# ASPECTS REGARDING THE ZONING OF FORESTS FROM MINING SURFACE AREAS LOCATED IN THE CURVATURE SUB-CARPATHIANS

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***Abstract.*** *Zoning forests in Romania has become a method used in managing forests during the '50-'60. This process allowed forest to have priority protection functions or production functions. Technical norms divide forests from the I[st] functional group, namely forests with protection functions, in 5 subgroups. One such subgroup is represented by 1-2-fortests with soil protection functions. Due to the fact that mining areas are also distributed in the national forest fund, the forests that surround them have been classified in the 2J function – Forests from around surface mines and pits located in areas with erosion hazards. The Curvature Sub-Carpathians present three mining areas created around surface mining exploitations (two in Prahova Sub-Carpathians and one in Ialomiței Sub-Carpathians). The stands that create these protection strips are generally composed of species that are specific to the level that is formed in these forests. As such, holm and common beech are predominant, followed by specific species that fight against erosion occurrences such as pine, locust and birch. Forest productivity is average towards weak due to the lithological substratum. The assigned exceptional conservation function causes a low intensity of applied works in order to avoid field movements that are specific to the Sub-Carpatthian area (landslides, muddy leakages, caving, rolling). In addition, they ensure the safe progress of local mining activities.*

***Keywords:*** *mining, pine, Sub-Carpathians, Zoning forests, protection functions*

## INTRODUCTION

The Curvature Sub-Carpathians represents a distinct subunit of the Sub-Carpathians located in the external part of the Carpathian Mountains. The unit makes a transition from the mountain area towards the plateau and plain one. The Curvature Sub-Carpathians are characterized by an alteration of hills and basins that range from 200 to 1000 m.

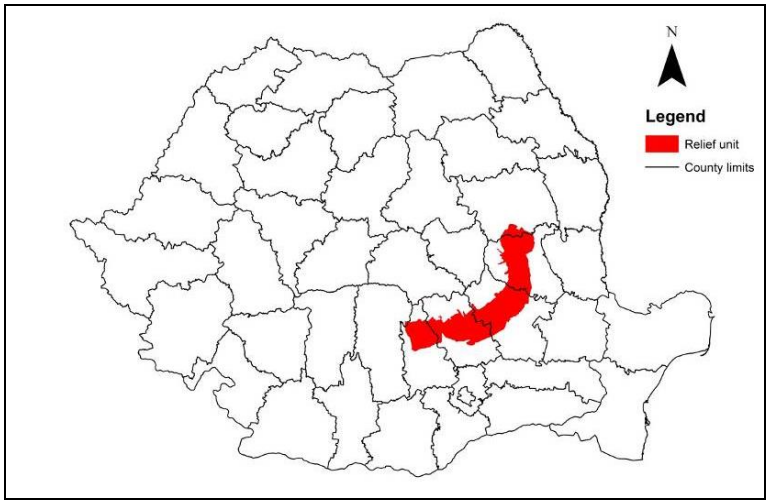


Figure 1. The Curvature Sub-Carpathians

The unit is divided in three main groups (Figure 2): Vrancea Sub-Carpathians, Prahova and Ialomița Sub-Carpathians and Buzăului Sub-Carpathians. These groups were created by taking into account the geomorphological characters of its component subunits (POSEA, 2005).

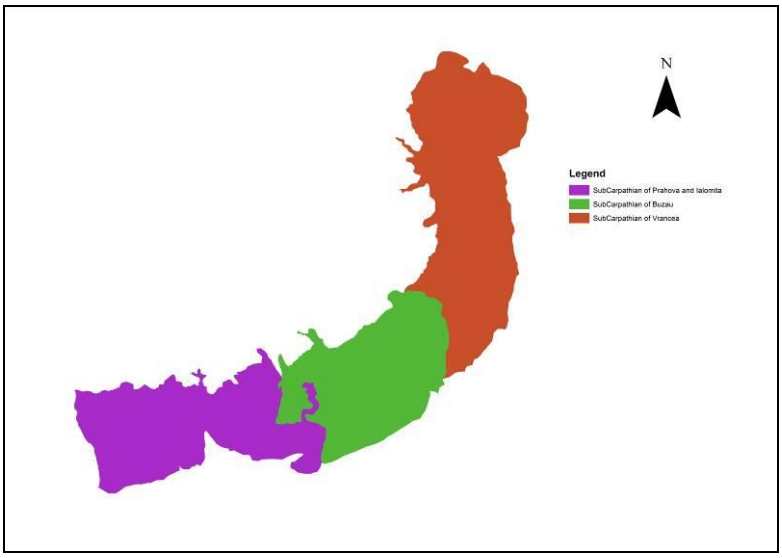


Figure 2. Component groups of the Curvature Sub-Carpathians (***geospatial.org)

The Curvature Sub-Carpathians area presents numerous mineral resources that have an important economic value. Among them, we mention petroleum, natural gases, coal, salt, different rocks for construction.

From a geologic point of view, the studied relief unit is composed of clay, shale, gravel, conglomerates and rubble, generally named as Mio-Pliocene molasses deposits. This is completed by fluvial-lacustrine deposits (BADEA, 1983).

A good part of these resources is located inside or near forests. The object of this study is represented by forests situated near extraction areas. In order to manage them, they obtain a protection function and receive works according to their functional type. As such, these forests were situated within the I$^{st}$ functional group, 2J functional category generally known as 1-2J-*Forests from around surface mines and quarries, in areas threatened by erosion – II Functional type* (***NT5/2000). The II Functional Type allows the realization of special conservation works.

Ion Popescu Zeletin promoted the concept of functional zoning for our national forests by proposing a system together with the country's electrification plan from 1950. Starting with 1951, a collective is created within the Forestry Research Institute, which has laid the foundation of forest functional zoning, regulated by HCM 201/1952 and HCM 114/1954 (GIURGIU, 2008).

The exploitation of subsoil resources has represented a permanent preoccupation. The last years have shown major negative effects for the surfaces covered by forests, endangering present habitats that were already jeopardized by other activities (SONTER ET AL, 2017). Efforts are made for finding ways in which a traditional activity that ensures the livelihood of a community does not lead to the destruction of local biodiversity (SONTER ET AL, 2018). The

lack of complex ecological measures in these extraction surfaces leads to the pollution of air (CĂPĂȚÎNĂ AND LAZĂR, 2008), waters and soil (SMICAL ET AL, 2015), as well as to other aspects connected to habitat fragmentation (LIMA ET AL, 2016).

The afforestation of waste heaps represents the main activity of reintroducing them in the ecological circuit (DINCĂ ET AL., 2009; DINCĂ ET AL., 2011; SILVESTRU-GRIGORE ET AL., 2018). In addition, the forests from this area have a multitude of ecosystem purposes such as: protection against landslides (DINCĂ ET AL., 2019), biodiversity (TIMIS-GANSAC ET AL., 2020; DINCĂ ET AL., 2020), a source of medicinal plants (VASILE ET AL., 2018), mushrooms (DINCĂ ET AL., 2016), non-wood forest products (TUDOR ET AL., 2019), forest fruits (TUDOR ET AL., 2021), or game species (CIONTU ET AL., 2018).

## MATERIAL AND METHOD

Data present in forest management plans from forest districts located in the Curvature Sub-Carpathians were used in order to determine forests situated in the 1-2J functional category (***Forest Management Plans). The data was then processed, leading to information about the stands' main characteristics (composition, age, structure, slope, soil type). Data was also gathered for the mining areas, including their function stage.

## RESULTS AND DISCUSSIONS

The data has led to the identification of three surface mining areas (figure 3) situated in Voinești (Ialomiței Sub-Carpathians) and Văleni de Munte (Prahovei Sub-Carpathians) Forests Districts.

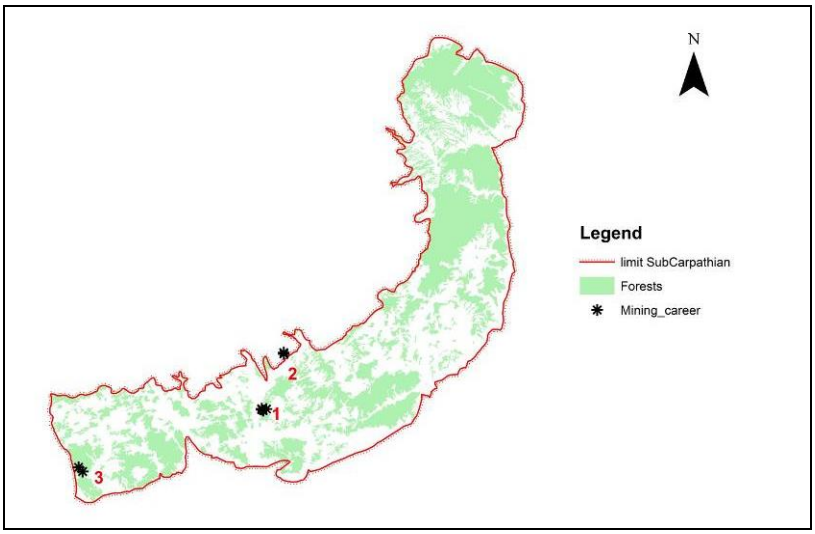


Figure 3. The location of mining areas in the studied relief unit

1-O.S. Vălenii de Munte - Gura Vitioarei quarry; 2-O.S. Vălenii de Munte- Lupoii quarry; 3- Șotânga quarry

The 2J functional category forests from O.S. Voinești are situated in Șotânga-Mărgineanca mining basin (fig4). This complex is composed of surface exploitations (quarries) in Popii Valley and subterraneous ones in Glodului Valley from where coal (charcoal more exactly) is extracted.

The area has a tradition of over 100 years. The exploitation was leased in 1893 by a French company and then shifted to a German administration in 1916 (***Monografie Dâmbovița, 1980).

Two forest areas with 2J functional categories were identified in the exploitations from O.S. Vălenii de Munte. The first one is located around Gura Vitoarei quarry from where quartz sand is extracted (POSEA, 1982). This exploitation has three extraction points (figure 5). The large number of unproductive forests is also important to be considered especially as it is caused by the lithological substratum.

The second area is a plaster extraction area named Lupoaia, situated near Bătrâni Village (figure 6).

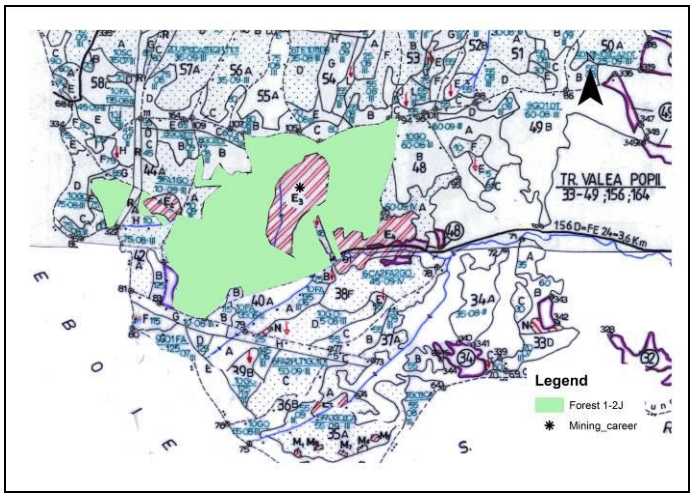


Figure 4. Valea Popii-Șotânga quarry (O.S. Voinești)

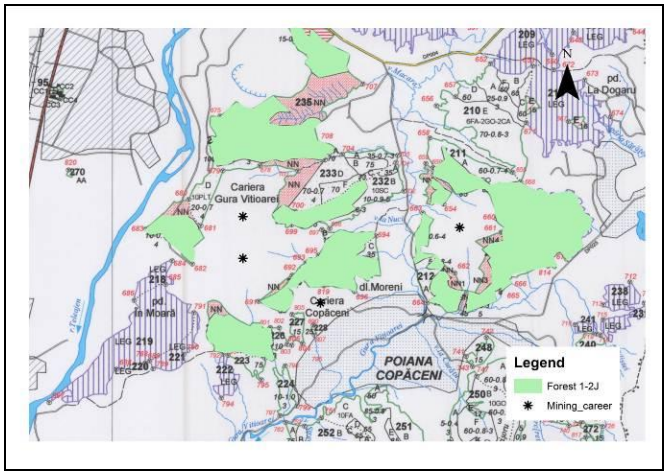


Figure 5. Gura Vitoarei quarry (O.S. Vălenii de Munte)

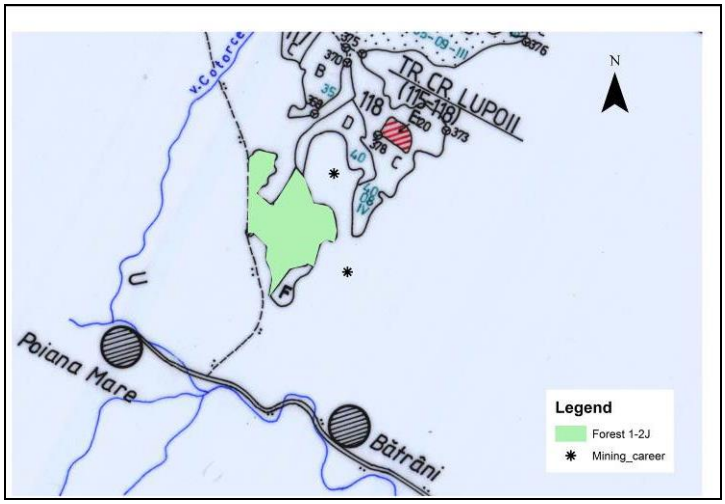


Figure 6. Bătrâni quarry (O.S. Vălenii de Munte)

The main characteristics of these forests are specific to the Sub-Carpathian level (figure 7). As such, they are mainly composed of holm (43%) and common beech (11%). We also note the presence of species recommended for this type of surfaces that are exposed to erosion, such as locust (16%) and different types of pines (8% - Sylvester Pine, Black Pine and Strobe Pine).

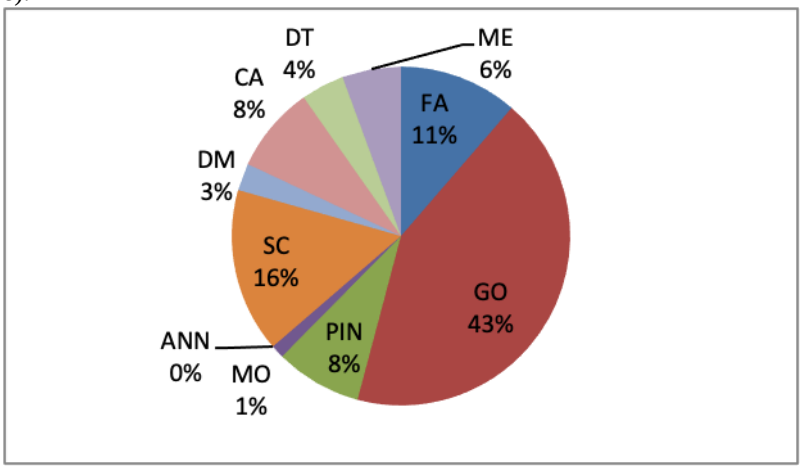


Figure 7. The composition of forests situated within the 2J category (*GO-sessile oak, FA-common beech,SC-locust, CA-hornbeam, ME-birch, MO-Norway spruce, PIN-black pine, DT-different hardness, DM-different mellow, ANN-black alder)*

**The stands' age** varies, with a predominance of stands with ages between 40 and 60 years (33%), followed by younger stands of up to 20 years (31%). The stands that are older than 100 occupy very small surfaces, of 2.1ha-1% (figure 8). This aspect is caused by conservation cuttings and by extracting old aged elements or by the creation of distinct sub-parcels that have received a different functional category (which allows higher intensity works).

As a particularity, the surface of old stands from Valea Popii-Șotânga area has decreased considerably during two management plans, from 31,4ha in 1999 to 2.1 ha in 2009. During the same management plans, the surface situated in the 2J category differs. As such, a surface of 82.8 ha was recorded in 1999, while only 69.5 ha was recorded in 2009. However, the management plan from 1989 mentions a surface of only 38.0 ha.

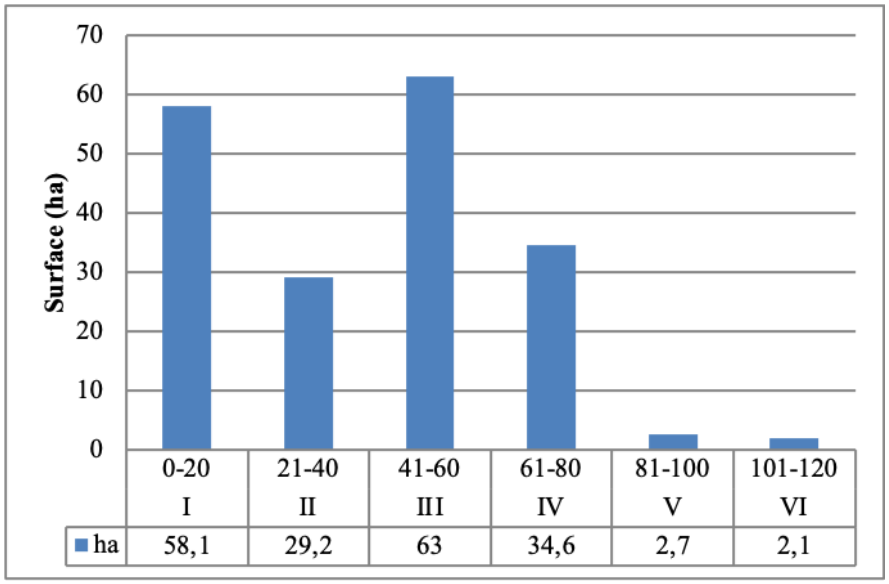


Figure 8. Age classes of the studied stands

**Field slope** is moderate, recording values between 16-35g (53%) and 0-15g (46%). A lower percentage of stands are located on fields that have a slope higher than 36g (1%) (figure 10).

**The main soils** are those from the Luvisol class (84%), represented by typical preluvisol (31%), typical luvisol (43%) and lithic luvisol (10%). They are followed by Cambisols (9%) and Lithosols (7%). The last two classed are present in the quarry from Gura Vitoresei, which showcases a large number of unproductive fields (fig.5). The surfaces occupied by lithosols have pioneer species such as pines (60%), holm and other mixture species.

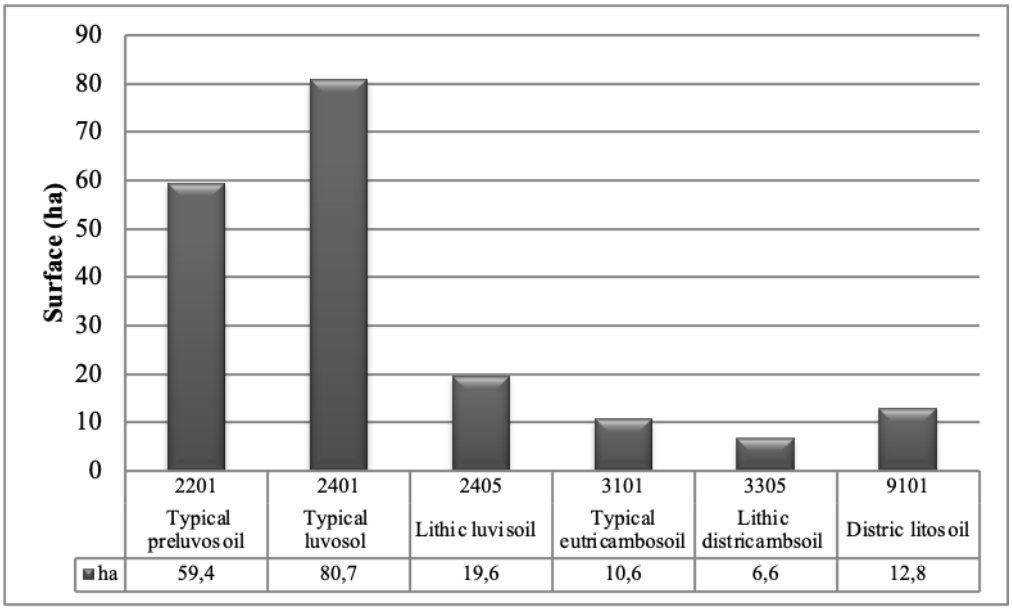


Figure 9. Soil types present in the analyzed area

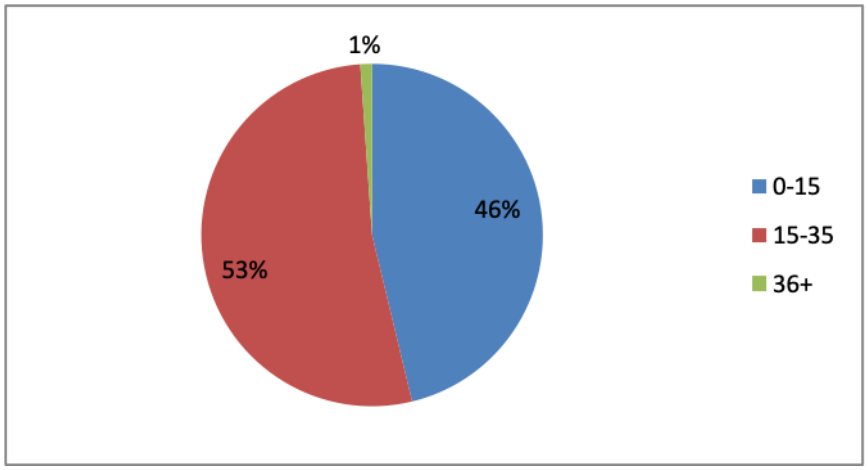


Figure 10. The distribution of forests on slope categories

The forest structure is even-aged and relative even-aged in a percentage of 96%, while a percentage of 4% is reserved for relatively-uneven-aged forests.

This structure is not recommended for these types of forests situated around areas predisposed to field displacement (TRACI ET AL, 1966).

Stand productivity is mainly average (76%) and weak towards very weak (24%). Stands from the I and II production class are not present.

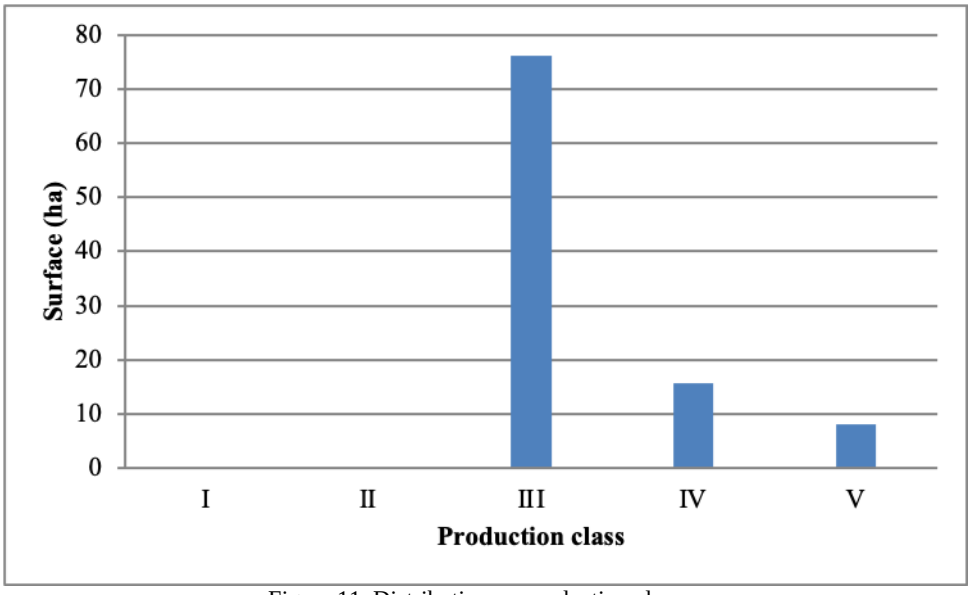


Figure 11. Distribution on production classes

## CONCLUSIONS

The assignation of functional categories is very important for forests situated near-surface mining extraction areas. Only through special conservation works, we can avoid the sudden exposure of soil and field displacements (landslides, mud leakages, caving, rolling) that are specific to the Sub-Carpathian area. The species present in these stands are recommended for this type of field.

At the present moment, Valea Popii- Șotânga quarry is deserted. However, it is important for forests situated now in this functional category to maintain their status as the area has not yet sustained conservation and ecology works. This means that the danger of field displacement is very high.

Gura Vitoarei quarry is still functional, while data was not available for Bătrâni quarry.

If we consider the particular case from Valea Popii, we can observe that the structure on age classes has changed during the application of forest management plans. In addition, there is a variation for framing the 2J category that can be correlated with the rhythm of the mining activity realized both at the surface as well as underground.

These types of exploitations were preferred in the past due to their low exploitation cost, especially when compared with underground exploitations. However, they turn against forests and the environment, as the costs for bringing them back to their initial state are enormous. We must not ignore the fact that part of these studied areas has been covered by forests in the past.

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