Assignment #3

WASH Diploma Course

Strategia Netherlands

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1. **Why is community based managed essential in management of water resource?**

Community-based management (CBM) is applied local knowledge , practices, and situations in partnership with state/governmental or non-governmental organizations (NGOs). In situations, where nation states are categorized as fragile or communities remain on the periphery of support from central government, Community-Based Water Resource Management (CBWRM) may be a more realistic option for involving local water users. CBWRM aims to engage directly with Community-based institutions and Water user groups so that they may play an active role in water resource management from the beginning. The idea is that the CBWRM provides an opportunity for communities to engage in Water resource Management with roles and responsibilities clearly defined. CBWRM does not attempt to be a direct replacement for national Water resource management plans, it provides WASH organizations with a very practical approach for engaging a water resource management as part of their ongoing service delivery work and it recognizes the need to improve management of water resource at a local level. CBWRM , communities play an important role in both water quantity and quality aspects as well as its monitoring (Prof. Soleiman, personal communication, Nov.20, 2018)

1. **With examples, discuss the difference between Community management and Community Participation.**

a) Community Management: Community Management is the discipline of ensuring productive communities.

Its responsibilities include: Define scope, ideal outcomes, and boundaries;

1. Ensure participants receive more values, then they contribute;
2. Promote, encourage and reward productive behaviors;
3. Discourage and limit destructive behaviors;
4. Facilitate constructive disagreement and conflict;
5. Advocate for the community and its members;
6. Monitor, measure and report;
7. Marshal internal advocates, resources and support; and
8. Manage tools and member experience. (Human 1.0 Network, 2011)

*b) Community Participation*: A process by which a community mobilizes its resources, initiates and takes responsibility for its own development activities and share in decision making for and implementation of all other development programmers for the overall improvement of its health status, The key to the successful organization of Primary Health Care (PHC) is community participation, through the process, the people gain greater control over the social, political and economic and environmental factors determining their health.

*Aims of Community Participation:*

1. The community develops self-reliance.
2. The community develops critical awareness; and
3. Community develops problem solving skills.

*Types of Participation:* Passive type (Manipulation), active (Consultation) and involvement Participation type (Community control). : ( Collinschimuti, June, 2015)

**3. Give five maintenance problems and difficulties. How can you overcome maintenance difficulties in the water supply system management?**

# Five maintenance difficulties and problems in the Water distribution or water supply in general and how I can overcome are as follows-

***Water Distribution/ Water Supply Challenges:***

Water supply challenges come in many forms: technical, environmental, economic, political, social and administrative challenges, among others.

*a) Technical Challenges:*

Technical challenges include design, construction and operations errors, leakages, aging pipelines, inappropriate technology, inadequately skilled workforce and water quality degradation, among others (By J. A. Omotayo, COREN (Council for the Regulation of Engineering in Nigeria) Registered Civil Engineer, 2014 ).

Design, Construction and Operations Errors: Water distribution/supply design is prone to errors coming mainly from wrong assumptions, inadequate statistics, computing input errors, inappropriate field changes during construction works and operational mistakes. Consequently, areas of low and high pressure regimes become unavoidable during operations. These often lead to frequent pipe bursts, loss of treated water, high repair and maintenance costs, traffic hold ups or diversions and reinstatement of roads before, during and after pipeline repairs. Another side effect is back siphon age of dirty and contaminated waters that impact negatively on the water qualities delivered to consumers.

In the developing countries of Africa, there is always the tendency to rehabilitate or expand existing waterworks/headwork's based on the assumption that any increase in production translates to corresponding increase in the number of people served. As such, little consideration is given to re-sizing the existing pipeline trunk mains to convey the treated water.

Leakages and Burst Pipelines: There is no Water distribution system anywhere in the world without some leakages and burst pipelines. Speight noted that about 23 – 27 bursts occur per 100 miles of pipeline in the US. Aging pipeline: The structural and hydraulic integrities of WD pipeline networks degrade with age. As corrosion progresses in steel and galvanized iron pipelines, they become weak and readily burst whilst still in service. Similarly, encrustation in cast iron and Asbestos Cement (AC) pipelines not only reduces their internal diameters leading to reduction in discharge but increases head loss and brings higher hoop stresses culminating in more frequent pipe bursts especially where booster pumps are involved.

Inappropriate Technology: In Africa, As-built drawings are often misplaced soon after operations start thus making line tracing and an appropriate modification a Herculean task. Also in Africa, most of the booster stations rely on power to operate high lift and booster pumps. Since power is erratic, WD is also erratic. Reducing dependency on power remains a challenge.

Inadequately skilled workforce: Most operatives do not know that transient pressure (water hammer) is induced with rapid closure of valves at reservoirs located on high grounds. And developing a team of skilled workforce is a problem as it takes time to assemble and train them. By the time they have gained sufficient technical knowhow and capabilities, some of them may be old and less agile, close to their retirement age or have been redeployed to other districts/zones. Some may even retire or join new employments thus creating a vacuum within the water agency.

Water Quality Degradation: Water quality degrades in Water supply/Water distribution in many ways: back siphon age of dirty and contaminated waters when pressures are low, dissolved corroded pipeline materials (iron, copper, etc), contamination during repairs, reduction in disinfectants residual due to oxidation and or formation of carcinogenic organic by-products, excessively long contact times and flows from sediments-laden service reservoirs, among others. The problem becomes worse with the stringent imposition of chemical limitations (quantity & time) beyond which disinfection not only violates national and WHO standards but impacts negatively on health of consumers.

Topography: Generally, service reservoirs are located on high grounds to be able to feed the adjoining Water Distribution/Water supply system. The steeper the slope, the greater is the flow to low land areas in Water supply system and the worse the supply regime to consumers closer to the service reservoirs on higher grounds.

*b) Environmental Challenges:*

In Water distribution, operations managers and operatives are increasingly faced with meeting emergencies when the environment roars. These include how to minimise wastages, restore or divert water supply, and minimize damages to properties during flood. Others include how to cope with drought, rainfall variability and bush fire.

Flood: Flooding of urban communities can cause damages (disconnection, breakages, flotation, back siphonages, silting of chambers, destruction of indicator posts, etc.) to various connecting pipelines. The affected networks may have to be partly or totally shut off, repaired, flushed, disinfected, and reconnected as quickly as possible. In unpaved areas, gradual erosion of earth cover over pipelines laid on hilly slopes is common.

Drought: With drought comes water rationing (diversions) to serve various segments of the communities affected thereby creating a good condition for back siphonage of unwholesome and dirty waters from the surrounding in areas not served or having low pressures. During this time, Engineers, Managers and operatives may have sleepless nights figuring out solutions and implementing the needed diversions to ameliorate people’s sufferings. During this time also bush fires can touch and damage uPVC, PVC and HDPE pipelines that are not fully buried underground.

Cold: In the temperate regions, taps are run to waste when temperatures drop close to or below freezing to prevent blockage thus putting pressure on Engineers, Managers and operatives to ensure continuous flow.

Water availability: Another challenge caused by the environment is that water demand is now exceeding availability in some localities: West Asia and Indo-Gangetic Plains in South Asia, and Florida and California in the US. More urban centers Water distribution systems will be affected as population grows, and coping with the new challenge may be a priority in future.

*c) Economic Challenges:*

Economic challenges include:

Inadequate Networks: In developing countries, Water distribution networks are inadequate to meet up with growing urbanization and population increase. WD networks in Nairobi and eleven satellite towns showed 10 percent to 47 percent approx. coverage. In ten urban centers surveyed in Ghana in 2007, only Accra had 82 percent coverage with others having 12 percent to 48 percent coverage. Nigeria has 47 percent water supply coverage1 thus implying that WD might be about 30 percent.

Cost of investment: All over the world, every WD is known to be capital intensive. The pipes, valves, fittings, service reservoirs, booster stations, meters, etc. do not come cheap. Sydney water invests about $300 million annually in order to cope with growth in water demand. Nigerian Federal Government spent over N800 billion ($5.16 billion approx.) between year 2000 and 2012, yet UNICEF estimated that only 47 percent coverage in water supply was achieved as at 2012. In 2006, WaterAid estimated that Nigeria needed $5.812 billion on water to meet the 2015 MDG (Millennium Development Goal) target. A half of this might go into WD networks. In 2005, the US needed $11 billion to meet up with water infrastructure and projected a 20-year spending estimate of $276.8 billion that both federal budgetary provisions and consumer tariffs could not meet up. Three-quarter of this cost were estimated for WD. Deo’s survey showed that Ghana urban water required $1.692 billion in 1998.

All these huge costs of capital translate to so many challenges: how to determine which aged pipeline to rehabilitate or replace, how to get the unit price of water right to recover investments and operations costs, how to provide a buffer to take care of emergences and future growth, how to gather and manage adequate demand and supply data, and how to adapt to new technologies.

Foreign and Domestic Debts: In Africa, a part of the challenge has to do with debt burden and or inability to secure foreign loans. For instance, the second phase of the Nsawam Water Supply Rehabilitation and Expansion Project for which €7 million external funding has been secured (part of which could have expanded the Nsawam distribution networks) could not be implemented as the Ghanaian government had to place embargo on foreign loans due to existing huge foreign debt burden estimated at GHc63 billion ($18.5 billion approx.). There was an economic report that some states in Nigeria (Lagos, Ondo, etc) have over-borrowed beyond what they could repay. Consequently, the Federal Government of Nigeria would not be in a position to guarantee external loans to these states.

Absence of cost optimization: To minimize capital cost, sizes of pipeline mains (rising, trunk and distribution mains), reservoirs, valves, etc. in the developing countries have to be limited. Most of the existing distribution mains in Nigerian towns are limited to DN100mm to DN150mm running through streets with DN200mm to DN250mm as trunk mains. In major capital cities, the trunk mains are limited to DN300mm to DN800mm. Even in cosmopolitan cities like Lagos, the trunk mains are limited to DN900mm to DN1200mm. Consequently, the flow carrying capacities of the trunk mains are readily exceeded by the exponentially growing water demand population. Unfortunately, when flow is increased in any WD pipeline network, the total head loss is increased thereby denying distant consumers of potable water supply.

*d) Political Challenges:*

Political challenges include: lack of political will, politics of contract awards and absence of common needs, among others.

Lack of political will: Only the political will can commit so much money into WD. Often this political will is lacking in most countries, whether developing or developed. The reason is not farfetched. Most of the political leaders in positions of authority do not come from the water industry, do not experience water shortages and cannot fathom why more funds should be committed into WD systems. In Nigeria, any such fund for WD must necessarily be for extension into areas previously un-served to gain political advantage (recognition in military regimes or votes in democratic regimes).

Politics of contract awards: Instances abound on contract awards to high ranking and favoured political party sponsors and or members at all three tiers (federal, state and local) governments in Nigeria. Gradually, the Nigerian water industry has been witnessing a surge in the influx of politicians, lawyers and accountants, among others. But this is an industry where expertise in the investigation, design, construction and operation of WD are required.

Absence of common needs:  The needs of countries vary from one to another, and have created some gulfs in having common collective decisions. While in the developed world, the needs are centered primarily on maintaining continuous flows with adequate pressures, replacing aging WD pipeline networks, and gathering/analyzing/managing field data, the needs in developing countries are centered primarily on extension to communities not yet served, tariff determinations, revenue collection and ownership structure (i.e. whether it should remain public, private or public-private). Also, the standards set by each country vis-à-vis the United Nations on “access to water” (i.e. safe tap water) vary from home taps in the developed countries to stand pipes located about 5km away in the developing countries.

*e) Social Challenges:*

Social challenges faced include:

Management structure: WD has been under public ownership in Africa for more than half a decade. Yet privatization has been successful in the developed world and has encouraged a push for its implementation in Nigeria and in Africa.  However, this move has been resisted by labor unions and the general public. Ghana tried it between 2006 and 2011 only to back out when it failed. Ekiti State Nigeria tried concession (a form of privatization) between 2008 and 2011 and had to scrap it for similar reason. Uganda and Nigeria’s Cross Rivers State governments have embraced a middle way called the public-private partnership or public-private sector participation (PPP). But not many African countries have keyed in to it.

Poor communication: Water is a “blue gold” and “Water is life” are slogans in the water industry. But when a bill board shows a child drinking from a tap or bathing under a stand pipe, the impression given is that water is not only cheap but a free social obligation. In Africa, WD is taken as a social responsibility of water agencies and governments to provide. Viewed in this perspective, pipe bursts and water wastages are not accepted as the responsibilities of the consumers. Thus pipe bursts before flow meters located within consumers’ premises may not be reported.

Illegal connections: Also based on this government social responsibility illusion, there exist many illegal connections to WD pipeline networks that are unreported. Nigeria is home to many illegal connections by water supply agents some of whom even install centrifugal pumps to draw water from distribution mains into their reservoirs and resell to the public.

Urbanization: Expansion of pipeline networks to new settlements moves in stepwise arithmetic progression in Africa but both urbanization and water demand move at geometric progressions. This creates a gulf. This will continue to go deeper. In addition, damages to WD pipelines, chambers, maker posts, etc. during road expansion programmes are becoming worrisome with displaced marker posts making line tracing a Herculean task.

*f) Administrative Challenges:*

The above five challenges are the main difficulties, but similarly, Administrative challenges facing WD include the determination and implementation of adequate wages and allowances structures to motivate Engineers, Managers and operative; their training and re-training; provision of adequate tools and equipment; better work schedules; etc. Others include ability to gather and manage large scale volumes of data on consumers, supply, demand, tariff, revenue, repair and maintenance, water quality, volume, pressure, pipeline materials and age, etc.

***Solutions To Water Distribution Challenges:***

Having noted the challenges under six different sub-headings, it is reasonable to address their corresponding solutions likewise.

*Solution to technical challenges:*

To mitigate high and low pressure regimes in WD today, analysis and design are facilitated using computer aided soft wares: Waternet, Eparnet, etc. Installation of some tri-function modern air valves is able to dampen pressure surges and mitigate damages. There is the need for water agencies to carry out water audit programmes: leakage detection programme, non-revenue water programme, head loss/pressure and flow monitoring programme, etc. This will enable water agencies understand the extent of losses in supply and in revenue, inability to meet consumer demands, high repair and maintenance costs, and how best to address them. For instance, Non-revenue water is estimated at 63 percent in Nigeria. Nsawam water audit reportshowed that leakages accounted for about 26 percent while the non-revenue water was about 53 percent. The import is that for every 100 consumers supplied, leakages have denied 35 others. As for tariff, 46 consumers were bearing the burden of 100 consumers. Of course, this explains why water rates are high in the developing countries and also why so many consumers are unwilling to pay their bills.

At the end of the water audit, water agencies and government must address leakages by gradually replacing old meters and aging WD pipeline networks. There are smart meters(e.g. Neptune meters, Sensus AMI meters, iMeters, etc) that can relay leakages and bursts to a SCADA (Supervisory Control And Data Acquisition), GIS (Geographic Information System), water agency asset management, etc. There are now HDPE pipes with fussion welds at joints (thus mitigating leakages at joints) and are of 12m long (thus minimizing the number of joints) that can be used. This pipe type has better flow characteristics: minimal headloss, high strength to withstand high hydrostatic pressures, non-corrosive and chemically inert for encrustations to form.

The use of an appropriate technology means that advantage of economies of scale can be used to produce more water at the same capital and running costs, thereby bringing down the unit cost of potable water delivered to consumers. Kenya is advancing an appropriate technology that takes advantage of gravity flows from high hills with minimum power and pumping arrangements.

Water quality should be monitored continuously, and when necessary, pipelines and service reservoirs should be flushed/cleaned and disinfected periodically even if there are no bursts.

*Solution to Environmental Challenges:*

A good approach is to lay pipelines deep enough to avoid exposure to flooding, erosion and bush burning damages. In Nsawam, we laid OD400 HDPE pipeline below R. Densu bed. The work was executed during the dry season and protected against flotation with concrete u-caps. It has survived high floods since 2013. In addition, there is the need for Engineers and Managers in the water industry to start planning on how to cope with variability in rainfall, particularly how to use the available WD systems to ration supply in the near future. A new approach involves the laying of parallel lines for recycled water that can serve non-potable purposes.

*Solution to Economic Challenges:*

Funding of water agencies should be given a top priority by governments and financial institutions. Consumers are often willing to pay for services that they enjoy. Any funding of water distribution pipeline networks is recoverable.  It is a good and worthwhile investment. The success of Calabar, Cross River State of Nigeria water scheme complete with the distribution system under public-private sector participation (PPP) initiative and funded from the scratch with an initial $141 million African Development Bank (ADB) loan is noteworthy. This has attracted more funds/agencies: $495.3m from World Bank, €3.0m European Union donation, N5.4bn ($34.8 million apprx.) from First Bank of Nigeria, N8.9bn ($57.4 million approx.) by Cross River State Government, etc. thus making water available to more urban centers in the State. The World Bank is a major pillar of fund and has been like that for Nigeria. Only recently, the Bank committed another $400 million to urban water supply in four towns in Nigeria. In addition to international funding agencies, national governments and banks should set aside a certain percentage (say 10 percent) of their funds for WD.

There is need for water agencies to have the right to fix their tariffs to recover both capital and running costs. This could come through PPP or privatization. At the same time, government should be prepared to support the underprivileged and poverty-stricken population in the developing countries using the Uganda PPP approach. Although privatization may not be a panacea to WD in Africa, it could reduce monopoly, provide funding, increase competition through cost-benefit optimization and improve delivery and availability of potable water. But before privatization takes its root in Africa, water agencies should thrive to lower their operating costs through economies of scale. Increase in volume of service delivery will result into reduction in operating costs.

Finally, computerized maintenance management system or Smart Water Grid systemscan be deployed for cost – benefit optimizations, analysis of vast amount of data in WD as well as assist water agencies and governments to make better choices rather than the traditional recourse to conservative minimum cost approach.

*Solutions to Political Challenges:*

Most American heads of State were former military men. Hence, they never joked with defense budgets. The more Water Engineers in positions of authority at both Federal and State levels, the better water policy issues can be implemented. Thus, Water Engineers should not shy away from politics. This is also the stand of COREN (Council for the Regulation of Engineering in Nigeria)..

There is the need for designers and consultants to properly advise political leaders to undertake a comprehensive review of water supply schemes (sources, intakes, water treatment plants, reservoirs and WD) before taking their political decisions. This will mitigate such experience noticed in Akure. The PPP strategy adopted in Calabar, Cross River State of Nigeria and Uganda has provided political pedestal to roll such exercise all over Nigeria, Africa and the developing world.

Inter-departmental fora to review master plans for towns, capital cities and cosmopolitan centers should take the front stage before any project implementation, be it on pipelines, road, etc. This will mitigate damages to WD networks during road expansion and rehabilitation programmes.

*Solution to Social Challenges:*

The solution to social challenges in WD still remains that of proper enlightenment. The slogan “Water is life” has been misunderstood by many and needed to be replaced with something like “Water is money”, “Water has a cost” or “Water is our wealth”. The importance is that when people see water wasting through pipe bursts or leakages, they know money is being wasted and should be stopped. This may even encourage the reporting of illegal connections and their prosecution. Illegal connections can be detected easily where smart meters have been installed. To serve as a deterrent, the costs associated with illegal connections and the volume of water consumed should be compounded and recovered from culprits. In addition, water agencies should improve on maintenance culture.

*Solutions to Administrative Challenges:*

It is very important for Engineers, Managers and operatives involved in WD to have commensurate motivating remunerations, flexible and convenient work schedules, appropriate training and re-training programmes, etc. to motivate them to work. Management should thrive to provide SCADA, non-destructive flow meters, GIS, etc. to enhance data analysis and management whilst facilitating decision making.

**Conclusion**

The challenges facing Water distribution/Water supply are numerous and cannot be exhausted and so do their corresponding feasible solutions. New challenges will crop up as the future unfolds, especially those relating to climate change. Governments and financial institutions should continue to invest in Water distribution/water supply because such an action is worthwhile, reliable, profitable, recoverable and socially lifestyle enhancing.

**4. What are Water technologies available in your area? Explain five.**

Water technologies available in my area are include: Dams, Berkeds, Springs, Shallow/dug wells, Mini-water systems, Hafir dams and bore holes; let me explain five of them:

**1.** Surface/Earth dams: This type of Water technology is traditionally historical source of water for Somaliland especially in pastoralist communities dug by their own traditional tool due to provide a water both their domestic use and their livestock as well.

2. Berkeds: this is the second generation technology of Somaliland water source, which is an underground masonry storage used to collect and cutch the flooding water for all consumption purpose.

3.Springs Protection: This is also another traditional source of water which Somaliland people-both pastoralists and Agro-pastoralist community get the water; especially the mountainous locations along the Golis range maintains at Red sea coastal areas.

4. Hand-Dug/Shallow wells: This type of Water Technology is commonly used in peri-urban areas and villages where the livestock rearing communities are concentrated in ; along the dry river-zones in particular.

5. Boreholes: This technology is the most productive one and its currently common in both peri-urban and urban areas of Somaliland; like remote areas, villages and cities. those wells water are the most drinkable and potable water for human consumption other than those above-stated technologies. their production reach the consumers either by stand pipe, public tabs or house hold connections (A/rahman, Former Director of Planning, Somaliland Ministry of Water Development, Personal Communication, (November 23, 2018).

**5. How do you ensure cost effectiveness in supply of water?**

I can ensure cost effectiveness in Supply of Water considering a significant reduction in system management costs; Through:

1. Capacity building: the delivery of services can be enhanced through training, planning and organization at the community, technical and managerial level.

2 .Community Management ensuring and participation of women: Ensuring the communities are the managers of their own water supply systems should be given high priority, to reduce long-term costs. The full and meaningful participation of women in community management structures is essential for long-term efficiency and success.

3. Technical and Logistical considerations: The largest single cost item in the hand pump option, and one which acts as constraint to expansion is the drilling operation and drilling success rate. Correct choice of drilling equipment, drilling area, and drilling rig movement can reduce overall costs. Since the drilling costs are the single major component of cost, actions to optimize the use of surveys, rig movement, and monitoring can have a major impact.

4. Local production of Materials and spare parts: For medium-term cost reduction in countries those have the capacity for their own local production of materials should be investigated. On the other hand, It should be noted, however, that in smaller countries the economies of scale necessary to justify local production may be difficult to achieve.

5. Tariff reduction: The Government should reduce or totally eliminate the tariffs when it necessary to import equipment and materials from the abroad (StrategiaNetherlands WASH Course note, Module 3, PP. 51-57) .

In conclusion, we should keep in mind these variables when talking about the reduction of cost of a water project:

1. Technology choice;
2. Level of service;
3. Labor and Material cost;
4. Accessibility and quality of the Water source;
5. Efficiency and cost effectiveness of project Management;
6. Community Management;
7. involvement of women; and
8. Contracting

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(StrategiaNetherlands WASH Course note, Module 3, PP. 51-57 (n.d. ).

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