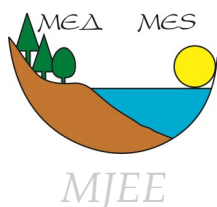


## Environmental impact assessment of quarries in four municipalities in western part of Kosovo

Оцена за влијание врз животната средина на каменоломите во четири општини во западниот дел на Косово

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Industry of quarry and its allied activities in Kosovo have significantly contributed infrastructural development (road construction, highway, bridges, etc.) and improving living standard during the last decade. On the other side, its negative impact in environment such as land degradation, air and water pollution, loss of biodiversity, health related issues, noise, and vibrations are present and often visible.

This research was focused on analysing the impact of operators on land degradation, air and water quality and biodiversity (flora and fauna including natural and cultural heritage). Research was implemented to assess environmental impacts of quarries in four municipalities located in the western part of the Republic of Kosovo: Istog, Pejë, Deçan and Gjakova. Research area covered a territory of 1,822 km<sup>2</sup>, or 16.71% of the territory of the Republic of Kosovo. In total, 16 quarries were identified, of which 13 were still active and 3 passive. The largest number of quarries operated in the municipality of Istog (6), followed by Deçani with 4, Peja with 3 and Gjakova with 3. Altogether, a quarry operation in the research area occupied an area of 41.56 ha.

The research findings showed that the quarry operations had high negative impacts in the environment. Even the most of operators had environmental permits issued by the Kosovo Ministry of Environment and Spatial Planning; they mostly weren't respecting the provisions stipulated in the law. Most of them didn't use any environmental friendly technologies, while existing technology had no filters for air and water purification. Deforestation, dust generation, water, air and noise pollution followed by resource depletion and biodiversity loss were common threats associated with open quarry operations in the investigated area.

**Key words:** Environmental Impact Assessment, quarry, pollution, biodiversity loss

Каменоломите и придружните активности во Косово значително придонесуваат за индустрискиот развој (изградба на патишта, автопатишта, мостови, итн.) и кон подобрување на животниот стандард во последната декада. Од друга страна, забележливо е и нивното негативно влијание како деградација на земјиштето, загадување на воздухот и почвата, загуба на биодиверзитетот, проблеми со човековото здравје, бучава и вибрации.

Ова истражување беше фокусирано на анализа на влијанијата на операторите врз деградацијата на земјиштето, квалитетот на воздухот и водата и биолошката разновидност (флора и фауна, вклучувајќи го природното и културното наследство). Истражувањето беше насочено кон проценка на влијанијата на каменоломите врз животната средина во четири општини од западниот дел на Република Косово: Исток, Пеј, Дечани и Гаково. Подрачјето од интерес зафаќа површина од 1822 km<sup>2</sup> или 16,71% од територијата на Република Косово. Вкупно 16 каменоломи беа идентификувани, од кои 13 се сеуште активни, а три се пасивни. Најголем број од каменоломите се наоѓаат во општината Исток (6), по што следуваат Дечани со 4, Пеј со 3 и Гаково со 3. Сите анализирани каменоломи заедно зафаќаат површина од 41,56 ха.

Резултатите од истражувањето покажуваат дека работата на каменоломите има значителни негативни влијанија врз животната средина. Иако повеќето од операторите имаа еколошки дозволи издадени од Министерството за животна средина и просторно планирање на Косово, сепак повеќето од нив не ги почитуваа законските одредби. Повеќето од операторите не користеа еколошки технологии, а постоечките капацитети немаа филтри за прочистување на воздухот и водата. Дефорестацијата, продукцијата на прашина, загадувањето на воздухот и водата, бучавата проследени со намалување на природните ресурси и загуба на биолошката разновидност се вообичаени закани поврзани со работењето на каменоломите во истражуваното подрачје.

**Клучни зборови:** Оценка на влијанието врз животната средина, каменолом, загадување, загуба на биолошката разновидност

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## Introduction

The Republic of Kosovo is rich in mineral resources, both metallic and non-metallic. In the formation of these mineral resources of particular importance have been geological and geo-tectonic processes, climate etc. that influenced the territory of Kosovo to create metallogenic and deposition areas of many inerts fields originating from sedimentary, metamorphic and magmatic rocks. This variety of mineral resources constantly has been in the focus of exploitation by local and regional companies' as well wider (Ministria e Zhvillimit Ekonomik 2012).

Today in Kosovo operate a large number of quarries which mainly use limestone rock to produce sand and gravel of different fractions for construction purposes (residential buildings, roads, bridges, etc.). Exploitation of natural resources in general, and in particular the resources that today are used as raw materials for construction and production of construction raw materials has grown at the local, regional and global levels (Mustaf et al. 2015). Exploitation of mineral raw materials besides being a precondition for humanity to develop its activities, to create and improve the necessary infrastructure for housing, transportation etc., is non-rational and as such is posing a concern not only at the national level but also beyond. This phenomenon is a serious problem, and for this aim countries all over the world are developing policies and legislation that support the environment in terms of prevention and undertaking measures to reduce pollution and over-exploitation of natural resources. So, in addition to many activities-such as the activities of anthropogenic character – the mining activities (quarries activity) are accompanied by environmental negative impacts (Okafor 2006). The process of exploitation, refraction, granulation and processing of rocks is complex because it goes through several stages, stages that have the specifications which also carry its negative effects on the surrounding environment. From the beginning of process, the definition of location, initial preparatory phase, before the end of the quarry operational life, manifestation of negative effects on the environment such as: loss of vegetation, destruction of landscape, degradation of original flora and fauna, creating waste, air quality deterioration,

alienation of land use, the impact on water quality, the creation of noise, vibration etc. are present. Different authors (Rajv et al. 2000; Gauch 2001; Langer 2001; Charbonnier 2001; William 2001; Kuntala 2006; Okafor 2006; Mehnaz 2009; Davied 2011; Merike et al. 2013, Mustafa et al. 2015) in their researches and reports emphasized that quarrying activity causes significant impacts in environment. One of the biggest negative impacts of quarrying on the environment is biodiversity threat and loss (Anand 2006). Quarrying activity presents a potentially very destructive to habitats and species (Makweba & Ndonde 1996; Mustafa 1998; Krasniqi 1987, 1998). The destruction of these habitats and species, even not in various stages of operations, can affect directly and indirectly. As Iqbal and Shafiq (2001) pointed out, threats to the survival of plants in mining and industrial areas come from the air pollution and dust released by mining activities of quarries. The use of mineral raw materials, such as the case of rocks, in one way or another generally has no direct risk to human health and environment. Maximal pollution effects on the environment from the exploitation of rocks and quarry activity as the process may be loss of land, vegetation, pasture, destroying of flora, fauna movement from that settlement, noise concerns etc. Therefore, recognizing the necessity of exploitation of mining resources despite the negative effects of their usage remains the challenge to keep in control by applying measures of rational use and minimizing the negative effects that have impacts on public health and environment in general.

The research area lies in the southwest and north-west of Dukagjini plain in Kosovo and includes the municipalities of Istog, Pejë, Deçan, Junik and Gjakovë (Fig.1). It covers an area of 1,822.84 km<sup>2</sup>, or 16.71% of the total territory of the Republic of Kosovo. In this area live around 275,372.00 residents or about 15.29% of the country population. The population density is 151 people per km<sup>2</sup>.

The relief of this region has features and specifics that are different from other geographic parts of the country. Geomorphologic formation is a result of several stages of crease, the tectonic sinking and raising, seismic

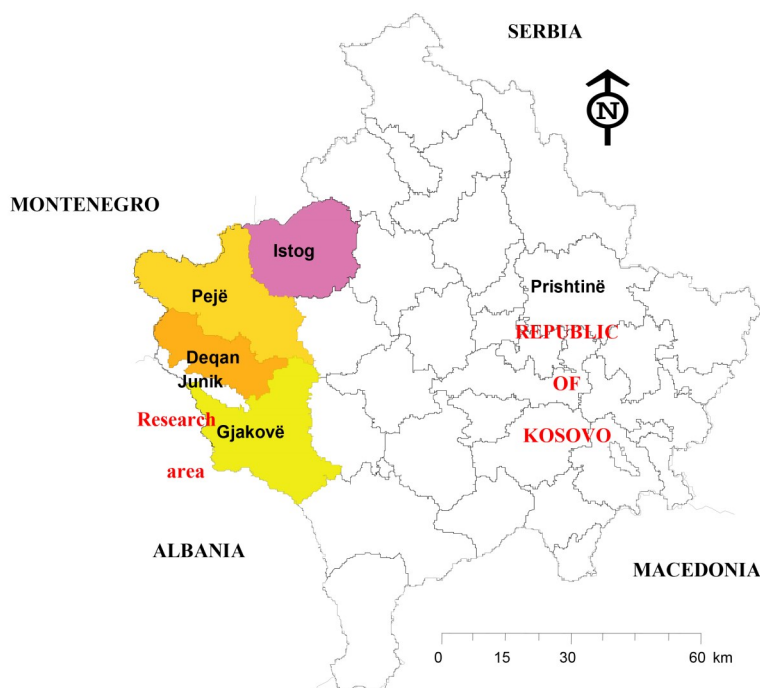


Figure 1 Position of the research area in Kosovo (Cadraku 2014)

activity, volcanic, transgression, and regression activities. The region is characterized by a young age, lithostructural and morphogenetic diversity. Numerous morphological changes resulted from the complex geological content, including activity of tectonic and neotectonic processes (Ahmetaj 1980). Three basic units characterize the geomorphologic construction of this region: mountain massifs, hilly-mountains and the plains. The most characteristic geo-morphological and orographic element of this area is the plain on both sides of the river basin Drini i Bardhe. In higher mountains, with limestone rocks, the phenomenon of karst formation process is present (Milovanović & Cirić 1968; Menković 1985). In morfogenic terms four genetic types of the relief are distinguished in this region: erosive type, type of karst terrain, type of glacial and type of fluvial relief (Ahmetaj 1980). The research area is characterized by magmatic, metamorphic and sedimentary rocks of the Paleozoic, Mesozoic and Quaternary era.

### Environmental Impact Assessment (EIA) in Kosovo

EIA is a systematic process to identify and assess the environmental effects or impacts of a particular action or project. Agenda 21 and the global plan for sustainable development, emphasize the importance of development and promotion of EIA, integrating environmental decision-making and other instruments and policies for this purpose. Reduction of environmental impacts can be achieved if development is based in sustainable environment principles. In international terms, the role of EIA was recognized in principle 17 of the Declaration on Environment and Development (Veselaj, 2008). Ten years ago, EIA is introduced as a concept also in Kosovo, and since then actions have been taken to mitigate the environmental impacts by development of investment projects. As a result, EIA became a key mechanism for decision-making on a proposed development projects in Kosovo. EIA, as a national instrument, should be applied to the proposed activities expected to have a negative impact on the environment and are subject to a decision by a state authority. The legal basis for assessing the impact on the environment is the Law on Environmental Impact Assessment (No. 03 / L-214). According to Article 2 of this law, assessing the environmental impacts means "identification and assessment of potential impacts of the project on the environment, consultation with environmental authorities and the general public, taking into account the EIA report findings and results of the public consultations in decision making, determining the method to prevention, mitigation adverse impacts on human health and the environment, as well as providing information on the decision". In addition to this law, in order to minimize and mitigate the negative impacts of the rock exploitation, the provision of other laws are required to be implemented such law on environmental protection, nature conservation, air, water, noise etc.

### Material and Methods

The overall goal of the research is an analysis of the environmental impact assessments and the level of environmental pollution from quarries operations in western Kosovo region. Four municipalities: Istog, Peja, Deçani and Gjakova are covered by the research. Specific objectives of the study are to assess the current state of the ecosystems in which these quarries operates, assess the biological diversity and plant species of nearby ecosystems, comparison of the plant diversity in the ecosystems with previous data, comparison of different operational methods between local companies for managing quarries and assess methods for ecosystems rehabilitation. The research was conducted through field visits, verification of the areas where quarries operates, data collection, processing and analyzing related to projects implemented in the region. Data collection about plants, plant herbarium from respective localities, and determination of plants is done through contemporary determination keys (Tutin et

al. 1964; Demiri 1981; Paparisto et al. 1988-2000; Paparisto 2003; Pajazitaj 2004).

### Results

In the area of research the total of 16 mining quarries are identified (Tab 1.), of which 13 or 81.25% are active and 3 quarries or 18.75% are passive. The largest number of mining quarries operates in the municipality of Istog, (6 of them), in the municipality of Decani 4 quarries (three active and one passive), in the municipality of Peja three mines quarries are identified, and in Gjakova 3 quarries of which one active and two passive are identified. All these quarries operations in this region cover an area of 41.56.46 ha (Tab. 1).

It resulted that 13 quarries develop combined mining activities such as digging, mining, aggregate breakage, and separation into various rock fractions. Only 9 of operators have operating licenses, while 4 others do not have. Not all operators of the research provided information and data about the documentation, in particular access on the EIA report: from 9 licensed companies only 5 provided access to the EIA's report. The interesting finding in these reports is that it contains a special chapter, which dealt with the reclamation plan (rehabilitation) after completion phases of mining activity. However, there was no plan of reclamation to be implemented in any of these mines or quarries. In some segments of the quarries, mining activities for the time being have been ceased. Therefore, as a result of non-compliance, and not taking measures under the reclamation plan, all quarries bring negative effects to the area close to the operations. Based on visual observation, it may be noted that negative environmental effects happen during quarry mining activities and are reflected in air, water, soil, flora, fauna and landscape.

*Impacts on air.* During assessment visits, it is noted that impacts on air are evident especially in the mining of rock masses of operations. This process is accompanied with noise and the spreading dust in the air. Air particles of detonated solid materials, have negative impacts on human health (respiratory channels) and creates a "dust cover" in the vegetation which prevents normal biological processes of plant development.

*Impacts on land.* Field assessment showed that the mining activity of quarries in this region resulted in the capture of a certain area of land. In addition, space for grazing and movement of fauna is reduced, flora is destroyed, it is disturbed the natural harmony of the landscape and the land surface within the area of operation has changed its destination. With intensification of mining activities, the level of erosion raised, associated with the movement of the material and its deposition in new area reflecting the soil lose and changes in the overall landscape of the nearby area. It is known that a layer of 0.50-1.20 m that needs to be removed results in almost total loss of flora and fauna. The wasteland layer that must be removed must be folded within the area of exploitation in order not to use additional land for this matter. This removal again brings negative effects in the destruction of vegetative cover. Animals will lose their living environment and landscape will change due to the creation of the wasteland hills.

*Impacts on water.* Overall results shows that quarry activities in the research area have negative impacts on surface waters, while their impact on groundwater is minimal. This happens because the operations mainly are taking place in the altitude over 600m, and hydrogeological data shows that static groundwater level is in depth of about 50m. Water impacts by operations are minimal because the water demand is low, and also the human capacity and mechanical devices impact is limited. The nature of the work in these quarry operation areas has not indicated any particular water pollution. Also close to the quarry field hydrographic network and groundwater aquifer horizons are not developed.

*Impacts on landscape.* Operations of the quarries resulted in significant impacts on the landscape in all mining

**Table 1.** List of operators in each municipality

Municipality	Name of the operator	Surface (ha.ares.m <sup>2</sup> )	Location	Coordinates N	Coordinates E
Istog	Shkembj " Sh.p.k	4.20.66	Sinej	42°47'10.86"	20°31'06.79"
	"MA.CON"Sh.p.k	5.00.02	Cerrcë	42°47'14.09"	20°27'16.07"
	"Granit - Shala" sh.p.k	4.84.64	Orobrdo	42°47'42.91"	20°31'53.82"
	"Melosi Com" sh.p.k.	1.46.47	Lubozhdë	42°47'00.62"	20°26'30.19"
	"Guri" Sh.p.k.	1.91.10	Fusha Gjveshur <sup>e</sup>	42°56'55.20'	20°25'32.30"
	"Granit" Sh.p.k.	2.85.26	Mali i Fshatit	42°46'31.74"	20°24'22.54"
	<b>Total</b>	<b>20.28.15</b>			
Peje	N.N. "Asfalti" Sh.p.k	3.84.28	Brestovik	42°42'12.30"	20°17'34.15"
	"Idila" Sh.p.k	3.36.82	Brestovik	42°41'56.56"	20°17'11.75"
	"BESNIKU- Q" sh.p.k.	1.40.46	Bellopoje	42°38'00.04"	20°16'42.47"
	<b>Total</b>	<b>8.61.56</b>			
Deçan	"Lika-Trade" Sh.p.k	3.07.55	Isniq		
	"JOOS- Krasniqi Gurthyes" sh.p.k.	5.10.98	Strellc i eperm	42°35'07.64"	20°17'36.54"
	"Lika-Trade" Sh.p.k	2.46.61	Shkoza-Shkoza	42°33'23.03"	20°16'11.29"
	Pasiv	n.n.	Strellc	42°35'16.19"	20°17'41.87"
	<b>Total</b>	<b>10.56.14</b>			
Gjakove	"Karakushi" sh.p.k.	2.10.06	Zhub	42°19'31.50	20°24'16.13"
	Aldeko	n.n.	Batush	42°27'04.90"	20°14'34.12"
	Pasiv	n.n.	Ponoshec	42°26'41.58"	20°16'12.26"
<b>Total</b>		<b>2.10.06</b>			
<b>Grand total:</b>		<b>41.56.46</b>			

quarries of this research area. The negative effects on the landscape including disturbance of the natural harmony and loss of aesthetic values of landscape are clearly visible. Certain areas influenced by quarry operations, lose their quality, turning them in not very popular for tourism and recreation development activities.

*Impacts on biodiversity.* During the exploitation, a large number of plant species is damaged, which repre-

sents a serious problem for the phytodiversity of the region. Following this degradation, animals living in the area or fed with different plants abandoned the area. Also, since quarries remained uncultivated after the exploitation, areas are quite vulnerable to erosion activities.

*Impacts in settlements and population.* Quarry processing in quarries often causes that displacement of set-



Figure 2 Quarry areas of "Guri" in Istog (left) and "N.N. Asfalti" in Peja (right)

Table 2 Plant species in the operational area of the research (Legend: Numbers shows the the operator name in the municipality: 1-"Lika-Trade"sh.p.k, 2-"JOOS-Krasniqi Gurëthyes"sh.p.k, 3-"Lika-Trade"sh.p.k, 4-Pasiv, 5-"Karakushi" sh.p.k, 6-"Aldeko", 7-Pasiv, 8-"Shkëmbi" sh.p.k, 9-"MA.CON" sh.p.k, 10-"Granit-Shala" sh.p.k, 11-"Melosi Com" sh.p.k, 12-"Guri" sh.p.k, 13-"Granit" sh.p.k, 14-N.N. "Asfalti" sh.p.k, 15-"Idila" sh.p.k, 16-"BESNIKU-Q"sh.p.k).

Species/Municipalities	Deçan				Gjakovë			Istog						Pejë		
Operator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Acer campestre</i> L.	+	+		+	+		+	+				+		+	+	
<i>Acer obtusatum</i> Mill.	+				+											
<i>Acer platanoides</i> L.			+	+				+	+	+	+	+	+		+	+
<i>Acer pseudoplatanus</i> L.		+		+					+		+	+		+	+	+
<i>Achillea millefolium</i> L.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Anchusa officinalis</i> L.	+			+												
<i>Caprinus orientalis</i> Mill	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Carpinus betulus</i> L.		+		+			+		+		+	+		+	+	
<i>Clematis vitalba</i> L.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Clinopodium vulgare</i> L.	+								+		+				+	
<i>Colutea arborescens</i> L.	+			+		+	+			+		+	+	+	+	
<i>Convulvulus cantabricus</i> L.	+						+	+	+				+		+	+
<i>Cornus mas</i> L.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cornus sanguinea</i> L.		+	+		+				+			+			+	
<i>Coryllus avellana</i> L.	+	+	+	+	+	+			+	+	+	+		+	+	
<i>Crataegus monegyna</i> Jacq.	+	+	+			+	+	+	+	+	+	+	+	+	+	+
<i>Dactylus glomerata</i> L.																
<i>Equisetum arvense</i> L.	+								+							+
<i>Euphorbia amygdaloides</i> L.	+	+	+	+	+		+			+		+	+		+	+
<i>Euphorbia cyparissias</i> L.	+		+	+	+	+		+			+			+		+
<i>Fragaria vesca</i> L.	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+
<i>Fraxinus ornus</i> L.	+	+	+	+	+	+	+	+	+	+		+	+			+
<i>Geranmium sp.</i> L.		+		+				+			+					
<i>Hypericum barbaratum</i> Jacq.			+			+			+			+		+	+	
<i>Hypericum perforatum</i> L.				+	+	+			+		+	+				
<i>Hyssopus officinalis</i> L..					+					+	+					+
<i>Lathyrus odoratus</i> L.						+										
<i>Orlay grandiflora</i> L.	+		+		+		+			+	+	+	+		+	+
<i>Plantago lanceolata</i> L.	+	+	+				+			+	+		+			
<i>Populus nigra</i> L.							+		+							
<i>Populus tremula</i> L.									+		+	+	+			
<i>Prunus spinosa</i> L.	+					+	+	+				+			+	+
<i>Pteridium aquilinum</i> L. (Kuhn.)							+		+							
<i>Pyrus amigdaliformis</i> Vill.				+			+	+	+	+	+	+	+		+	+
<i>Quercus cerris</i> L.	+	+			+			+	+		+		+		+	+
<i>Quercus petraea</i> (Mattuschka) Liebl.				+		+			+		+			+		
<i>Quercus pubescens</i> Willd.	+					+		+				+				+
<i>Rosa canina</i> L.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Rubus fruticosus</i> L.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Salvia verticillata</i> L.			+						+			+				
<i>Salix alba</i> L.						+			+			+				
<i>Sanguisorba minor</i> Scop.	+			+	+		+	+		+			+		+	+
<i>Scrophularia canina</i> L.		+														
<i>Silene vulgaris</i> (Moench) Garcke						+		+								
<i>Sorbus aucuparia</i> L.		+	+				+	+	+		+		+		+	
<i>Stachys germanica</i> L.	+		+				+		+		+		+		+	
<i>Stipa pennata</i> L.						+	+						+			
<i>Thymus sp.</i> L.	+					+		+	+		+	+			+	
<i>Trifolium pratense</i> L.	+		+			+			+			+			+	
<i>Tussilagofarfara</i> L.									+	+	+	+	+			
<i>Vicia cracca</i> L.			+			+										

lements to other locations, but in the research area it is not a case. Operators which use limestone inerts, after chemical analysis, proved that worker's are not subject to the health problems because limestone does not contain any hazardous substances for their health.

**Impacts from noise and vibration.** Work of the machinery (excavators, trucks etc.), blasts and quarry materials processing cause permanent vibrations, which are harmful to the environment. Vibrations can cause devastation of houses, cracks and other damages, may frighten the animals that live in nearby area and cause stress and disturbance to people. In the village Strelac, residents have complained to the municipal institutions because of cracks in their houses as a result of more frequent and powerful underground blasting. Therefore people reacted to the competent institutions, which have taken appropriate measures to stop further development of this activity. This quarry in Strelac is now closed (passive). Potential impacts of quarrying can be categorized into two groups:

Temporary effects that may occur during the opening-building (discharge of pollutants, noise, air emissions, dust);

Long-term effects that mainly are expressed during the mining operations (change of the landscape, noise, air emissions and dust, change of land, social and cultural impacts).

**No quarry alternative** – Without operations of the quarries development and employment in the region will reduce even more since. From this fact it is estimated that, "no quarry" alternative will result in adverse effects on economic and social development of the region, and higher unemployment.

As seen in Table 4, the biggest impacts are present in the exploitation and operations phase in the following: changes of the morphological characteristics, pollution of surface waters and groundwater, loss of soil fertility, changes in biotopes and the loss of tourism and recrea-

tion areas. Impact in geomorphologic features occurs during stages of exploitation, operation and waste generation.

## Discussion

This research identified a total of 16 mining quarries in municipalities of Istog, Peja, Deçani and Gjakova. Of these, 1 quarry is passive in Deçani, 1 in Gjakova also 1 passive quarry in Peja. All other companies were equipped with licenses, but regardless of this, they have managed to degrade the environment causing damage to plants, animals, humans as well as the landscape. Regarding the reclamation plan, no company started the implementation.

None of the operators has introduced filters for air purification although there are present attempts with a more classical approach such the irrigation system. This method is not effective because the dust is distributed on a large scale and visible even in several kilometers distance. All quarry operators are in line with the legal provisions when it comes to the distance from the settlements, even though there having been complaints from citizens because of noise; others are complaining that the blasting damages their homes.

No quarry operator has yet applied reclamation plan even though some of them have used all reserves in the location where the exploitation took place. Also landscapes where the quarry mines during the exploitation have become degraded, and from what we saw in the field, no operator has managed to give back part of degraded landscape to the previous view.

Based on the findings of this study, we recommend the tax on extraction of natural resources specifically on quarry inerts, which can encourage sustainable use and practices. This tax fee will help to overcome environmental

Table 3. The following tables are treated negative potential environmental impacts.

Medium	Type of impacts	Construction phase		Operations phase	
Land	Los of pastures	+	-	+	-
	Impact on elevation	-	+	+	-
	Degradation of agricultural land	-	+	-	+
	Land slips	-	+		+
	Land pollution from inerts	-	+		+
	Land pollution from waste deposition	-	+	-	+
Air	Dust	+	-	+	-
	Pollution from hydrocarbons	-	+	-	+
	Pollution from CO <sub>2</sub> and SO <sub>2</sub>	+		+	
Biodiversity	Degradation of natural habitats	-	+	-	+
	Threats for water plants	+	-	+	-
	Road construction in natural wild areas	+	-	-	+
	Wild habitats fragmentation	-	+	-	+
	Interference in mammals migration roads	-	+	-	+
Water	Waste water treatment	-	+	-	+
	Water pollution from accidental spills	-	+	+	-
	Secondary impacts in water for irrigation, ground water	-	+	+	-
	Change in natural water drainage systems	-	+	+	-
	Pollution of ground and surface water from sludge	-	+	-	+
Noise	Increase of existing noise levels	+	-	+	-
	Increase of noise level from machinery activity	+	-	+	-
	Increase of noise level for humans	-	+	-	+
	Increase of noise level for animals	+	-	-	+



*Table 4 General model of impacts on environment*  
(Levels of impacts: 0- no impact; 1- small impact; 2- significant impact)

	Study	Explo- tation	Transport of raw material	Operations	Industry (asphalt base)	Waste	Recultivation
<b>Geosphere</b>							
Pedological features	0	1	1	1	1	1	0
Geological features	0	1	1	1	0	1	0
Geomorphological features	0	2	1	2	1	2	0
<b>Hydrosphere</b>							
Ground water	0	2	1	2	1	1	0
Surface water	1	2	1	2	2	1	1
<b>Atmosphere</b>							
Air	1	1	1	2	1	1	0
Climate	0	0	0	0	1	0	0
<b>Biosphere</b>							
Animal species	1	1	1	1	1	0	1
Plant species	0	1	1	1	1	1	1
Biotopes	0	2	0	2	1	1	1
Green fund	1	1	0	1	1	1	1
<b>Conservation of natural resources</b>							
Soil fertility	0	2	0	2	1	1	0
Drinking water sources	1	2	1	1	1	1	0
Energy potentials	0	1	0	1	0	0	0
<b>Potential areas for:</b>							
Tourism and recreation	0	2	1	2	1	1	0
Agriculture	0	1	1	0	1	1	0
Other	0	1	1	1	1	1	1

cost of recultivation. Resources generated can be used to perform the preservation of the environment, but can also be used to provide health and other services for workers and local communities. Law on Nature Protection promotes the principle "polluters and user pay".

## References

- Ahmetaj I., 1980: Gjeomorfologjia e Sharrit dhe Brezovicës. Prishtinë: Përparimi **4**, p. 527-552
- Anand, P. B., 2006: Waste management in Madras revisited. *Environ. Urbanization*, **11(20)**: p. 161-176.
- Charbonnier, P., 2001: Management of mining, quarrying and ore-processing waste in the European Union. Study made for DG Environment, European Commission BRGM/RP-50319-FR <http://ec.europa.eu/environment/waste/studies/mining/0204finalreportbrgm.pdf>.
- Davied, E., 2011: Montserrat mining and quarrying industry study. Final report, Oxford Policy Management and Synergy Global Consulting. Oxford OX1 1BN E. UK <http://www.protectmontserrat.com/wp-content/uploads/2012/02/Montserrat-Mining-and-Quarrying-Report-FINAL.pdf>.
- Fedra, K., Winkelbauer, L., Pantulu, V.R., 2005: Systems for Environmental Screening. An Application in the Lower Mekong Basin. International Institute for Applied Systems Analysis. A-2361 Laxenburg, Austria, p. 169.
- Gauch, H., 2001: Multivariate Analysis in Community Ecology Cambridge University Press, p. 85.
- Krasniqi, F., 1982: Promene u flori i vegetacije Kosova poslednjih decenija i mere njihove zaštite. Makedonska Akademija na Naukite i Umetnostite, Skopje III, p. 59-67
- Krasniqi, F., 1998: Veçoritë e florës dhe vegetacionit të Kosovës dhe problemi i mbrojtjes së tyre. Kërkime, 6.p.51-66. ASHAK. Prishtinë.
- Kuntala, L.D., 2006: Gendered Livelihoods in Small Mines and Quarries in India: Living on the edge. Resource Management in Asia Pacific Program Research School of Pacific and Asian Studies The Australian National University ACT 0200, Canberra, Australia.
- Langer W.H., 2001: Potential Environmental Impacts of quarrying Stone in Karst— A Literature Review <http://geology.cr.usgs.gov/pub/ofrs/OFR-01-0484>
- Makweba, M.M. & Ndonge, P.B., 1996: The Mineral Sector and the National Environmental Policy. In: M.J.Nwandosya, et al. (Eds.). *Proceedings of the Workshop on the National Environmental Policy for Tanzania (Dares Salaam, Tanzania)*, 1994; 1996, pp. 164-173.
- Iqbal, M.Z., & Shafiq, M., 2001: Periodical effect of cement dust pollution on the growth of some plants. *Turk. J. Botany*, **25**: 19-24.
- Mehnaz, A. P., 2009: Mining and Quarrying. 2009 IUCN, International Union for Conservation of Nature and Natural Resources. Environmental Fiscal Reform in Abbottabad: Mining and Quarrying, Prepared by IUCN Pakistan, Swiss Agency for Development and Cooperation, Sustainable Development Policy Institute, and Government of the North-West Frontier Province.

- Menković, L., 1985: Glacialna morfologija Koritnika. Enti Krahinor për Mbrojtjen e Natyrës. Natyra e Kosovës, Prishtinë.
- Merike, R., Margus, N., Heidi, S., Ingo, V., Riho, I., 2013: Mine Blasts in the Aru- Lõuna Limestone Quarry– a. Multidisciplinary Study Using Seismology and Mining Engineering. Tallinn University of Technology (Estonia), 2 Geological Survey of Estonia.
- Milovanović, B., Cirić, B. 1968: Geoloska Karta. Zavod za geoloska i geofizicka istrazivanja- Beograd. Srbija.
- Ministria e Zhvillimit Ekonomik 2012 : Strategjia e resurseve minerale te Kosoves, [http://mzhe.rks-gov.net/repository/docs/Strategjia Minerare e R Kosoves 2012-2025 shqip.pdf](http://mzhe.rks-gov.net/repository/docs/Strategjia_Minerare_e_R_Kosoves_2012-2025_shqip.pdf) (accessed 12. 07. 2016)
- Mustafa, B.1998: "Basic characteristics of Flora and vegetation of Kosova an the danger of their disappearance.AJNTS. Journal of Natural and Technical Sciences. **5**: 115-121. Academy of Sciences of Albania.Tiranë.
- Mustafa, B., Fejza, I., Veselaj, Z., Hajdar, A., Pulaj, B., 2015: Environmental impact assessment of the quarries activity in the municipalities of Malishevë, Suharekë, Rahovec and Klinë. Kosovë. 3rd International Conference Research and Education in Natral Sciences focused on "Harmonization of Environmental Research and Teaching with Sustainable Policy", Procedings Book, Volume 2. P. 17. Shkodër, Albania.
- Okafor, F.C., 2006: Rural Development and the Environmental Degradation versus Protection: In P. O. Sada and T. Odemerho (ed.). Environmental Issues and Management in Nigerian Development, p. 150-163.
- Pajazitaj, Q., 2004: Përcaktuesi i bimëve Pteridofite dhe Spermatofite. Universiteti i Prishtinës, Prishtinë .
- Paparisto K, Vangjeli J, Ruci B, Mullaj A, Qosja Xh., 2000: Flora e Shqipërisë. Volume 1-4. Tirana: ASHASH. Instituti i Kërkimeve Biologjike.
- Tutin, T., Heywood V, Burges N, Valentine D, Walters S, Webb D1964: Flora Europaea, 1-5 Cambridge.
- Rajiv K. Sinha Dhirendra K. Pandey Ambuj K. Sinha. Mining and the environment: a case study from Bijolia quarrying site in Rajasthan, India. Environmentalist 2000, **20(3)**: 195-203
- Veselaj Z., 2008: Vlerësimi i ndikimit në mjedis- politikat në nivel global, të BE-s dhe lokal, Vol.1, REC and KFOS, Prishtinë.
- William H.I., 2001: Potential Environmental Impacts of Quarrying Stone in Karst—A Literature Review. U.S. Geological Survey.Open-File Report OF-01-0484, U.S. Department of the Interior, U.S. Geological Survey. [http:// geology.cr.usgs.gov/pub/ofrs/OFR-01-0484/](http://geology.cr.usgs.gov/pub/ofrs/OFR-01-0484/)