Anthropogenic influence within various zones on urban city of Nigeria

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INTRODUCTION

- Pollution of groundwater has become a major environmental problem in many developing countries.
- The main challenge of urbanization in many developing countries (Nigeria) is accessibility to good potable water,
- reinforced by uncontrolled population growth;
- the effect lead to inadequate hygienic infrastructural facilities with no actual waste dump site: dissolution of organic matter; infiltration of rainwater into the refuse pile; which then lead to leaching of soluble metals in form of toxic wastes into the ground water (Tijani, et al., 2004 and Adeniji, 2009.
- Persistent discharge of these wastes led to high contamination (IPCC, 2001, 2007).
- Groundwater quality degradation is related primarily to what the land is being used for and this could be;
- An industry (food, clothe or drug);
- Agricultural plantation;
- Mechanical workshop,
- and many others that contains anthropogenic products from emission of fuel combustion into the atmosphere which precipitated as rain and leached as water run-offs into the underlying aquifer thereby polluting the aquifer.

Groundwater contamination associated with man occurs from sources such as:-

Chemicals and waste dump sites

Sewage pits

burning of fossil fuels (especially coal),

waste incineration

High water run-offs

Figure 1: Contamination by Man

Contamination occurs from tye and dye

Affects the Groundwater through leaching

Element gets Introduced into Drinking water

With deadly diseases such as cholera, dysentery, diaherrea, with other diseases and ultimately death

Figure 2: Contamination by Man

JUSTIFICATION

- Due to the toxicity and health impact;
- Research was focused on the impact of contamination on groundwater of different zones;
- Information about impact of contamination on zones of a particular city is scarce

OBJECTIVES

- This study is therefore aimed at assessing the impact of **anthropogenic activities** on groundwater in crowded, market, residential and industrial zone;
- to determine the **source** of groundwater pollution in the study area.

Study Location and Geology

- ❑ Abeokuta metropolis the study area was divided into four zones:
- Crowded zone of Labaiwa and Olose area;
- Industrial zone of Itoku;
- Market zone of Kuto area and
- Residential zone of Elega Housing area,
- ❑ All falls within the Basement Complex Southwestern Nigeria.
- ❑ The study area lies within the Southeastern part of Abeokuta in Ogun State of Nigeria
- With latitudes 070 08'N and 070 13' N of the equator and longitudes 0030 20' E and 0030 23' E of the Greenwich meridian.
- The study area contains two major rocks types: Biotite Granite which covers approximately 10% of the study area, and it is observed in the North–Eastern part of the study area and
- Porphyroblastic Gneiss which covers about 90% of the study area (Fig 1).

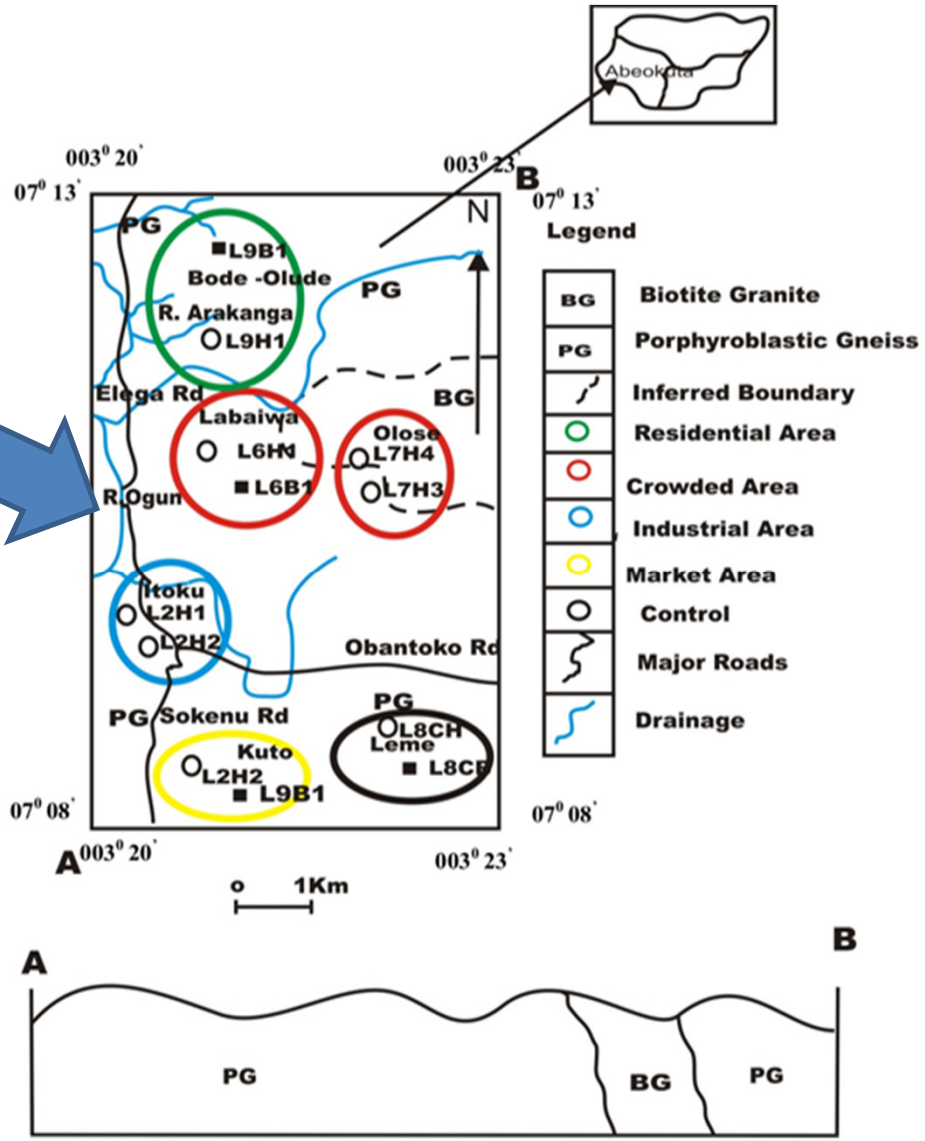

Figure 3: Location and Geology map of the study area

Study Design

The study area was divided into zones for better evaluation these are:

INDUSTRIAL ZONE at Itoku – Tie and Dye, with chemicals such as Sodium Hydro-sulfite(sodium dithionite) ($NaHSO_3$), Soda ash (Na_2CO_3), Common salt (NaCl), and Caustic Soda (NaOH)

Zone type	Area	Activities
Market	Kuto	Major Market where the selling of food items such as fruits, meat, rice , beans ,garri, ; use of generating sets within the area; Domestic use of firewood.
Crowded	Labaiwa, Olose	Domestic use of firewood, washing of clothes and use of generating sets.
Residential	Elega Housing Estate (Bode - Olude)	Use of generating sets; Quarrying of Porphyroblastic Gniess directly behind the estate.

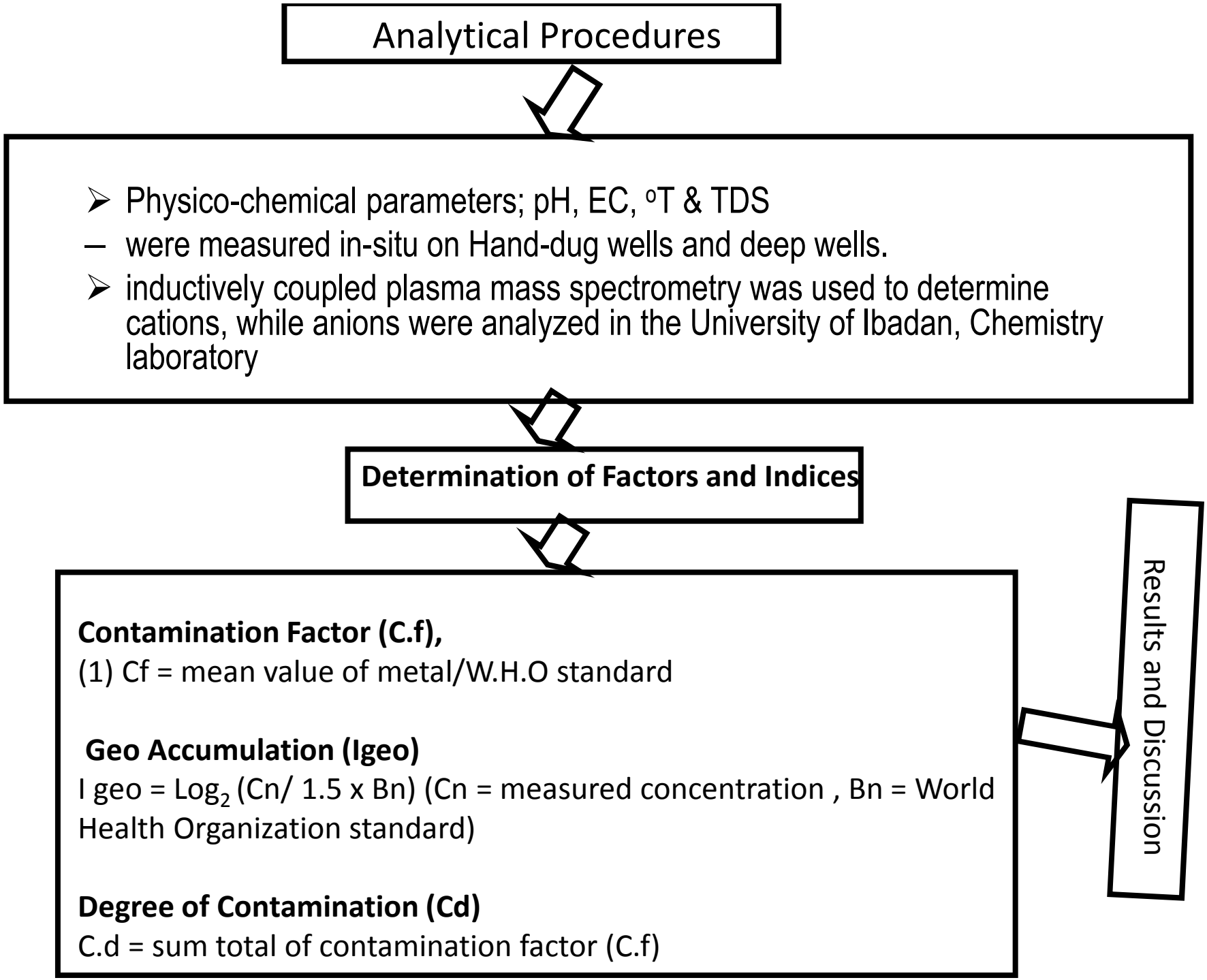
Analytical Procedures
➢ Physico-chemical parameters; pH, EC, °T & TDS
– were measured in-situ on Hand-dug wells and deep wells.
➢ inductively coupled plasma mass spectrometry was used to determine cations, while anions were analyzed in the University of Ibadan, Chemistry laboratory
Determination of Factors and Indices
Contamination Factor (C.f),
(1) Cf = mean value of metal/W.H.O standard
Geo Accumulation (Igeo)
I geo = Log2 (Cn/ 1.5 x Bn) (Cn = measured concentration , Bn = World Health Organization standard)
Degree of Contamination (Cd)
C.d = sum total of contamination factor (C.f)
Results and Discussion

Table 1: Mean Physico-chemical results of trace metals of rocks and water sources

Parameters (ppm)	Mean	Range	WHO (2006)	EPA (2008)	SON (2006)
K	19.05	1.74-88.91	13.48	-	-
Ca	49.11	17.07-86.63	75	-	-
Mg	8.78	3.14-18.60	200	-	0.2
Fe	0.99	0.01-10.01	-	0.03	-
Cu	0.00	0.00-0.00	2	1.3	1
Pb	0.00	0.00-0.02	0.01	-	0.01
Cl^-	168.33	60.00-350	200	-	-
NO_3^-	28.08	16.72-46.01	25	-	-
Mn	0.19	0.00-1.27	0.4	0.05	0.2
Na	47.48	8.81-168.6	200	-	200
Zn	0.03	0.01-0.04	3	5	3
TDS(ppm)	269.17	67-649	500	500	500
EC(us)	405.79	103.07-984.61	1400	1400	1000
pH	8.16	6.6-8.9	6.5-8.5	6.5-8.5	6.5-8.5
Temp (0C)	27.12	26-29	-	-	-
SAL (%)	0.03	0.01-0.06	-	-	-

Table 2: Contamination Factor for the various zones

Zones	Cu (ppm)	Mn (ppm)	Pb (ppm0	Zn(ppm)	Na(ppm)	Ca (ppm)	Mg (ppm)
Industrial	0.00	0.08	0.23	0.01	0.65	0.91	0.14
Market	0.00	0.00	0.10	0.01	0.40	0.85	0.11
Crowded	0.00	0.55	0.26	0.01	0.25	0.46	0.07
Residential	0.00	1.83	0.15	0.02	0.16	0.57	0.06
Control	0.00	0.01	0.59	0.02	0.22	0.57	0.09
W.H.O (2006)	2.00	0.40	0.01	3.00	200.00	75.00	100.00
C.D	0.00	6.02	2.94	0.17	3.88	7.64	1.06

CONTAMINATION FACTOR (Cf)

The contamination factor (Hakanson, 1980) is used to classifying the level of contamination of metals in water.

It is expressed as

Cf = mean value of metal/W.H.O standard

Where:

Cfi <1	Low contamination factor
1<Cfi < 6	Moderate contamination factor
3 < Cfi < 6	Considerable contamination factor

All the elements have a contamination degree of < 8 (cfi < 8), thus are said to have low a low degree of contamination

Table 3: Geo- accumulation index of the different zones

Zones	As ppm	Cd ppm	Cu ppm	Mn ppm	Pb ppm	Zn ppm
Industrial	-3	0.65	-17.5	-3	0.49	-7
market	-2.7	-0.5	-17	-14.5	-7	-7.5
Crowded	-7.5	0.55	-18	-2.4	-2.5	-7.25
Residential	-4	0	-15.5	-2	-3.5	-6.5
control	-6.5	0.05	-18	-6	-3	-7.5

GEOACCUMULATION INDEX (I geo)

The index is used in assessing contamination by Muller (1981)

That is; $Log_2 (Cn/ 1.5 \times Bn)$

Cn = measured concentration

Bn = World Health Organization standard

Where;

0	Igeo <0	Practically uncontaminated
1	0<Igeo<1	Uncontaminated to moderately contaminated
2	1<Igeo<2	moderately contaminated
3	2<Igeo<3	moderately to heavily contaminated
4	3<Igeo<4	heavily contaminated
5	4<Igeo<5	Heavily to extremely contaminated
6	5<Igeo<6	extremely contaminated

Geo-accumulation index result showed contamination only in the industrial zone with Cd with all the other zones showing practically no contamination

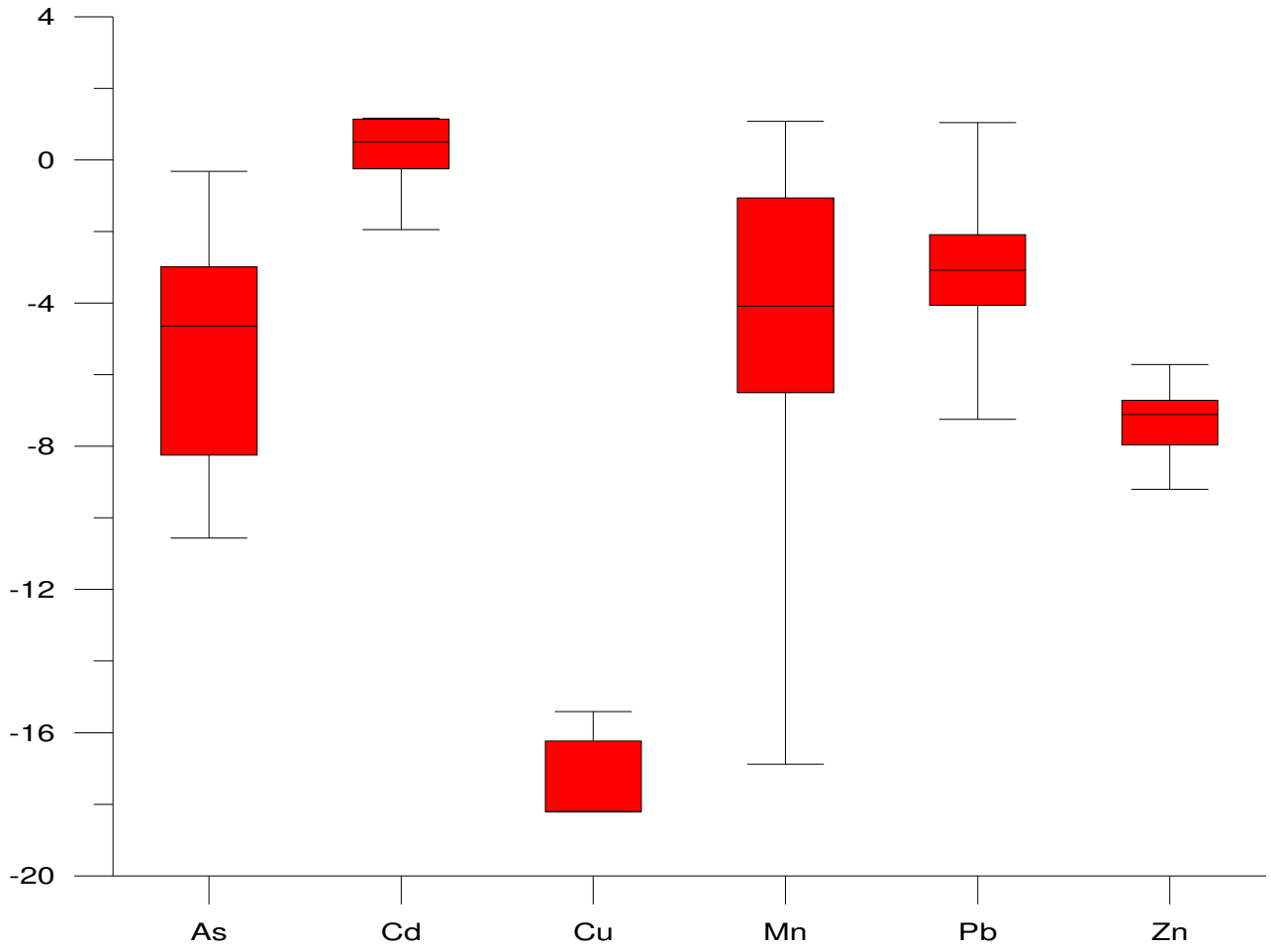

Figure 4: Box Plot for Igeo of Trace elements

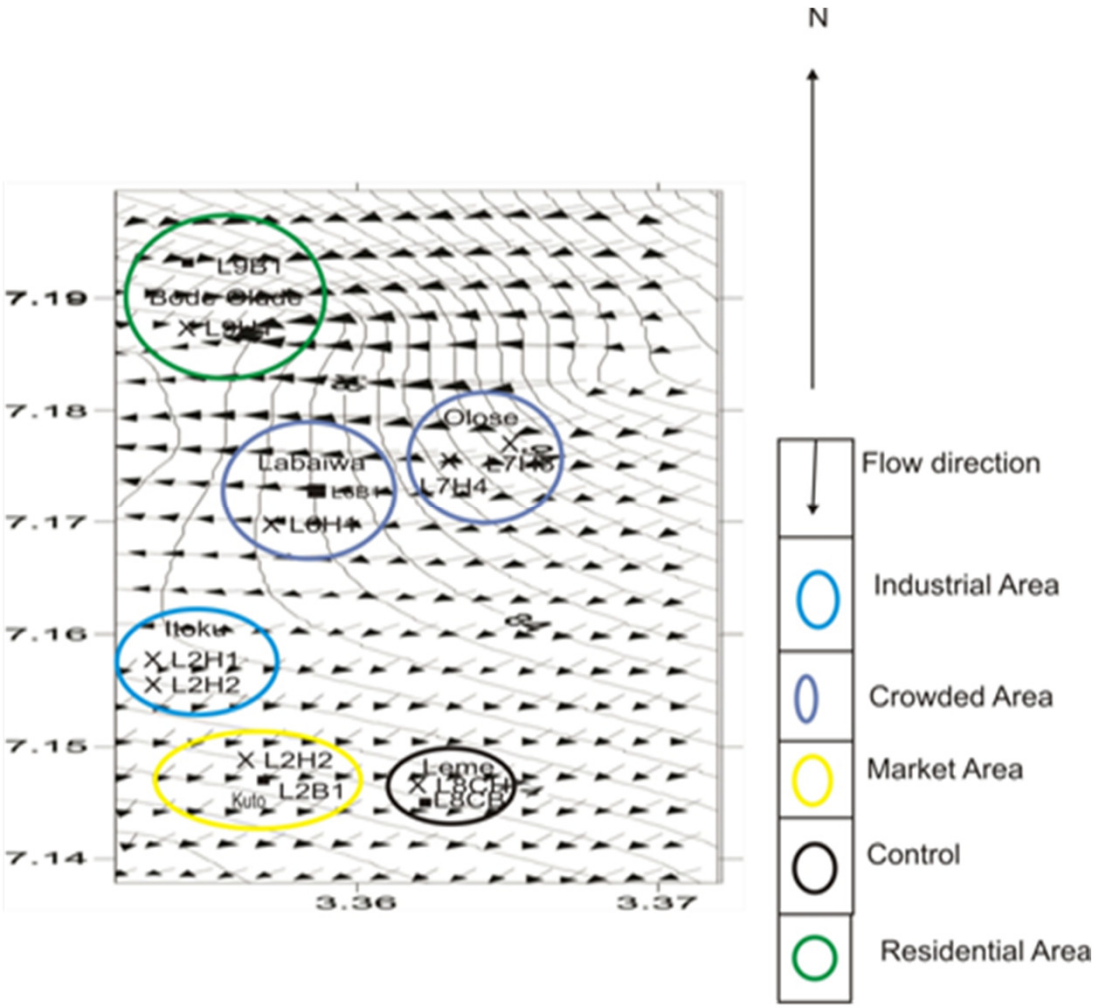

Figure 5: Piezometric map of the Study area

Piezometric Map (Plummer *et al*., 2011) revealed a general flow direction of North - East-South- West direction. Contaminated water flowing westward and southward in the crowded area may get leached and thus, affecting the aquifers of industrial area, and this could enhance the rate of contamination of the area.

Conclusion and Recommendation

Future pollution is certain especially in the industrial, market and crowded areas due to long term effects of the contaminants such as tie and dye, food items rich in Na, domestic activities with metal laden wastes, fuel combustion found within the area.

Though the contamination factor (C.f), of trace or heavy metals is relatively low in the zones proper monitoring of the areas are needed to avoid a long term effects of the metals in the area.

The study thus recommended that proper waste disposal systems should be in place to avert epidemic due to pollution in the environment.

Some Of My Other Works

- Environmental impact of cement factories was evaluated around Ewekoro environ. Soil samples and consumable vegetales (Sugar-cane (*Saccharumofficinarum*), Soko(*Celosia argentea*), Cocoyam (*Colocasiaesculerita*) and **Ewedu** (*Corchoruos olitorius*)) were collected 200m apart around the cement factory**.** Soils and vegetables of areas around the cement factory are contaminated with metals especially Zn and Mn.

- Remediation of arsenic in concentrated waters of highly urbanized Nigerian city.

- Comparison of phytoremediation water hyacinth (*Eichhornia crasspipes Mart. Solms*) and filtration with the use of geo-materials (marble, activated charcoal, filtration carbon and clay).

THANK YOU AND GOD BLESS