implementing organization:

**AVSI**

# Operation and Maintenance of water and sanitation systems in northern Uganda

***Successful operation and maintenance of water supply and sanitation systems in rural areas affected by complex emergency can relevantly contribute to the sustainable implementation of projects.***

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## Abstract

The main purpose of this paper is to identify possible challenges that can severely affect the selection and implementation of successful operation and maintenance strategies. For this a case study from AVSI's work in Northern Uganda is used. This selected area of Northern Uganda is affected by the consequences of a twenty years civil war. Recommendations on how to implement good operation and maintenance strategies are given.


## Introduction

The article focuses on operation and maintenance (O&M) strategies implemented in rural areas affected by complex emergencies. The important role of O&M in making project more sustainable is highlighted. Common challenges to successful O&M are identified and feasible ways forward are proposed. A case study from Northern Uganda will be used. In particular, the work of AVSI, focusing on one of its projects related to water and sanitation services improvement, will be decribed. It is shows how AVSI has planned and implemented O&M strategies in Northern Uganda between 2004 and 2009 and how O&M has contributed to make the project more sustainable.

AVSI is a non-profit, non-governmental organization, founded in Italy in 1972 and working in Uganda since 1984. From 2005 till today AVSI has been implanting in the Acholi Region the project "Improvement of water and sanitation services for people living in displacement in Northern Uganda". Headed by the WatSan Sector of AVSI Kitgum base, the project has aimed at contributing to an increase in water availability and improvement of the hygienic and sanitation conditions through various interventions.


**Figure 8 Map of Districts Affected by the Conflict**

**Key factors for successful O&M of water and sanitation systems in rural areas affected by complex emergency:**

- Flexibility;
- Participation of local authorities and communities;
- Awareness of local culture, beliefs and attitudes related to water, hygiene and sanitation;
- Awareness of existing policies and O&M systems;
- Efficient calculation of capital, start-up and O&M costs before selecting technologies and O&M strategies;
- Clear responsibilities for O&M activities;
- Implementation of preventive rather than reactive O&M strategies.

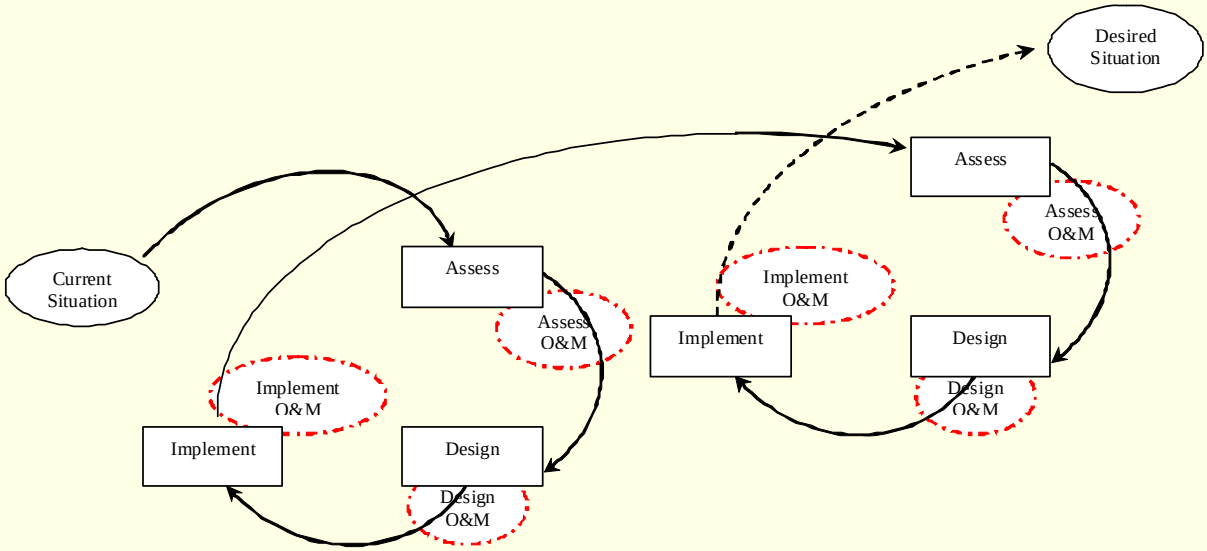


Figure 2: Project Cycle, revision of UNHCR (1999) model (UNHCR (1999).

## The Ugandan Civil War

For more than two decades, Uganda has been disrupted by a bloody civil war between the rebel group Lord's Resistance Army (LRA) and the Government of Uganda (GoU). As many contemporary conflicts, even the Ugandan Civil War can be defined as a complex and multi-leveled emergency (DFID, 2002) (A humanitarian crises where there is a considerable breakdown of authority resulting from internal or external conflict and may lead to extensive loss of life, massive displacements, and widespread damage to societies and economies. (House, 2007)). Through the fighting almost two million people have been displaced and forced to seek refuge in IDP (Internally Displaced People) camps, in urban and quasi-urban settings (these people usually depend on outside aid to sustain their basic needs) while others have become night commuters (people that leave their homes and spend the night in more secure areas such as urban centres, hospitals, churches, etc. ) .

Soon the camps were over crowded. However, little plan for provision of services was carried out and existing facilities in IDPs' camps were overstretched (AVSI, 2005) with on average water availability of 5 litres per person per day and more than 2000 people sharing one latrine stance. As a consequence, limited water and sanitation services severely affected the displaced population (ECHO, 2007).

After a truce was signed between conflicting parties the resettlement/return processes began to take place. Therefore, NGOs and Agencies activities started to shift their interventions from IDPs camps to satellite camps/return sites where support for new water supplies, sanitation and health services was required (Bjørkhaug et al., 2007).

## Theoretical background on O&M

O&M is a term commonly used to identify all activities implemented in order to run and keep in good conditions provided facilities (House, 2007). If considered in relation to water ans sanitation projects, O&M generally includes four major areas of intervention (this contribution only considers the first two):

- water supply,
- excreta disposal,
- solid waste management,
- drainage.

For each area of intervention, O&M includes activities that aim to prevent breakdowns and misuse of facilities (preventive maintenance) together with actions necessary to bring the system back into operation once breakdowns/misuse have happened (reactive maintenance) (House, 2007). Nevertheless, in order to implement effective and efficient O&M strategies, it is fundamental to consider them in each phase of the project cycle (Fig. 2). As a consequence, first of all feasibility of O&M needs to be assessed during the project assessment phase. Secondly, O&M strategies need to be designed and planned while planning the project itself. Finally, the selected strategies need to be implemented in coordination with all other activities. In particular, preventive O&M will be implemented before water systems and sanitation infrastructures are completed while reactive O&M only when needed.

However, it is this degree of complexity that allows several challenges to severely affect O&M. The challenges to O&M can be divided in technical, economical, social and managerial. In addition, they can be further separated in relation to the phases of the project when they are most likely to occur. (Table 1)

Technical challenges are generally related to physical construction of facilities. First of all, appropriate technologies have to be selected together with local communities and authorities. Beneficiaries should be informed on systems' options and costs in order to decide what responds better to their needs (Windblad and Kilama, 1980). Moreover, implications in terms of responsibilities, tasks and resources should be extensively explained in order to avoid misunderstandings and misuse of facilities. Secondly, good services have to be guaranteed. Low skilled labour and poor quality materials will affect the quality of construction and facilities, once completed, might need frequent repairs (Nkongo, 2003). Finally, handover manuals and/or special trainings regarding selected technologies, construction techniques and O&M strategies should be provided to all actors. If not considered, this three elements will severely affect O&M once facilities are completed.

Even, calculation of correct services' costs is as important as getting the technical design right (Deverill et al., 2002). In fact, without a real understanding of the systems' costs, financial sustainability of O&M cannot be guaranteed.

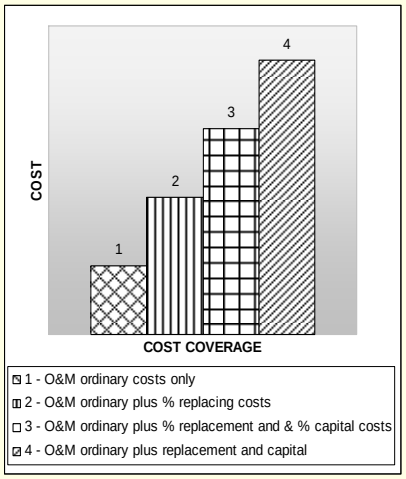


**Figure 3: Financial sustainability of O&M (House, 2007)**

Therefore, the first step is to understand what humanitarian actors and communities are expected to budget for in terms of capital and O&M costs. In addition, all involved actors should collaborate in order to identify and implement a source of income or revenue system appropriate to the context of implementation (Sutton, 2004). Figure 3 shows how the price of community contribution would increase on the basis of the type of costs beneficiaries are asked to cover. Therefore, good understanding of the type and use of communities' contribution will help NGOs/Agencies to better organize a successful revenue system. However, in an emergency context it is often difficult to put in place revenue

**Table 1: Challenges and Constraints to O&M**

| | PLANNING | IMPLEMENTATION & Handover | OPERATION & MAINTENANCE |
|---|---|---|---|
| **TECHINCAL** | • Appropriate technology<br>• Appropriate technical design | • Quality of construction<br>• Appropriate service level<br>• O&M manuals | • Baseline skills<br>• Availability of spares<br>• Availability of skilled labor<br>• Availability of tools |
| **ECONOMICAL** | • Budgeting<br>• Organization & management of financial flows<br>• Financial administration<br>• Financial control and monitoring | • Capital costs:<br>• construction costs,<br>• training costs,<br>• start-up costs;<br>• system appropriate to livelihoods of communities' members. | • Ordinary maintenance<br>• Extraordinary maintenance:<br>• refit,<br>• replacement,<br>• Up-grading;<br>• Community ability to pay;<br>• Community ability to raise money. |
| **SOCIAL** | • Risks from natural disaster and conflicts<br>• Ethnical/religious division<br>• Gender division<br>• Inequity & social cohesion<br>• Community commitment to the project | | • Community sense of ownership & legal ownership<br>• Community willingness to pay<br>• Community willingness to raise money<br>• Relevance of the project |
| **MANAGERIAL** | • O&M legislation and policies<br>• Appropriate management system | • Standardization of approaches across the sector.<br>• Coordination<br>• Training of implementing partners | • Efficiency of intermediate level actors – Govt, NGOs, private sector, community organizations |

systems and NGO/Agencies might be required to subside all capital and O&M costs. In this case clear plan should be designed and agreed on by all involved actors in order to move from an NGO supported system to a self-sustainable one as soon as the emergency phase ends.

Additional challenges to O&M can be the result of the social environment. As a consequence, implementing actors should develop a good understanding of existing needs, cultural behaviours, and ethnical/religious division/cohesion (Barakat, 2004). Consultation with and participation of the community is therefore strongly recommended especially if communities members are considered as consumers and producers of infrastructure services. In addition, if involved in all phases of the project, communities' sense of ownership and commitment to O&M activities are more likely to last in the long term (ACF, 2007).

Finally, managerial challenges can affect O&M in all its parts. As a consequence, some preventive measures need to be considered. First of all, planning of O&M should be carried out before facilities have been constructed. In order to do that, it is important that local authorities and community based organizations are prepared to accomplish managerial tasks and that existing policies can regulate O&M activities. Secondly, agreements with local authorities/communities should be reached regarding managerial responsibilities, services' use and users' contribution (Brikké, 2000). Participation plays therefore an important role especially if considered that local actors are equipped with knowledge often ignored by international NGOs/Agencies. Once planning is completed, managerial trainings should be organized for all involved actors. Finally, supervision/monitoring of O&M activities has to be carried out from humanitarian actors even after facilities have been handed over.

## The AVSI project in Northern Uganda

### WatSan systems and facilities: Selection of technologies

A limited number of technologies were selected in collaboration with local authorities and communities. Nevertheless, these were adapted to the sites of implementation, the evolving context and the functions they were expected to fulfil. Regarding excretal disposal, AVSI avoided all types of prefabricated latrines and pit latrines were constructed using local materials for the superstructure. In resettlement sites, AVSI workers promoted the construction of facilities at household level. Finally, in institutions AVSI generally constructed more permanent facilities in order to provide a more regular service with higher standards of quality. For example, latrines were characterized by reinforced pits, cement superstructures, and ventilation systems.

### O&M strategies

O&M is a complex task. As a consequence, during the planning phase AVSI tried to select context-effective technologies easy to construct and, when possible, to operate and maintain in the short and long term. In addition, services' costs were calculated and budgeted into the overall project costs due to the emergency context and the disrupted livelihoods of displaced people. During the project, preventive measures where undertaken in order to increase sense of ownership and capacity building. Local manpower was trained in construction techniques and communities were involved in the selection, construction and maintenance of facilities.

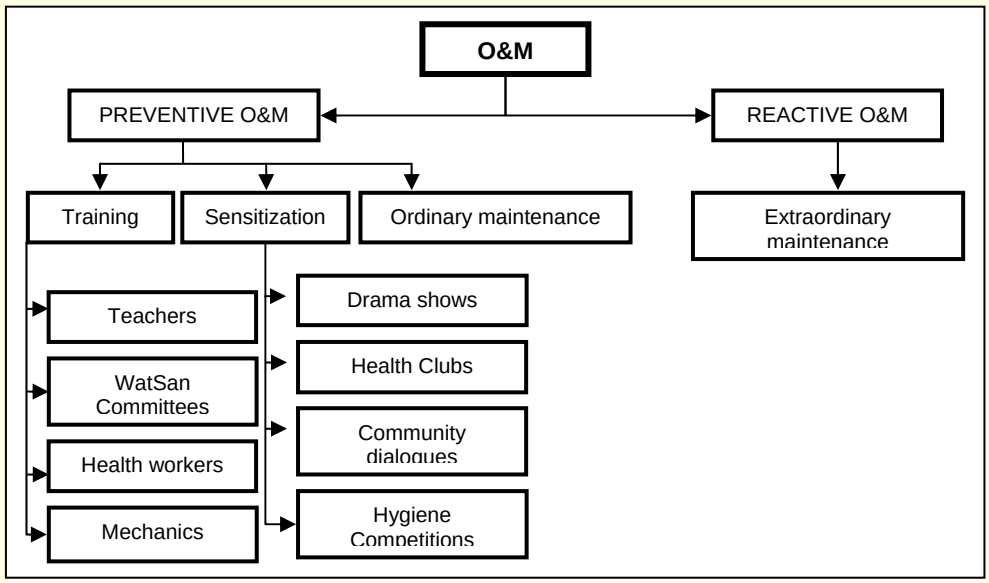


**Figure 4: O&M strategies implemented by AVSI in Northern Uganda.**

From Figure 4 it is immediately clear that AVSI has mainly invested donors' funds in preventive, rather than reactive maintenance in order to reduce systems' breakdown and quick deterioration of facilities. For instance, regular community

dialogues were organized by AVSI together with local authorities and WatSan committees. However, when preventive maintenance was not enough, AVSI carried out activities of reactive maintenance. For example, AVSI replaced damaged spares in collaboration with district mechanics., Nevertheless, although AVSI planned and implemented O&M activities during the entire project life, several challenges have been experienced.

## Challenges experienced

### Technical challenges

Participation of communities and authorities in technologies selection has been stressed by AVSI throughout the project. Decisions and technical designs have been agreed with all stakeholders when possible, and local manpower has been used for construction and O&M. As a result, selected technologies have in general effectively responded to IDPs and returnees' needs. However, two main technical challenges have been faced by: on one hand, selected technologies have been often misused or even vandalized by the users and on the other hand, lack of spares, tools and fuel have severely affected O&M of provided services.
Community and institutional latrines' doors have been often stolen as well as hand wash facilities.
Community leaders and key stakeholders explained that vandalism has been frequently the result of land disputes and users resentments towards schools and health units' workers. As a consequence, AVSI has replaced damaged/stolen components when possible and held community dialogues in order to reduce misuse of infrastructures. However results have not been yet assessed. In addition, regarding lack of spares, local authorities have frequently promised to organize districts' stores and to fund purchase of spares. However, this seldom happened.

### Economical challenges

Economical challenges have been one of the main constraints to the implementation of successful O&M. As previously explained, AVSI has decided to fund all capital and start-up costs due to the inability of users to pay for water consumption and sanitation facilities. All provided facilities are therefore not self-sustainable.

In coordination with local authorities and NGOs/Agencies, AVSI has promoted a campaign of sensitization in order to introduce a revenue system. However, majority of pilot projects have failed. Local authorities have recently guaranteed that fees for consumption of water will be soon introduced although communities will take a while to get used to the new policy. Nevertheless, no preventive measure seems to be used in order to avoid additional economical constraints.

### Social challenges

Even cultural behaviours, attitudes and beliefs have sometimes affected O&M of provided facilities. Hygiene behaviours are difficult to become a common practice and frequently people prefer to defecate in the bush. In addition, women and men are not allowed to share the same latrine while pregnant women believe that using latrines could harm the foetus. Furthermore, during the evaluation, majority of interviewees declared that construction of household latrines is not a priority with only the 37% of the entire sample owning one (Figure 5).

In institutions, cleaning rotation systems seems to be in place. However, due to poor sense of ownership, maintenance was rarely implemented. In addition, people enthusiasm seemed to quickly decrease once facilities have been completed. Additional voluntary work for operation and maintenance is therefore perceived as unnecessary. To these challenges, AVSI responded promoting sensitization at community level.

### Managerial challenges

Good management of WatSan facilities should be the result of interaction and collaboration between local authorities, communities and humanitarian actors. While communities have in general participated in WatSan facilities management, local authorities were seldom able to effectively do it. In addition, coordination between international NGOs/Agencies was quite poor affecting projects' results due to overlapping and lack of shared strategies. However, towards the end of the project, coordination and cluster meetings have been organized regularly. Nevertheless, some challenges to good management of WatSan facilities still need to be considered. First of all common strategies are not yet in place. Secondly,

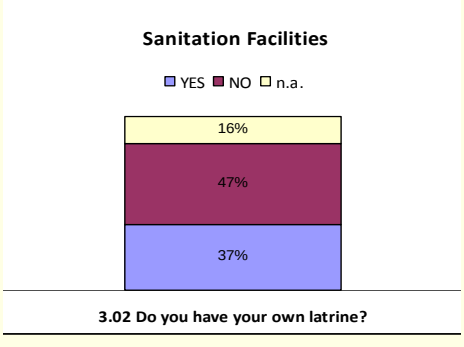


**Figure 5: Household latrines distribution**

national and local O&M policies are still underdeveloped and often unclear. Finally, although involved in all phases of the project, local authorities are still not able to take over NGOs and Agencies managerial role.

## Conclusion

n the project in Norther Uganda AVSI has directed available funds to preventive rather than to reactive O&M. Selected preventive strategies have been training, sensitization and ordinary maintenance and have been implemented in schools, health facilities, IDPs camps and resettlement/return sites. Nevertheless, a number of challenges have been experienced by the AVSI WatSan team. First of all, provided facilities have been often misuse or even vandalized. Secondly, self-sustainability of provided facilities has been affected due to AVSI decision to fund all capital and start-up costs for the construction, operation and maintenance. However, implementation of a revenue system was seen by AVSI as a non feasible option due to the emergency context. Thirdly, cultural behaviours and attitudes have severely affected good hygienic and sanitation behaviours. Finally, local authorities have repeatedly proved not to be able to manage and run O&M activities due to poor policies, lack of funds, lack of established revenue systems and poorly trained staff. To all this challenges, AVSI has responded with additional training, sensitization and direct collaboration with communities and local authorities. However, as the project is ending at the time of writing, it is still too early to evaluate if selected responses have been effective.

## Recommendations

In order to implement successful O&M it is important:

- to select, plan and implement O&M throughout the entire project and even later;
- to prioritize preventive rather then to reactive O&M;
- that communities and local authorities participate in the selection of technologies and of O&M strategies;
- to carried out KAP (Knowledge, Attitudes and Practice) assessment in order to provide culturally sensitive facilities;
- to select O&M managerial responsibilities and tasks in collaboration with local authorities and communities
- to assist local authorities and communities in order to acquire needed skills and to put in place appropriate managerial measures;
- to provide local authorities and communities with hand over manuals and/or special trainings on facilities design and O&M procedures;
- to carry out assessment and sensitization in order to select and implement appropriate revenue systems;
- to guarantee support and supervision even after the project ends in order to quickly respond to additional challenges.

**References**


ACF International Network (2007) *ACF's Water, Sanitation and Hygiene Policy*. http://www.actionagainsthunger.org/resources/publications.

AVSI (2005) *Improvement of water and sanitation services for people living in displacement in Northern Uganda, Project Proposal*.

Barakat S. (2004) After the conflict: reconstructions and redevelopment in the aftermath of war.

Bjørkhaug, I., Bøås, M., Hatløy, A., Jennings K.M. (2007) *Returning to uncertainty? Addressing vulnerabilities in Northern Uganda*, UNDP, OPM, Fafo AIS and Ugandan Bureau of Statistics.

Brikké, F. (2000) *Operation and Maintenance of Rural Water Supply and Sanitation Systems. A training package for managers and planners*, IRC International Water & Sanitation Centre, WHO, Water Supply & Collaborative Council, Operation & Maintenance Network.

Deverill, P., Bibby, S., Wedgwood A., Smout, I. (2002) *Designing water supply and sanitation project to meet demand in rural and peri-urban communities. Book 1: Concepts, Principles and Practice*, Loughborough University: WEDC.

DFID (2002) *Conducting Conflict Analysis Assessments: Guidance Notes*.

ECHO (2007) *Annual Report 2006.* http://ec.europa.eu/echo/files/about/what/annual_report/annex_2006_en.pdf,

House, S. (2007) *How to make wash projects sustainable and successfully disengage in vulnerable contexts*, ACF - International Network.

Nkongo, D. (2003) *'Regulation and Sustainability of Rural Water Supply Projects – What can we do better?'* WaterAid, Tanzania.

Sutton, S. (2004) *Self Supply: A Fresh Approach to Water for Rural Populations*, WSP, RWSN, DFID.

UNHCR (1999) *'Effective Planning. Guidelines for UNHCR Teams'*.

Windblad, U., Kilama, W. (1980) *Sanitation without Water*, SIDA, Stockholm Sweden.



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