

Assessment of Groundwater Quality and Saline Intrusions in Coastal Aquifers of Lagos Metropolis, Nigeria

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Received July 1, 2010; revised September 3, 2010; accepted September 18, 2010

Abstract

As a result of immense industrialisation and high population growth, groundwater is heavily relied on in Lagos metropolis to serve as an alternative source of water where surface water is seriously polluted. The continued reliance on ground water has resulted in its decline in quantity and quality. In this study, the coastal aquifers of Lagos metropolis were selected for an assessment of its groundwater quality and impact of saline intrusion. Water samples collected along the coastal region were subjected to various physicochemical analyses. Results obtained were compared with permissible values for drinking water stated by Federal Environmental Protection Agency (FEPA) and World Health Organization (WHO). The results revealed that all the water samples were significantly hard (range 522.14–1233.34 mg/L). The salinity was delineated by conductivity measurements. Three samples had specific conductance above the stated limits for fresh water. The samples however met the stipulated limits for drinking water for the other tested parameters.

Keywords: Industrialisation, Groundwater, Physiochemical Analysis, Salinity, Conductivity

1. Introduction

Groundwater has long served as a source of drinking water and it is still very important today. The development of ground water has provided great socio-economic benefits to humanity. Globally, groundwater is estimated to provide about 50% of current drinking water supplies. As groundwater is isolated from the surface, most people take it for granted that groundwater should be relatively pure and free from pollutants. Although most groundwater are still of high quality, at some locations, it is becoming increasingly difficult to maintain the purity of groundwater. One of the major sources of pollution of groundwater is by saltwater intrusions. Others include seepages from underground storage tanks, oil wells, septic tanks, land fills and agricultural leaching.

Saline intrusions into coastal groundwater via aquifer penetration have become a major concern [1] because it is the commonest source of pollution to groundwater. The extent of saltwater intrusions into groundwater is dependent on several natural and anthropogenic factors; the nature of the aquifer and its natural recharge rates being the major natural factors. The anthropogenic fac-

tors include excessive groundwater withdrawals [1-6] and lack of sealing of abandoned boreholes and oil wells. Studies have indicated that increased groundwater salinity may be due to clearing of natural forests resulting in enhanced recharges which leaches salt downwards from salt stored in the unsaturated zone [7] or causes the water to rise dissolving salt as it does so [8]. The pollution of shallow aquifers under cities represents a major threat to sustainability of drinking water supplies in many urban areas throughout the world [4,9]. Frohlich and Urish [10] reported that the deterioration of the freshwater quality due to natural sea water infiltration affects the balanced life of the coastal strip of Rhodes Island. The present study was conducted in Lagos State in South western Nigeria, boarded in the south by the Atlantic ocean, in the north and east by Ogun state and in the west by Republic of Benin. It occupies an area of about 3.577 sq km with a population of about 14 million. 80% of the population resides in the metropolitan Lagos, making the state the most urbanized in Nigeria [11].

The aquifer structure of Lagos state falls in the Benin basin where salt water intrusion into the recent sediments aquifers occurs beneath the fresh water lens [12]. These