



## WATER, SANITATION, ENVIRONMENT and DEVELOPMENT

### Water resources appraisal in the Keta Basin



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#### Introduction

The Keta Basin lies to the south-eastern corner of Ghana, and is virtually covered with saline water which exists in the form of lagoons. It is generally low lying, subject to periodic sea attacks and has significant groundwater resources which exist in various forms.

The total population of the communities is over 500,000 people (1984 census). The existence of salt on the surface and encroachment of sea water pose water quality problems. Fresh water exists at considerable depth in limestone and sand aquifers. Over the past 40 years water supply for domestic use has been based on these aquifers.

Keta Basin water supply has however not been satisfactory as population has increased and communities have developed. There is an urgent need to combine detailed hydrogeological investigations and innovative community management techniques, to optimise the use of existing fresh resources.

#### Geology

The area is underlain by Eocene and Cretaceous marine series of sand-stones, shales and limestones. It is flanked to the north-east by scattered outcrops of unconsolidated gravel, sand and mud. Dolerite occurrence as both sills and dykes are encountered at depth in the basin. To the north, the basin is fringed by gneisses of the Dahomeyan.

There is a NE-SW structural trend with sediments thinning and thickening northwards and southwards respectively. The basin is southward - dipping.

#### Hydrogeology

The results of drillings in the basin suggest the existence of three (3) types of aquifers: Limestone, Sand and Gravel, and Dahomeyan/Sedimentary contact aquifers:

##### The limestone aquifer

The limestone aquifer exists in 2 horizons, viz, the Upper and Lower horizons. The Lower horizon is a proven aquifer with large quantities of fresh water which can be harnessed for large scale water supply. The limestone slopes from NE (about 31 m deep) toward the sea, SW (183-213 m deep). Yields range from 300 LPM to 900 LPM and the recharge area is suspected to be on river Mono in the

Republic of Togo. Static water levels vary from flowing wells to 21.3 m.

##### Sand and gravel aquifer

Fresh water is being harnessed from very shallow handdug wells throughout the study area. At Ada, fresh water horizons range between 4 and 6 m in the sand gravel. From Anyanui to Anloga, the handdug wells are much shallower.

A few boreholes have been constructed within a very white gravelly pebbly aquifer. A gravelly and pebbly aquifer has been encountered during World Vision drilling activities at Adrakpo-Zogliko at depth range of 19-31 m.

##### The contact aquifer between the Dahomeyan Gneisses and sand and gravel aquifer

World Vision Ghana Rural Water Project drilling activities have revealed a thin wedge of productive sedimentary formation on the Dahomeyan at Torve, Gefia, Lume and Devego to name a few. Borehole logs reveal that the gneisses are weathered within the contact. The groundwater occurs within the sediments and the weathered gneisses.

##### Groundwater quality

The potential problem to water supply development and management in the Keta basin is the high salinity. The various identifiable fresh water aquifers are all liable to contamination from sea water intrusion, leakage from overlying formations and evaporation loss.

##### Water supply development

The present potable water supply systems serve about 50,000 people. In terms of quantity and quality (potability), there are over 400,000 people unserved in the basin.

Traditionally, water supply in the Keta Basin has been based on groundwater with abstraction from handdug wells until the 1950s when deep drilled wells were constructed. The Ghana Water and Sewerage Corporation (1969) and AESC (1974), separately recommended surface based water supply systems for the basin. The engineering designs of these large systems were made but have not been executed largely due to high costs. The

Danish International Development Agency (DANIDA) is currently embarking on water supply activities in the basin.

Rehabilitation works on some of the deep boreholes have been undertaken by Prakla Seismos in the recent past with World Bank funding.

All these initiatives need to benefit from animation and health and hygiene education activities which is aimed at motivating the population to own and manage these facilities. Communities volunteers need to be trained in handpump maintenance techniques, and equipped to carry out basic repair and maintenance of handpumps in their communities. The DANIDA programme seeks to address this issue.

### Recommendations

The study area has been divided into 4 zones.

- 1 Within the zone A, the limestone aquifer is either too deep or has not been encountered. The present usable water supply systems are a few boreholes and a lot of very shallow handdug wells.
- 2 The limestone aquifer is fairly shallow in most parts of zone B and the water quality is good.
- 3 In zone C, the sand and gravel aquifer is being recharged by fresh water from the Volta river. A number of handdug wells for fair water quality are operational.
- 4 Zone D is mostly underlain by the gneisses of the Dahomeyan. The contact between the Dahomeyan and the sediments is within this zone.

Zones A and C call for deep boreholes with good construction techniques or surface water supply systems to be piped from outside the zone. Whilst plans can be made by donor agencies and government to provide these systems, the present shallow handdug wells at Anloga and surrounding areas should be supported.

Zone B is the most favourable place for borehole drilling. Sea and brackish water intrusion into boreholes is minimal here. The handdug well option is feasible in some parts. Design specification of the systems should be critically assessed. With careful hydrogeological and geophysical studies more boreholes can be provided for communities in zone D. Development of shallow boreholes (30-45 m depths) along the Dahomeyan/sand and gravel contact can be undertaken.

### Conclusion

Water supply for the domestic needs of the 500,000 people living in the Keta basin can be satisfied from groundwater sources, using a combination of deep wells (100-250 m depth) and handdug wells (2-6 m depth) in areas which have been identified in this paper.

The availability of potable water and pumping systems should be buttressed by intensive animation, health and

hygiene education activity, together with pump maintenance training among the beneficiaries. The expected community management skills which will accrue, are an essential part of sustainable rural water supply development.

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