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## THE ENVIRONMENTAL IMPACT OF CRUDE OIL FORMATION WATER: A MULTIVARIATE APPROACH

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*Water bodies receiving effluents from gas flow stations were sampled for ten months (March to December). Fifteen physicochemical parameters were monitored at six locations. Results obtained were analyzed using principal component analysis and cluster analysis. Five principal components accounting for 72.43 % of total variance were isolated. The first principal component was a measure of sea water intrusion, the second component was a measure of total solids, the third component was a measure of organic pollution while the fourth and fifth principal component depicted the impact of effluent discharges. Effluents from gas flow stations were not the major causes of pollution of water resources in the locations of study. Cluster analysis showed no significant variation in the physicochemical characteristics of water samples based on location. Physicochemical parameters exhibited a seasonal pattern as a result of dilution by rainfall, reduced rate of evaporation in rainy season and dissolution of gaseous products of gas flaring in rain. Metals had no significant effect on the quality of water sampled from the six locations during the period of monitoring.*

**Keywords:** effluents, cluster analysis, formation water, principal components, pollution, rainfall.

### Introduction

Water pollution remains an ever increasing problem in developing countries as a result of industrial activities coupled with lack of technical capacity to cope with the negative impacts of these activities. Many industries discharge effluents into nearby water bodies without proper treatment and adherence to effluent discharge standards set by the Ministry of Environment. Some rivers and streams in urban areas are in a permanently polluted state because they receive effluents at multiple points along their reaches so that self-purification process is hardly ever achieved. The Lagos Lagoon is so polluted that it continuously gives out a stench that can be perceived from a distance. Sources of water pollution in Nigeria include industrial effluent discharge, runoff from markets and

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