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Impact of Mining Activities on Vegetation Composition in Pingel Mining Area Using Multi-Temporal Landsat Images

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Abstract:

The well-being of a people is dependent on mining within a sustainable framework. However, the mining industry is frequently viewed negatively due to the potential risks it possesses to human health and safety, as well as the harm it may cause to local, regional, and global environments, including land, soil, water, and forests. This study therefore, examines the effects of mining activities on the vegetation in Pingels and its surroundings as well as the changes in land use and land cover over a fifteen-year period (between 1986, 2001, 2016 and 2020). Numerous and diverse remote sensing methods are available for use to assess and identify vegetation cover. The Normalized Differential Vegetation

Index (NDVI) is one of them. Red and near-infrared (NIR) bands are used in this band ratio index, which has a range of +1 to -1, to determine if there is healthy or stressed vegetation present. For the entire surface-level landscape dynamics, we used the supervised classification for the years 1986, 2001, 2016, and 2020. We also established six classes of features to classify land use and land cover. These include the ground's bareness, the land that has been farmed, the vegetation, the river, the habitation, and the road. Google Earth Engine, Landsat images and ArcGIS 10.2 applications were used for the land use land cover changes. Our results showed that the classification of land use and land cover in the study area changed between 1986 and 2020, which may be adduced to the human activities such as mining. A rising and falling trend in total vegetation cover was observed in satellites' images, as well as on the tables of the mining activities in 1986, 2001, 2016 and 2020, In the same vein, the vegetation covers experienced continuous degradation up to 2016, before showing signs of recovery in the year 2020.

Results from the research includes the maps and tables below.

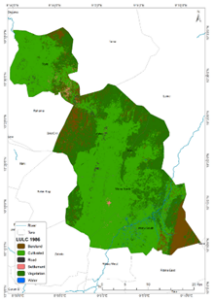

Figure 1

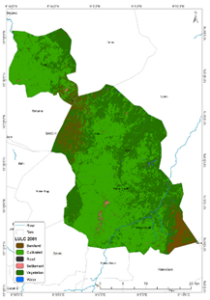

Figure 2

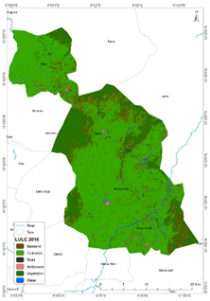

Figure 3

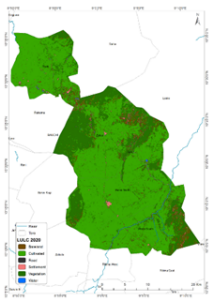

Figure 4

Figs. 1-4 show the Land use Land cover classification for the years 1986, 2001, 2016 and 2020. The color ranges from brown representing bareland, green for cultivated, black for road, pink for settlement, dark green for vegetation and blue color representing water.

Class	2020	2016	2001	1986	Total
Water	737.55	860.31	459.01	403.83	3422.17
Settlement	927.18	799.11	548.28	486	3993.42
Road	597.42	485.01	440.47	620.64	3175.36
Bare land	5016.69	9393.84	7773.67	8703.54	36370.72
Vegetation	20365.38	17207.28	32354.07	27807.93	118737.2
Cultivated	67099.23	65997.9	53167.95	56721.51	308018.3
Total	94743.45	94743.45	94743.45	94743.45	

Table 1: List of Land use Land Cover classification and Area cover for 1986, 2001, 2016 and 2020

Table 1: shows detailed information for the land use land cover classification for the years, a total of 947,43.45 hectares of Area cover for the six classes as shown above. A rising and falling trend in total vegetation cover was observed in satellites images and on the classification tables above, the vegetation covers experienced degradation in 2016, before showing signs of recovery in 2020, which was due to a community-wide tree planting effort.

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