



Sediments Toxicity of the rivers draining Ibadan Metropolis Southwestern, Nigeria.

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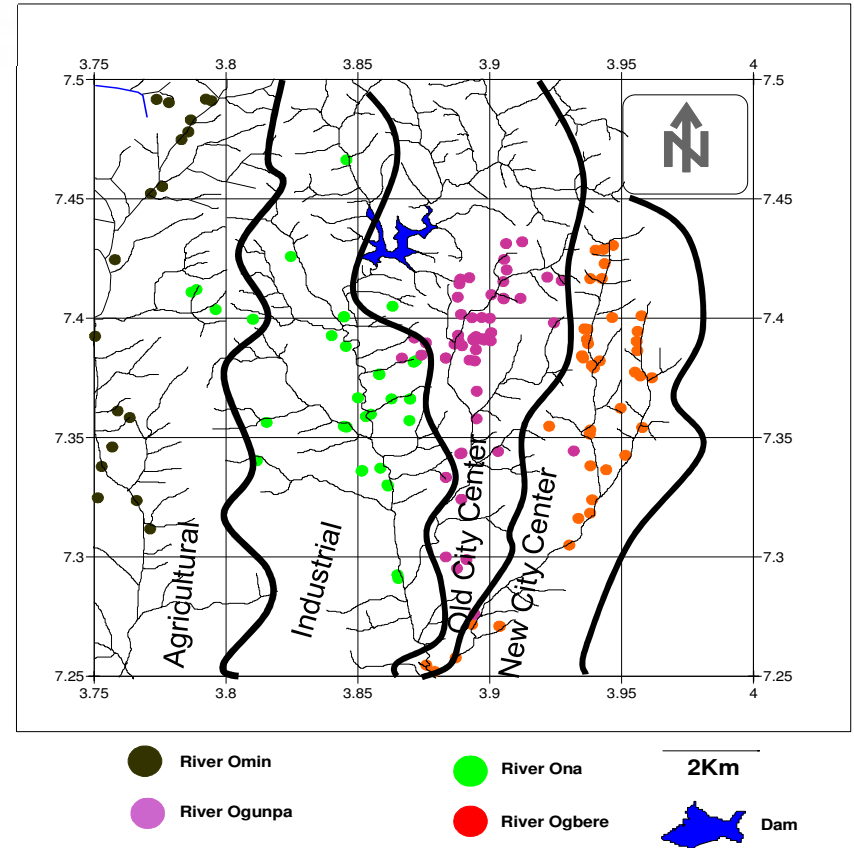
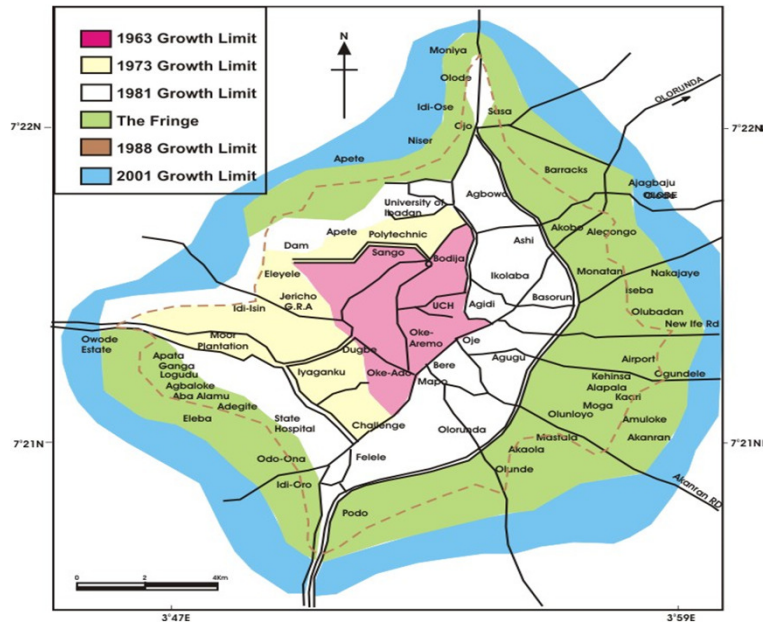
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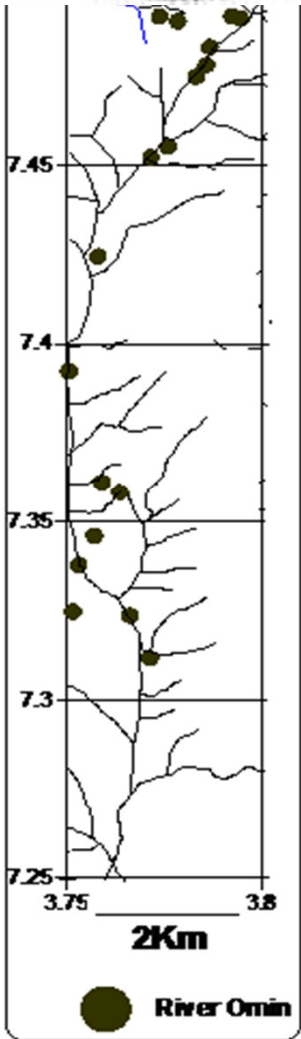
STUDY AREA

The study area is drained by Rivers Omin, Ona, Ogunpa, Ogbere.



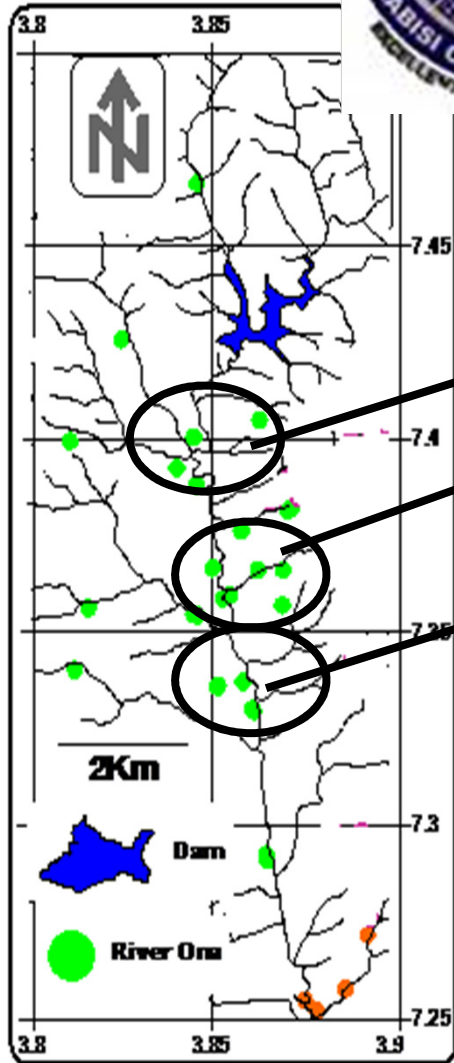


RIVER OMIN - AGRICULTURAL





RIVER ONA - INDUSTRIAL





· OLD CITY CENTER

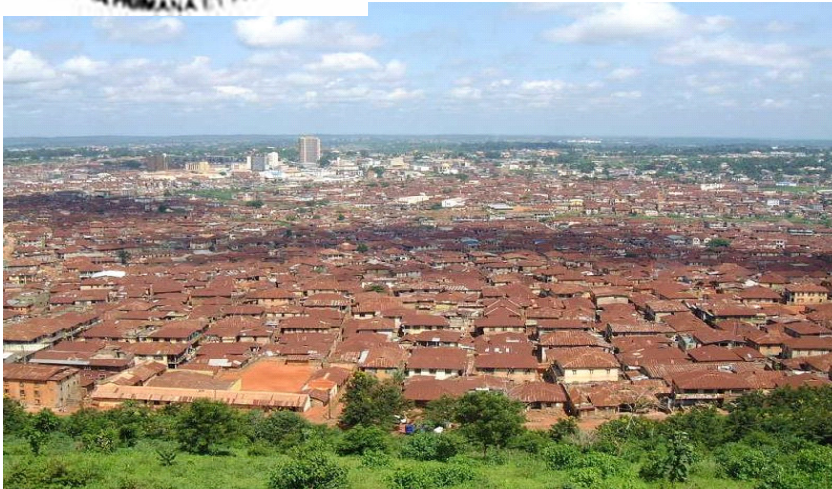


Fig. 1.1. An aerial view of part of unplanned urban setting of Ibadan metropolis
http://en.wikipedia.org/wiki/File:Ibadan_City.jpg

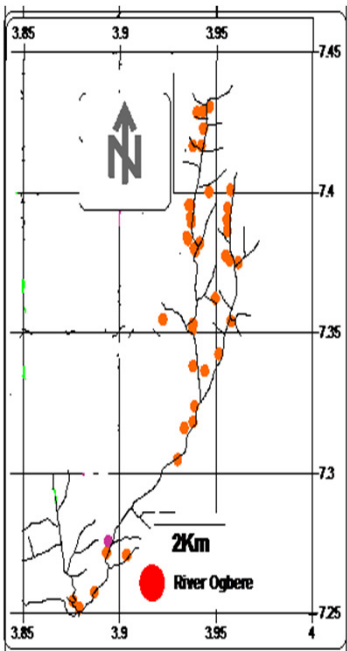


Unplanned urban setting
High traffic Density
Indiscriminate solid/liquid waste

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RIVER OGBERE - NEW CITY CENTER



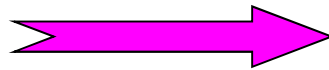
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▶ OBJECTIVES OF THE STUDY

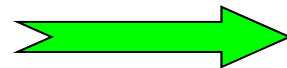
To determine the **mineralogical** and **trace metal contents** of the sediments.

- To evaluate the **pollution status** and identify the possible influence of **Land use/human activities on metal concentration** .



MATERIALS AND METHODS

- **233** bottom river sediment samples was collected along the stream and river channels
- **Omin-29**, Ona-53, **Ogunpa-91**, Ogbere-60.
- A sample was collected as **control** from a natural spring devoid of contamination.



MINERALOGICAL/GEOCHEMICAL

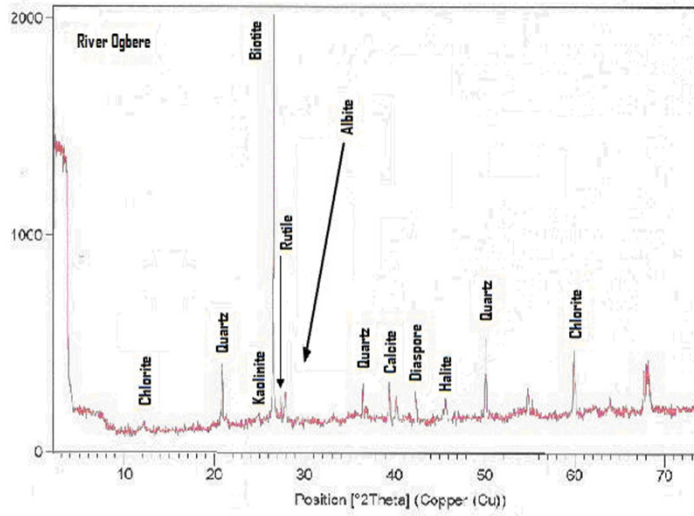
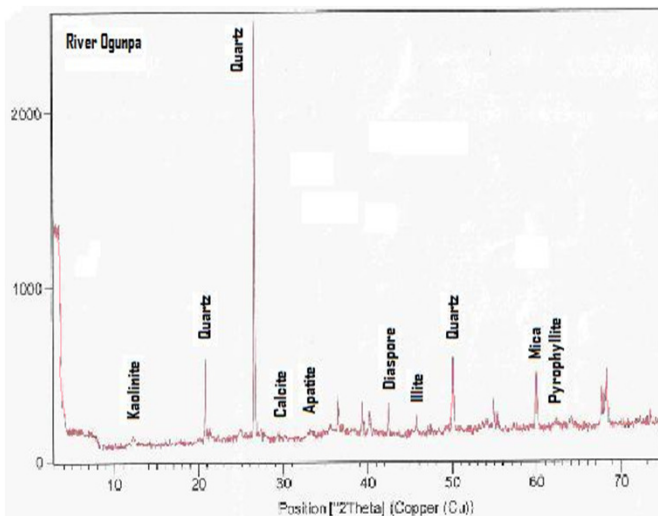
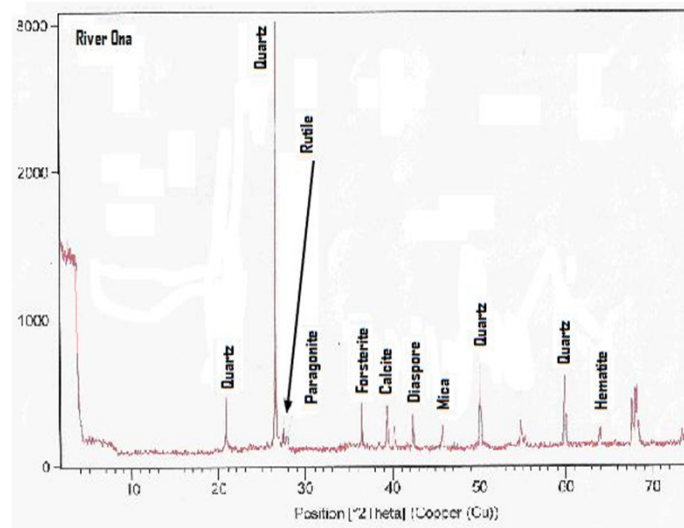
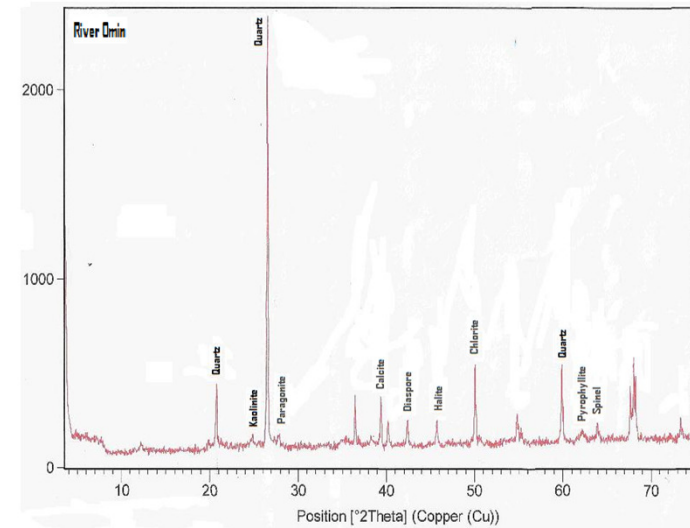
- **XRD** (NGSA Laboratory)
- **ICP-MS** (ACME Laboratory Canada)
- **SEQUENTIAL LEACH** (5-Methods)

Leach Methods

- **Sulphides**
- **Residuals**
- **Reducibles**
- **Organics**
- **Exchangeables**



MINERALOGICAL DATA



kaolinite, illite, chlorite, mica, calcite, paragonite, diaspore and quartz

Kaolinite, illite, were dominant in Rivers Omin and Ogbere

Quartz is the dominant mineral in Rivers Ona and Ogbere.



SAND-CLAY CONTENT - (Si:Al)

Si/Al controls the **sand-clay content** of any given sediment.

- Mean Si/Al values in the sediment include: ≤ 14.09 (Omin), ≤ 17.44 (Ona), ≤ 18.73 (Ogunpa), ≤ 15.0 (Ogbere) indicating high degree of **sand**
- **High sandy** content was recorded for **Ogunpa and Ona** rivers, controlled by the **lithology (Quartzite and quartz schist)**.

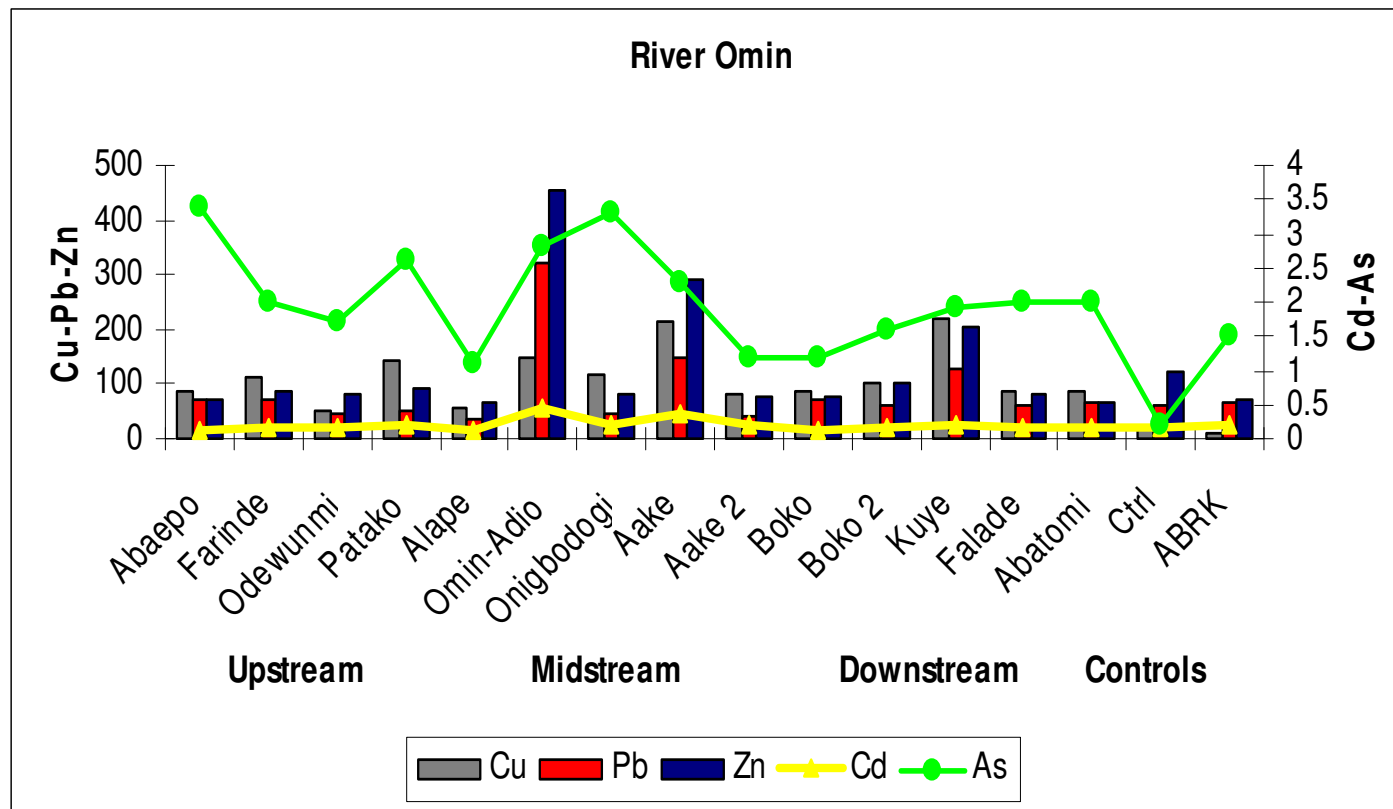
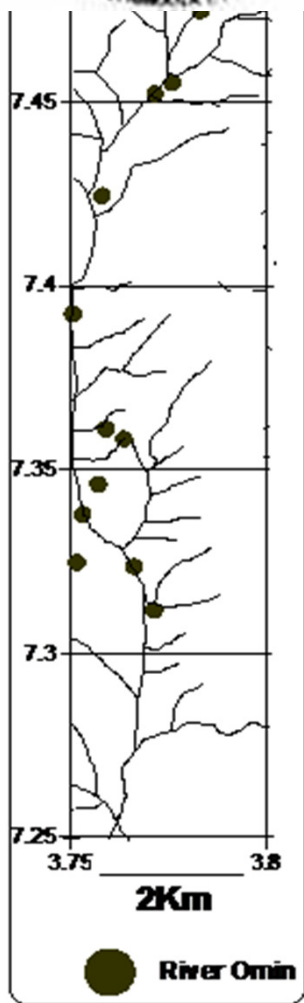
Rivers	Parameter	Others (>2mm)	Sand (<2mm)	Silt (75 μ m)	Clay (63 μ m)
Omin	Min	1.6	31.6	0.0	0.0
	Max	64.8	97.4	5.4	4.2
	Ave	30.6	66.2	1.4	0.9
Ona	Min	0.0	81.6	0.1	0.0
	Max	2.6	99.8	17.3	5.1
	Ave	0.5	95.2	3.0	1.0
Ogunpa	Min	0.0	50.2	0.1	0.0
	Max	47.6	99.8	17.3	5.1
	Ave	9.3	87.1	2.3	1.1
Ogbere	Min	0.2	17.1	0.0	0.0
	Max	82.7	97.9	21.1	2.8
	Ave	28.3	69.5	1.6	0.3



	Omin		
Omin	Si/Al	Ti/Al	Fe/Al
min	8.01	0.06	0.39
Max	26.22	0.32	1.74
Mean	14.09	0.12	0.95
	Ona		
min	11.08	0.05	0.23
Max	25.59	0.21	2.53
Mean	17.44	0.09	0.96
	Ogunpa		
min	8.55	0.04	0.61
Max	36.05	0.28	5.96
Mean	18.73	0.12	1.38
	Ogbere		
min	8.5	0.05	0.36
Max	32.83	0.26	2.65
Mean	15	0.1	1.58
Shale Ratio	2.59	0.05	0.51

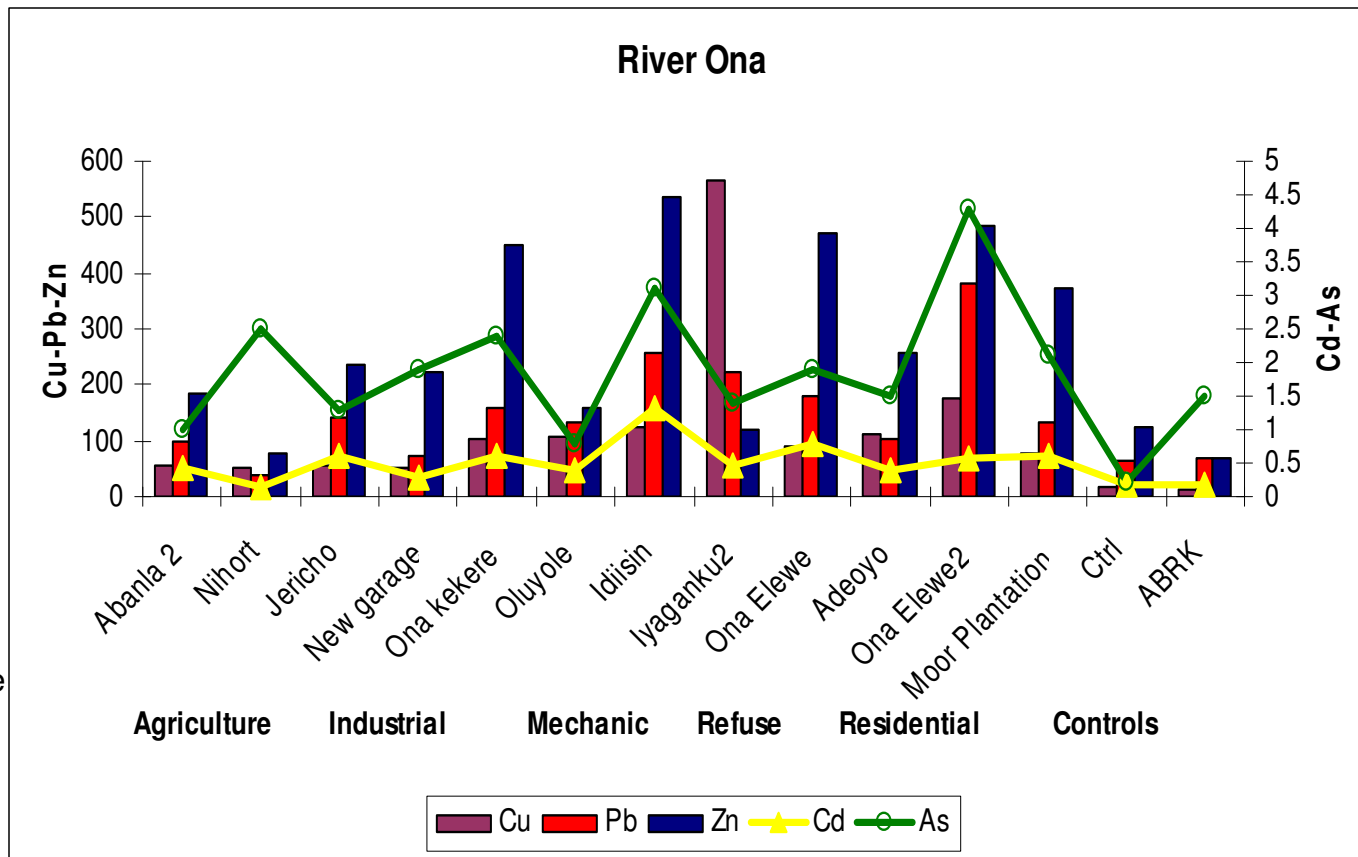
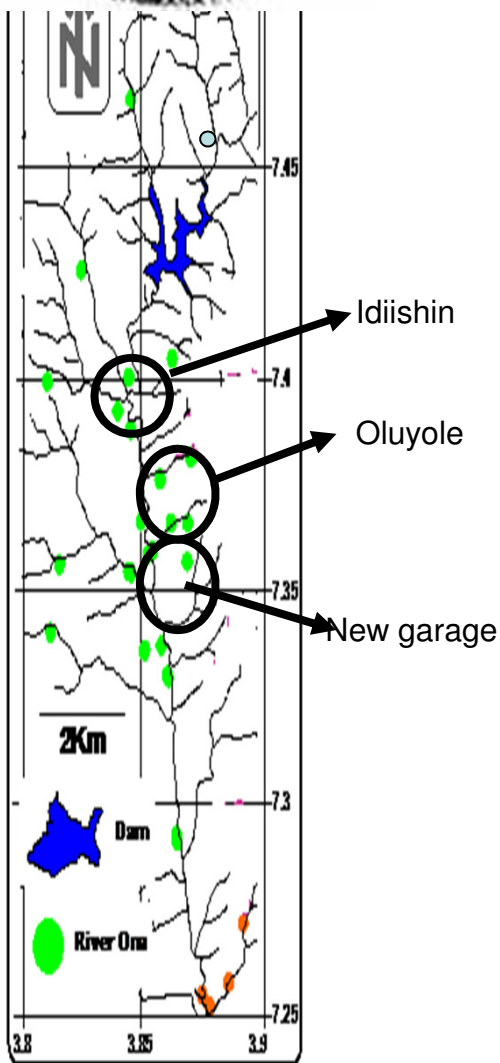


River Omin



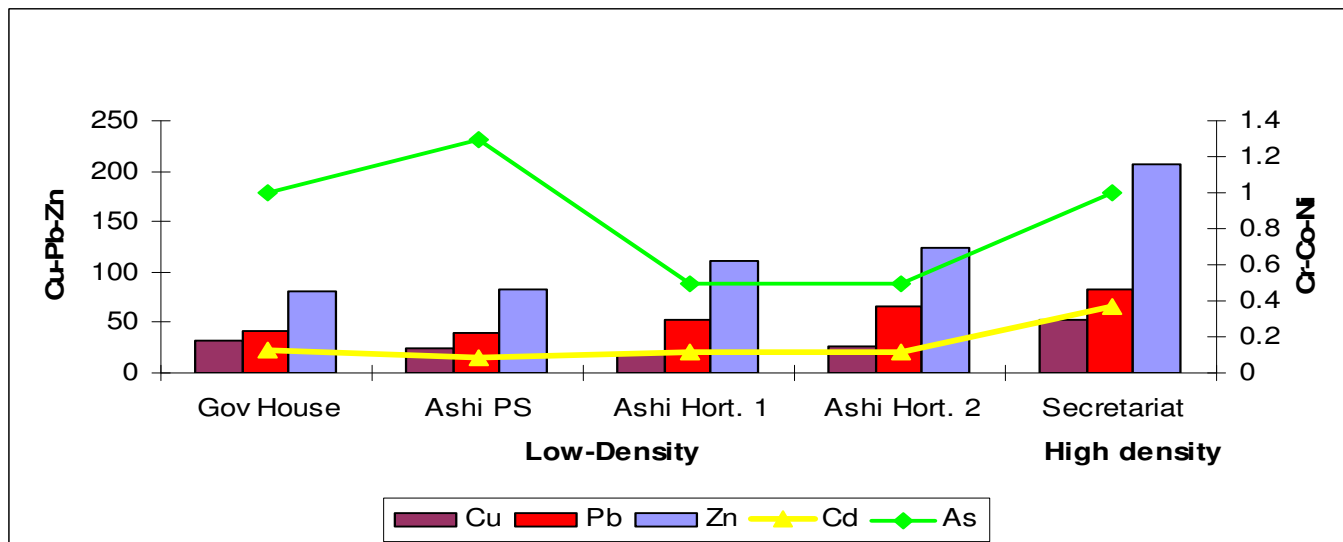
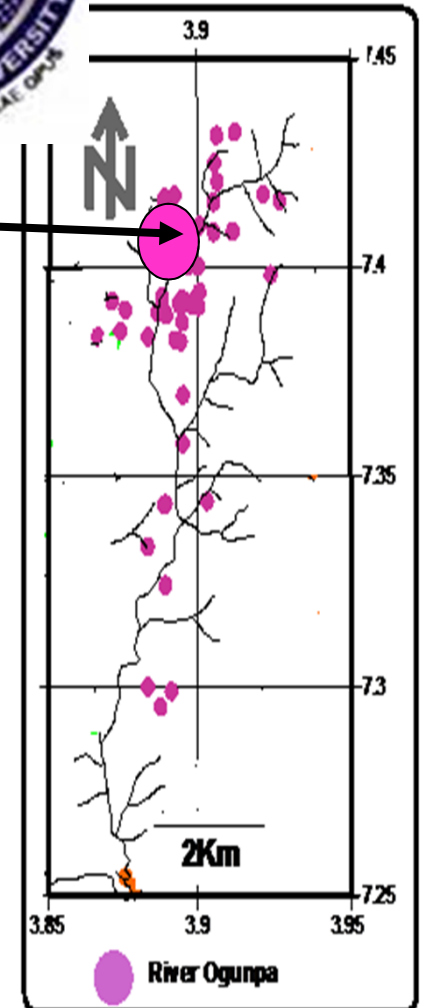
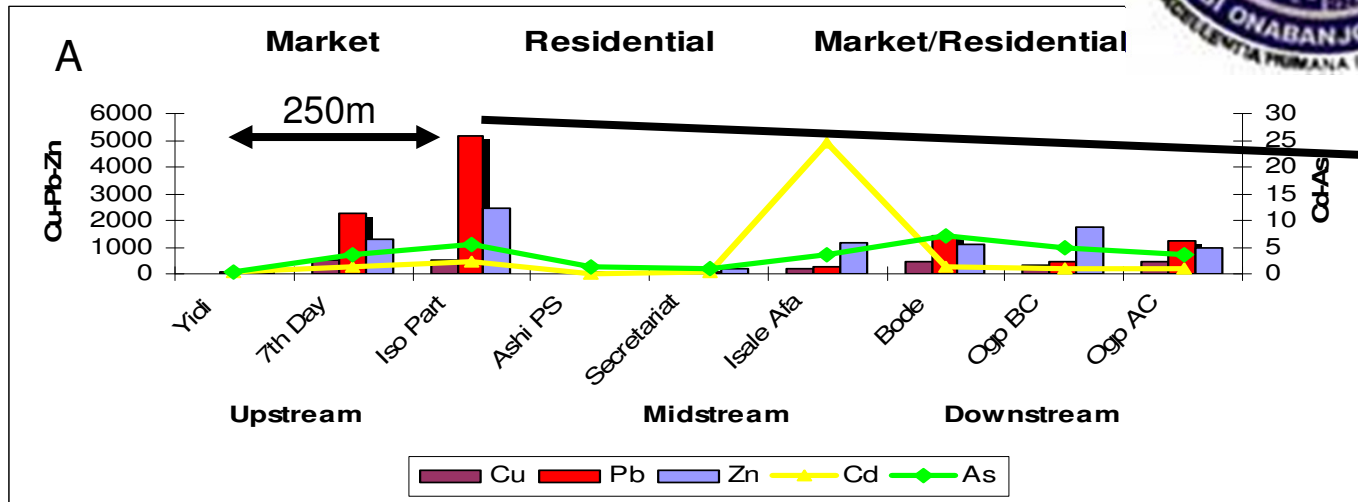


River Ona



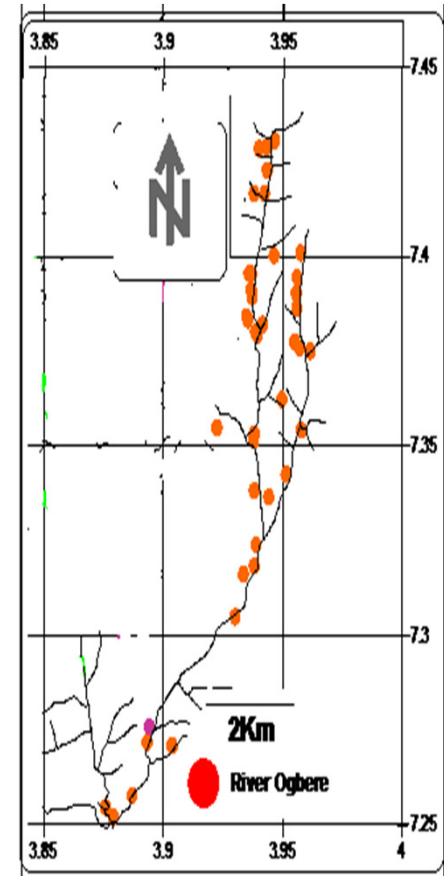
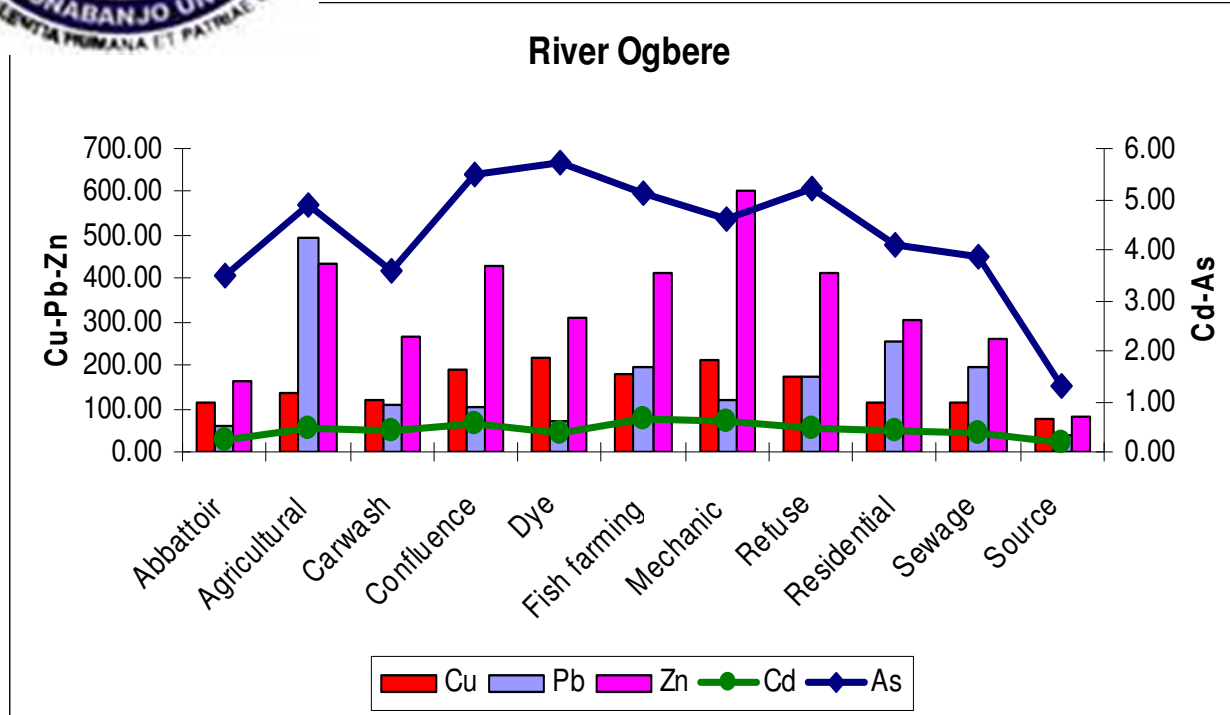


River Ogunpa



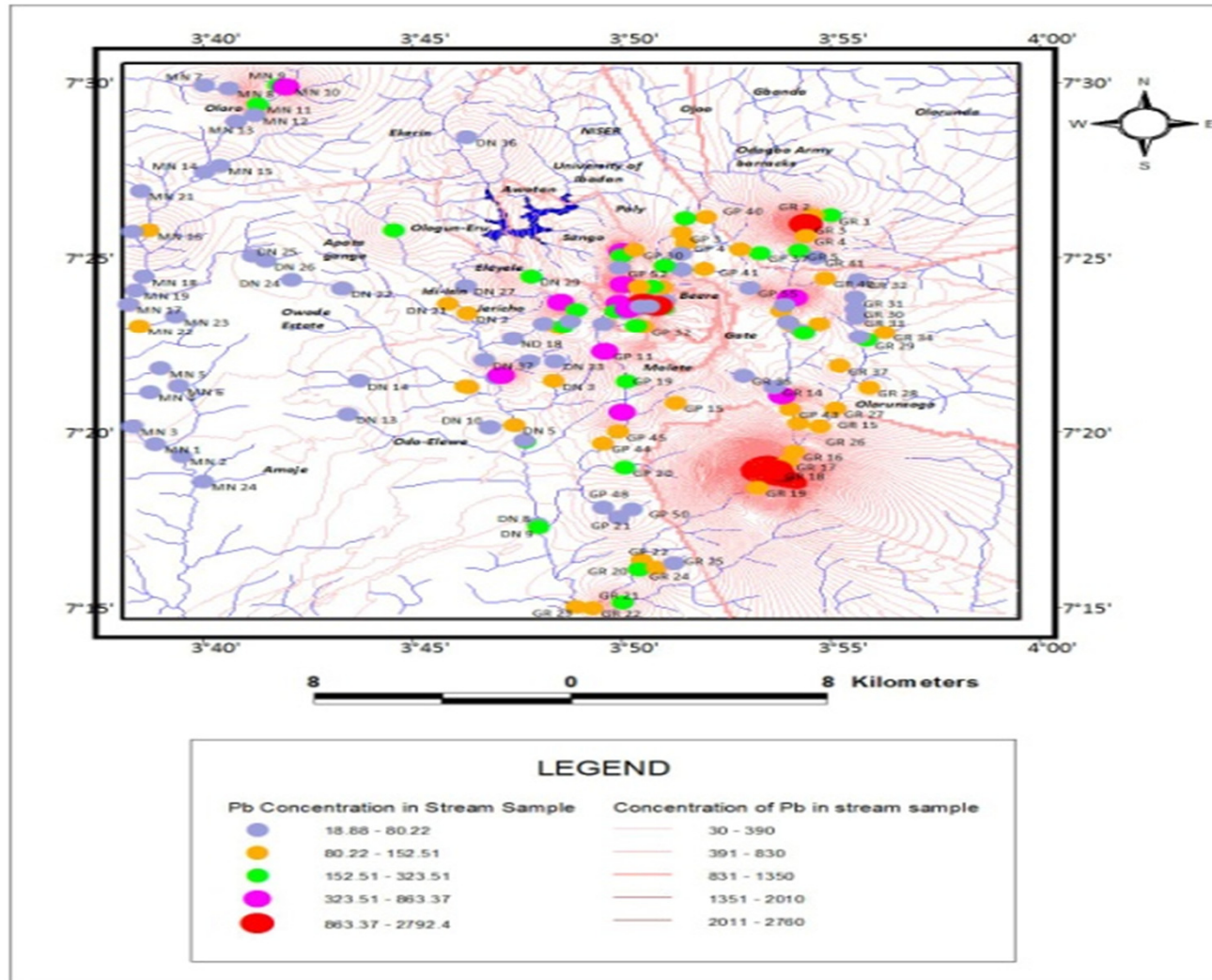


RIVER OGBERE





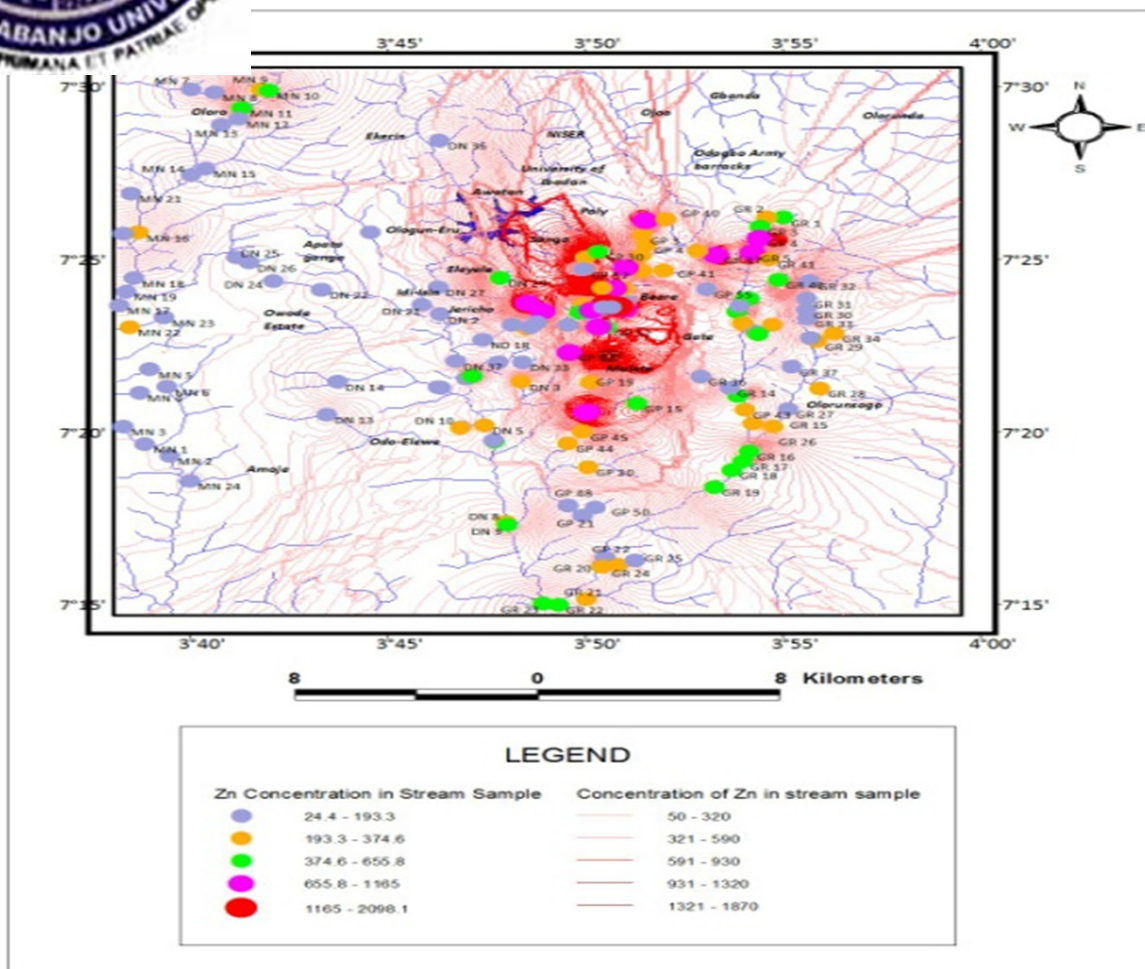
GEOCHEMICAL MAP

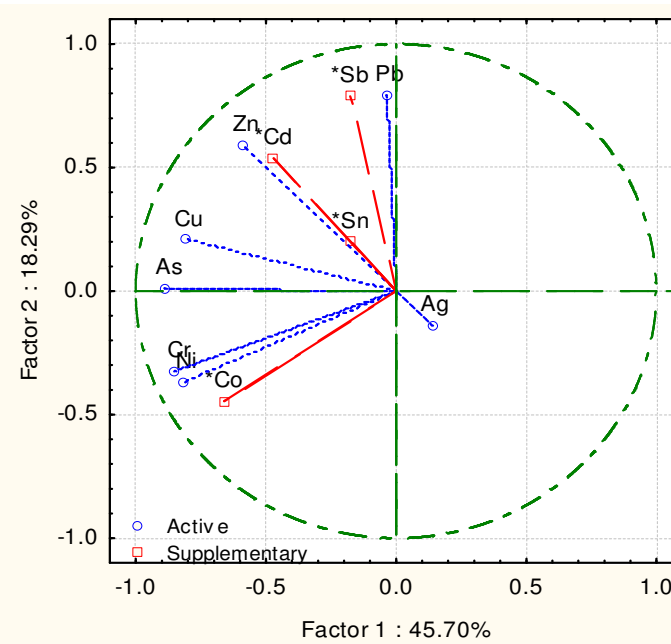
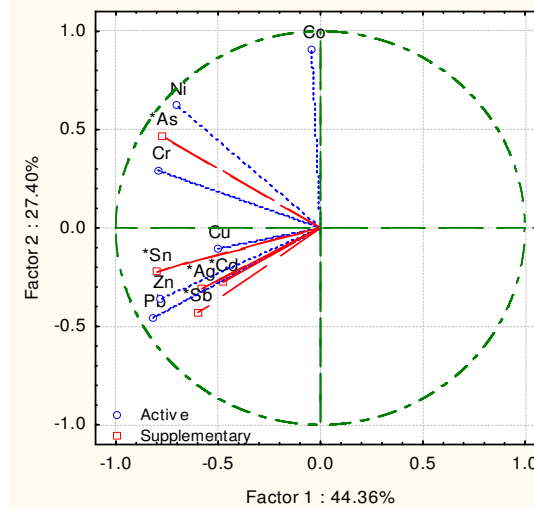
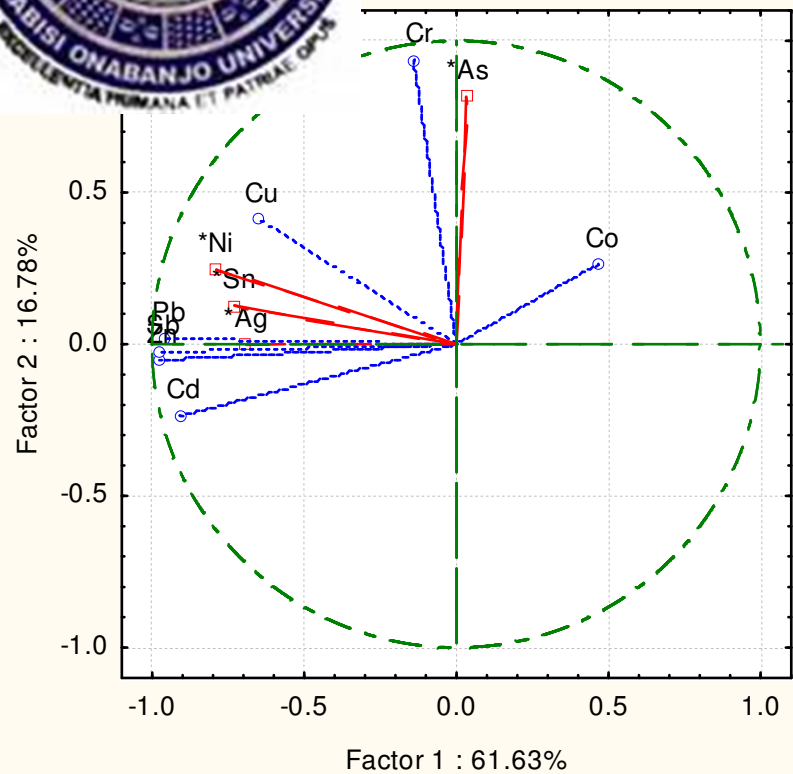


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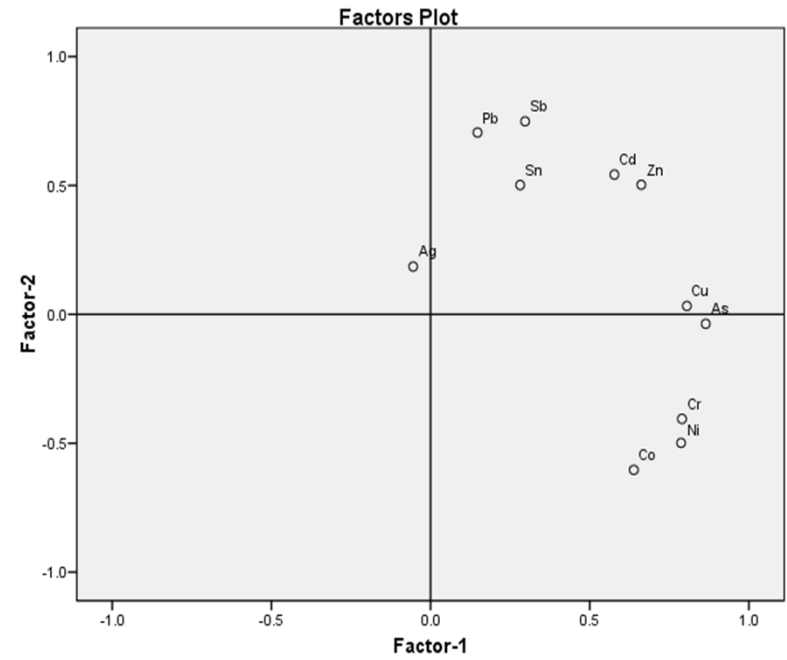
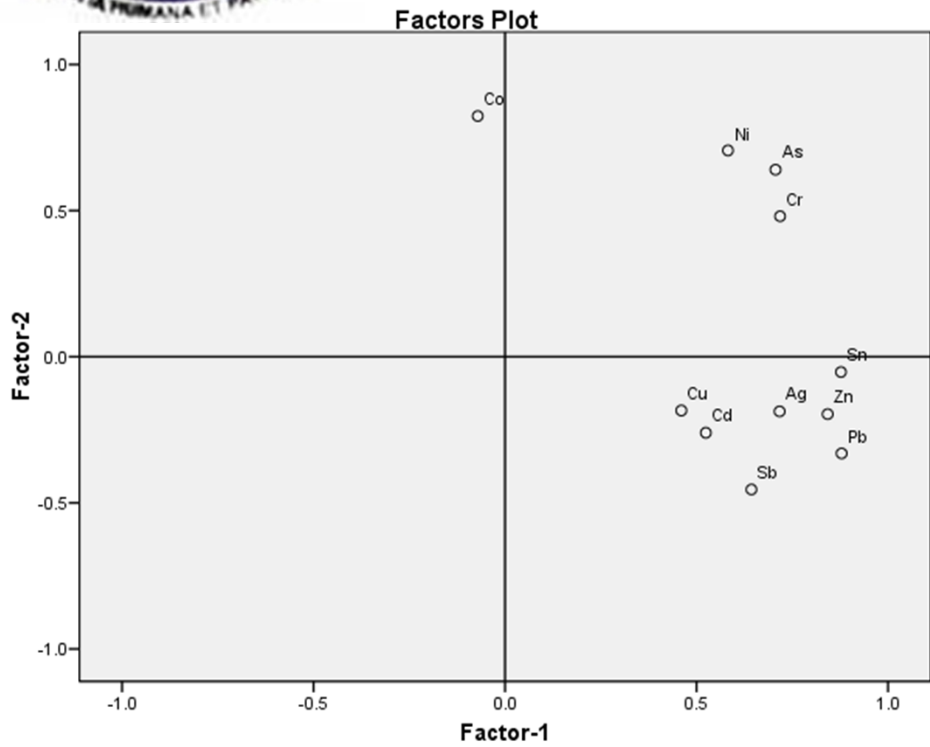


GEOCHEMICAL MAP





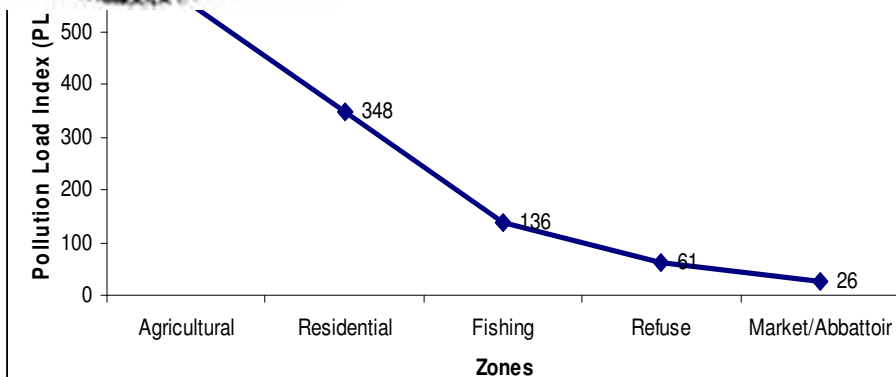
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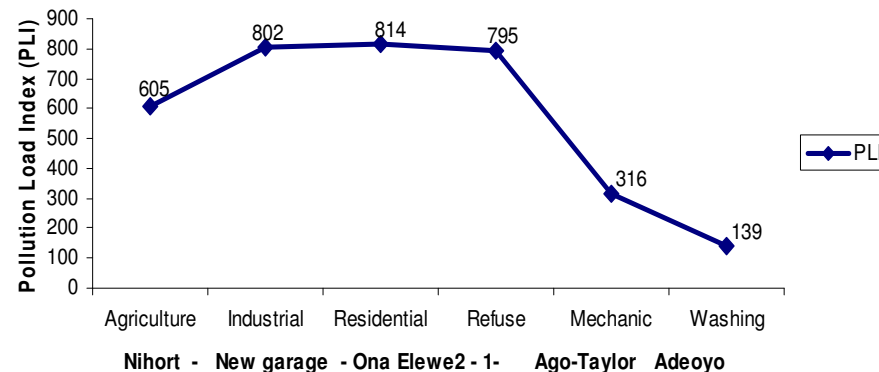


PLI COMPARISON

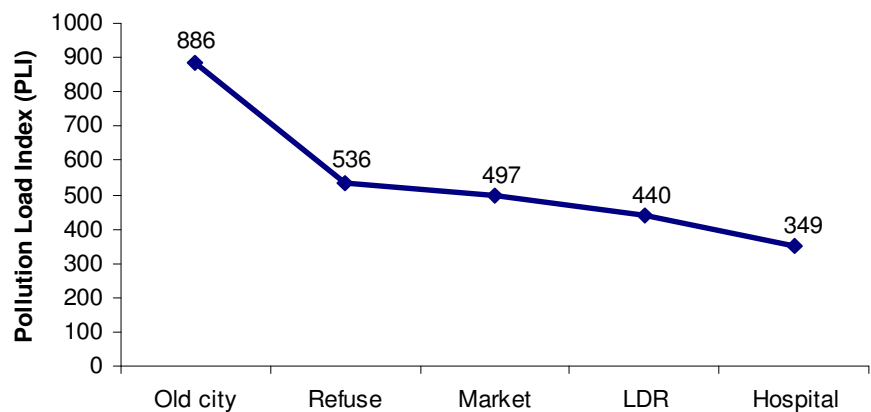
River Omin (PLI)



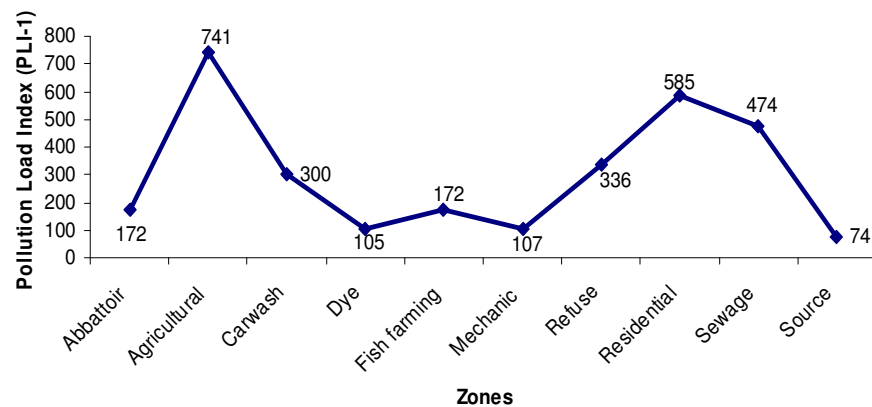
River Ona (PLI)



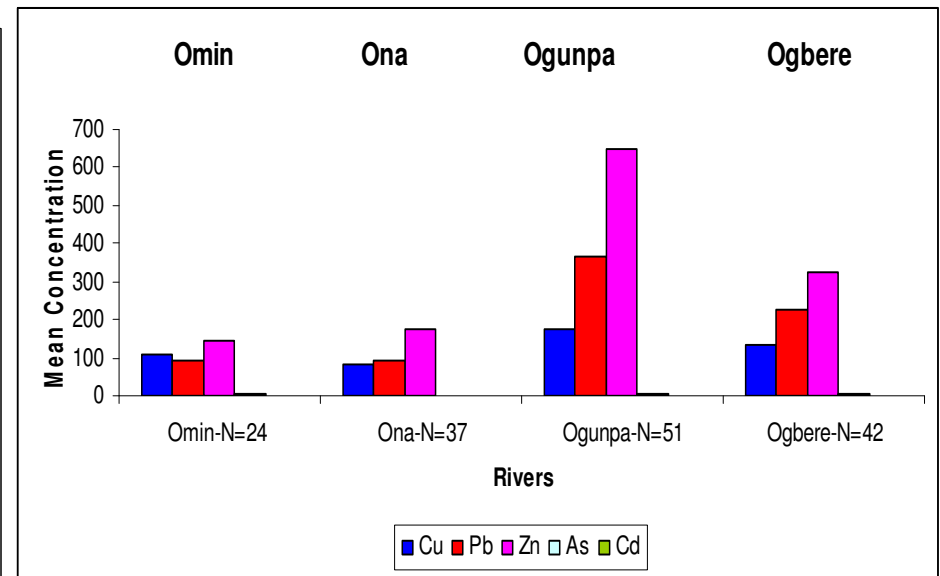
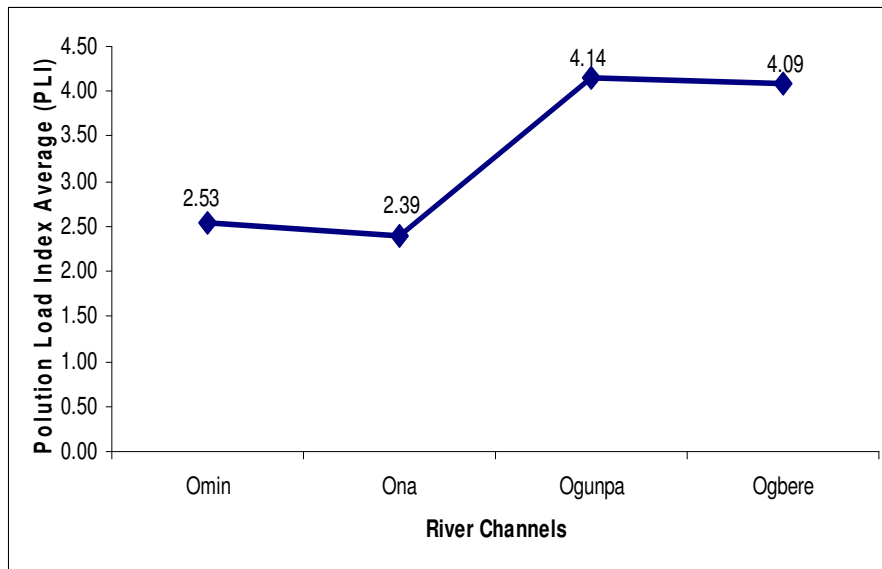
River Ogunpa (Old City Center)



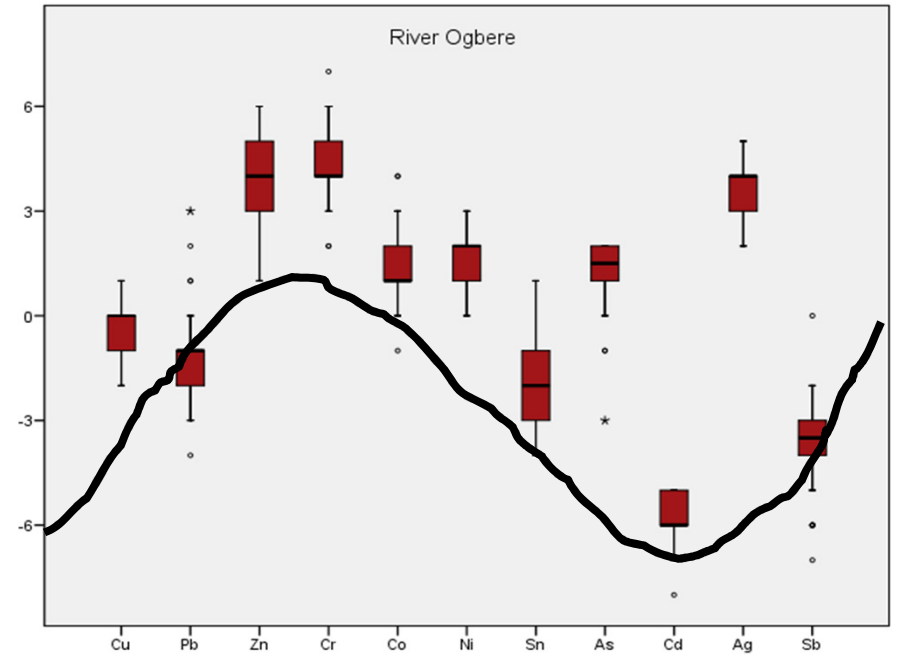
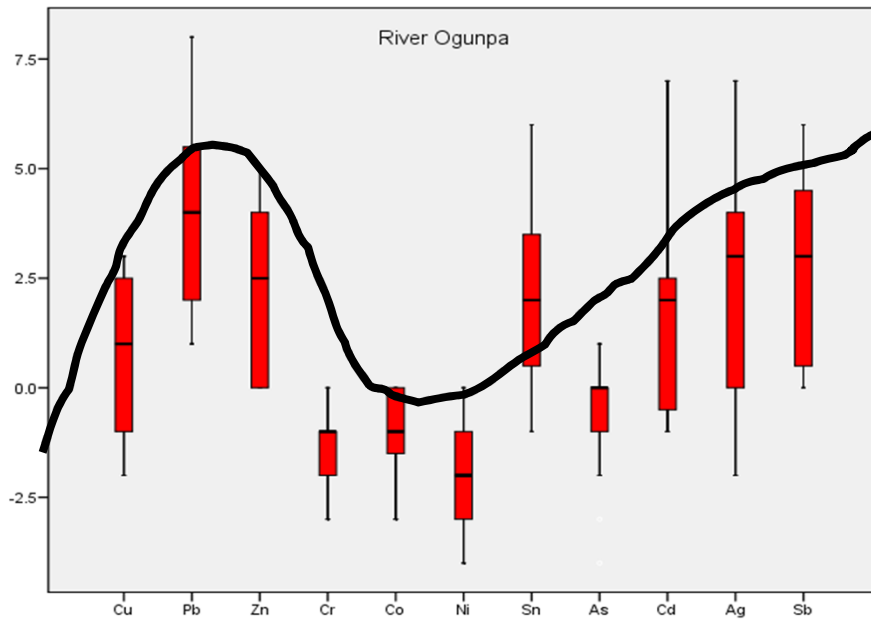
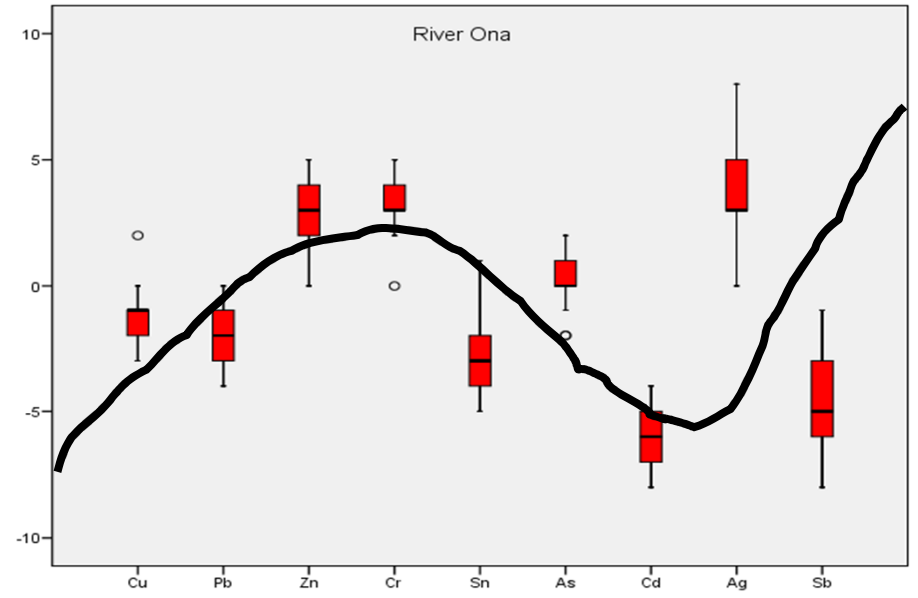
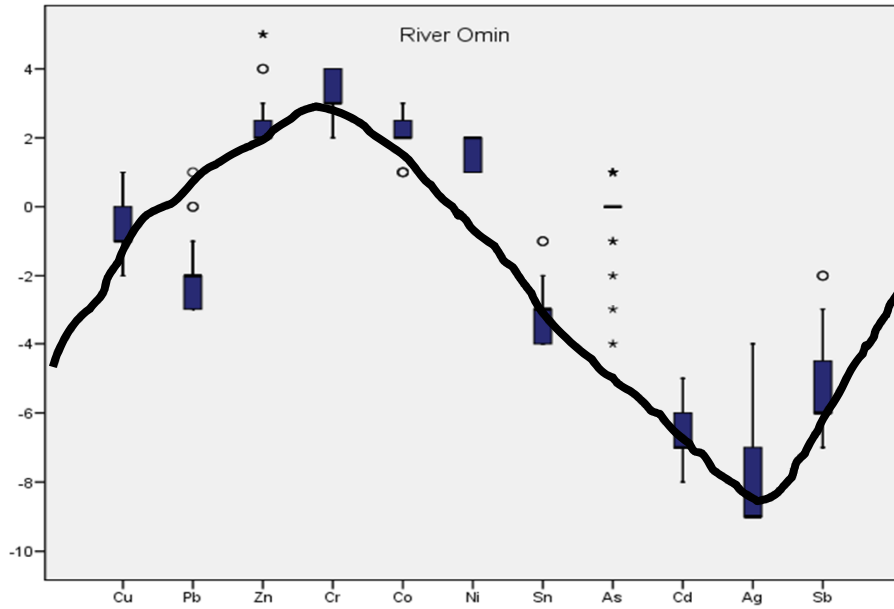
River Ogbere PLI-1



Comparison between the Pollution Load Index (PLI)



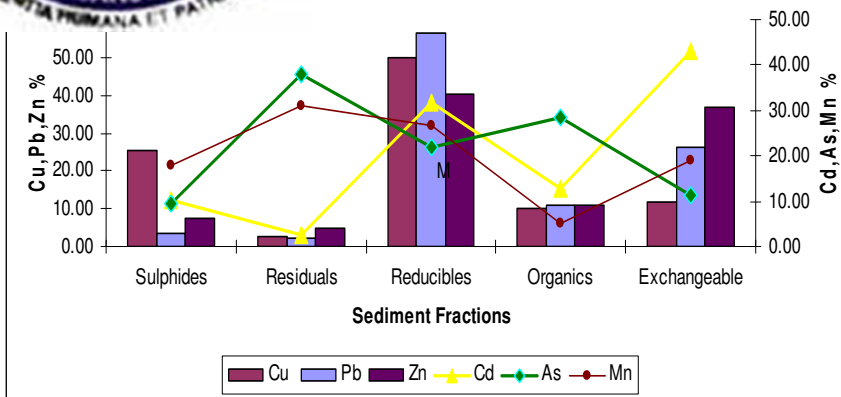
Comparison between the mean concentration and PLI values of trace metals in the four Rivers.



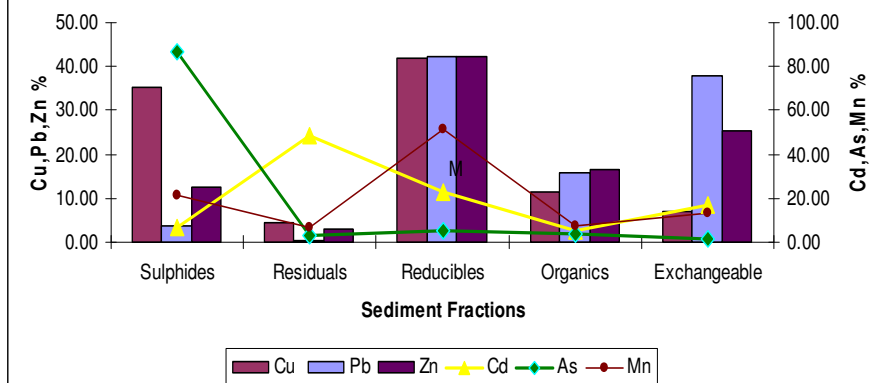
Comparison of Geo-accumulation Indices of the four rivers



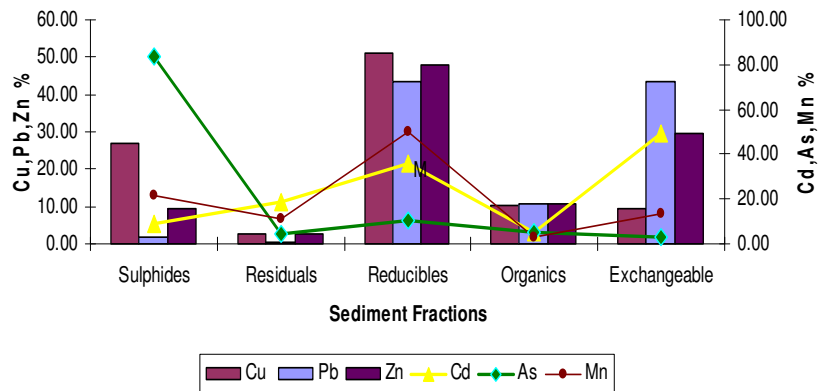
River Omin (Agricultural)



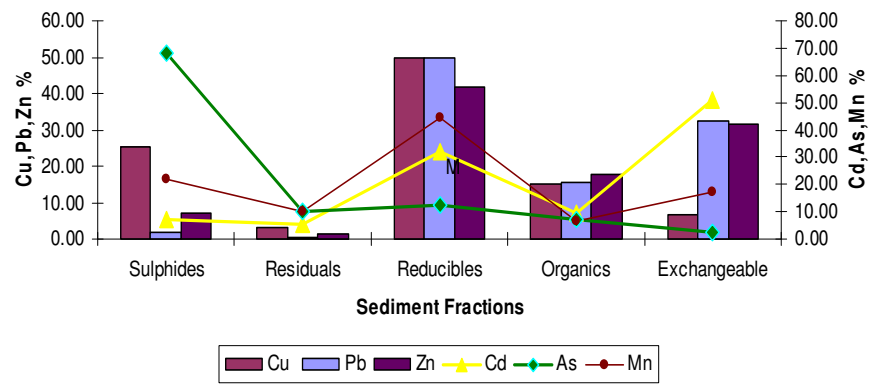
River Ona (Industrial)



River Ogunpa (Old City Center)



River Ogbere (New City Center)



Sediment fractions for Cu, Pb, Zn, Cd, As, Mn





Table 3: Sediment Guidelines

Metals	RIVERS				Guidelines/Toxicity Levels		
	Omin	Ona	Ogunpa	Ogbere	CBSQG	TEC	PEC
Cu	109.9	84.44	138.6	118.2	32	31.6	149
Pb	93.4	94.8	228.9	202.2	36	35.8	128
Zn	142.5	177.1	520	304.2	120	121	459
Cd	0.24	0.4	0.71	0.37	0.99	0.99	4.98
As	1.65	1.73	4.15	3.93	9.8	-	-

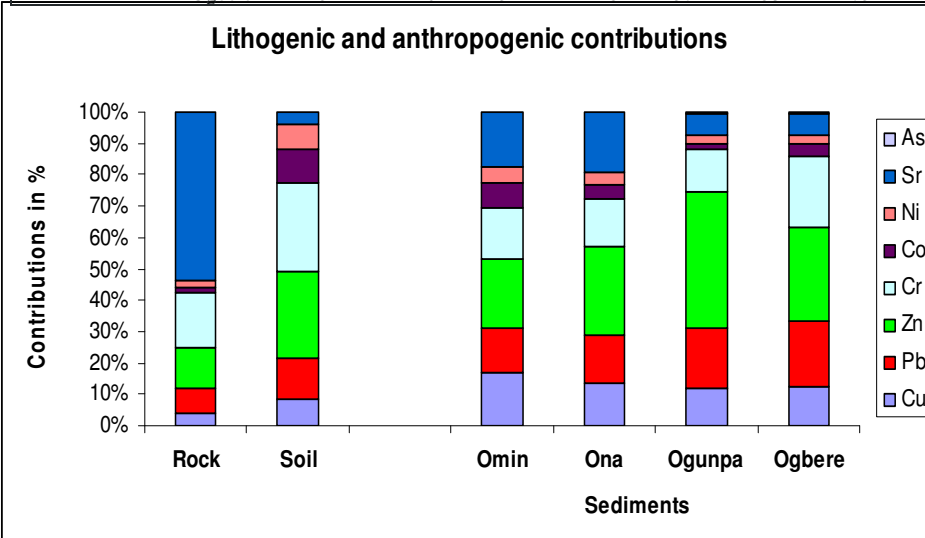
TEC-Threshold Effect Concentration; PEC-Probable Effect Concentration
 CBSQG-Canadian Sediment Quality Guideline





Table 4: Lithogenic and anthropogenic contributions of metals in the River sediments of Ibadan metropolis

(ppm)	Elements	Cu	Pb	Zn	Cr	Co	Ni	Sr	As
Rock	Rock	19.79	35.36	60.92	82.8	7.74	11.83	250.51	0.8
Soil (Fadina 2008)	Soil	28	43	93	94	36	25	14	-
River									
	Omin	110	93	142	107	50	36	111	1.7
Sediment									
	Ona	85	95	177	96	29	26	117	1.7
	Ogunpa	139	229	520	156	22	34	84	4.1
	Ogbere	132	226	322	248	37	35	73	4.2



Are the concentration of these metals in the sediments truly anthropogenic?

• **Enrichment of Pb, Zn, Cr, Co, Ni, As** in the sediments, attributed to **anthropogenic sources** (Table 3; Fig. 16).

High **concentration of Cu, Pb and Zn** is in **agreement** with earlier findings of **Odewande and Abimbola (2008); Fadina, (2008); Olatunji, et al., (2011)** on road dust, outdoor and indoor particulate matter and soils of the urban city.



Lithogenic and anthropogenic contributions



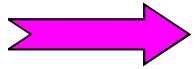
CONCLUSION



Weathering & Land-use; Urbanization: Population density; Human activities;



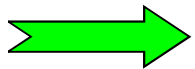
Toxicity of sediment has occurred in River Ogunpa (Old City Center) drainage channel



Anthropogenic metal enrichment is greater than the lithogenic metal enrichment in sediment derived from the drainage channels.



Cu, Pb, Zn, Cd and As: dominates the Bio-available sediment fractions



Efforts should be made to reduce pollution level: through mitigation



THANK YOU
FOR
LISTENING