



ORGANIC POLLUTION INDICATION AS TRACER FOR THE POLLUTION OF DEEP BORING WATER: THE EXAMPLE OF THE TOWNSHIP OF ABOMEY-CALAVI (BENIN)

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ABSTRACT

Pollution represents a serious problem for the environment; the worn-out waters domesticated and non-purified represent the main source of organic pollution of waters. The township of Abomey-Calavi is between the latitudes 6°20'23.4 " and 6°42'6.6 " North and the longitudes 2°14'13.8 " and 2°25'7.8 " East. Followed it of analysis in the different points of observation made the object of a treatment of data by the establishment of a card of organic pollution of 54 deep boring waters and 4 surface water of the region, that informs us on the influence of the dismissals and the quality of waters by the slant of an organic pollution indication that himself calculation according to the method of Leclercq, Maquet (1987) whose principle is to distribute the values of the polluting elements in 05 classes, to determine from his own measures, the number class correspondent for every parameter to make the average of it. The interpretation of the card representing the different parameters of organic pollution of the 54 deep boring water and 4 surface water gives some results on the contamination or not of the natural waters. The card shows that the different deep boring water in the region of Abomey-Calavi pass from a quality to another.

Keywords: Pollution, Abomey-Calavi, organic pollution Indication, card of pollution.

INTRODUCTION

Pollution is a serious environmental problem because of dumped waste into rivers and the sewage was untreated represent the main source of organic pollution of waters (Derradji and al., 2007; Bahroun, 2011). The worn-out waters domesticated non purified represent the main source of organic pollution of waters (El Mostafa, 2006; Bahroun, 2011). They generate a deterioration of the quality of the surface and underground waters. The township of Abomey-Calavi doesn't have a system of treatment of the worn-out waters. The load of these dismissals is more and more increasing with the socioeconomic development of the region. The present survey aims to determine the assessment of the organic pollution indication in the deep boring waters of the township of Abomey-Calavi.

THE REGION

The township of Abomey-Calavi, situated in the South part of Republic of Benin and the Department of the Atlantic, is limited at the North by the township of Zè, to the South by the Atlantic Ocean, to the East by the townships of Sô-Ava and Cotonou and to the west by the townships of Tori-Bossito and Ouidah. It is the vast township of the department of the Atlantic of which it occupies more than 20% of the surface. It spreads on a surface of 536km² representative 0.48% of the national surface of Benin.

The township of Abomey-Calavi is very close to the biggest plan of water Beninese lagunaire: The Nokoué lake. Indeed, Long of 20km (East-west) and large of 11km (North-South), the Nokoué lake has a surface of low water of about 160km² and represent the largest plan of water Beninese and most important lagoon of the point of view of its planning because of its proximity with the city of Cotonou (Dovonou, 2012). The Nokoué lake influences the underground water pollution considerably close to him (Hounsinou, 2012).

Organic pollution indication as tracer for the pollution of deep boring water: The example of the township of Abomey-Calavi (Benin)

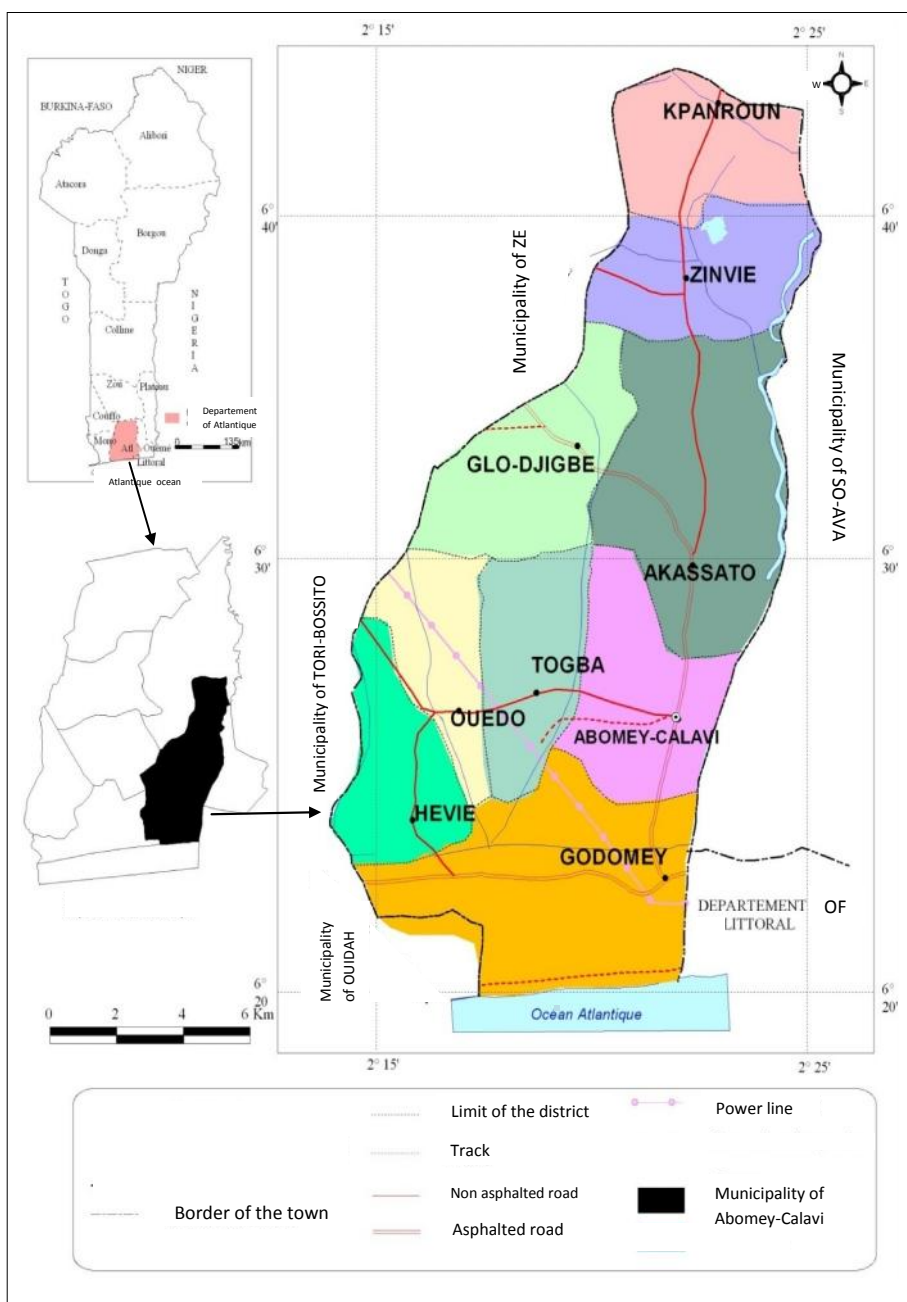


Figure 1: Location of the municipality of Abomey-Calavi.

MATERIAL AND METHOD

Material and method of analysis

We analyzed the waters of the Nokoué lake (surface water) and boring water in the township of Abomey-Calavi from January to March 2013. We achieved analyzes them at the Laboratory of Applied hydrology (LHA) of the University of Abomey-Calavi (BENIN). We measured the ions nitrates, ammonium and phosphate by ionic chromatography. The DBO₅ is measured by a DBO-Meter.

Data processing method

The approach of interpretation of the data on the organic pollution is based on the calculation of the Organic Pollution indication (IPO). The IPO depends on contents of water in ions ammonium, in nitrite and in orthophosphate and the DBO₅. One definite 5 classes of contents for each of these parameters. The IPO is the average of the numbers of the classes of every parameter. The values of the IPO permit to distribute the organic pollutions of waters in 5 levels.

Table 1: Classes of contents for each these parameters.

	DBO ₅ (mg O ₂ /L)	NH ₄ ⁺ (mg N/L)	NO ₂ ⁻ (µg O ₂ /L)	PO ₄ ³⁻ (µg P/L)
Class 5	<2	<0.1	<5	<15
Class 4	2-5	0.1-0.9	6-10	16-75
Class 3	5.1-10	1.0-2.4	11-50	76-250
Class 2	10.1-15	2.5-6.0	51-150	251-900
Class 1	>15	>6	>150	>900

The classification of the organic parameters makes itself according to five classes of quality corresponding to the generally admitted colors (Adnour, 2001).

Table 2: Level of organic pollution of waters according to the Organic Pollution indication

IPO	IPO Level of organic pollution
5.0 à 4.6	Very weak organic pollution (hopeless)
4.5 to 4.0	Weak organic pollution.
3.9 to 3.0	Organic pollution curbed
2.9 to 2.0	Strong organic pollution.
1.9 to 1.0	Very strong organic pollution.

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Figure 2: Color according to the classes of quality.

Following the different points of withdrawal permitted to calculate the natural indications of organic pollution of waters of the township of Abomey-Calavi.

Table 3: Organic pollution indication (IPO) of the sampled waters

Nature of water sampled	Points of withdrawals	Geographical coordinates		Organic pollution indication (IPO)
				Average
Surface Water (Lake NOKOUE)	L ₁	002°35 162E	06°41 907N	1
	L ₂	002°36 478 ^E	06°44 871N	1
	L ₃	002°36 670 ^E	06°45 990N	1
	L ₄	002°36 570 ^E	06°46 641N	1
Deep boring	F ₁	02°17'16,9"E	06°31'15,3"N	3.75
	F ₄	02°18'53.4"E	06°30'23.3"N	4.25
	F ₅	02°19'0,1"E	06°30'18,9"N	4
	F ₇	02°20'57,2"E	06°31'18,1"N	4
	F ₁₀	02°20'32,2"E	06°32'03,1"N	4.75
	F ₁₁	02°20'46,5"E	06°33'45,9"N	4.25
	F ₁₃	02°21'05,7"E	06°34'15,6"N	3.75
	F ₁₉	02°20'18,5"E	06°33'03,2"N	3.5
	F ₂₀	02°20'18,5"E	06°33'03,2"N	4
	F ₂₁	02°20'28.1"E	06°32'30.2"N	4
	F ₂₂	02°20'14,2"E	06°32'52,1"N	4
	F ₂₃	02°22'10.2"E	06°33'38.6"N	4.25
	F ₂₄	02°22'14,2"E	06°31'53,4"N	4.25
	F ₂₅	02°21'32,8"E	06°31'54,3"N	3.75
	F ₂₆	02°21'01,4"E	06°32'48,2"N	3.5
F ₂₇	02°19'52,4"E	06°31'48,7"N	4	
F ₂₈	02°22'14,4"E	06°32'03,3"N	4	
F ₂₉	02°22'11,7"E	06°31'13,6"N	3.25	

water	F ₃₀	02°19'47,8"E	06°34'12,2"N	4
	F ₃₁	02°18'58,6"E	06°35'37,1"N	4
	F ₃₂	02°19'37,8"E	06°30'00,0"N	3.5
	F ₃₅	02°19'36,0"E	06°32'35,3"N	3.75
	F ₃₇	02°19'26,0"E	06°33'27,1"N	4
	F ₃₈	02°16'27,2"E	06°30'18,9"N	4.25
	F ₄₂	02°18'13,3"E	06°20'50,2"N	4.25
	F ₄₄	02°18'44,9"E	06°24'18,3"N	4
	F ₄₅	02°14'57,5"E	06°27'23,2"N	3.75
	F ₄₆	02°13'19,3"E	06°29'19,0"N	4.25
	F ₄₇	02°22'32,0"E	06°39'46,8"N	3.75
	F ₄₈	02°19'53,4"E	06°40'22,7"N	3.75
	F ₄₉	02°20'24,4"E	06°40'17,2"N	3.25
	F ₅₀	02°16'41,5"E	06°28'30,6"N	4
	F ₅₁	02°16'52,9"E	06°25'01,1"N	3.75
	F ₅₂	01°15'17,2"E	06°30'13,2"N	4
	F ₅₃	02°15'48,9"E	06°27'20,0"N	4.25
	F ₅₄	02°15'23,5"E	06°27'20,0"N	4.5
	F ₅₅	02°15'34,2"E	06°27'13,7"N	4.75
	F ₅₆	02°15'04,4 "E	06°29'21,8"N	4.75
	F ₅₇	02°18'35,9"E	06°29'36,9"N	3.75
	F ₅₈	02°18'35,9"E	06°29'36,9"N	4
	F ₆₁	02°18'38,3"E	06°27'09,9"N	4
	F ₆₂	02°18'07,6"E	06°26'33,0"N	4
	F ₆₃	02°20'56,2"E	06°36'24,7"N	4.5
	F ₆₄	02°20'10,8"E	06°36'06,6"N	3.75
	F ₆₅	02°20'39,9"E	06°35'40,9"N	4
F ₆₆	02°20'39,9"E	06°35'40,9"N	4	
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F ₇₇	02°20'32,0"E	06°37'50,7"N	4	

The different points of withdrawal made the object of a treatment of data by the establishment of a card of organic pollution of waters natural of the township of Abomey-Calavi that informs us on the influence of the dismissals and the quality of waters by the slant of the organic pollution indication.

DISCUSSION

The interpretation of the card of indication of organic pollution of the natural waters indicates the degree of change of the waters of the survey region.

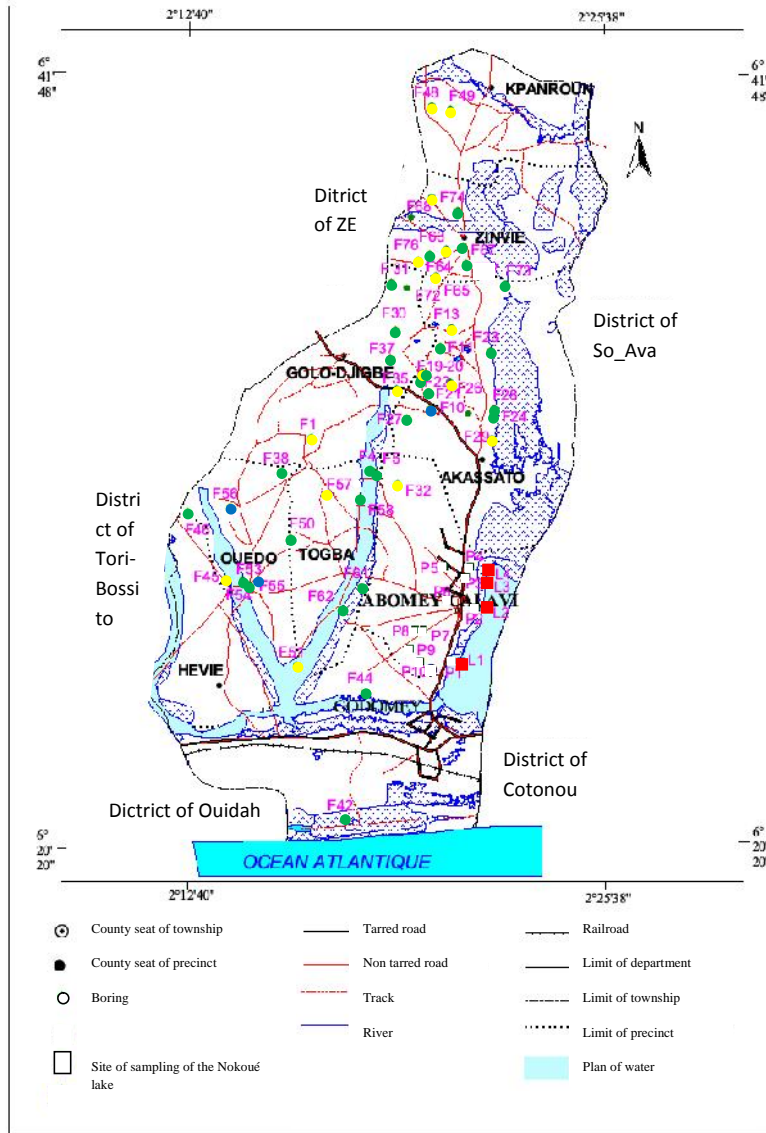


Figure 3: Organic pollution indication (IPO) card of the natural waters in the township of Abomey-Calavi.

All the samples of surface water (NOKOUÉ lake) analyzed have a very strong level of organic pollution (IPO = 1). The assessment of the pollution of the underground waters by the IPO shows a contamination by the waters of surface polluted. However the degree of pollution remains least by contribution to the surface water.

The third of deep boring water studied have a curbed organic pollution level. Indeed, 61.11% of the studied deep boring have a level of weak organic pollution (IPO between 4 and 4.5) and 5,5% of the boring have a very weak level of organic pollution (IPO between 4.6 et5).

CONCLUSION

The origin of the excessive quantities of the nitrites, phosphates, DBO_5 and ammonium in the waters natural of the township of Abomey-Calavi, seem to be essentially of urban origin. The worn-out waters contain big nourishing substance quantities in particular as the organic matters encouraging, by their tipping, the fast and continuous growth of seaweed and aquatic plants (case of the NOKOUÉ lake). Indeed, we notes an eutrophication of the NOKOUÉ lake (Mama, 2010). In the township of Abomey-Calavi pollution is a serious environmental problem because of dumped waste into rivers and the excessive use of manures in agriculture. The degree of pollution varies from a zone to the other with contents that sometimes pass those that recommends the WHO. Water, by its elevated solvent power, dissolves the substances rejected by the human activity. The chemical pollutants are numerous, various and most harmful origins are the compounds of nitrogen as the nitrites, provoking serious unrests at the young vertebrates. They can provoke hypertension and can be the precursors of carcinogenic nitrosamines (Castany, 1982). The assessment of the pollution of the boring waters by the IPO shows a contamination by surface water. However the degree of pollution remains least by contribution to the waters of surface.

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