

Global Change on Rural Water Systems in Southwestern Anambra State, Nigeria By Okeke, I.C (Ph.D), Odunuga, S.S (Ph.D) and Oyebande, L.B(Prof)

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Abstract: Change in global climate systems are key environmental issues in the world today. These changes are both naturally and humanly induced; and thus affect mankind adversely. The effects on the world water systems especially in rural sources are alarming. The rural communities of Southwestern Anambra State, Nigeria typifies rural water sources and global change effects, poor water quality from the sedimentary formation of the floodplain, eutrophication and presence of water hyacinth on the surface water supply systems. The effect of sedimentary formation on the groundwater was determined using physical and chemical analyses of the deep ground water. Questionnaire administration and focus group discussion were adopted to get information on the impact of the environmental changes with respect to water supply on the local communities. Ph, turbidity and Iron (Fe) values were recorded respectively with most values above the World Health Organization standard limits. The study examines water quality components and its interrelationship to global change effect while the paper recommends that the geotechnical changes in the ground water formation be taken into consideration for sustainable rural water.

Keywords: Change, biogeochemistry, rural water

Introduction: Global change is a gradual or rapid process that occurs due to temperature and seasonal variations at different places which could threaten water sources thereby resulting to drought or excess flooding. Deviations from the “normal “ in the climates of West Africa has resultant effects of seasonal cycles disruption, rainfall unpredictability which could pose threats to the ecosystem and agriculture, food security and water deficits. Health and socio-economic consequences are also imminent while stable ecosystems such as the Sahel Savanna may become vulnerable due to drought, and problematic ecosystems. In Southwestern, Anambra State, Nigeria, ecosystem changes at both dry and wet seasons affecting the water quality and availability. The study thus attempts to bridge the gap affecting global change and water quality in the Area as well as ways to minimize the global change effects.

Study Area: The study area covers the Ogbaru Local government area of Anambra State with towns such as Ogwu-aniocha, Umunankwo, Ogwu-Ikpele, Ohita, Iyiowa-Odekpe, Ossomala and Akili-Ogidi amongst others with population of 221,879 (NPC, 2006). The Flood plains at these farming and fishing settlement sites floods during the rains and dries up completely at dry seasons. The aquifers are quite shallow with average elevation of 25m above sea level. Ogbaru has its headquarters at Atani. The dominant water sources include the River Niger, Orashi River, streams such as Onukwu stream, boreholes and rainwater harvest. The climate lies within the tropical rainy climate zone {AF} in accordance to Koppens climate classification and under the influence of tropical continental (CT) and tropical maritime (MT) air masses with the convergence zone (ITCZ) shifting seasonally with pressure belts and isotherms.

Global Change Problem: Global change could be natural or human induced (Fig.1) with enormous consequences. Changes in weather and climate have been known influence domestic, industrial, agricultural water resources and increase the vulnerability of humans to infection. Water hyacinth dominates the River Niger at Ogwu-Ikpele while the flood plains are flooded during the wet season making accessibility difficult and extremely dry at dry seasons thereby affecting crop growth and food security.

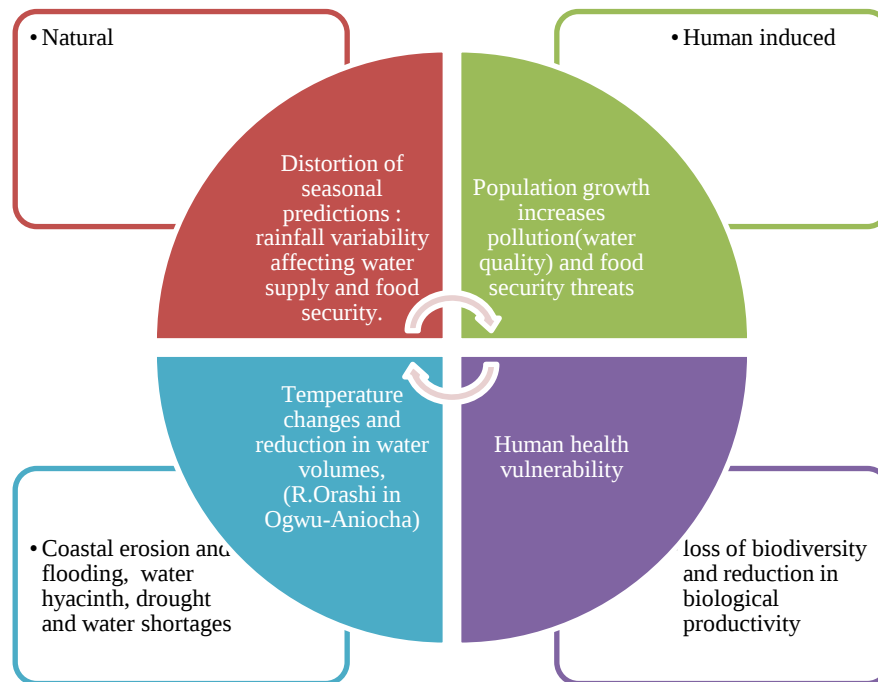


Fig.1: Global change problem: cause and effect in Anambra SW

Okeke, 2009 in Access to rural water supply in Southwestern, Anambra State stated that the water quality is predominated by high iron content which reduces the acceptability of the water because of the reddish colour signifying groundwater being tapped from the deep lateritic soil where iron is being contributed to groundwater. However, water for domestic use is still suitable. However, due to global change, The Niger River serves for drinking, washing, transportation and farming which is their major occupation. Industrial pollution from the breweries such as Premier, Life and Savannah act as pollutants to the Niger River.

Consequences of global change: Global change effects could be devastating to water, land and human resources. A schematic of the consequence is represented in Fig.2. The change process and the integrated assessment could help management of the climatic scenario in Nigeria.

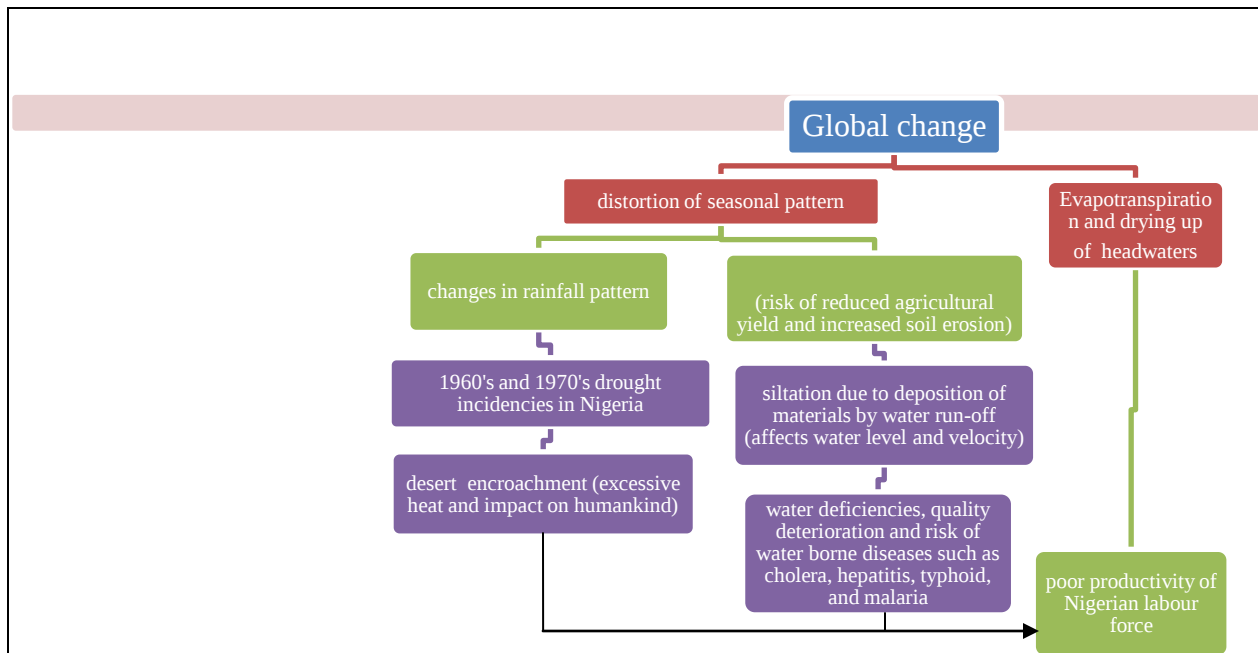


Fig.2: Consequences of global climate change in Anambra SW

Methodology: Structured questionnaires and focused group discussions were randomly carried out in the Ogbaru Local Government Area of Anambra State to help develop and establish indices and indicators as well as extent of change from climatic conditions. Rainfall data of Onitsha station (Fig. 3), as well as Physiochemical components in Table 1, of water ph, turbidity, Fe (iron), water quality components and relationship to global change were collected and analysed.

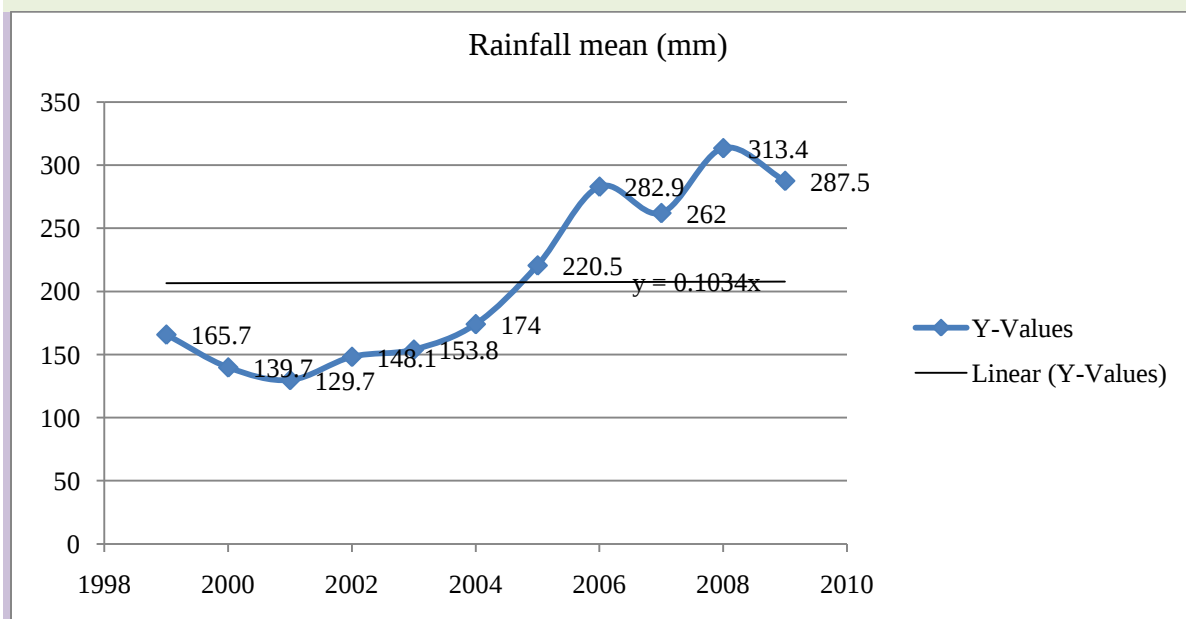


Fig. 3: Mean monthly rainfall chart of Onitsha station, Anambra SW

Table 1: Chemistry of Sampled Water in Ogbaru LGA Anambra State

LGA/ towns	Sample point	GPS Long. Lat.		Appearance	pH	Turbidity (NTU)	Nitrate (mg/L)	Ammonia (mg/L NH ₃)	Hardness (mg/L CaCO ₃)	Total Iron (mg/L Fe)	Salin- ity as Chlori- de (mg/L Cl ⁻)
			Method		AST M D12 93	ASTM D1889	APHA Std Mtd 4500 - NO ₃ ⁻ E	ASTM D1426	ASTM D1126	APHA Std. Mtd. 3500 – Fe D	AST M D512- 89
			WHO Limit	Clear and Colourless	6.5 – 8.5	5	50	1.4		0.3	250
			FMEnv Limit	-	-	-	-	-	-	-	-
Ogbaru											
Ogwu Ikpele	R. Niger At Ogwu Ikpele	5° 43' 50" 6° 38' 37"		-	-	-	-	-	-	-	-
Ogwu Aniocha	R. Orashi At Ogwuani - Ocha	5° 47' 47" 6° 45' 18"		Colourless with brown deposits	4.92	3.49	5.72	0.55	7	0.60	1..9
Ossomala	Federal Government Borehole	5° 52' 06" 6° 40' 54"		Deeply brownish with some tiny brownish deposits	5.90	460	0.00	2.66	18	15.38	2.7
Umunankwo	Onukwu Stream	5° 52' 51" 6° 41' 40"		Colourless with some tiny dark deposits	6.37	3.01	6.6	0.63	24	0.49	1.2
Akili Ozizor	R. Niger At Akili Ozizor	5° 59' 23" 6° 43' 53"		Brownish with lots of brown deposits	6.16	52.9	1.76	0.57	21	1.42	3.0
Iyiowa Odekpe	Idemili R. At Niger	6° 06' 31" 6° 45' 31"		Brownish colour with tiny brown particles	6.78	48.6	1.32	0.73	18	1.18	NA

(Source: Okeke, 2009) Note: WHO Limit = World Health Organization Limit for potable (drinking) water; Salinity measured as in chloride; NA = Not analyzed due to insufficient sample; --- = No sample collected; Salinity measured was as in chloride; ASTM = Acronym for American Society for Testing and Materials; APHA = American Public Health Association; D's = various test methods for particular tests;

- ❖ **Results:** Significant mean yearly rainfall variability which gives rise to seasonal variations. The Ogbaru LGA samples had mostly brownish deposits with iron (Fe) levels correspondingly higher than the WHO limit and although Iron (Fe) is not classified as a chemical with great risk in water, its high levels in samples could impair water colour and taste.
- ❖ The Ossomala and Umunankwo samples had iron levels as high as 15.38 mg/l and 21.00 mg/l, respectively. These two samples also had the highest degree of turbidity with values of 460 NTU and 339 NTU, respectively which could impair taste and appearance of water. Generally, ammonia contents except for Ossomala with 2.66 mg/l, nitrate and hardness levels for all sampled points were below the WHO and FMEnv set limits. Samples mostly from free private boreholes and streams had very acidic pH while most roof catch rainwater harvest samples had alkaline pH values. This indicates a tendency that health risks could result from intake of water with these parameters.
- ❖ High turbidity characterizes the Akili Ozizor and Iyiowa Odekpe samples. The prevalent water borne diseases in Ogbaru LGA includes cholera – 47.3%, dysentery – 11.8%, diarrhoea – 9.4%, typhoid fever – 11.3%, dermatitis – 3.2% and epidemic cases – 35.3%.

Recommendations and conclusions: Considerations of geotechnical changes in groundwater formation, dealing with uncertainties and most importantly, education of the masses on the global effects of climate change and the importance of adapting to it.

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