



Ecological Vulnerability Assessment of Mining Areas under Operation (Case Study: Tabas County)

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Extended Abstract

Introduction: Mining is one of the most effective human activities to change the situation in the region, particularly in arid area. The human demand for minerals and energy resources under the ground has made mining and exploration operations inevitable. Mining is one of the common human behaviors with numerous outcomes for the ecosystem along with serious environmental and ecological consequences in natural ecosystems such as desert areas, leading to positive and negative changes in these areas.

Materials and methods: In this study, it has been sought to assess the ecological vulnerability of mining areas of Tabas using environmental degradation model. The current applied research methodology is based on spatial data analysis and spatial analysis tools in ArcGIS software environment. In this regard, altitude, direction and slope maps were extracted from ASTER, while NDVI map was extracted from MODIS to determine vegetation vulnerability. In the next step, necessary corrections, drawings and analyses were performed. Isothermal maps were used to produce climatic maps for the temperature factor and the border and coastal zone stations were considered for the precipitation factor. Soil maps were obtained from soil map files, while geological maps were taken from geological map files at a scale of 1:100000 and groundwater maps were used from baseline data of regional water stations. To quantify environmental degradation phenomena, severity and degree of ecosystem vulnerability, an environmental degradation model is developed. This model is one of the methods of modeling system analysis, introduced for the conditions of Iran.

Result: The results of the analysis and summarization of the data from the study area elevation map show that the highest level is related to Class 1 and less than 1000 m (66%) and the second level is Class 2 with 28.77%

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of the study area is located. As more than 94% of the area is covered by one or two vulnerabilities. Therefore, the ecological factor of elevation in the region is not very sensitive. While regarding the factor of slope, 45.69% of the area was in the vulnerability codes of 2 and 3. Moreover, considering the geographic direction, over 47% of the area had high ecologic vulnerability and was placed in code of 3, while 86.55% of the area with a depth of less than 10 cm was in code5 regarding the factor of soil. In addition, 71.71% of the area was in vulnerability codes of 3, 4 and 5 regarding geological factors and 100% of the area was put in vulnerability code of 1 with average annual temperature of over 15 degrees Celsius for the factor of temperature. Regarding precipitation, 99.47% of the area had the vulnerability code of 8, while vegetation and low NDVI indicator of the area led to a vulnerability code of 4. Most of the area is located in the first class of EC (387-771 microseconds) with a vulnerability code 1. This code covers about half of the area. Finally, 99% and 98% of the area were assigned vulnerability codes of 1, 2 and 3 considering the depth and quality of underground water, respectively. The scope of ecologic vulnerability in the overall area under study, 62.21% of the area was in vulnerability code of 2, and 30.36% in vulnerability code of 3. Accordingly, 11.6% of the area under study which covered 679579.9 acres was exploited for mining, out of which 658047.6 acres were located in vulnerable and semi-vulnerable ecologic areas with vulnerability codes of 2 and 3.

Discussion and Conclusion: In the present study, soil and geological factors have the most ecological limitations. In this area, due to the high sensitivity of the soil, the possibility of erosion is high and special attention should be paid to soil erosion during the environmental management process. Particularly in areas with low vegetation or barren land, there is a wide range of restrictions. In addition, the vulnerability of these areas increases with decreasing vegetation density. The percentage of vegetation in the eastern and southwestern districts of Tabas is higher and with a sensitive vulnerability class. The southern areas of the city are more resistant than the north, but are scattered and scattered. So, ecological restrictions are expected to increase in the western and central parts of Tabas County due to the low density of vegetation. So there will be more destruction and erosion. Obviously, urgent decisions to protect sensitive areas to prevent damage to land during extraction and operation are essential. Therefore, the mining areas in Tabas County need special management attention. The mine exploitation area comprises 62% of the study area, most of which is located in sensitive and semi-sensitive classes with vulnerability codes 2 and 3. Also, soil and geological factors with the highest ecological limitation are more diverse than other factors in the region. Therefore, due to the high sensitivity of the soil and the possibility of erosion, especially in areas with low vegetation cover or desolate areas (eastern and southwestern areas) as if are most vulnerable, special attention should be paid to erosion during the mining process.

Keywords: Mining, Vegetation percentage, Topographic factors, Arid and desert areas, Tabas