

## RURAL WATER SUPPLY PROJECTS AND SUSTAINABLE DEVELOPMENT IN NIGERIA

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### ABSTRACT

The study reviews the sustainability issues that are associated with rural community water provision and some of the challenges experienced in the Niger Delta region of Nigeria within the context of project benefits sustenance. Several rural communities in Nigeria derive water supply through hand pump operated water supply wells. The sustainability of this approach to water provision was assessed using a qualitative research methodology and undertaking a comparative review of Micro-Projects Programme (MPP3) in Nigeria with that of Volta Region Community Water Supply Programme (VRCWSP), in Ghana. The findings reveal the absence of sustainability in the current approach and the paper recommends that if community based hand pump operated rural water supply projects are to be sustainable; the sustainability factors must be given full consideration in its design and implementation. A post-project management approach is suggested which should be effectively monitored, assessed, linked and integrated into the implementation and post-operational management of hand pumps water supply systems. The use of a community based and community driven project-management options in the management of community rural water supply is proposed as this remains a credible alternative over control by external or government agencies.

**Keywords:** Sustainability, Water-Supply, Hand-Pumps, Project Management, Project Benefit.

## INTRODUCTION

This study reviews the sustainability issues using a project management approach in order to provide a more sustainable strategy for managing hand pump operated water supply projects. It assesses whether there is the need to adopt a dynamic process that will promote sustainable management of a project's benefits. The rationale centres on the assertion that community rural water supply consisting of hand pump operated shallow wells is considered to be a suitable technology for water supply in low-income (rural) communities of Niger delta. There are however several cases where they have fallen out of service within a limited period after creation (Harvey and Reed, 2004). Most of these projects have been planned and created without a strategy for its long-term operations (Franks, 2006). Africa recorded a 45% rural water coverage in 2000 when compared with 40% in 1990, still leaving 237 million people not supplied with water (WHO/UNICEF, 2000). Urban water coverage in Africa recorded at 85% in 2000, with 37 million people urban dwellers not supplied with water. In Nigeria, the percentage of rural water coverage in 2000 was 40% and urban 60% as compared to 37% rural and 83% urban in 1999 (ADI, 2004). In this context, it is very clear that the rural communities are lagging significantly behind urban areas in water provision. According to Lockwood, (2004), Harvey and Reed (2004) and Wood (1994), the hand pump is appropriate technology because: they are low cost; easy to operate and maintain; the financial implication to the community and the donor is low; the recurrent costs are low; the financial responsibility for the on-going O&M of water supply systems falls within the users' community; the technical skills, tools, and spare parts required for the O&M is available; also, the availability of shallow groundwater resources beneath the earth surfaces in the developing countries makes it a most viable option for community rural water supply. However, other technology options exist such as protected springs; hand pump equipped boreholes on wells; rain water harvesting; hand-dug wells; gravity fed system and semi-scale pumped systems for rural water supply. Though each has its own advantages and disadvantages but experience has shown that in the Niger Delta region of Nigeria, there is a proliferation in the use of hand pumps possible due to the shallow water level.

Water is an essential resource that has economic value in all its rival uses and should be accepted as an economic good. According to Lockwood (2004), and Wood (1994) the set of assumptions in the choice of hand pumps, is that it is the best low-cost measure for community water provision. It is affordable; easy to maintain; an appropriate technology; readily available to the communities; easy to construct and install; efficient and easy user friendly. The simpler the technology, the less the Operation and Maintenance (O&M) requirements and the more sustainable it is likely to be. However, as good as these assumptions are many hand pump projects have failed to achieve the desired benefits. For example, in Sub-Saharan Africa, countries like Ghana and Nigeria, hand pump water supply projects have rarely fulfilled the intended purposes (Parry-Jones, Reed and Skinner, 2001). Developing countries are littered with remains of projects that died when donor funding ended' The question is why do these projects fail or get abandoned, and even become 'white elephants' within the very poor communities that desperately need them? Cusworth and Franks (1993) contend that the "missing link" is seeing beyond the project implementation phases and to appreciate that the end result is not the project but the assets created by the project when put into operation. Multi-year financial planning is not usually provided for. Other authors contend that it is the wider institutional issues that are not put in place or properly implemented and poor or lack of regular preventive maintenance practices (Harvey and Reed, 2004, Parry-Jones, Reed, and Skinner, 2001). In Nigeria, hand pump operated water supply projects are abundant but to a large extent they are not functional. Although, some of these issues have ethical reasons, the most prevalent factors are:

- *Who is responsible for the maintenance of these projects for the benefit of future generations after project implementation;*
- *How will they be maintained;*
- *What factors can obstruct or aid the sustenance of the alternative in order to curb the threats of water-borne diseases in the community that are often associated with unsafe drinking water resulting from the use of contaminated stream and rainwater sources.*

Communities perceive it as the responsibility of the donor to make provisions for sustaining the benefits of these water projects. It is felt that in communities where they are unable to, make such provision, they should liaise with the local government or the community leaders to develop strategies for its sustenance. This view has in the past generated communal crises, political dichotomy, crime, corruption even in a case where the project requires minimal maintenance. Therefore, the need to focus attention on sustaining these projects and its benefits is just as crucial as the project itself. Sustaining the benefits of a project involves the management of the scheme that are put in place by the project, which centres on long-term investment and accumulation with the prime objective of providing opportunities for the project beneficiaries and the owners of the assets created by the project (Franks, 2006, Cusworth and Franks, 1993)..

## **SUSTAINABILITY FACTORS IN COMMUNITY BASED HAND PUMP OPERATED WATER SUPPLY PROJECTS**

### **Sustainability and Sustainable Development Conceptualised**

The World Commission on Environment and Development (WCED 1987, 8) defines sustainable development as development which ‘*meets the needs of the present without compromising the ability of future generations to meet their own needs*’. The concept of sustainability at first relied on environmental phenomenon, but currently, it has gone beyond the boundaries of environmental issues to include social, economic, political, and development issues (Edum-Fotwe and Price, 2009). Understanding what constitutes sustainable and unsustainable development is crucial in any project management and post-construction management system. Hence, it would be sustainable development if it reduces the disparities between the poor and the rich. In addition, Porritt (2000) in Lutzkendorf and Lorenz (2005, 213) argued that for the achievement of sustainability, it is necessary to measure it against a set of four ‘system conditions’ such as:

- Finite material (including fossil fuels) should not be extracted at faster rate than they can be redeposit in the earth’s crust;
- Artificial materials (including plastics) should not be produced at a faster rate than they can be broken down by natural processes;
- Biodiversity of the ecosystem should be maintained; whilst renewable resources should only be consumed at a slower rate than they can be naturally replenished;
- Human needs must be met in an equitable and efficient manner.

Cooper and Jones (2008) in their study on social housing management argue that development will be sustainable when attention is given more to greater community engagement; deliberative forums to help people live more sustainable lifestyles; investigating ways in which stakeholders can influence decision-making; new commitment to support education and training in sustainable development; and response to key environmental issues. Therefore, while the concept of sustainable development from literature is well known and widely used, there appears to be no common

understanding of it. For instance, in consideration of what ‘needs’ are regarded as being important, sustainability varies from nation to nation.

### **Policy Support and Organisational Arrangements Factors**

Policy factors are discussed in the context of policy and organisational structures within and outside a project environment. Policy development and implementation are essential to project sustainability. As a result, it has led to a high interest of voluntary organisations (NGO’S), private sector and community based organisations (CBOs) providing active services delivery in Africa (ADB, 2005, IIED, 2000). Where there are no policies developed, every sector and actor will see the issues differently and use different execution strategies that will cause disintegration. The level of politics is a core issue to sustainability and the democratic system of a country must be one having the total commitment to providing conducive atmosphere for the hand pump water supply project otherwise the possibility of project failure is high (Parry-Jones *et al*, 2001). Policy formulation is multi-dimensional and dynamic in nature, which the actors supporting the low cost technologies must be ready to adapt for the successful implementations of the projects. ADB (2005), Harvey and Reed (2004), assert that institutions and personnel to drive policy implementation; stakeholders that adhere to policy and strategy guidelines; a consistent regulatory and legislative framework; and an adequate financial resources are necessary to ensure sustainability. Again, the institutional and organisational set-up particularly the maintenance strategies put in place which would guarantee the financial returns over the expected project life span is equally vital. Management at the lowest appropriate level requires the role of the local and national government, the private sector and non-governmental organisation. Community Level Operation Maintenance has been overwhelmed by the community management preference, which requires proactive approaches (Colin, 1999). Although, this management strategy seems good, it appears that there is need to accept decentralisation of maintenance approaches for effectiveness and efficiency as highly centralised decision-making does not promote sustainability (Boydell 1999). As such, Anand (2007) suggest that the federal government should have the main role of setting the policy and institutional framework which other sectors follow through participatory democracy, but, sustenance of water supply through good governance is a priority.

### **Technological Factors**

The United Nations Development Programme (UNDP) and the World Bank initiatives in the 1970s on global/ interregional project laboratory testing and technological development of hand pumps for rural community water supply indicate that technology might no longer be a limiting issue to hand pump operated water supply project sustenance in the rural community (Parry et al., 2001), and suggests that better sustenance of such projects and the related local benefits can still be gained when the pumps are purchased offshore and delivered through local participation. On the matter of availability of spare parts relating to hand pump water project sustenance, it is a problem in most Africa countries because the quality, availability, procurement and supply of these hand pump parts are challenging and at most times, the project developers fail to consider the future consequences of these factors to the project sustenance. It is argued that the purchase of hand pump parts should be made to be economically feasible and viable (Baumann, 1994) and the locally manufactured spare parts should have a strong linkage to the community market for better contact with the beneficiaries of a project as in the case in Ghana, Nigeria and Tanzania (Woodhouse, 1999;).

### **Environmental Factors**

The Sustainability of community based water supply projects in the context of the environment is related to groundwater resources (Parry-Jones et al (2001). Arlosoroff, Tschannerl, Grey, Journey, Karp, Langenegger, and Roche (1987) estimated that an India mark II hand pump characteristically yields 12 litres of water per minute which measures less than 6metres cube per day for eight hours continuous operation. Well sitting and development, screen obstacle and chemical composition of the water are fundamental environmental factors in community hand pump water supply project and the successful sustenance of its benefits. In the context of sustainability and water composition, the more saline the water, the more the metallic component of the hand pump is subjected to corrosion syndromes. Anand's (2007) study in Chennai, India suggests that coastal communities are more vulnerable to salinity ingress. However, there is advancement towards using plastic rising mains that help to prolong the life span of hand pump in aggressive water environments, by which the Niger Delta region of Nigeria is highly affected. The odour and colour of the water are also important considerations.

### **Community Social Perceptions:**

Community needs and priorities have become common factors why community water supply projects fail because of their belief in the use of their natural water sources as a ready alternative. This is a common cause of water supply project failures in Africa and particularly Niger Delta in Nigeria where most of the area is covered by fresh and salt water. Furthermore, gender diversity, which is on the global agenda, affects water provisions and project request requires the involvement of all community groups irrespective of the gender in the decision-making and management of the system. Hoffman (1992) has found that there is still gender discrimination for example, where men and women were trained on how to maintain the hand pumps, the female input or efforts were not rewarded while the male were rewarded for the same service rendered. Also, Cleaver's (1991) study in Zambia confirmed that while women were members of a hand pump water project committee, all the tasks were performed only by men. The study in Zambia suggests that the committee set-up is not the case rather the changing community leaders and at most times the traditional rulers influence the decision-making in the community. UNICEF report in Nigeria (WELL, 2001) on rural water programme confirms that the most active group in hand pump maintenance were the CDC that was democratically elected by the community themselves. Parry-Jones et al., (2001) and Cleaver (1991) emphasised that one of the main substance of community participation in project decision-making and implementation is to stimulate a sense of ownership, which increases the level of maintenance to hand pump projects.

### **Economic/Financial Factor:**

The economic/financial factors stem from capital costs and community contributions, water tariff and real costs of maintenance. Harvey and Reed (2004), Parry-Jones et al. (2001), Woodhouse (1999) suggest that, since the capital costs of hand pump operated water supply projects are huge and the community or individual cannot afford it, the responsibility should be left for the government, donors or NGOs. However, Parry-Jones et al (2001) suggest that even though such concern should be carried by the project financier, the community must prove commitment either in-cash or in-kind but at most times in-kind and further concludes that it is through this commitment that community could have concern for the project and the organisational capacity to sustain it. However, an evaluation of a UNCDF project in Guinea Bissau indicates that the failure of hand pump operated projects and other projects was the failure to develop an appropriate strategy for operation and maintenance (O&M) cost recovery at the community level which then undermines the sustenance of the projects benefits. A WSP (2001) study reveals that the costs of operation and maintenance of rope

hand pump in Nicaragua is only US\$10 per year as in contrast with the India Mark II of US\$59-107 per year. Water tariff is a means of recurrent costs recovery from the hand pump which can be used for the annual operation and maintenance as in the case of Ghana (Harvey, Jawara, and Reed, 2002). An understanding of the real costs of operation and maintenance of hand pump water project is important but usually neglected.

### **GENERAL PERSPECTIVES IN SUSTAINING PROJECT BENEFITS**

“Projects are argued as a temporary undertaking to create a unique product or service” (PMI, 2000). However, the British Standard states that projects are “unique set of coordinated activities, with a definite starting and finishing point, undertaken by an individual or organisation to meet specific objectives within defined schedule, cost and performance parameters” (BS 6079, 2000). Whatever be the understanding from these definitions, it is the venture of capital in a time-bound interference to create fruitful assets (Cusworth and Franks, 1993), but the issue is not to create the assets rather than to sustain the created assets but “there is need to see beyond the project phase and to appreciate that the end result of the project is the output which create the assets of continuing benefit and value to the clients and beneficiaries”. Hence, the post-project phase of commissioning, operations and maintenance for project sustainability is considered. Project Commissioning is that phase connecting the project implementation to the project operation and marks the ‘handing over’ time when the assets created by the project is put into use. The thought that the facilities once created could immediately be put into operation and that no running in period was required (Cusworth and Franks, 1993) is contradictory, misleading and is discarded. It is the right time to correct the notion that an important activity such as commissioning, which is a key step to project successful operation is overlooked in project planning and management. However, within the project development and management literatures, commissioning phase is considered as not part of the project cycle but a linear process that focuses into the future. The Project commissioning must be overemphasised as the hallmark of changing the created assets to a scheme; the opportunity for the project owners to constantly be in touch with the employees and becoming familiar with the project operational strategies. However, the commissioning strategies may vary or differ, but generally are operational, safety and contractual issues. Operational objectives entail putting the created assets into use, looking at the most efficient, effective and profitable strategy of operating them, and training the operators or users in an economically effective and efficient manner, with the familiarisation of the clients with the products or services that may be availed to them. Safety objectives entail passing tests and safety checks, training and testing operators in emergency procedures and the search for hazards to which the facilities might give rise to contractual objectives entail providing predictions of performance, passing of acceptance tests and provision of triggers for payment stages.

Once the commissioning phase is completed, the operational phase of the project starts, which entails the duration the project, starts normal activities to yield the expected benefits. However, it is an important phase in the project cycle but too often insufficient attention is always given during the project preparation phases, even many contractual project cycles do not include it as part of the project development (Cusworth and Franks, 1993). Nevertheless, three main features exist in managing operations: Operational Procedures, Resource Control and Environmental Project Relationship

Operational Procedures: Ensure the effective operations, safety, records and maintenance of the created assets/facilities. It entails aspects such as ‘what’, ‘who’ and ‘how’ things must be done.

Resource Control: is concerned with the management of capital, fund, materials and machines for the effective operation of the project.

*Environmental Project Relationship*: Entails the management through monitoring and control of the internal and external environmental system in relation to the project output and possible impacts to the project operations.

Effective and efficient project maintenance is a key element to sustaining project benefits and health or safety (Field and Keller, 1998). It takes the form of planned maintenance programmes, which ensures that the assets created, continue to operate continuously without further injection of external resources from the government or donor agency for rehabilitation. Finally, all project maintenance goes beyond keeping the facilities in operation to a maintenance programme based on the principles of moving “from the crises of unplanned maintenance to the inevitability of planned, preventive maintenance” (Cusworth and Franks, 1993). There are a few project Management constraints associated with hand pump operated water supply projects. The constraints are lack of technical know-how and local management staff as a result of insufficient capacity building; lack of education, information, awareness, participation, involvement, decentralisation and communication; much interest on the implementation stage; and lack of monitoring and appraisal/evaluation strategy. These constraints are completely linked with the hand pump water project sustainability factors aforementioned in the earlier section.

## **MICRO-PROJECTS PROGRAMME (MPP3) AND VRCWSP PROJECTS**

### **Methodology**

A qualitative approach with two explanatory case studies was used. The study reviewed reports on the Volta Region Community Water Supply Programme in Ghana and the Micro-Project Programme in the Niger Delta region of Nigeria. For the MMP3, the report is a midterm evaluation aimed to assess the relevance and the performance of the programme, its impact on poverty alleviation among the rural communities and its contribution to the reduction of the social tensions in the area; review the organisational and management structure of the Micro-Projects Management Unit (MMU) and advise on appropriate enhancement; and advise the Technical Programme Committee (TPC) and MMU in policy formulation for further implementation of the MPP3. Also to investigate factors that ensures the project sustainability. This was geared toward ensuring that the objective of the MPP3 which is to help improve the living standard in poor settlements of the Niger Delta (Rivers, Bayelsa and Delta States) in Nigeria, contributing to the reduction of the poverty, social tensions and crisis. The project purpose is to implement basic infrastructures and support income-generating activities. The results would be the implementation of around 5,000 micro-projects (MPs) ranging from € 1,000 to € 20,000 mainly in the sectors of water supply, village transport, health systems, income generation or micro-credit schemes. Special attention would also be given to non-physical results of projects including capacity building of local organisations and improvements of skills and technical knowledge of local craftsmen and contractors. The MPP3 is an evolution from the Lomé convention and the multi-annual micro-projects programmes, one of the instruments the EU/ACP uses to build a development co-operation with nations. This focus on the development of people's economic and social situation, in response to the needs of local communities which their participation is outlined in article 252 of the convention according to two main criteria: the micro-projects are to be undertaken "at the initiative" of local communities, and these have to "contribute to their implementation" in terms of services, cash or kind. It was on this basis that the Federal Republic of Nigeria and the Commission of the European Communities are implementing the Micro-Projects Programme (MPP3) for a total amount of €21 million in the three core Niger delta states.

The choice of these cases was hinged on the premise that it offered an in-depth understanding and explanation of the issues affecting rural water supply sustainability, convenience, time and cost reduction. The study also reviewed national statistics on water supply sources in Nigeria. Both cases are within the West African sub-region and share similar

geographical, socio-cultural, political and environmental norms and values. A content analysis method was used to compare and contrast various dimensions from the selected cases. Participant observation and also played a key role in the methodology. The discussions are based on the sustainable factors and the post-project management approach to community hand pump operated water supply projects and the sustenance of its benefits such as: policy support; institutions and project operations management structures; maintenance management; project commissioning; environment/ technology; community perception/involvement; economic/financial contributions; and monitoring, evaluation, and reporting strategy (Harvey and Reed, 2004, Parry-Jones *et al*, 2001, Cusworth and Franks, 1993).

## **FINDINGS/DISCUSSIONS**

The study reveals that community hand pump operated water supply project benefits, are sustainable where all the institutional factors and the post-project management approaches are properly incorporated, interconnected and tackled rather than focusing on wider institutional issues alone. Also, that some intervention is in reality run as a project instead of programme as claimed in their objectives. This is indicated in the case of the MPP3 in Niger Delta region of Nigeria. From the critical analysis of the MPP3 and the VRCWSP, the paper suggests that wider external project environmental issues and internal project environmental approaches is very important and fundamental, except monitoring, evaluation, and reporting which remains the mortar to all other factors.

### **Technological Factors**

Most hand pump operated water supply project failures are associated with lack of standardised spare parts, hardware problems, technological transfer and unplanned maintenance design. In the case of hardware problems, the most frequent issue is the breakage of pump rods (Parry *et al.*, 2001), as it is noticeable in Nigeria, Ghana and other African countries, but the level of this problem regarding sustainability is a function of the technological advancement of that country in the area of water supply. However, local manufacturing of hand pump particularly in Nigeria is predominant which is in line with the Afridev and India mark III technology but the quality and durability of these pump are often poorly manufactured to the extent that its use becomes risky to water provision (Parry *et al.*, 2001). Nevertheless, quality specification can be put in place and monitored for compliance on the hand pump production for hand pump sustainability in Niger delta. Irrespective of this strategy, most of the locally manufactured hand pumps are more costly in certain Niger delta states than those imported.

### **Policy Support:**

This is a fundamental issue in the projects benefits sustenance. Policy is aimed to provide a supportive and conducive environment for community water supply as the stronger the clarity and proper enforcement/implementation of the developed policy, the better the project benefits sustenance and vice-versa. Hence, successful community water supply management requires policy and strategic support from all levels of the government. The VRCWSP has a national policy strategy for community rural water supply to grassroots communities through the CWSA, whilst the MPP3 has a policy statement at the national level without proactive strategy to encourage the policy to the rural community. Also, the VRCWSP policies supported and encouraged community rural water management, contributions, involvement, ownership and standardisation of hand pump water supply system and the hand pump project benefits is sustained (Harvey *et al*, 2002) whilst the MPP3 lacks this merits (MPP3 Report, 2006). However, there is no guarantee that the development of appropriate policy for community hand pump operated water supply project benefits sustenance will



result in sustaining water supply but a dynamic process is encouraged to regularly repeat, review and revise policy as to address the problems (Harvey and Reed, 2004).

### **Project Commissioning:**

This is a fundamental issue to project sustenance but is always overlooked in project management cycle. It is the period of handing over a project for its created assets to be put to productive use. In the case of the VRCWSP in Ghana, commissioning is seen by the government, donor and the beneficiary communities as “event driven” activity signifying their empowerment to totally participate and commit to the management and operations of the project. This implies that the project commissioning is done between the government, the donor and the recipient communities. Whilst in that of the MPP3 in Nigeria is between the government and donor (EU) either at the state, regional or national level and at times even done on radio or television announcement as based on experience. Finally, the hallmark of transferring the created assets from a project to a system guarantee that operational, safety and contractual aspects are more certain with the VRCWSP, therefore making community rural water supply via hand pump project benefits more sustainable and assured in the VRCWSP in Ghana than the MPP3 in Niger Delta region of Nigeria.

### **Institutions and Project Operations Management Structures:**

Sustaining community hand pump water project benefits is a function of the institutions/operations management structures put in place to manage the on-going project system when the created assets by the project are put into operations to yield benefits. The VRCWSP has strong and proactive management structures starting from the CWSA, the District Assemblies to the village technical teams with two-ways feedback reporting system. This indicates that hand pump water projects are managed, maintained, financed through community contributions, controlled, used and monitored by the community and the CBOs focuses on the Project Operations Management (POM) of procedures, resources control, and procurement. In contrast, the MPP3 has only an implementation team and no OPM structures in place either within the community or from the national level to manage the post-project operations, which implies that at the completion of the project, the team cease to function and then, water supply sustenance is doubtful.

### **Community Social Perceptions:**

According to Anand (2007), UNDP (2006), Parry et al, (2001), Harvey and Reed (2004), Cleaver, (1991), WELL, (2001), Woodhouse, (1999), etc, community social aspects in terms of their needs and priorities, technology choice acceptance, gender diversity, village level power structures and project ownership, capacity building, involvements, participations and communication are vital and fundamental to community rural hand pump water project benefits sustenance. In VRCWSP case, the recipient communities have their rights to choice of technology option, take ownership, participate and involve right from the on-set project initiation phases. Communities make financial commitments, which give the community the opportunity to be aware of the product that is to be delivered in their communities. Also community capacity building is done to the CWSA, the District Assemblies and to the Village Machines Teams (VMT) on regular basis to take new challenges. Because of these, the community make their highest total commitment and financial contributions to the hand pump water projects maintenance and sustenance in the community. On the other hand, the MPP3 case considered all these issues as typically revealed in the implementation strategy adopted. Also, capacity building and inclusion of the women in the community implementation committee is considered. But the choice of their needs and priorities, appropriate technology that will be cheap to maintain and

ownership of the project is to debate as most of the implemented project are imported into the community on the ground that, it is the decision of the government and failure to accept the technology deprives the community the opportunity.

#### **Programme/Hand pumps Project Maintenance Management:**

Water supply project to rural community and its sustenance is depended on the maintenance approach implanted for the continuous operations. The kind of maintenance management is the planned “preventive” method, either routine regular or periodic shutdown maintenance; as unplanned maintenance led to maintenance crises thereby affecting project benefits sustenance. On the VRCWSP, the community maintenance teams CWSA, DA and the APM including caretaker committee’s set-up by the community do the maintenance operations. These bodies through the VRCWSP charge and collect water tariff at the hand pump points which accounted for the repair, purchases of spare parts and other necessary routine services for hand pump water project benefits sustenance. Through the VLOM approach to rural water supply, the VRCWSP emphasised the choice of ‘when’ and ‘who’ to involve in the hand pump mechanics and to make payments of all repairs. The community select people who are trained in hand pump habitual repairs and fault identifications. The strong supported community operated maintenance system via planned preventive through routine regular maintenance strategy provided more than 85% of steady potable water supplies in the recipient communities. On the other hand, the MPP3 has no advantage of this sort, as their main focus is to complete the project without evaluating the internal and external project environment for the hand pump water project benefits sustenance in the communities.

#### **Financial/Economic Issues:**

According to MacDonald and Pape (2002), cost recovery system is a better choice for the community operation and maintenance of community rural water supply through hand pump. This entails the act of charging the recipients of the service the full or near full costs of rendering the services including the costs of constructions, installations, operations and maintenances. In the VRCWSP the communities are charged money in form of water tariff to cover hand pump repairs, spare parts purchases and replacement. The communities are mainly supported to ensure all costs related to the operations and maintenances while monitoring and reporting plus other administrative costs are the institutional responsibilities. On the case of MPP3, the emphasis is made on community contribution to the project implementation costs without thought to the post-project success and benefit sustenance to the beneficiaries. There are also no strategies in place to encourage the community to provide recurrent cost of the project after completion since the operational costs are not made feasible to the communities. Hence, it is argued that for the project benefits sustenance, all the financial /economic issues to the direct cost of the O&M must be known to the communities and willing to contribute to cover such amount (Franks, 2006, Harvey and Reed, 2004).

#### **Environment and Technology Issues:**

Technology choice depends on the environmental condition as both determine the water project benefits sustenance in the community. The community’s right to choose from a range of technology options that is most appropriate, low-cost, easy to maintain, repair and affordable is significant rather than sophisticated one that is difficult to understand and manage by the community. Considering the cases, the MPP3 water supply failure is related to the hydrological nature, water quality, the groundwater level, pump type and the well sitting and lack of drainage around the hand pump (MPP3 report, 2006). Also, the lackadaisical attitude of the project provider to allow the community to choose from hand pump alternatives that will suit the community is lacking and alarming. The VRCWSP considered a careful assessment of the benefits, limitations, costs, maintenance and management needs of the present environment, technology preference and

then allow the user's to make decision on which option that will better address the priority need of the community (Harvey et al, 2002). Therefore, the environmental and technological sustenance of community rural hand pump water project benefits demand full assessment and assurance of the water availability as the more porous the basement rock and moderate the depth, the better the aquifer and the more the water quality and availability with less difficulties of operations to the people.

### **Monitoring, Evaluation, and Reporting:**

Monitoring, evaluation and reporting is the mortar that holds the other factors of sustainability and the post-project management phases together, providing for their proper integration and interlocking. Monitoring is an on-going process that ensures the determination of whether or not a particular approach is achieving set landmarks. Hence, monitoring, evaluation and reporting is important to ensure water supply and hand pump standardisation, effectiveness, efficiency, replicability and equity in the communities (Harvey et al, 2004). The VRCWSP opted and adopted a strong monitoring, evaluation and reporting process that made the recruitment of environmental health officers in the hand pump water projects management team at all community levels. It is now established at the village level for community to play central role in project supervision, feeding the CWSA with adequate information need for the compilation of periodic reports (Harvey et al, 2002). Whilst the MPP3 monitoring ends once the project is implemented and lacking this advantage. However, WaterAid is developing it to cover every aspects of sustainability (Harvey and Reed, 2004, Parry-Jones et al, 2001). Finally, sustenance procedure model for each of the factors as adopted from Harvey and Reed, 2004 are shown in appendix III- VIII and a particular issue triggers each. Also, the summary of the critical analysis shows that sustainable community hand pump operated water supply benefits is achievable through regular monitoring, evaluation and reporting of the various sustainable factors and the post-project management approach of project commissioning, POM, and PMM. However, the procedures adopted are no guarantee to the sustenance of community rural water supply project benefits rather it is to be implemented and managed as a "process" than as a "blue-print" project.

### **CONCLUSION**

In the VRCWSP project, the benefits are sustained as the various concepts and management of the post-project issues are understood, correlated, applied and followed. The policy support from the national level to the community with regular monitoring and reporting helps to identify areas of concern for immediate mitigations measures. The community rural water supply through this alternative has 85-90% functionality in the Volta region. Also, community involvement, contributions, ownerships and participations to choose own technology preference that will be easy and least costs of maintenance and management for the on-going operations of the water supply system is proactive. On the other hand, the MPP3 though made huge success with the advent of good "paper" strategies for the implementation of the projects. But the sustenance of the community hand pump water project benefits is disbelieving. In this case, encouraging community water management, ownerships, technology choice and environment assessment is lacking. Most importantly is the post-project management approach plus monitoring, evaluation and reporting which is the pivotal to the other factors. It ends once the project is implemented. Also, the community is not involved and allowed participating in the project decision-making stages leading to imposition or deprivation of projects to the communities. Therefore, this paper argues that careful follow-up of the post-project management approach and the institutional factors dynamic analyses are vital where community hand pump water project benefits sustenance is to be achieved. Also, community rural water supply whatever is the technology alternative is to be managed as process rather than as blue-project. This will allow future challenges associated to the alternative to be properly managed through regular reconsideration, amendment, and possibly modify

the business case as the case maybe. Finally, the issue of managing dishonesty, capacity building, supply chains, good governance and participatory democracy appears significant and decisive to projects benefits sustenance. Further research on community hand pump water project benefits sustenance is conducted. It is proposed that no hand pump project should be implemented in any particular environment without a strategic approach for the maintenance. It is also required that every community set-up their own management committee to look after the on-going operations and maintenance of their respective projects (Parry-Jones et al., 2001). However, whatever is the case, the community should be encouraged to build up their own management structure

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