The impact of mining activities from Moldova Noua on forests

Cântar I. C.1, Chisăliţă I.1, Cadar N., Merce O.1, Turcu D.1

1 Forest Research and Management Institute

*Corresponding author. Email: cantar.cosmin@yahoo.com

Abstract   Located in most cases in areas that belonged of forest areas, current or former mining areas from Moldova Noua removed from forest fund vast tracts of forest, being replaced with mining objectives. This paper aims to achieve a quantitative and qualitative assessment of areas affected by mining residues, surfaces which mostly were part of the forest. The impact of mining on the environment in Moldova Noua in general and forests in particular is a broad topic which, undoubtedly, can not be exhausted only by publishing an article. The negative effects of mining activity can be measured and quantified in money even through a wide assessment of soil, water, blanket herbaceous forest etc. This paper is intended as a starting point on evaluating the impact of mining on the environment in the town Moldova Noua, especially today when, despite the existence of large amounts of ore in the underground, mining activity in this region seems to be forgotten, other industries prospering in the area.

Key words Moldova Nouă, mining activity, tailing dumps, forestier fund

By impact of mining activity in a region should be discussed both positive and negative effects. The first category includes raising living standards in the area by improving the economic situation of settlements in the area and its inhabitants, the abundance of jobs, positive demographic growth, consumption growth among the population.

Any mining activity carried out in an area, has socio-economic impacts on the community, attracting local labor force. This leads to higher living standards of local people involved in these activities, but on the other hand leads to an increase in prices locally. Heavy conditions of work in underground mining activities, due to the specific hydrogeological conditions (underground water reservoirs) have a particular risk of work accidents that can occur unwanted, equally affecting workers directly involved and their families, but the entire community. Cessation of mining activity produces a degradation of the area under different aspects: first economic and social, then visual, ecological, hydrological, geomorphological etc. (7).

The negative effects, however, have an impact on the environment and landscape and as a chain reaction through poor management can reflect on human health.

Mining activity, an important branch of industry produce, considering the nature of his specific, many and varied environmental impacts on the atmosphere, lithosphere, hydrosphere and by default on biosphere. The same author states that negative effects arise through changes in the landscape, manifested by landscape degradation and resettlement of households and the industrial objectives from mining areas, by occupying large areas of land for mining activities, stockpiles, storage of minerals, industrial installations, access roads etc., areas that are totally unusable for other purposes, for a long time (3).

In the paper “Evaluarea impactului asupra mediului generat de haldele de steril (Studiu de Caz: Mina de Cârbune Lupeni, Valea Jiu)” (romanian), the authors state that damage to the environment as a result of various activities within this industry leads to an ecological imbalance that affects life all living organisms. Consequently, in their view, finding ways to prevent and reduce the impact of mining on the environment is a priority in this industry. (5).

Land degradation, by vertical and horizontal movement, dumps and tailing dumps sliding are other negative effects that can result from irresponsible mining activities and which, through soil chemical pollution may affect for many years its fertile properties (3).

At hydrosphere level, the negative effects are felt by pollution of fresh surface waters and groundwater, as well as hydrodynamic imbalance of groundwater. However, noise, vibration and radiation scattered in the environment can have a strong adverse action. All this adversely affects the flora and fauna of the area and at the same time with establishing of the waste dumps, the land is subject to bicenogenesis (1).

Mining industry exert great influences on the environment which is manifested in all phases of mining and preparing processes. Regardless of the method applied for the recovery of a deposit is required numerous and various physical and chemical operations resulting in, on the one hand, useful
minerals and, on the other hand, the sterile material extracted from the ore together with useful material. In addition to solid residues, mining generates liquid and gaseous waste in massive amounts. Quantitatively, they exceed by many times the solid residues (3).

Although the negative effects of mining to date are important and undeniable, this industry has on hand many possibilities to minimize negative environmental impacts and moreover, the reconstruction of the affected areas to even higher quality parameters that the initials (4).

Over time it has created a tight competition between the interests of administrative, economic, social and strategic related to useful minerals from underground and public interests or even private interest, which refers to the optimal use of environmental resources (landscape, territory, system of surface and underground waters, atmosphere etc.) (3).

Considering the above, the research goal of this study is to assess the impact of mining activities from Moldova Noua on the affected areas from forest fund. This can be achieved through the following objectives:

- quantitative assessment of the affected areas in perimeter and around the mining objectives;
- qualitative assessment of the affected areas;
- assess the current status of the affected areas (ecological restoration, abandonment, etc.);
- prospects for evolution in time in these areas.

**Material and Methods**

In order to achieve the research objectives set out above, were used as research methods the following:

- **bibliographic research and documentation**, which was the starting point for achieving the objectives, by identifying in literature, the implications of such an activity in terms of impact on people and on the environment. Also to compare the current situation of the land with forest area from vecinity, which occupied in the past the affected areas, research and bibliographic documentation has been done in the forest management plan by identifying characteristics stand in the immediate vicinity of the affected areas.

- **routing codes observation** was used to identify the instalations and mining perimeters which affecting the environment in the town Moldova Noua as well as quantitative and qualitative evaluation of the affected areas and surrounding areas unaffected;

- **measurements** were carried out strictly for quantitative assessment of the areas affected by mine activities and their location in terms of GPS coordinates;

- **analysis and synthesis** have allowed solving the last goal of the research, identifying prospects for evolution of these areas as well as the elaboration of research results and general and specific conclusions.

Materials used in carrying out the research consisted of bibliographic references that refer to the mine from Moldova Noua, the history of this activity on these lands, mining areas and objectives.

To achieve the research on land phase were used GPS, needed to determine the coordinates of mining objectives and photo camera for achieving photo documentation.

In desk phase were used ArcReader software for reading the management map in digital format, GoogleEarth software where was transposed places of interest from management maps in order to determine their location in the forest fund. The areas affected were determined by GoogleEarth.

Mining areas were compared and reported to the nearest management unit in order to determine the site and forest type existing here before the mining activities.

**Results**

The actual history of Moldova Noua village is closely linked to mining. Documented for the first time in the census of 1717, the city located on the creek "Boșma" (today Boșneag) bearing different names „Poșneazi”, „Pesnak”, „Boșneak”, „Bosneac”, designations, locals say, come from Bosnian nationality of an entrepreneur's of mines from here. In 1865, on a map of Vienna is mentioned "Banya Moldova", meaning Mina Moldova (Hung.), and in 1808, in the land books is written „Neu Moldava” as forming the border with Sichevita (6).

The same author states that the town is one of the important mining sites, since Roman times, there are even different artifacts that prove this. Exploited by the Turks until 1718, Moldova Noua mines passed into the ownership and operation of Austrians in 1723 when it was founded the mining administration from Oravița.

Contemporary mining exploitation, by the change in natural landscape that appears togethther with mining activities and prospecting works from Moldova Noua, changed its appearance, but its restoration after finishing work was not done in all cases as it should. Mining points to which we refer, respecting their latitudinal location, from north to south are: „Ogasul Baiașului” mine, „Ogasul Grecului” mine, „Florimunda” mine, surface mining exploitation, „Suvarov” mine, preparation factories no 1 and 2, „Gărâna Mare” mine, „Varad” mine and tailing dumps.

**“Ogasul Băiasului” mine**

Located in the north of Moldova Noua in the contents Production Unit V, Moldova Noua Forest Department, bordering the management units no 29A, 29D, 29C. Currently, on the site of former „Ogasul Băiesului” mine (Fig. 1) is located „Ogasul Băiesului”
forest chalet is located here after the ecological restoration of the area. Coordinates of the location of the former „Ogasul Biaisului” mine are 44° 46’ 38.78” N and 21° 41’ 38.41” E. Estimated area that was removed from the forest and which is not in forest fund today, but that is still owned by the National Forest Administration is 1,12 ha.

![Fig. 1 Former area of „Ogasul Biaesului” mine (today „Ogasul Biaesului” forest chalet) (Foto: Cântar Ilie, 2015)](image1)

„Ogasul Grecului” mine

Former „Ogașul Grecului” research mine (Fig. 2) is in the north of Moldova Noua city, on the valley with the same name and is now a grassy plateau area with slopes stabilized with black locust, after ecological restoration work carried out after mine closure. Located in the content Production Unit V and bordering management unit no 48 B, the area of „Ogasul Grecului” mine as coordinates the following: 44° 45’ 41.90” N and 21° 42’ 05.24” E. The surface from perimeter of mine that is not yet restored to forest fund is 0,52 ha.

![Fig. 2 Area of „Ogașul Grecului” mine (Foto: Cântar Ilie, 2015)](image2)

„Florimunda” mine

Still crossed by a road, site of the former mine „Florimunda” (Fig. 3) was restored through revegetation and stabilization of slopes with black locust. Former mining area is located in the north of Moldova Noua, bordering with management unit no 53 from the content of Production Unit V, Moldova Noua Forest Department having as coordinates, approximatively, 44° 45’ 02.80” N and 21° 41’ 54.02” E. The area which today can still be restored to forest fund by reforestation works is 3,18 ha.
Surface mining exploitation

Surface mining exploitation (Fig. 4) remove from the forest fund the largest forest area of all mines in Moldova Noua, being located entirely within the forestry fund in the north-east of the city. The forest area, that still need to be restored to forest fund, measured by reducing the surface to horizon is 155.39 ha in the Production Unit V and in the vicinity of management units no 57, 58, 59, 60A, 61A, 55A. Guidance coordinates are 44° 44' 17.54 " N and that 21° 42' 09.10" E.

„Suvarov” mine

Main mine before closing Moldova Noua mining, „Suvarov” mine (Fig. 5) is located in the north-east of the city in the vicinity of management units no 62A, 93E, 80C, 112A, 111A, 111B, 111D from the contents UP V. Within „Suvarov” mine, located at coordinates 44° 43' 43.56" N and 21° 42' 08.27" E, needs to be reclaimed an area of 17.19 ha. It should be noted that „Suvarov” mine is located out of town, right next to the road connecting the village Padina Matei with Moldova Noua city.
Preparation factories

Located in the south-east of Moldova Noua, preparation factories (Fig. 6) no 1 and 2 were processing the copper ore, resulting the sandy dust sterile disposed in tailing dumps. Preparation factory no 1 was constructed in the area of agricultural land and preparation factory no. 2 in the forest, bordering with Production Unit V, management unit no 123A. Agricultural and forest land removed from circuit has an area of 60.21 ha of with the location coordinates 44° 42' 53.78" N and 21° 39' 50.84" E.

„Gărâna Mare” mine

Former research mine „Gărâna Mare” (Fig. 7), briefly worked and is located in the body of management unit no 113A and 112C of the Production Unit V at coordinates 44° 43' 23.63" N and 21° 41' 58.59" E. Surface removed from the forest area by placing this mine and which are not yet restored ecologically is 1.17 ha.
"Vărad" mine

Set in non wooded land, "Vărad" mine (Fig. 8) has affected agricultural land and grassland by removing from their circuit an area of 4.67 ha. Approximate coordinates of the mine are: 44° 42' 15.81" N and 21° 40' 20.16" E.

Tailing dumps

Located near the Danube and preparation factories, tailing dumps (Fig. 9), occupy the largest area of all mines objectives studied, having over 230 ha without forest vegetation. The coordinates in the middle of tailing dumps are 44° 40' 34.66" N and 21° 39' 16.73" E. The areas occupied by tailing dumps was not forest areas, but their stabilization requires conversion into forest plantations, because "stabilization using forest vegetation" (2) is the only solution to stop dust pollution in the area.
Summarizing the above data was conducted the „Summarizing table on the impact of mining activities from Moldova Noua on forests”. Compared to the data above, this table includes data on forest type and site type from areas affected by mining activities, obtained from consulting the forestry management plans of the Production Unit V of Moldova Noua forest department.

Table 1

<table>
<thead>
<tr>
<th>Name of mining objective</th>
<th>Area (Ha)</th>
<th>Perimeter/Length (Km)</th>
<th>Coordinate</th>
<th>Production Unit and management unit from vicinity</th>
<th>Site types</th>
<th>Forest types</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Ogasul Baiasului” mine</td>
<td>1,12</td>
<td>0,62</td>
<td>44° 46’ 38.78” N 21° 41’ 38.41” E</td>
<td>Production Unit V, management unit 29A, 29D, 29C</td>
<td>6252</td>
<td>4212</td>
</tr>
<tr>
<td>“Ogasul Greceului” mine</td>
<td>0,52</td>
<td>0,73</td>
<td>44° 45’ 41.90” N 21° 42’ 05.24” E</td>
<td>Production Unit V, Management unit 48B</td>
<td>5242</td>
<td>4212</td>
</tr>
<tr>
<td>“Florimunda” mine</td>
<td>3,18</td>
<td>1,10</td>
<td>44° 45’ 02.80” N 21° 41’ 54.02” E</td>
<td>Production Unit V, management unit 53A</td>
<td>6112</td>
<td>5162</td>
</tr>
<tr>
<td>Surface mining exploitation</td>
<td>155,39</td>
<td>9,99</td>
<td>44° 44’ 17.54” N 21° 42’ 09.10” E</td>
<td>Production Unit V, management unit 57, 58, 59, 60A, 61A, 55A</td>
<td>6131</td>
<td>5241 5151 4213 5162</td>
</tr>
<tr>
<td>“Suvarov” mine</td>
<td>17,19</td>
<td>4,93</td>
<td>44° 43’ 43.56” N 21° 42’ 08.27” E</td>
<td>Production Unit V, management unit 62A, 93E, 80C, 112A, 111A, 111B, 111D</td>
<td>5221</td>
<td>4213 4241</td>
</tr>
<tr>
<td>Preparation factories</td>
<td>60,21</td>
<td>7,44</td>
<td>44° 42’ 53.78” N 21° 39’ 50.84” E</td>
<td>Production Unit V, management unit 123A (preparation factory no 1)</td>
<td>6132</td>
<td>5131</td>
</tr>
<tr>
<td>“Garana mare” mine</td>
<td>1,17</td>
<td>0,72</td>
<td>44° 43’ 23.63” N 21° 41’ 58.59” E</td>
<td>Production unit V, management unit 113A, 112C</td>
<td>6231</td>
<td>4241</td>
</tr>
<tr>
<td>“Varad” mine</td>
<td>4,67</td>
<td>3,45</td>
<td>44° 42’ 15.81” N 21° 40’ 20.16” E</td>
<td>Agricultural land and grassland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tailing dumps</td>
<td>234,16</td>
<td>14,07</td>
<td>44° 42’ 34.66” N 21° 39’ 16.73” E</td>
<td>Agricultural land and grassland</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>477,61</strong></td>
<td><strong>43,06</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

Bibliographic research showed that local history is closely linked to mining, Moldova Noua is one of the places marked for mining, exploited since Roman times, maintaining mining in this region during the Turkish occupation, Austrian and until today.

Field observations allowed the evaluation of aesthetic and landscape mining areas, some of which are introduced into the natural landscape as much as possible by post-closure work carried out by interprinderea mining (“Ogasul Baiasului” mine, „Ogasul Grecului” mine, „Florimunda” mine, „Gărâna Mare” mine, and areas on slope and a part of plateau of tailing dumps). Other mining objectives mentioned and the aforementioned still requires such work to bring these areas in a form as close to the initial.

Looking at Table 1, it is noted that the mining areas where have not yet achieved post-closure works are occupying the largest area of degraded land among all the studied areas.

On site types, land areas most affected by mining (Fig. 10) are those belonging to site types (Hilly for quercus stands, podzolled, II), 6112 (Hilly for quercus stands, rocky and excessive erosion), 6131 (Hilly for quercus stands, podzolled, III).

Analyzing the land affected by mining activities on forest types, we can observed that they belong mostly to forest types 5131 (Sessile oak stand for slope with Gramineae and Luzula luzuloides (m)), 4213 (Beech stand for hill on shallow soil with calcareous layer (m)), 5162 (Sessile oak with Oriental Hornbeam with lower productivity).

References

1. Cătărău I. – 2014 – Cercetări privind procesul de renaturarea în cadrul plantațiilor forestiere instalate pe haldele de steril din zona orașului Moldova Nouă, Teză de doctorat, Universitatea de Științe Agricole și Medicină Veterinară a Banatului „Regele Mihai I al României” din Timișoara;
2. Chisăliţă I. – 2001 – Cercetări privind stabilizarea haldelor de steril de la Moldova Nouă cu ajutorul vegetației forestiere și influența acesteia asupra mediului, Teză de doctorat, universitatea „Transilvania” din Brașov;
8. *** – 2006 – Amenajamentul UP V Valea Mare, OS Moldova Nouă.