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WATER AND SANITATION FOR ALL: PARTNERSHIPS AND INNOVATIONS

Development, operation and maintenance of RWS



Joseph Samu Bockarie, Botswana

BOTSWANA IS A landlocked country which lies between latitudes 18° S and 27° S and longitudes 20° E and 29° E. The country is relatively flat with gentle undulations and occasional rocky outcrops. The main altitude above sea level is 1000 metres and the total land area is 582 000 km^2. Two thirds of the country is covered with thick sand layers as deep as 120 metres of the Kgalagadi desert. Main annual rainfall ranges from over 650 mm in the extreme south-west. The national average is 450mm. The average daily maximum temperatures range from 22°C in July to 33°C in January. Average daily minimum temperatures range from 5°C in July to 19°C in January. Botswana has a current estimated population of 1.3 million, of which, 24 per cent lives in urban centres. The remaining 76 per cent lives in rural areas. According to the 1981 population census, 39 per cent of the rural population lives in gazetted villages while 37 per cent lives in scattered rural settlement (Geoflux 1992). The population growth rate is 3.4 per cent per annum.

Water resources

Botswana is largely dependent on groundwater resources which provide the major source of water supply for domestic consumption and livestock watering in rural areas. It is estimated that the current use of groundwater is 76×10^6 m^3/ per annum (SMEC and WLPU consultants 1991). This represents 64 per cent of the total water consumed in Botswana. SMEC, WLPU 1990 also estimates that groundwater resources for the whole country may contain an extractable volume of 100,000 million cubic metres per annum. The recharge rate is however low.

The quality of groundwater in most areas of Botswana is within the acceptable limits specified by the World Health Organisation. In certain areas the water quality might have problems and will need special treatment plant like desalination plants. There are very few perennial rivers and these are concentrated in the North West region.

Rural water supply

A formal programme of Rural Water Supply was launched in 1972 under a Swedish Aid programme and the Government of Botswana.

The target for the Swedish Aid Programme was set at 354 villages with an overall total population served being 650,000. This target was achieved and the Swedish Aid programme ran from 1972-1993 at the total cost was P70 million (£18 million).

The Swedish International Development authority (SIDA) contributed 55 per cent of this total while the Government of Botswana contributed 45 per cent (SMEC 1991).

Development process of rural water supplies in Botswana

Policies, institutions and planning process

As stated in National Development Plan 7,1991-1997, The Government of Botswana has two policies in the water sector:

- Firstly and more importantly, to meet the basic needs of the population through the provision of a safe, reliable and affordable water supply which is available to all and,
- To meet the requirements of industrial, mining, commercial, and Institutional users in order to achieve the major objectives of rapid economic growth and sustained development.

These Policies are met through the co-ordinated efforts of the following institutions which are involved in the sector:

Ministry of Mineral Resources and Water Affairs: is responsible for policy, planning, development and regulation of all primary water resources. It is responsible for water resources development, design and construction of water supply schemes in both major and rural villages. and the operation and maintenance of water supplies in 17 major villages which accounts for 22.5 per cent of the country's population.

Water Utilities Corporation: Being a parasta tal organization is responsible for supplying water to six urban centres and this accounts for 21.5 per cent of the population.

Ministry of Local Government, Lands and Housing (MLGH) has the overall responsibility for provision of water and wastewater services for District Councils.

The District Councils are responsible for the operation and maintenance of water supply schemes.

The Ministry of Health is responsible for monitoring the quality of water in the country.

For planning purposes,coordination meetings are held on quarterly basis with each District Council to plan and review progress on development rural water supply for new villages and upgrading and rehabilatation old schemes. In these meetings decisions are made on lists of villages upgrading and rehabilitation in each financial year.

Components of rural water supplies schemes

Unlike many rural water supply schemes in other countries, the technical aspect of rural water supply scheme in Botswana is quite complex. For instance the development of a borehole involves the use of geophysical survey instrument for siting, and drilling equipment for drilling. Hence a typical village water supply consists of one or two boreholes, storage tank and reticulation system.

Management aspect.

Design:

A crucial aspect which has led to a successful implementation of rural water supply in Botswana is the formulation of design manual. Botswana's first rural water supply design manual was developed in 1989. This manual which is in three volumes addresses basic design criteria, technical requirements and design procedures. The use of this design manual has led to the successful standardization of components of the rural water supply schemes.

Construction management

Community involvement in construction of rural water supply scheme is through the provision of direct labour. Direct labour is recruited from the community and is paid on daily basis. Payment for labour is a significant variation from other countries where communities participate freely without pay in rural water supply projects. Another crucial aspect of construction management is site meetings which are held on monthly basis between the contractor and us. AS-built drawings are also prepared at the end of construction and during commissioning of the project a handing over certificate is issued to the District council.

Private sector involvement :Partnership and innovations.

To improve the implementation capacity, we have developed partnership with the private sector in rural water supply. Private sector through consultants and contractors are involved in water resources investigation, design and construction of our schemes. The innovative approach adopted is the development of standard agreement for procurement of services of consultants. The agreement defines the duties of the client and the consultant and conditions under which these duties are carried out. The consultants are asked to price each of the services such as preliminary and detailed design, tender documentation and construction supervision where applicable. These costs constitute uniform unit rate and will remain in force for an agreed period. Villages for groundwater investigation or design are allocated to the consultants based on these rates. This approach saves time as once the agreement is in force, there is no need for tendering time and again. There is hardly any backlog of projects as projects which cannot be cost-effectively done by inhouse crew can go automatically to the private sector. Contractors are also extensively used in construction of our rural water supply schemes. Through continuous monitoring and data collection we have developed the relationship between the size of the project based on population and cost and hence the cut off point at which decisions can be made on whether the project should be given to the contractor or it should be done inhouse. Another area of private sector involvement is supply of waterworks equipment and construction material. The innovative approach adopted is the one year supply tender which is administered every year for the supply of waterwork equipment ranging from pipes, pumps, and water tanks. The suppliers are asked to quote competitive prices based on estimated quantities. The prices are to remain in force for a year. Delivery periods are also estimated. This cuts down on bureaucratic procedures of going to tender for small items.

Operation and maintenance: local authority/district council capacity building.

The District Councils are currently operating and maintaining 460 village water supply schemes.

All the District Councils have an established water and waste water Departments with defined organizational structure. The water and waste water Department has the following sections;

- **Operation and maintenance section** - responsible for the day to day delivery of water services to all villages.
- **Construction and repair section** - responsible for rehabilitation, extension and augmentation of the water supply systems as required by the growth of the village.
- **Design section -** responsible for ensuring that all water supply and waste water systems with all their components are properly recorded and mapped, and that these documents are constantly updated and correctly filled.
- **Wastewater section** - responsible for safe and environmentally sound operation and maintenance of water borne sewerage systems from plot borders to the efficient disposal.
- **Administrative support section** - responsible for supporting the Head of the Department and all sections with proper administrative procedures.

  Special projects have been put in place towards capacity building of district councils to operate and maintain the rural water supply schemes. These projects are:
  - Human Resources Development Plan:. Under this project the job descriptions and schemes of service has been developed and training of water supply operators is undertaken.
  - Infrastructure and Logistic Support are provided in the form of offices and workshops, vehicles plant and equipment.

Financial aspects.

Development costs.

The Development of standard Rural water supply scheme requires a big capital investment. For example it costs about P500,000 ($1,500.00 to undertake full groundwater investigation to locate a borehole. It also costs about P500.000 ($1,500.00) to design and construct water supply scheme for a medium size village. Hence this amounts to initial capital investment of about P1,000,000 ($350,000.00) for full upgrading and rehabilitation. To date the annual budget for Rural Water Supply developments is sourced from Domestic Development fund from the Central Government and this amounts to P95,000,000($32,000,000) for 1997/98 fianancial year.

Operation and maintenance cost:

Another aspect of Rural Water Supply cost is the running costs which include operations, maintenance, minor replacement and overhead costs. The annual estimated budget for a particular District with a total population of 412,970(1991) and 142 village water supply schemes is P9,059,590.00($3,000,000)in 1996/97 financial year. The average cost of running a typical village water supply varies between P60,000 -P150,000.,00($20,000-50,000) per year. The running cost is met by the District council from money disbursed to them as revenue support grant by the Central Government.

Tariff structure:

The Government policy is to provide water for basic need free of cost. To cater for the basic needs, water provided through standpipe remains free of charge to users. The basic need is defined as consumption below and up to 5 cu.m. In design of rural water supply 65 per cent of the population are catered for through standpipe.

An incremental tariff system is used for rural water supplies where a low concessional rate will apply to first tier of water consumption aimed at covering basic needs. Hence the tariffs structure is such that the first 5 m3 is highly subsidized, the next 15m3 is subsidized but to a lesser extent, while the additional consumption is charged at the rate which allows the District Councils to cross subsidize the consumption in the in the first two bands. The current tariff structure in force is as follows: 0-5 m3/month,charge is P0.50,6-20 m3/month, charge is P1.50,21-40m3/month, charge is P2.25, above 40 m3/month, the charge is P2.80. This tariff structure only allows for 47 per cent of recurrent cost to be recovered

Problems with rural water supplies.

Since the launching of formal Rural Water Supply Program in 1972, there has been tremendous achievements in developing water supply services to all gazetted villages. However, these achievements have not been attained without problems. Some of these problems described below:

- **Vulnerability of groundwater**:
  Rural water supply depends largely on groundwater resources. However recent experience has shown that most of the boreholes are declining in yield due to severe drought conditions, nature of hydrogeological formation, and inadequate borehole development. On the other hand the demand keeps increasing. The boreholes are pumped for 24 hours in most cases, whereas they are designed to pump for 10 hours. This leads to mining of the groundwater. Groundwater availability in sufficient quantity has posed some problems. This has lead to interconnection of villages, which makes the schemes very expensive.
- **Water quality problems**:
  Certain areas of Botswana have water quality problems such as salinity, high fluoride hydrogen sulphide, nitrate and iron contents. Expensive treatment processes such as desalination plants, package treatment plants are used, thus posing operational problems because of lack of skilled manpower.
- **Community participation in operation and maintenance and user education in water conservation methods**:
  Community participation in operation and maintenance is not yet fully achieved. Activities such as fencing of boreholes, standpipes and tanks are still financed by the District Councils. There is also lack of user education in water conservation methods and demand management. People fill barrels with water from standpipes for their livestocks. This misuse of water has lead to high demand in villages in excess of the original demand.

Operation and maintenance.

Although lots of efforts are made in capacity building of the District Councils to operate and maintain the water supply schemes, there are still some thorny problems such as :

- **Lack of skilled manpower: The** councils have inadequate skilled manpower required to operate and maintain some of the complex treatment plants such as desalination plants. Vacancy rates are also.
- **Water losses: About** 20 to 40 per cent of water is lost through leakages in the distribution systems, overflow from the tank and wastages through standpipes.
- **Shortage of transport :**There is acute shortage of transport in so Councils. The shortage can also be attributed to poor fleet maintenance
- **Collection of tariffs: District** Councils have a very poor record on revenue collection and hence tariffs collected is far below the recurrent cost even though the tariff is officially in force. Table 1 below depicts this appalling situation.

What is the way forward

Given the problems outlined above and the increased Development, Operation and Maintenance costs of the

rural water supply schemes. The only choice is to look for alternative innovative approaches in our development strategy. Recently we held a seminar for water engineers and technicians from water and waste water department to look for solutions for sustainability and improved operation and maintenance. A consensus was reached on the need for: community involvement in all aspects of rural water supply, cost reduction measures. Following the Africa 2000 initiatives which is self reliance through capacity building, people directed planning, design and implementation, we have decided to adopt the following approaches as the way forward:

- Community involvement in all aspects of the projects should be encouraged. All Districts will experiment various forms of community involvement and document their experience.
- Revenue collection mechanism should be improved. Specific targets of percentage of recurrent cost to be collected should be indicated.
- All standpipes and bulk water supply points should be metered and monitored
- Leak detection and control of production and quality of drinking water programmes should be instituted on pilot basis in each District.

Conclusion:

The recent final evaluation report (Interconsult Sweden AB,Sept1995) has specifically pointed out that the majority of rural population in gazetted villages are today enjoying a reasonably reliable water supply service. Coverage now stands at 89 per cent and this indeed is an impressive progress given the severe climatic conditions. This paper has discussed the development, Operation and maintenance aspects of rural water supply and has identified crucial factors which have contributed greatly to the success of the rural water supply programme. These are proper organisation and planning ;adoption of design manual; proper construction management; involvement of private sector; standardisation of all waterworks equipment; capacity building and favourable Government policy and financial commitment. However despite these success stories, some problems areas have also been identified as threatening the sustainability of the programme. These problem areas are attributed to the increasing capital and recurrent costs with very little prospects of cost recovery. There is also lack of community participation in financing and operation and maintenance. Hence the paper concludes that our development process in Rural Water Supplies has to be seen in the light of the African 2000 initiatives. It is definitely time to review our development approach in such a way that people will be made to contribute to capital investment and operation and maintenance of the schemes.

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Table 1. Operation and maintenance costs and income from tariffs during 1996/97 financial year