ASSESSMENT OF THE URBAN LANDSCAPE OF PETROȘANI MUNICIPALITY AND THE IMPACT OF ABANDONED BUILDINGS ON IT

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Abstract: *The city of Petroșani, as well as the whole area known as Jiu's Valley, is integrated in a general vision of transforming a mining region into a tourist destination and, in this context, the aspects related to the quality of the urban landscape must be taken into account in a vary serious manner. Although the Petroșani municipality is located in an area considered by many to be idyllic (being surrounded by hills and mountains with altitudes of over 2000 m, being crossed by spectacular valleys and gorges) the intensive industrialization (mining exploitation: Dâlja, Livezeni; mining machinery and equipment companies: UMIROM, UPSRUEM) from the communist era left a significant mark on the urban landscape. Moreover, after 1995, with the restructuring of the mining sector, many of these industrial buildings lost their usefulness and are currently abandoned. Of course, the restructuring of the mining sector, in particular, but also the lack of jobs in alternative sectors of activity led to the massive depopulation of the municipality, which led to the increase of the number of abandoned buildings, which are currently in different stages of degradation. The urban landscape should not be ignored, this being the first that comes in contact with the tourists who will visit this region and will contribute to the economic well-being of the inhabitants. As these buildings, beyond the degradation of the urban landscape, constitute true outbreaks of infection and, being exposed to arson and collapse, they constitute a public danger, in the present paper we set out to evaluate quantitatively and qualitatively the urban landscape of Petroșani municipality and to estimate the impact that some of the abandoned buildings have on the urban environment in general. For this purpose we have used specific methods for analyzing the urban landscape and we have adapted the methods for identifying/estimating the anthropic impact on the environment (the network method and the impact matrices) for the situation under study.*

Key words: *Petroșani, urban landscape, abandoned buildings, environmental impact*

INTRODUCTION

Following the restructuring process of the Romanian industry as a whole, and, especially the extractive one (coal mining to be more precisely), the population of Petroșani municipality decreased from 52,390 in 1992 to 34,331 in 2011 (a decrease of about 35%) (***, 2014) and continues on the same trend.

Restructuring of the mining sector has not only led to a decrease of the employees in the field and in those directly related (mining machinery and equipment companies, institutes and design-research-development companies in the field etc.), but also to a restriction of the activities in other sectors (services and utilities, public food, education, health, etc.), practically being seriously affected the zonal economy and encouraged labor migration (FAUR et al., 2017). In the context of those presented, it is easy to understand why a large number of industrial, public and private abandoned buildings have appeared and continue to appear in the urban landscape/environment of Petroșani municipality.

MATERIAL AND METHODES

Short description of Petroșani municipality

Petroșani municipality is located in the central part of Romania, in the south of Hunedoara county (Figure 1), at the confluence of the East Jiu with the West Jiu rivers, geographically at the latitude of 45°24'44 " north and the longitude of 23°22'24 " east (***,

2014). Outside the town with the same name, the municipality of Petroșani has the following localities in administration: Peștera Bolii, Dâlja Mare, Dâlja Mică and Slătinioara.

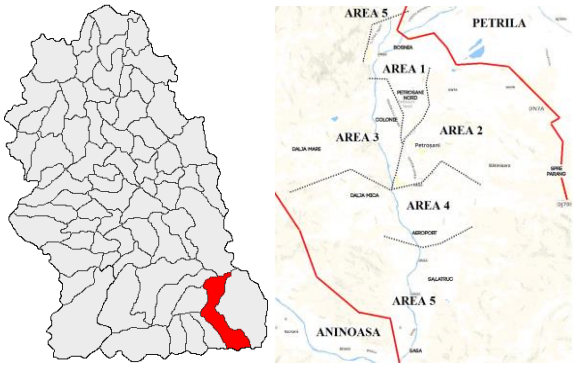

Figure 1. Location of Petroșani municipality within Hunedoara county and its areal divisions (***, 2014)

It is the most important city within the Jiu Valley Basin (Petroșani Depression). It has an administrative area of 19,556 ha (195.56 km^2), being located between the Retezat and Sebeș mountains (component unit of the Șureanu Mountains) to the north, the Vâlcan Mountains to the south, Godeanu to the west and Parâng to the east (NIMARĂ, 2011).

The relief of Petroșani city is typical for mountaind depressions (Figure 2), it is located at an altitude of 615 - 620 m, the highest altitude in the area being recorded in the Parângul Mare Peak (2519 m) and the smallest at Livezeni (the riverbed of East Jiu is at an altitude of 560 m) (NEGOE 1, 2019).

Figure 2. Panoramic view of Petroșani municipality (photo by: LightShadeFX)

Petroşani municipality is located on two important communication routes: DN 66 (E 79) Târgu Jiu - Simeria at the intersection with DN 66A Petroşani - Uricani - Câmpu lui Neag, with extension to Herculane and DN 7A connecting the city to Valea Oltului, Petroşani - Voineasa - Brezoi) (NEGOE 2, 2019). Regarding the distance to the big cities, the city of Petroșani is located at 370 km from the country's capital, Bucharest, and 91 km from the capital of Hunedoara county, Deva city.

The official story of Petroșeni begins in 1788, when the name is recorded in the book "Journey from Postdam to Constantinople" by Prussian officer Gotze. Only in 1818 the name of Petroșeni town is mentioned in official documents (***, 2014).

After 1840, the region will experience a rapid development, as the surface exploitation of coal discovered in the area begins. The mining basin would become the largest coal field in Romania and one of the most important in Europe (***, 2014).

Until 1920, Petroșani was known as Petroșeni (a name still kept today by the natives peasant, the so-called "momârlani"), but from February 14, 1921 the settlement will become as we know it today, namely Petroșani.

On January 4, 1924, Petroșani commune becomes a town, and on March 1, 1968 it becomes a city (municipality).

Also, since 1948, the city of Petroșani becomes a university center, by establishing the "Coal Institute", today the University of Petroșani, which was to become one of the most prestigious higher education institutions with mining profile in Romania and Europe.

On the other hand, at present, on the administrative territory of the city is the Livezeni Mining Exploitation, the headquarters of the Hunedoara Energy Complex, Mining Museum (the only one in the country with a mining technique profile), one of the most prestigious research institutions in Romania, the National Institute for Research and Development for Mining Security and Explosive Protection (INSEMEX) (NEGOE 2, 2019).

According to official data (***, 2014), in Petroșani city there are almost 30,000 taxable buildings, the public and private patrimony, owned by the community of Petroșani, and, according to the list of the Ministry of Culture, the following historical monuments exist on the administrative territory of Petroșani municipality: the first headquarters of the Romanian Petroşani Joint-stock Company (at present Petroşani Mining Museum); the headquarters of the Mining Trade Union between (at present is the social canteen); the wooden church of the Holy Archangels (Sânonilor, built in the 18th century); the Officials Casino (at present the Dramatic Theater I.D. Sîrbu); Prince Mircea dispensary (today the headquarters of the Petroşani Students Cultural House); the Workers (currently the La Belle Epoque Restaurant); the “Colonia Workers Housing” (created at the end of the 19th century, today it is known as the Colony District "urban historical area"); the historical center of the city (between Victoriei Square and the Civic Center, dating from the end of the 19th century).

It should be noted that these buildings cannot be considered as monuments in the true sense of the word, the spectacular architectural elements being poorly represented (DURA AND NISTOR, 2014).

Assessment of the urban landscape of Petroșani municipality

The landscape is an instrument of territorial design and development. Defining elements that condition the landscape are form and history, and landscape analysis and reading requires knowledge of the structure and materials that make up the landscape (ARMAȘ, 2006; IANOȘ, 2000; IANOȘ, 2004).

According to a previous study (BUIA and NIMARĂ, 2019), based on the recommendations in the specialized literature (BACIU, 2014; BOLD and NIMARĂ, 2016; ELC, 2000; LI and IEMA, 2013), the urban landscape of Petroșani municipality fits in the category of distinct landscapes, in which the localities have a predetermined plan or are developed organically, with a clear structure, the presence of craftsmanship skills, recognized outside the local community, average number of pictures, paintings or postcards of the available landscapes, one or more recognized events for traditional features, relatively stable urban dynamics, with very few changes in recent years, a few industrial constructions in operation, a few new constructions, recent beginning of an urbanism system, few historical monuments, good accessibility (one or more national roads or railway transport of medium-good quality).

From a qualitative point of view, an evaluation was made taking into account 15 indicators, as can be seen in Table 1:

Table 1

Quality assessment of urban landscape (Modified after BUIA AND NIMARĂ, 2019)

Name of indicator	Value		
	Low	Medium	High
Buildings and historical monuments (19th and 20th century)	X		
Buildings and constructions of new architectural value after 1989	X		
Buildings built between 1950 and 1989			X
Green areas, parks and recreation areas		X	
Pedestrian assemblies, public squares		X	
Homogeneity of architectural style	X		
Visible homogeneity in height	X		
Visual homogeneity as shape and structure		X	
Aesthetic contrast between buildings (shape, structure, color)		X	
Detached, demolished or demolished buildings		X	
Contrast on residential areas		X	
Accessibility between functional areas			X
Industrial zones in operation	X		
Decommissioned industrial zones		X	
The visual and qualitative aspect of the transport infrastructure		X	

The indicators that obtained the high value were: the accessibility between the functional areas and the buildings, respectively those constructed during the last two, three decades of the 20th century (as a result of the general economic boom - the industrial sector in private - mining industry and the construction of mining equipment).

RESULTS AND DISCUTIONS

Description of some abandoned buildings from Petroșani municipality

It is practically impossible to include in this study all the abandoned buildings from Petroșani and for this reason we have selected a number of 6 buildings, which we considered to be representative and which can best highlight the impact and risk manifested on the urban environment.

C1. Former Military Unit 01032 (private property, area 1) - constructed in the central area, is ruined on the day that passes, without the authorities being able to intervene (Figure 3a). In the building that has an area of 335.44 m^2, as well as an interior courtyard of 279.27 m^2, the City Hall intended to move the Community Public Service for the Evidence of Persons.

In addition to the danger it poses for passers-by, periodically pieces of plaster, bricks and tiles falling from the building, there is also the danger of arson and its propagation in the neighboring buildings (in the last 5 years, firefighters were forced to intervene 4 times in order to extinguish fires caused by those who sheltered in these ruins) and the dejections and household waste generated transformed the area into an outbreak of infection.

C2. Petroșani Central Workshops/IUMP/UMIROM/GEROM (private property, area 3) - at the north entrance in Petroșani, between Dărănești and Petroșani Rail Station, we are greeted by the ruins of what was once an important mining equipment company in Romania (Figure 3b). Beyond the importance on the industrial and socio-economic level (here being employed more than 3,500 people at one time), some of the now abandoned buildings are loaded with history, here being cast the famous Infinity Column, a masterpiece of the famous sculptor Constantine Brancuși.

C3. CONSMIN building (private property, area 3) - as the company name suggests, it had as object of activity mining constructions and, as expected with the restructuring of the activities in this sector, the company went bankrupt. The building located on Mihai Eminescu

street was abandoned, at present being in a state of ruin and constituting a real public danger for passers-by (by collapsing of constructive elements) (Figure 3c).

Figure 3. Abandoned buildings from Petroșani municipality

C4. Student Cultural House (the "new" establishment, property of Ministry of Youth and Sport - National Youth Authority (ANT), area 1) - the construction started 27 years ago, in the autumn of 1992. According to the construction plan, at the time of commissioning, the building was to have, among other things, a 485-seat showroom, a discotheque, a restaurant, 12 studios for guests, rehearsal rooms for artistic formations, as well as numerous other annexes. The building works were abandoned in 2006 (Figure 3d). The University of Petroșani wants to take over the building, conditioned by the possibility of financing the project from European funds (at a first analysis we are talking about 3 million Euros).

C5. CFR (Romanian Rail Ways) Deposits (CFR patrimony, area 3) - located at the north exit from Petroșani Rail Station, on the left side on the direction towards Simeria, these deposits have not been used since the early 90s (Figure 3e). For a long time in these buildings, people from Colony District found their shelter turning them into real outbreaks of infection

and causing some small fires. At present the structure of resistance is severely affected, the roof presenting an imminent danger of collapse, was abandoned by people, being "taken over" by homeless animals.

C6. Apartment building (public domain, area 4) – located in Aeroport (Airport) District. After the restructuring process started in 1996 (still unfinished), due to population migration, entire apartment buildings were abandoned (Figure 3f). Beyond the danger represented by the plaster pieces that fall out of the building, by the unsightly appearance, this represents a real danger for children in the area who use it as a playground.

Identification of the impact of abandoned buildings on the urban environment

One method used in environmental quality assessment to identify the impacts of a project on it is the network method (LAZĂR AND FAUR, 2011).

Figure 4 shows an impact network built in order to highlight the primary and secondary impacts generated by the presence of abandoned buildings within the area of Petroșani municipality.

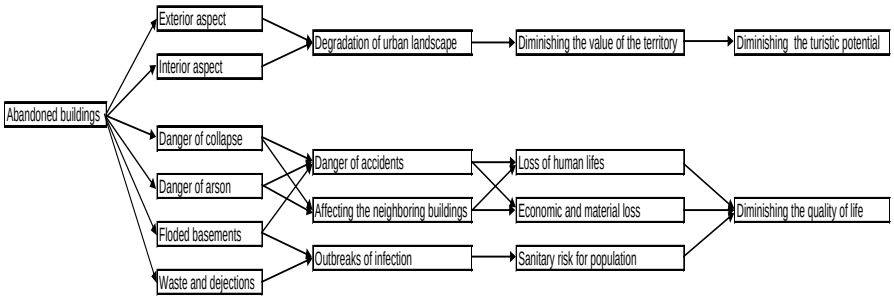

Figure 4. Network for environmental impact identification

As can be seen, the impact network allows only a general identification of the existing or potential impacts generated by abandoned buildings from Petroșani municipality on the urban environment. For this reason, for an individualized identification and quantification of this impacts, we resorted to another method, namely that of impact matrices.

Assessment of the impact by matrices method

Generally, the most used are the quantitative type matrices, which aim to evaluate, through a numerical score, both the individual impacts and the overall impact of the project, and are constructed by assigning to each crossing point a numerical coefficient that expresses the importance of that interaction compared to the others. In this case, the matrices become operative tools of the impact analysis and evaluation phase (LAZĂR and FAUR, 2011).

In order to identify and quantify the impact of abandoned buildings in the city of Petroșani on the urban environment, we built a matrix (Table 2) in which, on lines, we have the buildings identified and described in the previous paragraph (the 6 buildings), and on the columns we have the types of degradation and the dangers that they represent (7 categories: a - the state of the resistance structure; b - the external appearance; c - the internal appearance; d - the stability of the constructive elements; e - the danger of arson (the presence of combustible elements); f - the presence of the waste/outbreaks of infection; g - flooded spaces).

The last column presents the average impact that each of the analyzed buildings has on the urban environment. The value of the average impact is important for the last subchapter, the one assessing the risk that these buildings represent for the urban environment and implicitly for the most important component of it, humans.

The following values were adopted for the construction of the matrix (NEGOE 2, 2019):

0 - no impact (not applicable for the analyzed building);
1 - minimum impact:
a - there are no indications that certain elements of the resistance structure may be affected, no detailed specialized investigations are necessary (a visual inspection by a specialist in structures is sufficient);
b - visible areas affected by infiltration, lack of small plaster fragments, inscriptions (graffiti), discolored areas;
c - visible areas affected by infiltration, lack of small plaster fragments, inscriptions (graffiti), discolored areas, local cracks in walls, ceilings, steps, etc .;
d - no drops of plaster blocks, bricks were reported, but isolated tile drops caused by snow sliding were reported;
e - wooden structures and flammable materials are reduced in volume and their distribution in the building does not allow the generalization of a fire;
f - there are waste materials in the building, but these are not organic in nature, dejections are not reported, rodents and insects have been reported;
g - water accumulates in some rooms during torrential rainfall, but it evaporates shortly.
2 - medium impact:
a - the elements of the resistance structures are seriously affected, there is a need for thorough specialized investigations, resistance tests;
b - large areas affected by infiltration, lack of large plaster fragments, inscriptions (graffiti), large cracks visible on the outside;
c - large areas affected by infiltration, lack of large plaster fragments, inscriptions (graffiti), pieces detached from walls, ceiling and steps, cracks extended into walls, ceilings, steps, etc.;
d - periodic drops of plaster blocks, bricks and tiles were reported;
e - wooden structures and flammable materials are extended in volume (25 - 50%), and their distribution in the building allows the generalization of a fire;
f - in the building there are important volumes of organic waste, human and animal dejections are reported, colonies of rodents and insects are present;
g - certain rooms (basement) are partially flooded, the water is infected, it has a strong unpleasant smell and does not evaporate throughout the year.
3 - major impact:
a - the resistance structure is irreparably affected, the collapse of the building is imminent and represents an active danger for pedestrians and vehicles in the area of influence;
b - appearance of ruin, absence of plastering on more than 50% of the outer surface, lack of portions or fragments from the outer walls, building covered by spontaneously installed vegetation;
c - obvious infiltration (practically it rains in the building), absence of plastering on more than 50% of the interior surface, inscriptions (graffiti), partially or totally collapsed walls, lack of pieces of roof, ceiling and floors, partially or totally collapsed steps, etc.;
d – daily falls of plaster blocks, bricks and tiles;
e - wooden structures and flammable materials are expanded in volume (> 50%), their distribution in the building allows the generalization of a fire, there have been fires in the past, they can extend to neighboring buildings;
f - the building is practically an improvised waste deposit, large quantities of human and animal dejections, colonies of rodents and insects are present;

g - the basement of the building is completely flooded, the water is infected, it has a strong unpleasant smell and it does not evaporate throughout the year.

Table 2

Impact assessment/evaluation matrix

Impact matrix	Impact factors (type of degradation – danger)							*AVERAGE
Building	a	b	c	d	e	f	g	IMPACT
C1	3	2	3	3	3	3	1	**3
C2	1	2	2	1	0	1	0	1.4
C3	3	3	2	3	2	2	0	**3
C4	0	2	1	1	0	0	2	1.5
C5	2	3	3	3	3	3	1	2.57
C6	1	2	2	1	2	1	2	1.57

* The average value of the impact is calculated without taking into account the cells marked with 0. For example, in the case of an abandoned building that does not have a basement, there is no problem of water accumulation, but at the same time the building may have the resistance structure severely affected and a high risk of arson. Therefore, even if water is not a problem, it does not necessarily mean that the danger posed by that building is lower than in the case of a building in which the temporary or permanent presence of water is reported;
** If for the state of the resistance structure the awarded score is 3, is major impact, then automatically and the average impact for the respective building will be considered equal to 3.

Depending on the scores obtained by the analyzed buildings in Table 2 (the impact that these buildings have on the urban environment), we can establish 4 intervals according to the type of interventions required (NEGOE 2, 2019):

= 1 → buildings with minimal impact on the urban environment, requires cosmetic works/current maintenance (green);

> 1 - 2 → buildings with medium impact on the urban environment, requires renovation of the exterior and interior, inspection of the resistance structure, sanitation (C2, C4 and C6) (yellow);

> 2 - 3 < → buildings with major impact on the urban environment, requires immediate intervention to the resistance structure, extensive works of restoration of the exterior and the interior, sanitation, elimination of the arson risk (C5) (orange);

= 3 → public danger buildings, the impact is maximum, saving these buildings is not justified from the point of view of historical or architectural value and must be removed immediately (demolished) from the urban landscape/environment (C1 and C3) (red).

Risk assessment

Certainly these buildings are at the same time a risk factor for the population of Petroșani municipality. The risk is the probability of a negative effect occurring within a specified period of time and can be reproduced in the form of the equation Risk = Danger x Exposure (MO, 1997). The risk can then be calculated by multiplying the probability factor with the severity factor in order to obtain a comparative figure.

Based on those presented above, we have designed a risk assessment method, starting from the values obtained for the average impact, presented in Table 2.

Thus, we considered that these values can be equivalent to the danger posed by these buildings, and the exposure is determined according to the area in which they are located (see fig. 1 and the description of the studied buildings). Basically, the areal divisions of the territory of Petroșani city was made based on aspects such as: the presence of heritage, administrative, socio-cultural and educational buildings, accessibility and distance from them, the quality of the infrastructure, parks and recreation areas, pedestrian and auto traffic etc. (***, 2014; NEGOE 2, 2019).

Based on these considerations, we set a scale from 1 to 3 for the exposure (1 small (reduced) exposure, 2 medium exposure and 3 high exposure) as follows:

1 - corresponding to area 5 of the municipality;

2 - corresponding to areas 3 + 4 of the municipality;

3 - corresponding to areas 1 + 2 of the municipality.

Next, we built the risk assessment matrix, presented in Table 3.

Table 3

Risk assessment matrix

Building	Risk calculation elements				RISK
	Average impact	Danger	Location (areal division)	Exposure	
C1	3	3	area 1	3	9
C2	1.4	1.4	area 3	2	2.8
C3	3	3	area 3	2	6
C4	1.5	1.5	area 1	3	4.5
C5	2.57	2,57	area 3	2	5.14
C6	1.57	1.57	area 4	2	3.14

According to the general recommendations of order 184/1997, 4 risk classes were established, and the buildings taken into study were framed into them (NEGOE 2, 2019):
1 - 3 → low risk - buildings are in an incipient state of degradation, are located in areas with low pedestrian and car traffic and do not present a risk to the population (C2) (green);
> 3 - 6 < → medium risk - the buildings are visibly degraded, they are located in areas with average pedestrian and car traffic, they present a risk to the population in certain conditions (eg: roof tiles dragging), (C5 and C6) (yellow);
6 - 8.5 → major risk - the buildings are in an advanced state of degradation, they collapse, they are located in areas with average pedestrian and car traffic, there are frequently reported falls of the constructive elements, outbreaks of infection, the risk to the population is permanent (C3 and C4) (orange);
> 8.5 - 9 → extreme risk - the buildings collapse, they are located in areas with heavy pedestrian and car traffic, there are real outbreaks of infection, they were affected by arsons and there is the risk of their extension to neighboring buildings, the risk for population is permanent (C1) (red).

CONCLUSIONS

In order to facilitate the extraction of general conclusions for the present study, we have constructed Table 4. In this table a comparison is made between the impact on the urban environment and the risk for the population generated by the analyzed abandoned buildings.

Table 4

Comparison between the environmental impact and the risk

Building	The impact over the urban environment	The risk over the urban environment and humans
C1	3	9
C2	1.4	2.8
C3	3	6
C4	1.5	4.5
C5	2.57	5.14
C6	1.57	3.14

The following can be observed:
- three of the buildings fall into equivalent classes of impact and risk: C1, generates maximum impact and extreme risk (public danger building); C4 and C6, generates a medium impact and risk;
- a single building, C2, generates a medium impact and a low risk;
- one building, C3, generates maximum impact and major risk;
- a single building, C5, generates a major impact, the risk being medium;

The general conclusion that can be drawn by analyzing Table 4 is that abandoned buildings do not always fall into equivalent classes of impact and risk, this fact being strongly influenced by their location (the areal division in which are situated).

Buildings C2, C3 and C5 generate an impact located in a higher class compared to the environmental risk (which is in the immediate lower class) due to aspects related to the positioning of these buildings (the distance to the central area of the city) and to the values of pedestrian and car traffic.

As a result of this study, it can be stated that all these buildings have a negative impact ranging from average to maximum on the urban environment and, with an exception (C2), they present a risk ranging from medium to extreme for the population.

For this reason, part of the abandoned buildings (C1, C3 and C5) must be removed from the urban landscape/environment of Petroșani municipality (demolished, and the land thus released made available for other purposes), while the rest must enter as soon as possible in capital repairs and rehabilitation works.

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