

**ASSESSMENT OF ECOLOGY AND RESTORATION OF WETLANDS IN MINING AREAS:
A CASE STUDY OF THE OBOTAN GOLD PROJECT AT MANSO NKRAN IN THE
AMANSIE WEST DISTRICT OF THE ASHANTI REGION, GHANA**

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ABSTRACT

The study was conducted in the Obotan Mines of the Resolute Amansie Limited (RAL) in the Amansie West District of the Ashanti Region of Ghana. The primary aim of the study was to assess the reclamation work being undertaken by RAL after completion of mining as mandated by the Ghana Environmental Protection Agency (EPA). The parameters studied included vegetation and fauna (birds and small mammals) of the revegetated areas, physical and chemical quality of water in the created wetlands in the concession and the quality of soil in the revegetated areas. In addition, the perceptions of the local communities about the impact of past mining and the extent of environmental awareness in the area were assessed.

Ten sites made up of three pits (ABN, ABS and AD), three created wetlands on the tailings dam (TA1, TA2 and SD1), two points in the Ayensu Creek – a natural wetland – (WF1 and WF2) and two points on the Ofin River (OF1 and OF2), all in the concession were selected for water quality studies. Water quality parameters analysed were pH, temperature, dissolved oxygen, conductivity, turbidity, suspended solids, phosphorus, nitrates and heavy metals (Arsenic, Cadmium, Iron, Lead, Manganese and Zinc).

Vegetation and faunal surveys were carried out in the revegetated areas (Abore, Adubeaso and Nkran waste dumps and the tailings dam) as well as in a secondary forest for comparison. Soil and sediment samples were taken from the revegetated areas, the secondary forest, the natural wetland and a created wetland on the tailings dam and analysed for pH, organic carbon, organic matter, total nitrogen, total phosphorus, calcium, magnesium and heavy metals. Soil and sediment samples were also analysed for particle size and to determine their textural classes. Six communities, Abore, Kyenkyenase, Kurofoforom, Konuase, Nkran and Kwanchiabo, were selected for the social survey using mainly structured questionnaires.

The results showed that, surface waters in the concession (both from natural and created sites) were slightly acidic to alkaline with mean pH ranging from 7.81 units to 8.67 units. With the exception of two sites (TA1 and TA2), the mean pH of surface water from all the sites were within natural background levels of 6.5-8.5 units. The mean pH of all the sites also fell within the EPA safe ranges for freshwater aquatic life (5.0-9.0), domestic use and fisheries (6.0-9.0) and aquaculture (6.5-9.0). The average temperature in all the pits fell within the 28-30 °C EPA range for the growth of *Clarias* sp. and *Oreochromis* sp. The mean dissolved oxygen concentrations ranged from 1.32 mg/l to 3.02 mg/l and was below the natural background range of 5.0 mg/l to 7.0 mg/l. Conductivity values ranged from 0.119 mS/cm to 0.717 NTU and were below the Ghana EPA guideline value. Apart from site WF1, the

mean suspended solids values from all the sites were within the EPA <100 mg/l range for the protection of aquatic ecosystems.

The arsenic concentration in water from both the natural and created sites ranged from 0.008 mg/l to 0.193 mg/l and exceeded the Ghana EPA standard for mining and mineral processing, while the mean cadmium concentration in water from all the sites were below the Ghana EPA standard of 0.1 mg/l for mining and mineral processing. The study also showed that growth and development of vegetation in the created wetlands were poor, suggesting that, the necessary hydric soil conditions needed for the propagation and growth of hydrophytes (aquatic plants) had not developed properly yet.

The soils in the study area were predominantly sandy clay loam. The average percentage organic carbon and organic matter as well as nitrogen contents of soil and sediments ranged from 0.19-2.48%, 0.33-4.28% and 0.03-0.21% respectively. The values of soil organic carbon, organic matter and nitrogen in the secondary forest were relatively higher due to higher accumulation of plant litter as compared to the revegetated sites. Total phosphorus concentrations in the soils showed no significant differences between the secondary forest and the revegetated sites. Heavy metal concentrations in the soil and sediments were elevated and followed the order: Iron (Fe) > Manganese (Mn) > Arsenic (As) > Zinc (Zn) > Lead (Pb) > Cadmium (Cd). Revegetation of disturbed lands in the concession had been successfully carried out with trees grown to between 6-10 meters. However, majority of the planted trees were exotic species. A total of 97 bird species belonging to 31 families were recorded. The secondary forest yielded the greatest number of species (63), while the Nkran waste dump yielded the least number of species (32). One globally threatened species, *Ahanta francolin* (*Pternistis achantensis*) and four nationally threatened species were recorded. Species encounter rates ranged from 16.0 to 31.5 species per km, while bird encounter rates ranged from 96.0 to 165.0 birds per km. The overall species and bird encounter rates of the study area were 12.1 and 121.5 species per kilometre of transect distance respectively. There were no significant differences in abundance and diversity of small mammals between the secondary forest and the revegetated sites. Evidence of medium and large mammals returning to the revegetated sites was found given the hope that faunal life may be restored to an appreciable level in the concession.

The socio-economic survey revealed that, land degradation was the most striking impact of mining activity and the associated inadequate compensation payment was a potential source for discontent among the communities in the area.

It was concluded that, the reclamation programme of the Resolute Amansie Resources' mine had generally been successful and could be emulated by other mines in the country.

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