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Geographic information system application in environmental impact assessment of mining on archaeological/ cultural elements in Nigeria

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Geographic Information System (GIS) increases the amount of information that can be analysed, manipulated, stored, and displayed, after being used to organise, analyse, visualise, and share different types of data and information, sometimes from different historical periods and at various scales of analysis, mostly in the form of maps, globes, reports and charts. This study elucidated how GIS can be used to enhance Environmental impact Assessment (EIA) in general, as well as the level of impact mining of iron on the environment, and the archaeological/cultural elements at Itakpe, Kogi State, Nigeria. The role of GIS in Environmental Impact Assessment (EIA) was reviewed, and in addition, an investigation into the impact of iron ore mining on the environment of Itakpe, and on archaeological/cultural elements was undertaken. Both quantitative and qualitative methods were employed, including key informant interviews, photography, field surveys, with the aid of the Global Positioning System (GPS) device. These constituted primary data sources for the study, whilst secondary data were obtained from maps obtained from the Federal Department of Surveys in Lagos, as well as maps obtained from other sources, such as, the Nigerian Atlas. Obtained data were analysed using Arc Map 9.3 version of the ArcView GIS application. It was found that Itakpe was an iron ore smelting site with lots of artefacts like tuyeres and stone anvils. However, these along with the immediate environs of the iron ore mines have been negatively impacted by mining activities. Several ore-bearing rocks lay scattered around locations, corroding under the influence of oxygen and moisture, while several of the tuyeres were also broken and crushed either by heavy earth-moving machinery or due to some other anthropogenic activities. Erosion had also deformed the mines with several gullies formed, some reaching over 8 meters in depth and over 3 meters in width. Due to the data-intensive nature of environmental impact assessment, the GIS provides a veritable means of data manipulation and analysis. So, considering the mining relationship between iron ore and crude oil, and that some petrochemical industries tried to diversify into iron ore mining, this study thus, highlighted the significance of GIS to EIA, with particular reference to the impact of iron ore mining on the environment of Itakpe, as well as the archaeological/cultural elements found therein, all which are indicators of health hazards, exploitation of environmental resources and lack of environmental sustainability.

Keywords: ArcView GIS application, environmental impact assessment, geographic information system, iron ore mining, petrochemical.