Multicriteria for Optimal Land Use after Mining

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Abstract : Mining in Colombia represents around 2% of the GDP (USD 8 billion in 2018), with main productions represented by coal, nickel, gold, silver, emeralds, iron, limestone, gypsum, among others. Sand and Gravel had been decreasing its participation of the GDP with a reduction of 33.2 million m3 in 2015, to 27.4 in 2016, 22.7 in 2017 and 15.8 in 2018, with a consumption of approximately 3 tons/inhabitant. However, with the new government policies it is expected to increase in the following years. Mining causes temporary environmental impacts, once restoration and rehabilitation takes place, social, environmental and economic benefits are higher than the initial state. A way to demonstrate how the mining interventions had contributed to improve the characteristics of the region after sand and gravel mining, the NDVI (Normalized Difference Vegetation Index) from MODIS and ASTER were employed. The histograms show not only increments of vegetation in the area (8 times higher), but also topographies similar to the ones before the intervention, according to the application for sustainable development selected: either agriculture, forestry, cattle raising, artificial wetlands or do nothing. The decision was based upon a Multicriteria analysis for optimal land use, with three main variables: geostatistics, evapotranspiration and groundwater characteristics. The use of remote sensing, meteorological stations, piezometers, sunphotometers, geoelectric analysis among others; provide the information required for the multicriteria decision. For cattle raising and agricultural applications (where various crops were implemented), conservation of products were tested by means of nanotechnology. The results showed a duration of 2 years with no chemicals added for preservation and concentration of vitamins of the tested products.

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