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Operation and maintenance of rural handpump water supply systems in Ghana, West Africa

ABSTRACT

A brief outline is given of major rural handpump water supply projects undertaken in Ghana until year 1984. The present status of the operation and maintenance of the resulting water supply systems is given. Activities to be carried out to improve the maintenance set-ups in future, including plans to involve the well users in their operation and maintenance, are also discussed.

INTRODUCTION

In Ghana the provision of potable water for domestic purposes is the responsibility of the Ghana Water and Sewerage Corporation (GWSC). By policy water supply to rural communities (ie. those with population under 2000) is by means of boreholes fitted with handpumps at an approximate ratio of 400 persons to one borehole.

For some 35 years now GWSC through its Drilling Unit has completed about 1000 wells and fitted them with handpumps across the country. In addition, various donor countries and agencies have sponsored a number of large-scale drilling programmes for some of the rural areas in Ghana during the last 15 years. Most significant of these have been the Upper Region Water Supply Project (URWSP) sponsored by the Canadian Government through CIDA (1974-81) and the 3000 Well Drilling Programme in Southern and Central Ghana funded by the Government of the Federal Republic of Germany (1978-84). The two projects resulted in the completion of 2300 and 3000 handpump wells respectively in seven administrative Regions of the country (see fig. 1).

MAINTENANCE PRACTICE OF GWSC

Maintenance services, like other aspects of GWSC's operations, have

been traditionally administered by autonomous Regional Headquarters. Repairs of machinery and vehicles in the Regions are undertaken at workshops located at the Regional capitals.

Early in the 1970's the formation of District offices with workshops and stores attached was initiated in the Regions, to improve the maintenance facilities for the water supply of the rural areas. But the workshops and maintenance crews at the Districts have almost always been engaged in the maintenance and repair of pipe-borne water supply systems. The handpump systems completed by the Drilling Unit are therefore not maintained fully. As a result the handpumps are left unrepaired and the villagers go back to their old sources of water supply. The net result is that most of the GWSC handpump systems have fallen into disuse.

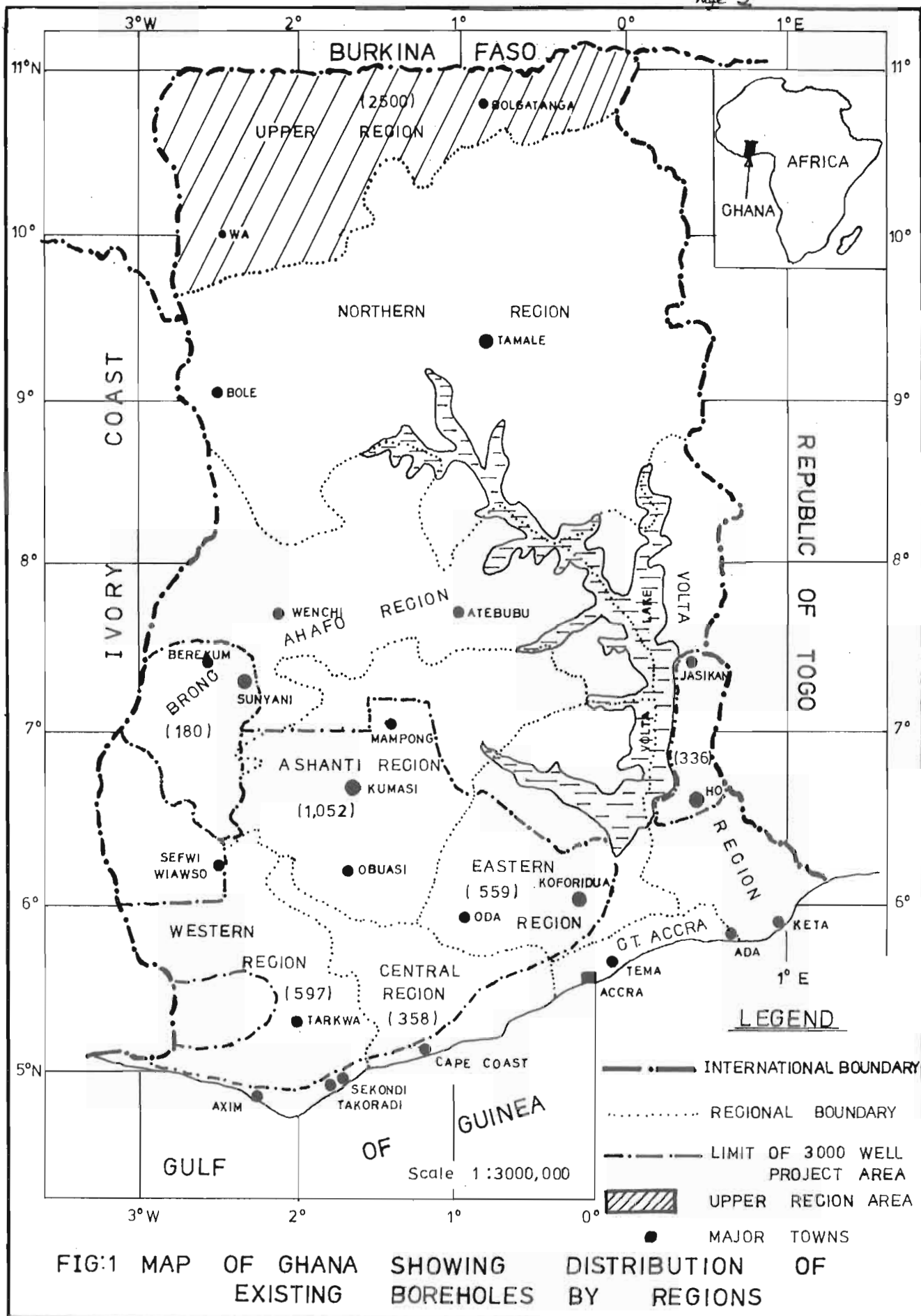
NEW MAINTENANCE SET-UPS

a. General

To forestall the non-maintenance of their systems, both the URWSP and 3000 Well Project introduced the setting up of well maintenance programmes as a major aspect of the Projects. The strategy involved the re-organisation and strengthening of existing GWSC facilities in the Regions to meet the increased maintenance needs related to the project's installations.

The basic concept of the maintenance programme for each project is for regular inspection and preventive maintenance of each pump with major repair or replacement on an as-required basis. Regular inspection was introduced to overcome communication and transport problems villagers face in reporting broken pumps.

For inspection and preventive maintenance, Inspectors riding motorcycles regularly visit each pump to ensure it is operating, liaise with villagers on site and pump maintenance and make necessary above-



ground repairs. Service crews in trucks capable of complete field servicing of the pumps, fix pump the Inspector was unable to repair, either because he did not have the correct part with him or because the pump unit required removal from the well. The two separate functions by the pump Inspectors and the service crews are coordinated and operated as one.

b. URWSP

The URWSP maintenance organisation comprises of a Regional Workshop at Bolgatanga and District Workshops at five District Centres at Bawku, Bolga, Tumu, Lawra and Wa. Each District Workshop has a supply of parts to support field operations. It also makes minor vehicle and pump repairs, welding, and metal fabrication. Major repairs from the District Workshops are referred to the Regional Workshop, which makes minor and major repairs on all equipment, pumps and vehicles in the Region.

A maintenance District Centre is headed by a District Engineer, Manager or Officer-In-Charge who is charged with the day-to-day responsibility of the Centre. The District Head reports to the Regional Manager of GWSC.

c. 3000 Well Drilling Programme

The organisation here comprises of 16 District Maintenance Centres equitably distributed throughout the project area (see fig. 1). There is a main Workshop at Kumasi, three medium-sized workshops at Ho, Nsawam and Takoradi, and smaller workshops at the remaining 12 District Centres. Each of the 12 smaller maintenance workshops has a supply of spare parts for pumps, and also repairs minor pump breakdown. Major pump repairs and repairs on vehicles are carried out at any of the three medium-sized workshops or at the Main Workshop in Kumasi. These four workshops are well stocked with tools and spares.

The 16 maintenance centres have been grouped into five and each group is headed for the time being by (an Expatriate) Consultant Supervisor. Each Supervisor is responsible for the running of the Centres in his Districts. Each centre has a crew comprising of a motorcycle Inspector and service crew personnel

equipped with a cross-country vehicle.

d. Training of staff

Both maintenance organisations had the common aim of performing practical servicing and repairs of the handpumps, wells, and service vehicles, and training of Ghanaian personnel to undertake the maintenance on their own in future. The services of expatriate Consultants were used to achieve this aim. The Canadian Consultant's involvement on URWSP ended in 1981 and Ghanaian personnel have fully taken over the Unit's operations. The services of the Consultant on the 3000 Well Maintenance Unit will continue until the end of 1985.

The training of the local staff has been mainly through on-the-job sessions supplemented by short formalised classroom courses. The sessions are directed towards three groups: Regional/District Supervisory staff, field staff, and workshop staff. Topics taught include: preventive maintenance and repair procedures for handpumps, service trucks and motorcycles; management and supervision; mapreading; reporting; record keeping; safe working procedures and first aid.

e. Performance of maintenance set-ups

On the average 80% of all pumps have been operating at any given time on URWSP since 1976, with monthly performance typically ranging from 70 to 90%. On the 3000 Well Programme the respective figures are 85% and 75%-95% since January 1984.

COMMUNITY PARTICIPATION IN RURAL WATER SUPPLY MAINTENANCE

a. General

As part of the implementation of the handpump well systems on the two projects, it was proposed to involve the village well users in their maintenance. In the course of drilling of boreholes and installation of pumps therefore, village chiefs and village development committees were briefed on the work whenever possible. In some cases the villagers were involved in certain operations - for example with the back-filling of well-pads in the Upper Region. The villagers were also encouraged to select a "pumpman" or caretaker for each

village, to be responsible for proper functioning of all handpumps in the village.

b. Training and role of "pumpman"/caretaker

The use of village pumpman/caretaker is well under way in some Maintenance Districts. Following instructions of GWSC pump Maintenance Inspectors, the caretaker starts with minor jobs like lubricating and tightening of bolts and nuts on handpumps at his village. Later, a group of them is invited to the District Maintenance Centre for further training. Fields covered during the training include: sanitary aspects - cleaning of well pads and surroundings, provision of drainage for spilled water from pump and rain water; provision of watering troughs for animals; operating principle of pump installed in village; minor preventive maintenance procedures; reporting on major pump faults at the maintenance centre; eventual taking over of full preventive maintenance of pumps at a village.

Pump caretakers who have been trained as above are gradually taking full responsibility of preventive maintenance from the GWSC pump Inspectors, and will take over fully when they gain confidence in the task. This will not only save costs of running such systems, but will establish self-sufficiency and initiate a certain degree of independence of the villages.

c. Recommendations for Improvement

A serious omission that came to light on the two foreign-sponsored projects has been the lack of a proper "Responsibility and Educational Campaign" to involve the well users in the implementation of the programmes. Both projects planned to use other agencies - the Ministries of Health and Rural Development, Department of Community Development, and the Radio - to educate the people on the aims and objectives of the Programmes. For a number of reasons, however, educational programmes planned by these organisations were never implemented fully.

It may be safer to include such a campaign for future drilling programmes as part of the overall programme, to effectively involve

the benefiting communities in the rural water supply implementation from the on-set, in such aspects as:-

- deciding on the location of boreholes in the community,
- some aspects of the construction phase, for example in site access clearance and borehole site clearance, well-pad construction, and back-filling around well pads,
- techniques of pump installation,
- a more significant role in the maintenance of the water supply systems,
- modalities for charging water rates for rural systems to pay for the emoluments of maintenance service personnel and the supply of spare parts for handpumps and service vehicles.