Flooding and groundwater quality in a peripheral urban zone: the case of the district of Agoè-Zongo in Lomé, Togo

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plan

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Introduction 1

Aquifers in urban area are more and more threatned because of increasing human activities, water needs and overexploitaion .

The situation of urban aquifers is becoming worst when they are located in area that are often flooded because of climatic changes

Further more water supply in also becoming a major chalenge for people in developing countries.

The rapid population grow and the wild urbanisation pose problems of water supply in periurban areas

Introduction 2

.In Togo water supply service do not follows the urbanistaion in big cities and the periurban area are suffering more of this insuffisance specially in Lome, the capital of Togo

This is the main reason why peoples are oblidged to drill wells or drillings in their court. Those who don't have means to drill buy drilling water from the neigbourg.

Water from wells and drillings is not controled for it quality by gouvernmental offices. So peoples are exposed to many risk when trinking this kind of water

Introduction 3

Since 2008, Lome the capital is confronted to inondation which affect the peripherial districts aslo

The aim of this study is to investigate how flooding and human activities impact the quality of ground water in one of the peripherial district of Lome called Agoè-Zongo

Objectives

Main objective

To assess the chemical quality of groundwater in flooding zones specially in Agoe-Zongo

Specicific objectives

- Determine the heavy metals **(Fe, Cd, Pb, et Ni)** contents of groundwater in this district
- Determine the concentrations of **nitrates, nitrites** and some major elements **(Mg, Ca, K, et Na)** in goundwater;
- To asses the health risk for people trinking that kind of water

STUDY AREA

- Agoèe-Zongo is located at the northern part of Lome
- It is a new created district since 2001. Before that the district was located in the middle of Lomé, and has been resttled because of new constructions.
- The district is caracterised by a high population density,
- Water supply installtion don't reach all the houshlod.
- The district is flooded each year, wild garbage dumps; used water no collected
- Wells and drillings are used for drinkwater supply

STUDY AREA

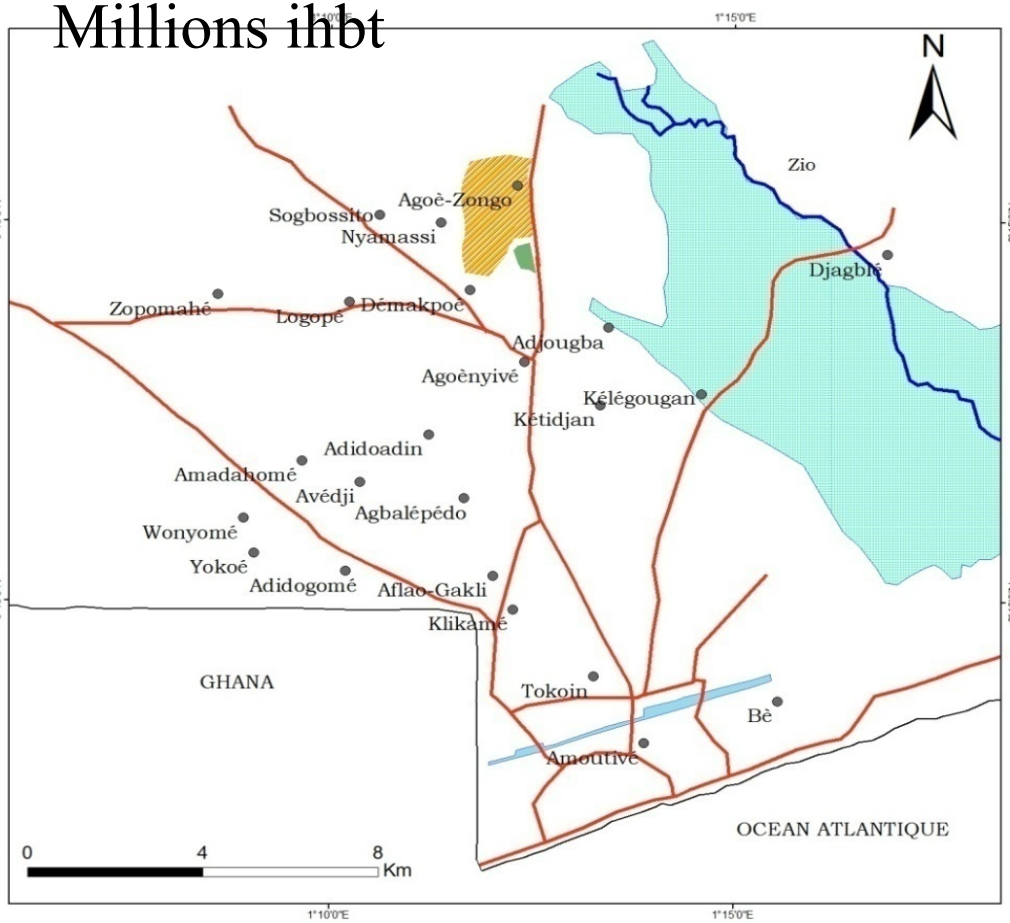
- Agoe-Zongo lies in the valley of the river Zio, this zone is flat and often flooded in the rain season
- The region belongs to the caostal basin of Togo composed of sand, clay, gravel, phosphoprites and limestones
- From hydrogeological point of view there 3 main aquifers in this basin, from top to botoom:
- The aquifer of the Continental Terminal
- The aquifer of Palecene
- The aquifer of Maestritchian

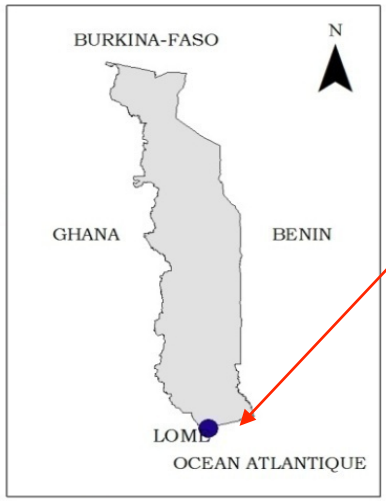
Secondary aquifers are the aquifer of littoral sand an stream alluvions

Agoè –Zongo is built on the superficial aquifer of Continental Terminal, Aquifer deep 20-40 m

STUDY AREA

Togo is a small country in Wast Africa, Area 56 000 Km2, Population ; 6 Millions ihbt





LEGENDE

- Quartiers
- Voies de communication
- Cours d'eau
- Limites de Lomé
- Zone d'étude
- Lagune
- Terrain de golf
- Vallée Zio

Aniko POLO-AKPISSO/ LBEV/ FDS / UL / Avril 2011
Source: Carte IGN TOGO

STUDY AREA

Flood in some parts of the district during rain season 2011

MÉTHODOLOGY

Sampling

Total of 30 groundwater samples have been taken

- 26 Well samples
- 4 Drillings samples

Water samples have been conserved in clean PE bottles

Sampling points have been located using a GPS

Water T, pH and electrical conductivity have been measured using a Crison pH-meter and a conductimeter model WTW 315i.

Heavy metals and major cations have been measured by AAS (Thermo Orion Solaar S2)

Anions have been measured by Colorimeter Thermo Orion Aqua IV

RESULTATS & DISCUSSIONS 1

1- pH values

- **Well waters**: pH varies from 5,73 to 8,15

  23,07% wells have acid water bellow WHO norms

- **Drilling** water pH varies from 5,82 to7,04 only 1 sample shows acid pH F3(pH=5,82)

WHO norms 6,5 - 9,5)

RESULTS & DISCUSSIONS 2

2 – Electrical conductivity

- Well water: conductibility varies between 2,04 à 1856 µs/cm and higher values are found in P5, P6, P7, P9, P18, P19, et P24 > norme française (250µs/cm)

- Drilling water : electr conductibility varies between 3,52 à 11,13 and are within the guide lines (250µs/cm)

Average value in well water is 498.78 µs/cm which is higher than average value in Drilling (4,7µs/cm),

There is a high infiltration rate of surface water in shallow aquifers is the main reason for the high mineralisation of groundwater

RESULTATS & DISCUSSIONS 3

3 – Mineralisation

Well water: mineralisation varies between 2,78 à 1578,4 mg/l where 7 samples show values above WHO norms (1000 mg/l)

Drilling water: mineralisation varies from 3,52 to 11,13 mg/l which responds to WHO norms

Well waters are highly mineralised (425,63mg/l) >> than bohrehole waters (6,41mg/l)

RESULTS & DISCUSSIONS 7

Major elements (mg/kg)

Substances	**Potassium**	**Sodium**	**Calcium**	**Magnésium**
Average well waters	65,672	261,912	236,233	38,107
Average Drillinge waters	108,923	275,551	303,351	43,194
WHO norms	**12**	**150**	**400**	**50**

Those high values of major elements explain the high mineralisation of water

RESULTS & DISCUSSIONS

Nitrates and Nitrites

Parameters	P5	P8	P10	P18	P25	WHO norms
NO_2^- (mg/l)	0,3	0,05	0,2	0,2	<0,05	0,1 (3/5)
NO_3^-(mg/l)	180,2	1,7	452,7	104,7	38,7	50 (3/5)

RESULTATS & DISCUSSIONS

Heavy metals

Elements	**Iron**	**Lead**	**Cadmium**	**Nickel**
Units		Mg/l		
Average well water	0.22	0.58	0.13	0.30
Average Drilling water	0.15	0.78	0.11	0.30
WHO morms	**0.2**	**0.01**	**0.003**	**0.02**
Degree of contamination Well water	**1.12**	**58**	**42**	**15**
Degree of contamination Drilling waters	**0.75**	**78**	**37**	**15**

RESULTS & DISCUSSIONS

Survey on the use of this kind of water

Usage Of water	Drinking	cooking	Wash dishes	Bath	House construction
Puits	50%	54%	100%	100%	100%
Forages	50%	50%	100%	75%	100%

STUDY AREA

Water supply in fontaines, wells and private drilling

CONCLUSIONS 1

- Agoè-Zongo is caracterised by bad sanitation and flooding situation
- High infiltration of surface water into groundwater
- High groundwater mineralisation and acidification
- High degre of contamination of groundwater by heavy metals Pb, Cd and Ni, nitrates and nitrites
- Contamination is higher for Pb(58p et 78d), Cd (42p et 37d) et pour le Ni(15p et 15d)

CONCLUSIONS 2

- This situation can be a risk for health for peoples living in this district

Recommendation

-for government to creat better sanitation condition for peoples in Agoè-Zongo (solid waste and used water management, rain water drains etc

-for peoples: they should treat water before using it

PERSPECTIVES

Perspectives

- Continue investigation for other contaminants such as mercury, organo carbons (HAP, BTEX) as well as for pathogens,
- Assess the health risk for peoples trinking that kind of water

Merci pour votre attention!