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## THE NOISE LEVEL ANALYZE RESULTED DUE TO FORESTRY ACTIVITIES WITHIN THE RODNA MOUNTAINS NATIONAL PARK

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**Abstract:** This paper presents a study on the noise level coming from forestry activities carried out within the Rodna Mountains National Park. It is known that there were 76 logging places on the reservation territory registered from January to September 2014, placed at a considerable distance inner the park boundaries. Corroborating the noise recorded at the analysed points with the number of logging places, as well as with the large distances between the logging places and the primary platforms, there can be considered that the noise pollution is affecting large areas, with a negative impact on the protected area.

**Key words:** Noise pollution, Rodna Mountains, Economics activities, Protected areas.

### 1. INTRODUCTION

The noise pollution is considered to be one of the major factors of environmental pollution, its effects accumulating over time, with negative implications on population and environment. Anthropogenic noise is proved to be a serious issue for the national parks and their acoustic monitoring reveals chronic exposure of wildlife to noise.

The elevated levels of noise significantly reduce the distance and surface for the acoustic signals to be determined by an animal. A number of studies indicate the gravity of the effects that noise has on various taxa, including important behavioural changes, reproductive success, density and community structure. The noise effects on animals can be physical - damage to hearing, physiological (Example increased energy consumption), behavioural changes.

The impact of the noise pollution on animals is determined by the characteristics of the response given by species, as well as the

number of situational factors: habitat, stage of the life cycle, prior noise exposure, duration and frequency of noise.

The reactions to the noise depend on: noise type, frequency, intensity, amplitude and duration.

By increasing the background noise with 5 dB in the frequency of the acoustic signal, the distance at which the predators can be heard is reduced up to 45%, while predators experience a 70% reduction of the search area [1].

Prolonged exposure to noise has as one consequence that the wildlife avoids certain areas, thus reducing potential habitat areas. For example, deer, grouse and grouse mountain birch preferentially selected habitats with less noise, far from human activities.

The noise monitoring in protected areas should be a priority for accredited bodies. In this respect, it is necessary to identify the noise sources and establishing the propagation maps.

## 2. METHODS

Logging within Rodna Mountains National Park involves cutting activities, “pulled- close” and the transport of wood. All these operations are performed with noisy equipment [3].

From January to September, 2014 there were 76 logging points. The distances between the points of cutting and primary loading base platforms of wood trucks can reach up to 10 km.

Wood descent of the mountain is usually done by using special tractors (TAF), on forest roads usually along and through the valleys. To determine the noise level inside the Rodna Mountains National Park there were made a series of measurements at different points: the cutting, the primary platform, a TAF path sites, quiet areas.

### 2.1 Equipment

To achieve the measurements there has been used the meter type NL - 32, Figure 1, produced by RION/ Japan, which is a portable device used for sound level measurements according to the Romanian standards [ISO 1996 -1], [ISO 1996 -2] [ ISO 1996-3] and the IEC.



Fig. 1. Sonometru NL-32

The measurements of sound pressure level can be made using different types of microphones. The type of microphone used for the sonometer NL - 32 is prepolarized type UC

- 53° which provides a stable and safe response [2].

### 2.2 The measurement of the noise level

The device was set to determine the continuous sound pressure level “A” at every 10 seconds for 5 minutes. The values recording was made on the sonometer card for which there prepared tables and graphic representations were using the NL - 22PB1 program.

Measurements were made at the points agreed together with the Administration Rodna Mountains National Park at a height of 1.5 m above the ground at a temperature of 14°C.

The measurements were made in four timber cutting areas and four primary transfer timber platforms, located on the map, Figure 2.

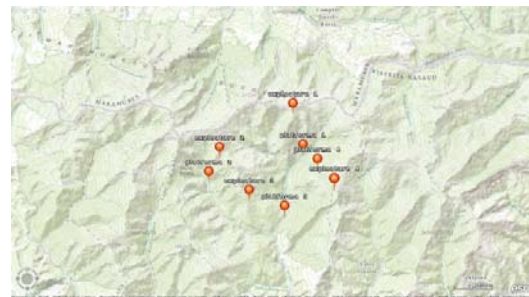


Fig. 2. The sound measurement points position

The distances the sound measurements were made from the source of sound are: 50 m, 100 m and 200 m inside the forest on the slope.

#### 2.2.1 The noise level in the operating point 1 at a height of 1.5 m above the ground operation

The *first wood cutting* is indicated on the map with 1 being located at a approximate distance of 13km to the southern boundary of the park, in the Anies valley.

*Measurements at 50 m from the cutting point.*

The noise values recorded at a distance of 50 m from the wood cutting were downloaded in the data processing program NL - 22PB1 and graphics were generated to visualize the level sound for the analysed period.

Graphical representation of values is shown in the Figure 3.

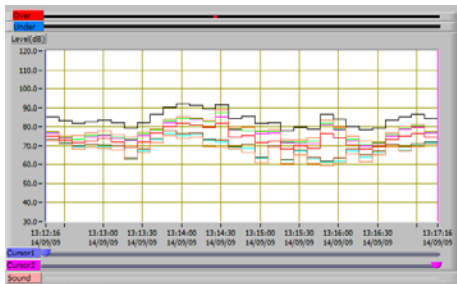


Fig. 3. View the data measured at a distance of 50 m from the noise source – forest operation 1.

*Determinations at 100 m away from the wood cutting place*

Measurements made at a distance of 100 m from the place of trees felling were performed to determine the noise level by promoting the sound through the forest for a period of 5 minutes. Recorded values are presented in graphical form in the Figure 4.

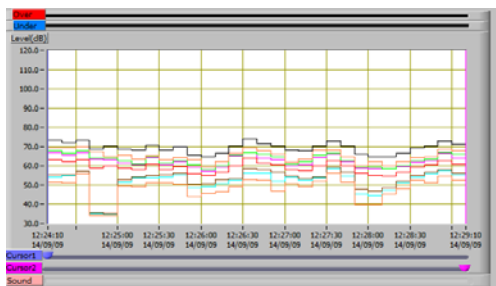


Fig. 4. Viewing the data measured at a distance of 100 m from the noise source- forest exploitation 1

The maximum recorded level is 62 dB, value that exceeds by far the level recorded during the day in quiet areas.

*Determinations at 200 m distance from the cutting place*

The values recorded for noise indicators, measured at a distance of 200m from the wood cutting are shown graphically in the Figure 5.

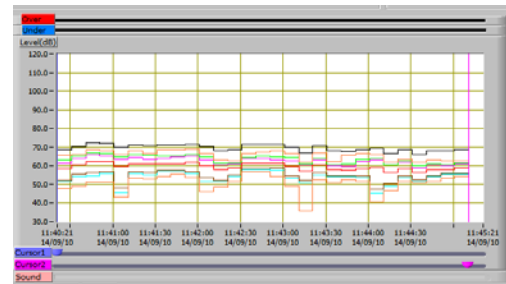


Fig. 5. Visualization of the measured data at a distance of 200 m from the noise source – forest exploitation 1

### 2.2.2 The measurement of the noise level near primary platform 1, at a height of 1.5 m from the ground

The **primary platform 1** is placed at the distance of 3,7km to the southern boundary of Rodna Mountains National Park, Large Anies Valley.

The sound recording was made when loading of the existing wood maneuvers were taken on road trains for timber transport.

*Measurement at 50m distance from primary platform 1*

The noise values recorded at a distance of 50 m from the primary platform are shown in the Figure 6.

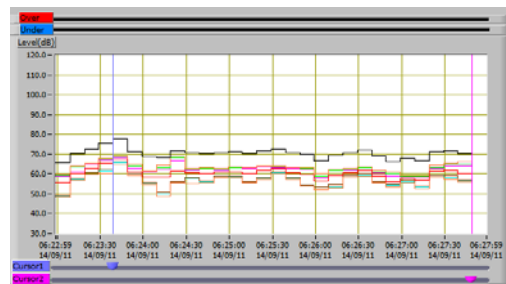


Fig. 6. Representation of measured data at a distance of 50 m from the primary platform

*Measurements at 100m distance from primary platform*

Figure 7 presents graphically the noise indicators from the measurements made at a distance of 100 m from the primary platform.

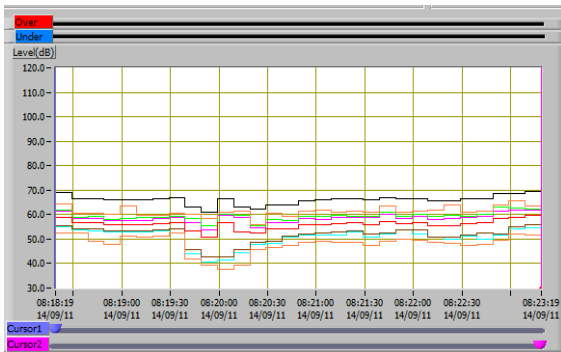


Fig. 7. Viewing the data measured at a distance of 100 m from the primary platform

#### *Measurements at 200 m distance from the primary platform*

The graphic of Figure 8 allows the viewing of the recorded data for measurements at 1.5 m above the ground and 200 m far from the transporting machine found on the primary platform.

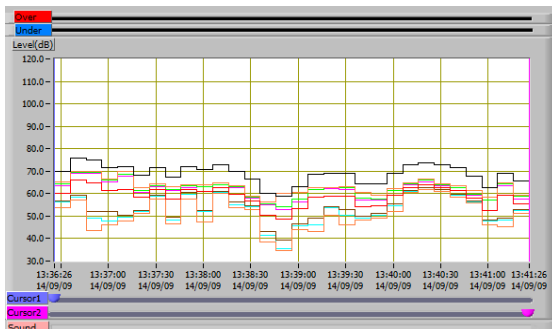


Fig. 8. Viewing the data measured at a distance of 200 m from the primary platform

Comparing the values obtained by measuring the noise in the three points of measurement, there can be noticed an increased level of noise, at the point of 200 m having been reached values close to those recorded at 50 m. This is due to geometric divergence (the difference in altitude), the effect of reverberation, and the height of the sound source.

The results obtained in the analysed four operating points and four primary platforms are similar to those described above, with slight variations of the noise level due to the different characteristics of equipment, weather

conditions and temperature, forest density and geometrical divergences.

For a better overview of the situation in Rodna Mountains National Park, there has been made a comparative study of average values obtained from the measurements close to the four operating points and the four primary platforms for different distances from the noise source. All measurements were carried out in the forest with a difference of the altitude between the source and the recording point.

#### **2.2.3 Measurement of the noise of the forest articulated tractor TAF**

There have been made a set of measurements within the forest, at an intermediate point between the wood cutting place and primary platform, in the moment the TAF was in transit, at a distance of 50 m to the road surface.

Figure 9 presents graphically the noise indicators obtained from the measurements realized at a distance of 50 m from the forest road in the moment of TAF transit.

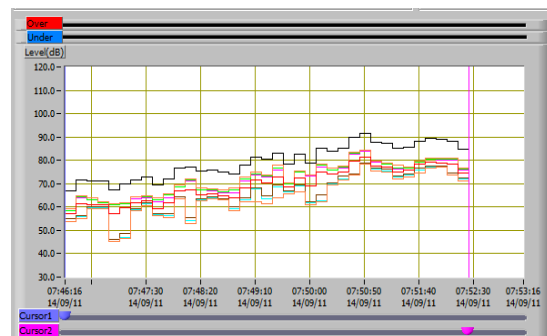


Fig. 9. Viewing data measured timber transport crossing equipment

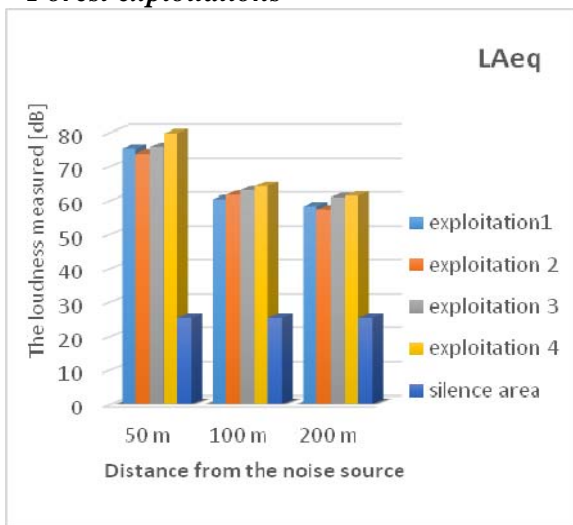
As shown in the figure above,  $L_{Aeq}$  may reach the value of 81dB when the TAF was in front of the sonometer.

From discussions with TAF's driver, working in the second wood exploiting, I found out that 6 timber transport machines were loaded daily, with two of such machines. The time spread between the operating point and primary platform is approximately an hour.

Following this analysis I conclude that about 6 times per day multiplied with 2 hours per transport (round trip), there is a high level of noise on the road used by TAFs.

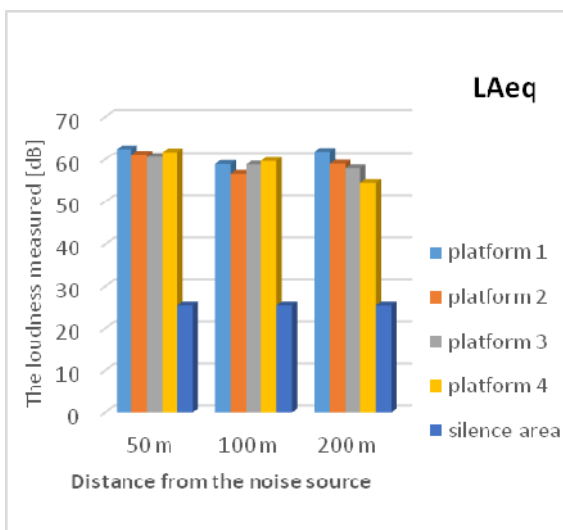
The noise indicator values determined in the 8 analysed points were compared with the values recorded in quiet areas In the Figures 10 and 11 are the plots of the average values of the points analysed records.

**Forest exploitations**



**Fig. 10.** The values recorded for  $L_{Aeq}$  noise indicator at the point measurements were performed

**Primary platforms**



**Fig. 11.** The values recorded for  $L_{Aeq}$  noise indicator at the point measurements were performed

By comparing the values obtained in the quite areas to those of exploiting or primary platforms, it can be observed a doubling of the noise level in the areas of human activities. Persistence over time of these values produces stress for the wild life, changing thus their behaviour and habitat.

**3. CONCLUSIONS**

The noise measurements made within Rodna Mountains National Park highlighted the issue of noise pollution within protected areas, in the areas where economic activities are allowed.

Taking into account the information about the propagation of the sound in the forest, the number of noise sources and noise level recorded near each of these sources, there can be pictured the impact that noise pollution has on under protection wildlife.

Analysing and comparing the values recorded in the cutting point, the TAF transportation and primary processing platform, it was shown that equipment used to logs transportation from the place of cutting to the loading point produces the highest noise level pollution.

Knowing that ongoing logging activities in the protected area corroborated with tourism and leisure activities lead to high levels of noise in some areas. Thus, it is necessary to identify quiet areas and habitats for species that are sensitive to noise, while creating passageways between them.

**4. REFERENCES**

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#### **Analiza nivelului de zgomot provenit din activitățile forestiere în Parcul Național Munții Rodnei**

**Rezumat:** Lucrarea prezintă un studiu asupra nivelului de zgomot provenit din activitățile forestiere desfășurate în interiorul Parcului Național Munții Rodnei. Se cunoaște faptul că pe teritoriul rezervației în perioada ianuarie-septembrie 2014 au existat 76 puncte de exploatație aflate la distanțe considerabile față de limitele parcului. Coroborându-se nivelul de zgomot înregistrat la punctele analizate cu numărul exploatațiilor, precum și distanțele mari dintre puncte de tăiere și platformele primare, se poate considera că poluarea fonică afectează suprafețe mari, cu impact negativ asupra ariei protejate.

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