draghici C, Pintilii RD Schvab A 2011.*Territorial management within the systems affected by mining. Case study the South-Western Development Region in Romania*. Iran. J. Environ. Health. Sci. Eng., 8 (4): 342-352.

Chen, C.C., 2009. *Environmental impact assessment framework by integrating scientific analysis and subjective perception.* Int. J.Environ. Sci. Tech., 6(4), 605-618.

Chiriac C., 2009. *The emergence of multi-level governance model in Romania* (*Emergența modelului guvernanței multi-level în România*), 2009, Revista Transilvană de Ştiințe Administrative, 1(23), 5-18.

Cullingworth B. & Nadin, V., 2006. *Town and country planning in UK.* Routledge, London. 481 p.

Damian, G., Damian, F., Năsui, D., Pop, C. & Pricop, C., 2010. *The soils quality from the southern – eastern part of Baia Mare zone affected by metallurgical industry*. Carpathian Journal of Earth and Environmental Sciences, 5(1), 139–147.

Dragomir, N., Masu, S., Bogatu, C., Lixandru, B., Lazarovici, M. & Cristea, C., 2009. *In situ remediation of soils polluted with heavy metals. Part i. Using of supported materials*. Journal of Environmental Protection and Ecology 10(1), 42–48.

Fekete, J.G., 2006. *Education, research and development tasks of environmental protection.* Carpathian Journal of Earth and Environment Sciences, 2, 5-12.

Ferencz, L. & Balog, A., 2010. *A pesticide survey in soil, water and foodstuffs from Central Romania.* Carpathian Journal of Earth and Environmental Sciences, 5(1), 111-118.

Gavrilescu, M., 2009. *Behaviour of persistent pollutants and risks associated with their presence in the environment–integrated studies.* Environmental Engineering and Management Journal, 8(6), 1517-1531.

Ghinea, C. & Gavrilescu, M., 2010. *Decision support models for solid waste management-an overview.* Environmental Engineering and Management Journal, 9(6), 869-880.

Giri, D., Murthy, V.K., Adhikary, P.R. & Khanal, S.N., 2007. *Estimation of number of deaths associated with exposure to excess ambient PM10 air pollution*. Int. J. Environ. Sci. Tech., 4(2), 183-188.

Haynes, H., Haynes, R. & Pender, G., 2007. *Integrating socio-economic analysis into decision-support methodology for flood risk management at the development scale (Scotland).* Water and Environment Journal, 22, 117–124.

Ianoş, I., 2004. *Urban dynamics. Applications to the city and the Romanian Urban system* (*Dinamica urbană. Aplicații la oraşul şi sistemul urban românesc*), 213 p., Tehnical Publishing House, Bucureşti.

Ianoş, I., Peptenatu, D. & Zamfir, D., 2009. *Respect for environment and sustainable development.* Carpathian Journal of Earth and Environmental Sciences, 4(1), 81 – 93.

Kavaliauskas, P., 2008. *A concept of sustainable development for regional land use planning: Lithuanian experience*. Technological and Economical Development of Technology, 14(1), 51–63.

Mrkajic, V., Stamenkovic M., Males, M., Vukelic, D. & Hodolic, J., 2010. *Proposal for reducing problems of the air pollution and noise in the urban environment*. Carpathian Journal of Earth and Environmental Sciences, 5(1), 49-56.

Naddafi, K., Nabizadeh, R., Soltanianzadeh, Z. & Ehrampoosh, M.H., 2006. *Evaluation of Dustfall in the Air of Yazd.* Iran. J. Environ. Health. Sci. Eng., 3(3), 161-168.

Naghibi, F. & Shirmohammadi, H., 2008. *Physical spatial development: a GIS analysis with emphasis on environmental impacts-case study Nalos city*. Iran. J. Environ. Health. Sci. Eng., 5(1), 43-50.

Nasseri, S., Dehghani, M., Amin, S., Naddafi, K. & Zamanian, Z., 2009. *Fate of atrazine in the agricultural soil of corn fields in fars province of Iran*. Iran. J. Environ. Health. Sci. Eng., 6(4), 223-232.

Nejadkoorki, F., Yousefi, E. & Naseri, F., 2010. *Analysing street traffic noise pollution in the city of Yazd*. Iran. J. Environ. Health. Sci. Eng., 7(1), 53-62.

Newman, P., 2006, *The environmental impact of cities*. Environment and Urbanization, 18(2), 275-295.

Nouri, J., Omidvari, M. & Tehrani, S.M., 2010. *Risk assessment and crisis management in gas stations*. Int. J. Environ. Res., 4(1), 143-152.

Obire O., Ogan A. & Okigbo R.N., 2008, *Impact of fertilizer plant effluent on water quality*. Int. J. Environ. Sci.Tech., 5(1), 107-118.

O'Sullivan, J.J., Gebre F., Bruen M. & Purcell P.J., 2010. *An evaluation of urban flood estimation methodologies in Ireland.* Water and Environment Journal 24, 49–57.

Peptenatu, D., Pintilii, R.D., Cepoiu L. & Drăghici C., 2009, *Polycentric development strategy – an efficient instrument in administrative decentralization*. Romanian Review on Political Geography, 2(2), 99-111.

Peptenatu D., Pintilii R.D., Draghici C. & Stoian D., 2010, *Environmental pollution in functionally restructured urban areas: case study – the city of Bucharest.* Iran. J. Environ. Health. Sci. Eng., 7(1), 87-96.

Peptenatu, D., Pintilii, R.D. & Draghici, C., 2011, *Environmental risk management of urban growth poles regarding national importance.* Int. J. Environ. Sci. Tech., 8(4), 737-746.

Petrişor, A.-I., Ianoş I. & Tălângă C., 2010, *Land cover*

and use ahanges focused on the urbanization processes in Romania. Environmental Engineering and Management Journal, 9(6), 765-772.

Picu, A., 2009, *A study upon occupational noise pollution exposure at a metallic confections plant*. Carpathian Journal of Earth and Environmental Sciences, 4(2), 65-74.

Pintilii, R.D., Peptenatu, D. & Drăghici, C.C., 2008. *Criteria and indicators for determining the areas of urban influence* (*Criterii şi indicatori de delimitare a ariilor de influenţă urbană*). Comunicări de Geografie, 12, 421-426.

Priadi, C., Ayrault, S., Pacini, S. & Bont, P. 2011. *Urbanization impact on metals mobility in riverine suspended sediment: role of metal oxides.* Int. J. Environ. Sci. Tech., 8(1), 1-18.

Popescu, F., Ionel, I. & Ungureanu, C., 2009. *Ambient air quality measurements in Timisoara. Current situation and perspectives.* Journal of Environmental Protection and Ecology 10(1), 1-13.

Ranade, P., 2007. *Environmental Impact Assessment of Land Use Planning Around the Leased Limestone Mine Using Remote Sensing Techniques*. Iran. J. Environ. Health. Sci. Eng., 4(1), 61-65.

Robu, B. & Macoveanu, M., 2009. *Strategic environmental assessment for plans, programs, policies in Romania: multi-criterial method.* Environmental Engineering and Management Journal, 8(6), 1451-1456.

Roshan, G.R., Zanganeh, Shahraki, S., Sauri, D. & Borna, R., 2010. *Urban sprawl and climatic changes in Tehran.* Iran. J. Environ. Health. Sci. Eng., 7(1), 43-52.

Rutkauskas, A.V., 2008. *On the sustainability of regional competitiveness development considering risk technological and economic development of economy.* Baltic Journal on Sustainability. Vilnius: Technika, 14(1), 89-99.

Secu, C.V., Iancu, O.G. & Buzgar, N., 2008. *Lead, zinc and copper in the bioaccumulative horizon of soils from Iasi and the surrounding areas*. Carpathian Journal of Earth and Environmental Sciences, 3(2), 131-144.

Sjöberg, L., 2007. *Emotions and risk perception*. Risk Management: an International Journal. 9, 222–237.

Vafaeinezhad, A.R., Alesheikh, A.A., Nouri, J., 2010. *Developing a spatio-temporal model of risk management for earthquake life detection rescue team*. Int. J. Environ. Sci. Tech., 7(2), 243-250.

Vinke-de Kruijf, J., Dinica, V., Denie, C.M. & Augustijn, B., 2009. *Reorganization of water and waste water management in Romania: from local to regional water governance.* Environmental Engineering and Management Journal, 8(5), 1061-1071.

*** Local Council no. 297/27.11.2008

*** Council Directive 96/62/CEE

*** Council Directive 1999/30/CE

*** Council Directive 75/440/CEE

*** Council Directive 80/68/CEE

*** Directive no. 2006/12/CE

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