22nd WEDC Conference New Delhi, India, 1996

REACHING THE UNREACHED: CHALLENGES FOR THE 21ST CENTURY

Resource management for water supply

Mrs K. Padmaja, India

FRESH PROTECTED DRINKING water facilities are at present available to only 75 per cent of the rural population in Andhra Pradesh state. Out of 19596 partially covered habitations in the state, about 17777 habitations are yet to be fully covered.

Resource management is the most desirable development stage of any water supply system, the basic aspects of which are:

- Human resource management.
- Financial resource management.
- Technical resource management.
- Water resource management.

Human resource management or organisational sustainability

Human resource management is vital for the planning and implementation of water supply systems. Technical organisations are good at area survey, designing, tendering, construction and supervision but are weak in operation and maintenance of completed schemes. Usually, design of projects, supervision and construction are emphasised and considered more attractive than simple maintenance of schemes.

Very often PWS schemes do not function due to low pressure, leakages or irregular water supply, Water supply is also pumps or public stand posts.

Institutional arrangement and legislation

For an effective system to be formalised with centralisation / decentralisation, it is essential to have task analysis, proper personnel management, training and monitor, coordination and communication.

Manpower development and training

Proper manpower planning, training and selection of trainees are key issues for human resource management. Training must be based on careful assessment of skills and requirements. Human resource management accounts for salary, income generation, career planning, job rotation etc. For effective personnel management and maintenance of water supply systems, job satisfaction, motivation, training, community involvement and participation are important.

Monitoring and control

Proper human resource management is essential for data collection, inventory management, quality control, spare parts provided etc.

Departmental experience

At present there are about 1454 pump mechanics and 185 mobile teams working. In the three tier system, there is one mobile team for 500 H.Ps, one pump mechanic for 50 H.Ps and one caretaker for each H.P. The department trains the mechanics on the field, and bears 50 per cent of the cost of training.

Financial resource management or financial sustainability

Water supply, a basic necessity is provided free of cost with capital investments subsidised to 100%. Very little money is collected from people using public taps / handpumps. O&M of PWS schemes / handpumps are either under funded or not funded, while depreciation of assets are not accounted. Water bills are not properly collected and even if collected are not properly maintained.

Financial resource requirements

- Requirements for labour, goods, services capital etc.,
- Activities - construction / restoration, plg. / cons, of new works, replacement of worn out equip., Extn. / upgradation of services.
- Maintenance requirements - Routine repairs, preventative maintenance, unanticipated repairs.
- Major repairs - Inadequate O&M, poor materials / cons, misuse / vandalism.
- Management and overheads - Personnel management, works, supplies, training, monitoring etc.
- Financial management and accounting - accounting budgeting, billing / collection, etc.
- Cash management - Management info, shortage of funds, cash raising options, community fund raising, indirect tax, user charge, effective utilisation of assets, proper mtc, and replacement.

Departmental experience

At present the govt. provides financial inputs for new PWS schemes or augmentation of the existing facilities. For O&M purposes, there is very meagre allocation of resources, as a result of which PWS schemes are either not maintained or very poorly maintained.

Technical resource management or technological sustainability

The existing technology employed to supply water to rural areas are through protected water supply schemes,

Mini pws schemes, public stand posts or handpumps as the case may be. The existing defluoridation techniques include handpumps fitted with defluoridation plants, (NEERI, Activated alumina, Resin etc.) Fill and draw type defluoridation plants, PWS scheme or a handpump from a fluoride free source or a combination of the above. The desalination techniques are based on Reverse Osmosis technique or Electro dialysis technique.

Technology choice

- Technology selection must be based on identified maintenance requirements and local resources / user involvement.
- Technology must be affordable, for maintenance and operation costs are to be paid by users.
- Technology must be feasible, quality of the system acceptable to suit local conditions.
- Level of available expertise, quality of systems and components, availability of spare parts and tools, environmental and geohydrological considerations.
- Standardisation of technology simplifies maintenance - develops national and regional capacities for maintenance.
- Supply and distribution of spare parts should be guaranteed and organised before implementation.
- Immediate repair facilities essential - local conditions, alternatives, additional facilities.
- Replacement of system components with better quality spares.

Departmental experience

Out of 19474 PWS schemes including extensions completed, about 681 need repairs. A majority of could be put to optimum utilisation with better technology for O&M and availability of spare parts. On an average, about 9000 borewells need repairs every year. Out of 216618, about 6626 hand pumps need repairs while 1700 borewells require flushing.

A fifth of the piped water supply is lost due to leakages on account of mismanagement and poor maintenance.

In DHAKA 62 per cent of the water is lost due to poor O&M.

In MANILA AND JAKARTA the losses are 58 per cent and 57 per cent respectively.

Water resource management or ecological sustainability

Dynamic ground water management is needed where aquifer recharge is essential in drought prone areas. Depleting water table is common and shallow dug wells dry up in summer. Indiscriminate drilling of borewells without adequate recharge leads to further lowering of ground water table. Effective watershed management deals with:

- Rain water.
- Soil moisture.
- Ground water.
- Sub surface dams.
- Surface water

Rain water

Rain water run off when allowed to percolate improves aquifer recharge. Bunds, furrows, conventional soil conservation techniques can be taken up in the rainfed area to encourage percolation. Small storages with a water spread area of 0.5 ha. will prevent floods, reduce gully formations, prevent soil erosion and ensure soil moisture.

Soil moisture

Soil moisture is available in the unsaturated zone i.e. zone above the water table. About 60 per cent of the rainfall is stored in the unsaturated zone, depending upon the porosity, depth of zone, rate of precipitation and annual rainfall. Conservation of soil moisture is effected by raising green manure or cover crops.

Ground water

For maintaining ground water table level, mini percolation tanks have to be constructed in the boundaries of selected areas of 20000 ha. of watershed and subwatersheds. For water spread purposes, d / s areas of the mini tanks are used as discharge zones. Percolation tanks constructed on the d / s of the watershed are expensive and submerge land for considerable lengths of time. Mini percolation tanks are more cost effective than percolation tanks. For deep percolation a trench may be excavated parallel to the tank bund.

Sub surface dams

Subsurface dams are used for storing ground water and preventing loss of ground water from the watershed. Subsurface dams are simple and economic in design with one meter puddle clay.

Aquifer management

Summer irrigation crops are to be avoided to conserve ground water for drinking purposes. Small diversion weirs / check dams are to be constructed across stream beds with proper abutments to conserve water.

Surface water

Surface water bodies are mini percolation tanks, percolation tanks and minor irrigation tanks. Mini percolation tanks are feasible in a watershed. Feasibility of MI tanks are more situation specific and may or may not be possible in a watershed.

Increase in recharge increases the base flow in streams and ground water flow from catchment of mini and micro watershed into the streams. Such surface flows are pumped and used for irrigation purposes. Suitable diversion weirs can be planned at regular intervals in the stream. Diversion works are highly cost effective, their capital cost being 1 / 5th of the conventional storage works.

Departmental experience

About 50 per cent of the defunct schemes do not function properly due to failure of the source. Proper selection of

a suitable water source / water shed management would have either prevented the scheme from becoming defunct / increased utilisation.

China's experience

The above "Four water concept" is tested and refined for several years in Nampi experimental station in Hebei province in China. Mining of water or external diversions from other basins were avoided.

Similarly water levels were raised in Xiong Xian county in central part of Hebei province. A strict common resource management resulted in substantial energy saving and increased yields. "Village service teams" were established to guard against illegal pump operations and monitor ground water levels.

References

[1] Departmental observations (Engineer-in-chief. P.R, Hyd.)
[2] Four water concept (T. Hanumantha Rao, 1996).
[3] WHO publication on Financial principles.