



MLFM and AVSI

partnership present:

# *Amazi ni isoko y'ubuzima*

*Eau Source de Vie*

*Water Source of Life.*



**Sustainability and future reproducibility:  
Here's how our method responds to community WASH  
problems.**

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# INTRODUCTION

## Partnership history

**AVSI-MLFM partnership** started in 2002 in order to respond to water and sanitation needs of Rwandan population. Until today this partnership realized 5 projects, for about 220 km of distribution systems and the building of 204 latrines (36 for particularly vulnerable households and 168 for public places). In these years AVSI and MLFM have been working in Gicumbi and Gatsibo Districts, where they've been recognized by local authorities to be the first partners to talk with, in order to reach goals stated in the District Development Program (PDD). Our projects had given a significant contribution to the MDGs connected to Water and Sanitation (Goal 7): *to halve the population with no access to safe water and to basic sanitation services*. As shown before, this goal is a key element also to act in favour of goals 4 and 5 (*combat against child mortality and improve maternal health*) as well as goal 6 (*combat against HIV, malaria and other diseases*). Our interventions are on line with Millennium Development Strategies and with the governmental priorities in order to contribute to poverty reduction and in favour of sustainable development as stated in "Vision 2020" as regards WASH sectors.

The partnership has been strengthening through joint actions in support to children from the Muhura orphanage and their families. This support provides access to care, education and caring and loving environment. Lately on, when the new Child Care Reform (MIGEPROF) underlined the importance of family reunification, we have undertaken new project, aiming to facilitate and support the reunification process of children living in orphanages to their families or host families. Main activities are psychosocial support and economic empowerment of their families through small livestock.

MLFM/AVSI partnership is not limited to the Rwandan reality but we have been doing similar fruitful experiences of collaboration in other countries such as Haiti, Tanzania and Italy.

## MLFM & AVSI in partnership

**Name:** rehabilitation of the old aqueduct Muhura – Rwamiko

**Type of aqueduct:** vertical pumping water supply.

**Description:** this project involved the rehabilitation and improvement of the old Muhura-Rwamiko aqueduct (Gicumbi District), made by MLFM in the 1987-1992s. We have also completed the rehabilitation of the hydroelectric power station built by MLFM in the 90s, which feeds the pumping station and water supply of the Humure Hospital.

The areas of intervention are: hygiene, preventive health, family and the environment.

**Activities:**

-Rehabilitation of several parts of the water supply net such as: tanks, pipes and terminal fountains.

-Rehabilitation of the pumping station with the purchase of a new pump, the most powerful one and safe, to ensure supplying continuous drinking water to the aqueduct in service.

-Changing the electrical panels to stabilize the frequency of the energy produced by the hydroelectric power station.

The technical changes were accompanied by awareness raising and hygiene education, which have had as first purpose the improvement of the proper use of water resources and environmental protection for the population itself, which thus contribute to the implementation of the project.

**Beneficiaries:** 45.000 inhabitants.

**Duration:** 18 months (from 2001 to 2002)

**Staff involved:**

Expatriates:

-1 project manager.

Premises:

- 10 people (topographer, engineer, site foreman, accountant, plumber, foreman, etc.)

- About 50 people involved (labourers, workers, warehouses workers, drivers, entertainers, guardians, etc.).

**Local counterpart:** Gatsibo District.

**Donors:** MLFM and AVSI private funds.

**Name: Gicumbi aqueduct (UE)**

**Type of aqueduct:** vertical pumping water supply.

**Description:** The project, which was funded by the European Union, is located in Gicumbi District. The areas of intervention are: hygiene, preventive health, family and environment.

**Activities:** Our work involved the construction of two facilities:

- A pumping station capable of powering the aqueduct of Nyamabuye using the natural energy produced by Mubuga waterfalls.
- The rehabilitation and upgrading of the distribution network of the aqueduct of Gisiza.

The technical changes were accompanied by awareness raising and hygiene education, which first purpose was the improvement of the proper use of water resources and environmental protection for the population itself. The latter thus contribute to the successful implementation of the project.

**Beneficiaries:** 28.000 inhabitants.

**Duration:** 3 years (from 2007 to 2010).

**Staff involved:**

Expatriates:

- 1 head engineer;
- 1 project manager expert on educational and social sector.

Premises:

- 15 people (topographer, engineer, site foreman, accountant, plumber, foreman, etc.)
- About 250 people involved (labourers, workers, warehouses workers, drivers, entertainers, guardians, etc.).

**Local counterpart:** Gicumbi District.

**Donors:** UE (*European Union*).

<b>Name: the great aqueduct of Byumba (MAE)</b>
<b>Type of aqueduct:</b> vertical pumping water supply.
<b>Description:</b> the project was born from the desire to improve the living conditions of the population in the Districts of Gicumbi and Gatsibo, specifically on Rwamiko-Rebero-Humure zones. The areas of intervention are: hygiene, preventive health, family and environment.
<b>Activities:</b> the project provided the construction of a water pipeline of 40 km to distribute drinking water to the inhabitants of the hills of Rubona, Kirwa, Bushwagara, Gisiza and ridges of Kagamba, Muko, Nyabihu and Ngange. This was the main action around which revolved all activities of hygiene education, public health and environmental protection in order to ensure a better quality of life. Overriding was also the education of youth. The project includes, in addition to school support, the provision of teaching materials and the start of literacy courses for adults and young people.
<b>Beneficiaries:</b> 65.000 inhabitants.
<b>Duration:</b> 3 years (from 2007 to 2010).
<b>Staff involved:</b> Expatriates: - 1 engineer; - 1 experienced operator in the socio-educational; - 1 logistics and administrative staff member. Premises: - MLFM and AVSI local staff; - About 200 people involved (labourers, workers, warehouses workers, drivers, entertainers, guardians, etc.).
<b>Local counterpart:</b> Gicumbi and Gatsibo Districts and Sectors of Humure, Rebero, Rwamiko.
<b>Donors:</b> MAE ( <i>Italian Ministry of Foreign Affairs</i> ) and Lombardia Region.

**Name: ESV (Eau Source de Vie – Amazi ni isoko y'ubuzima) The Rutare aqueduct.**

**Type of aqueduct:** vertical pumping water supply.

**Description:** this project aimed to integrate and extend the action of MLFM and AVSI water projects already active in the District of Gicumbi, in order to serve other four neighbouring sectors, especially on Rutare areas.

The entire project was designed to meet the needs of drinking water and sanitation of the inhabitants of the interested areas. Especially it aimed to help the most vulnerable groups such as women (more than half of the total beneficiaries), children in elementary schools and people physically debilitated (HIV-positive patients and others hosted in health centres).

Furthermore, the project contributed to the achievement of the Millennium Development Goals related to water and sanitation (MDG 7): to halve by 2015 the proportion of people without access to drinking water supply and basic sanitation. This action is also the key to reduce child and maternal mortality and to fight against diseases.

**Activities:**

- Rehabilitation of the old water supply of Rutare, with a network of 37.2 km and 33 public fountains
- Construction of 53 new ecological latrines in 4 schools, benefiting 4,093 students.
- Measures for environmental protection: protection of sources and 20,000 new trees planted.
- Sensitization of the population, both actors and beneficiaries from the project: hygiene promotion activities specifically intended for the most vulnerable and needy residents of the rural area.
- Creation of a system for monitoring the spread of diseases: a database monthly updated has been created with data for the diagnosis of cases linked to waterborne diseases. The results of the study are shared with local authorities and made available to them.
- Capacity building of the stakeholders of the project: 84 local workers have been trained and made competent in the matter, so they will be able to manage water infrastructures in a completely independent way.



<b>Beneficiaries:</b> approximately 67,000 people (more than 35,000 are women)
<b>Duration:</b> 2 years (from 2011 to 2013)
<b>Staff involved:</b> Expatriates: - 1 technical expert in water infrastructure. Premises: - 10 people AVSI (social worker, support staff) - 84 people involved (skilled workers, leaders of health, health care workers and driver).
<b>Local counterpart:</b> Gicumbi District
<b>Donors:</b> MLFM and AVSI funds

<b>Name:</b> ESV2 (Eau Source de Vie – Amazi ni isoko y’ubuzima) Cyamuhinda-Kagogo
<b>Type of aqueduct:</b> gravitated aqueduct.
<b>Description:</b> this project has been made possible by the partnership among several Italian associations: MLFM, AVSI, Giuliano N'Abana Association and Futuro Insieme. It aimed to rehabilitate the aqueduct of Cyamuhinda - Kagogo, in Gicumbi District, to improve the living conditions of Rwamiko – Rebero - Humure sectors population.
<b>Activities:</b> - The rehabilitation and upgrading of the distribution network of the aqueduct of Cyamuhinda - Kagogo (11 km) and the construction of a new extension of 3 km. - The aqueduct involves 11 km of water supply, two main tanks and 14 terminal fountains. - Rehabilitation of collection chamber and others structures. - Training and awareness (initial and final) of beneficiaries and population by APH.
<b>Beneficiaries:</b> 12.355 people: the Primary School of Rugaragara, Cyamuhinda Nursery and the Health Post of Cyamuhinda.
<b>Duration:</b> 1 year (from 2013 to 2014).

**Staff involved**

Expatriates:

- 1 engineer;
- 1 experienced operator in the socio-educational;
- 1 logistics and administrative staff member.

Premises:

- MLFM and AVSI local staff;
- About 40 people involved (labourers, workers, warehouses workers, drivers, entertainers, guardians, etc.).

**Local counterpart:** MININFRA (*Ministry of Infrastructure*) and Gicumbi District.

**Donors:** MLFM, AVSI, Giuliano N'Abana Association, Futuro Insieme and Intesa San Paolo Foundation.

## Projects realized by MLFM

Year	Project	Beneficiaries	Aqueduct
1987	Muhura aqueduct	40.000	Water pumping through renewable energy
2002	Rehabilitation Muhura aqueduct	45.000	Water pumping through renewable energy
2003	Bymana aqueduct	12.000	Gravitated aqueduct
2004	Nyampundu aqueduct	6.000	Gravitated aqueduct
2005	Rutare aqueduct	23.000	Water pumping through renewable energy
2006	Cyeza aqueduct	4.500	Water pumping through renewable energy
2006	extension Bymana aqueduct	15.000	Gravitated aqueduct
2007	Rwamiko aqueduct	60.000	Gravitated aqueduct
2008	Gicumbi aqueduct	35.000	Water pumping through renewable energy
2008	Kibungo aqueduct	12.000	Water pumping through a diesel engine
2010	Remera – Byumba aqueduct	12.000	Water pumping through renewable energy
2011	ESV - Rutare aqueduct	28.000	Water pumping through renewable energy
2012	Bukure aqueduct	5.000	Gravitated aqueduct
2012	Bulimbi aqueduct	8.000	Gravitated aqueduct
2013	rainwater reserves in Muhura high school	650	Storage of rainwater
2013	ESV2 Cyamuhinda-Kagogo aqueduct	1.200	Gravitated aqueduct
2014	reserves in St Joseph orphanage of Muhura	200	Storage of water
2014	extension Cyeza aqueduct	2.000	Water pumping through renewable energy

In addition to hydric projects MLFM, in its history in Rwanda, has been designer of others kind of projects:

Area	Project		Year	Beneficiaries
Muyanza	Digital divide.		2009	
	Women development centre and multi-purpose room construction.		2011	
	Nursery building construction.		2014	
	Training to improve of skills and knowledge in handcraft production for the women of the centre		2014	
Muhura	Muhura high school	Digital divided	2009	740 students
	St Joseph orphanage	Dormitory rehabilitation	2012	130 children
		Toilets rehabilitation	2012	130 children
		Nursery building construction.	2012	150 children
		Bio-gas construction	2013	130 children
		Support to children hosted in the orphanage St Joseph Muhura (in partnership with AVSI)	In course	60 children, only for MLFM
Realization of projects to help the reintegration of children in family (in partnership with AVSI)	2014 In course	8 families		
Centre Izere	Room rehabilitation to realize a gym for kids with disabilities		2013	20 children
	Support to children hosted in the Izere centre.		2012 In course	10 children

## Projects realized by AVSI:

<p><b>Increased Care and Support for OVC in Africa</b></p> <p>Rwanda, Kenya, Uganda, Ivory Coast</p> <p><b>2005-2010</b></p> <p><b>Northern, Eastern and Southern Provinces</b></p>	<p>Provide care and support for 12,000 orphans and vulnerable children, their families and communities. Work closely with over 100 community based organizations for direct implementation. Conduct activities ranging from education and health support, to psycho-social care, community development interventions, income generating activities for older youth and families, and capacity building of local partners. Regularize enrolled children’s school attendance, increase capacity of families to provide for the needs of their children, increase access to health services, and improve administration by local partner organizations and associations.</p>	<p>USAID <i>(United States Agency for International Development)</i> PEPFAR <i>(U.S. President's Emergency Plan for AIDS Relief)</i></p>
<p><b>Distance Support Program</b></p> <p>Rwanda-Northern, Eastern and Southern Provinces</p> <p><b>1994-Present</b></p>	<p>Long-term support to over 2,100 OVCs improving the conditions for psychosocial and academic progress, while strengthening the capacity of the children’s families, caretakers and local organizations to respond to their needs. Fulfillment of school requirements (uniforms, books, fees etc), organization of after school recreation and educational activities, and creating of programs designed to improve the economic status of the child’s family through training and support to parents.</p>	<p>Private Donors</p> <hr/> <p>6 local Partners</p>

<p><b>Increase water supply to improve living conditions through Socio-Educational and Environmental Interventions</b></p> <p>3 sectors in Gicumbi District <b>2007-2010</b></p>	<p>Increase availability of safe water and improved practices related to water and hygiene while assuring water supply and access to clean water to the residents of Gicumbi. Create baseline survey and data collection, evaluate the results. Create Public Private Partnership (PPP) technical commission of management and train its 20 founding members. Provide four courses in Global Information Systems management. Training of 100 trainers to conduct awareness campaigns on hygiene, environmental protection best practices and water use. Support to 19 nurseries at local schools. Construction of 20 public latrines in public meeting spaces and markets. Capacity building for 90 community leaders, 18 associations of farmers and cattle raisers, and 36 health/social workers who have given over 900 public awareness presentations.</p>	<p>European Union</p>
<p><b>Improving living conditions of the Rwandan population through environmental, Social and Educational Interventions</b></p>	<p>Increase availability of safe water and improve practices related to water and hygiene. Assure access to clean water to the people living in Gicumbi and Gatsibo Districts by constructing 40 km of new water pipe lines. Use social animation to raise general awareness about basic hygiene, environmental protection and water use. Reforestation along 40 miles of service roads with nursery creation</p>	<p>Italian Ministry of Foreign Affairs</p> <hr/> <p>Ministry of Natural Resources</p>

<p>Gicumbi and Gatsibo 5 sectors <b>2002-2010</b></p>	<p>and training of local workers. Create and distribute 30,000 informational health brochures. Train 30 health workers in conjunction with health care centres. Construct over 50 houses for the most poor, create 5 construction-worker corporative businesses, identify and reforest 50 km<sup>2</sup> of land, identify and support OVCs. Literacy course “on the hills” for 370 adults.</p>	
<p><b>Child Protection Through an Integrated Approach – phase I and II</b>  7 sectors in the Gatsibo District <b>2006-2009</b></p>	<p>Improve community level capacity to care for and protect OVCs. Nurture a protective environment for children through psychosocial training for 60 teachers, social animation in mobile tents, and support to associations which help OVCs including a day-care centre serving over 500 families resettling from refugee camps in Tanzania.</p>	<p>UNICEF <i>(United Nations Children's Fund)</i></p>
<p><b>Community Approach to support people living with HIV/AIDS</b>  Humure, Kabuga and Macubira <b>2002-2006</b></p>	<p>Initiate a mobile HIV/AIDS campaign that carries information, education and voluntary counselling and testing. Decentralize access to all the information needed to fight the spread of HIV/AIDS. Offer individual and group sensitization; videos on health, nutrition and children’s rights; drama, art and games; and reading rooms to encourage literacy. Work with local health officials, to provide free voluntary counselling and testing for HIV/AIDS. Support 18 associations of people living with HIV/AIDS (widows living with children).</p>	<p>WFP <i>(World Food Program)</i></p>

	Provide associations with food and seed kits from several UN agencies, help them cultivate and participate in income-generating activities. More than 100,000 contacts.	
<b>Humure Health and Nutrition Centre</b>  Gatsibo District <b>1998-2009</b>	Funding of Humure Health Centre providing medical assistance to 5,000 people. The Health Centre was later take over by the Rwandan Ministry of Health. Create Humure Feeding Centre which offers supplementary food, the screening of malnutrition and educational support to some of the most vulnerable of the District. As well he centre offered a literacy classes for children, support to mothers association, community garden, and gives nutrition classes.	CBAU <i>(Comunità Biellese Aiuti Umanitari)</i>
<b>Child Protection Circle</b>  Gatsibo District and Gihembe, Nyabiheke, Kiziba Refugees <b>2010 -2013</b>	The project aimed to build capacity of local and refugee communities for establishing and maintaining effective Child Protection systems in 14 sectors of Gatsibo District and 3 refugees' camps.	UNICEF
<b>Akazi Kanoze</b>  Rwanda-Northern/ Gicumbi, Eastern / Gatsibo and Southern	Youth employment and Work Readiness programme, aiming to prepare, in collaboration with Training Centres and schools, young people to work and be able to deliver quality service trough preparedness.	<b>EDC</b> <i>(Education Development Centre)</i>



<p>Provinces/ Kamonyi, Muhanga, Nyanza, Ruhango <b>2010-Present</b></p>		
<p><b>Researches Community Based Child Protection Mechanisms and GBV in the Refugees Camps</b></p> <p>Gihembe and Kiziba Refugees <b>2012 -2013</b></p>	<p>The project aimed to conduct a research on CP practices in 3 refugees' camps and surrounding communities.</p>	<p><b>BPRM, HCR, COLUMBIA UNIVERSITY</b></p>
<p><b>HOPE Program</b></p> <p>Rwanda- Northern / Gicumbi , Eastern / Gatsibo and Southern Provinces / Kamonyi, Nyanza, Ruhango <b>2013-Present</b></p>	<p>This overall programme, is formed by a holistic Package in support for vulnerable Rwandan children and their families. The aim is to support, prepare, and strengthen them in the pathway of personal development, self-reliability, resilience, both at a personal and familiar level. Communities are not forgotten and the action wants to empower them and make them more resilient. This program is constituted by 3 sectors: socio-educational, CP/GBV and economic empowerment of families. Activities are sustained trough different grants and different donors, but the action is harmonized trough coordinated and integrated vision.</p>	<p><b>Different projects ongoing</b></p>

*The purpose of this booklet is to show how MLFM/AVSI method responds to community WASH problems by creating a water supply net in the light of two principles core in today's development projects: sustainability and future reproducibility.*

*This method is based on two interrelated aspects: technical actions (building and maintenance of water infrastructures) and behaviour changing actions.*

*Therefore this booklet will illustrate achieved results and best practices emerged from MLFM/AVSI collaboration to show what, according to us, should be the ideal project.*

## **TECHNICAL PART:**

### **Introduction**

First of all it has to be clear all our projects aim to respond and cannot be implemented without being aware of local needs. It is for this very reason that we work in close partnership with local authorities, which are the firsts to express request of intervention. The studies and the project realization are done according to the District and local authorities' development plans (District Water Plan mainly) and WASAC (Water Sanitation Corporation) ones, which will be the responsables of the future administration.

### **Survey and studies:**

The technical part starts with a survey of the intervention area. The water sources assessment is made during the dry season through weir, theodolite and GPS (*Global Positioning System*). It allows us to know their positions and the flow rates available, in order to start designing the project. Once the position of sources known, the technical planning starts over involving the individuation of water supply net (or rehabilitation if there is an old one).

$$(20 \text{ L per person a day}) * X (\text{N}^\circ \text{ beneficiaries}) + 2,6\% (\text{Annual demographic growth rate}) \times \text{numbers of years estimated} = \text{essential flow rate needed}$$

\*20 L per person a day is the minimum standard supply requests by WHO (World Health Organization);

Studies and analysis are also important to estimate the realizing costs of the project. Once the budget known, we can start the fund raising, targeting different sources: private funds, institutional donors, new partnerships. Studies and analysis are also important in order to assess and determinate the necessary funding. Right after, the research and funding campaign can start over.

### Water Analysis

Water quality study is critical to understand whether the project can be carried out or not. To use a source, we have to rule out the presence of bacteria harmful to human health such as: *Coliformi Totali*, *Staphylococcus Aureus*, *Sulphite-reducing Anaerobes*, *Streptococci faecalis* and *Salmonella*. In order to carry out in-depth analysis on the spot, a small laboratory was set up in the MLFM Byumba office, in full compliance with the EAS (East African Standard, the laws that regulate the parameters for the analysis of water in all the countries of East Africa) standards. The culture mediums for microbial growth, as all the material in the lab, meet the requirements for water analysis in accordance with the law regulating the analysis of drinking water (Law EAS 15-2: 2000). Each analysis is then conducted following the guidelines, for proper testing. The results will be compared with the table of legal parameters mentioned in the same law. The analyses produced in our laboratory, thanks to the respect of EAS standard, are recognized as valid in all East African Community countries.



### Water sampling.

The potability of the water is tested alongside the course of the whole aqueduct: from sources to terminal fountains, it is surveyed so as to rule out any alterations or seepage along the distribution.

## Securing of sources

The securing of sources involves several steps:



*PHOTO: A SOURCE CAPTURED (ESV PROJECT)*

- First of all, the sources are "**captured**" in order to protect them and to permit their conveyance in the **collection chamber**.
- All the area around the source must be protected by a **fence** to avoid future contamination due to human or animal presence.
- The surrounding area is **terraced** to **fight soil erosion**.

## Types of Aqueducts (gravitated and vertical pumping)

Depending on the sources position, there are two kinds of aqueducts systems that can be realized.

### 1) GRAVITATED ACQUEDUCT:

If the sources are in a higher than the water supply net position (where beneficiaries are located) it will be possible to cover the distribution network through a **gravitated aqueduct**. The water from the sources, exploiting the gravity force, is piped into different tanks and then distributed to beneficiaries through fountains.

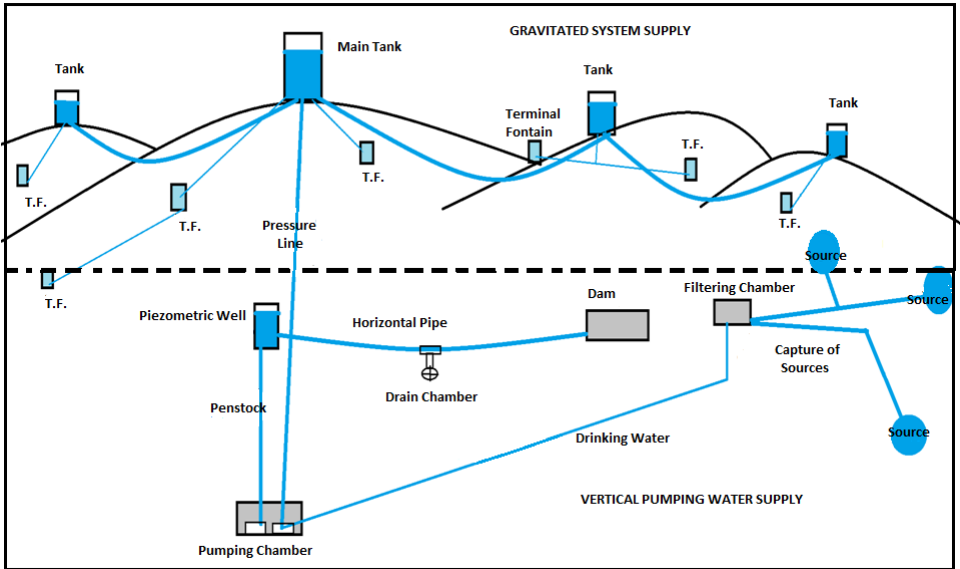
### 2) VERTICAL PUMPING WATER SUPPLY.

When sources are lower than the water supply net position, useful to serve beneficiaries, it will be necessary to **pump water in quota** (meaning to the level of the supply net position), over the whole water supply net. In this case we would have to value every possibility at our disposal. The vertical pumping can be powered in four different ways:

- solar energy,
- electric energy,
- fuel engine;
- hydraulic movement (**turbo pump**).

Once water has been pumped and it has reached the main tank, situated above the whole supply net, it is distributed through a gravitated system.

All these solutions have different costs and are not always realizable. The best one, in terms of long-term costs and future sustainability is the **vertical pumping system powered by hydraulic movement**.



*(Scheme of a vertical pumping water supply).*

## Infrastructure realised in case of vertical pumping through hydraulic movement

We have just exposed the two main systems to supply water to our beneficiaries. As previously said, the best solution according to us is the vertical pumping through hydraulic movement. Hereby follows the explanation on how to build a sustainable water supply net by a vertical pumping system, moved by hydraulic power.

### Filtering chamber

First step, as water comes out from the collective chamber, is channelled into the **filtering chamber**. Quartz and travertine filters are crucial to clean water from solid materials suspended in diameter course and correct the water PH, as well as safeguard the pump and metal pipelines.

Water, which comes from sources, flows through an oxygenator and enters into the **first** of the four basins that compose the whole filter.

Once the water has decanted in the settling basin, it passes through the **second one**, filled with fragments of **quartz** of different diameters, to be further filtered. From a hole situated in the lower part of the second basin water flows in the **third one**, filled with pieces of travertine. The **travertine** is a limestone with many proprieties: it increases pH and alkalinity and regularizes hardness and improving potability characteristics of water.

The **forth** and latest basin is named **load tank**. From here water flows out to the pumping chamber, by a pipe collocated in the middle of the basin.

### **Debate on chlorine**

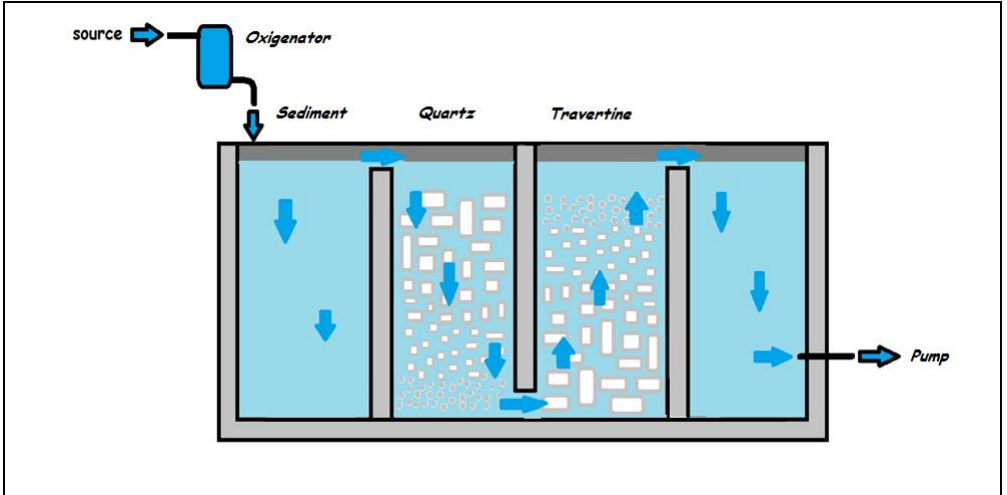
This issue is lately matter of debate. Although it is used to disinfect water, its employ can provoke side effects for health.

As we have already said the travertine filter corrects the water pH and reduces the bacterial load. This is possible thanks to a bacterial film, naturally created around the fragments of travertine, able to eat harmful bacteria.

As a result of this process, the water quality is improved. Furthermore, the cooperative or the enterprise (PPP), responsible for the future administration of aqueducts, constantly verifies the water quality through laboratory analysis (see below).

This is the main reason why we prefer to avoid the addition of additives such as chlorine. Its presence, if it is not kept under control, could become damaging for consumers. Furthermore, among all alternatives, the filtering chamber is the most sustainable solution both in terms of bio (no additive) and in terms of future management (see below). Although the construction cost of this chamber is higher compared to other solutions, from a long term perspective, it is cost effective, easier maintenance and healthier. Chlorine adding needs daily monitoring and adjusting, on more aqueduct spots. Moreover, quartz and travertine are local materials. During water fetching, since we don't use chlorine, beneficiaries are sensitized on how to clean the recipients and keep water clean

by the turncock. Most of them are as well beneficiaries of the awareness campaigns (see below).



## The Dam Construction

Once in the pumping chamber, what do we need in order to pump water? In the case of a vertical pumping through hydraulic movement we need another big source of water, as a river, located in a higher position than our pumping chamber. This water stream, suitably channelled, will activate the turbine which then will transmit the movement to our pump. To realize the whole process we need several facilities described here below.

The **dam** is the first facility we find in a water canalization system. In the following panel, all works realized in order to complete the dam.



1) estimation of the area:

- topography and geomorphology of the site;
- assessment of available water resources and energy potential;
- site selection and basic scheme of the system;

2) terracing;

3) elevation of the dam wall;



*PHOTO: ESV DAM*

*PHOTO: ESV  
DAM*



**Parameter of the dam;** creation of an inclined plane adjacent to the main wall of the dam. This has two purposes:

- To reinforce the main wall of the dam increasing its resistance,
- To facilitate the outflow of water from the overflow.



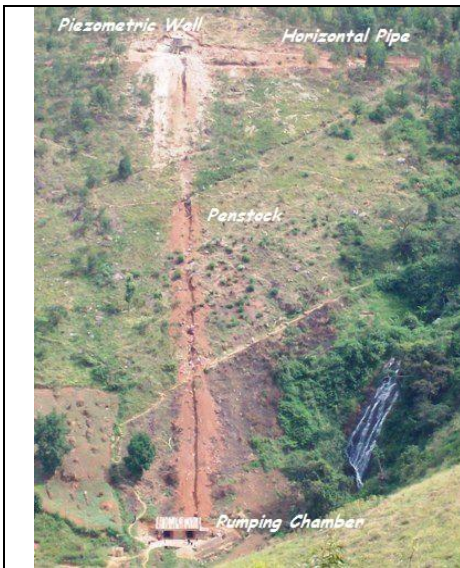
- 4) construction of **sediment trap**;
- 5) wall to protect **valves** necessary to dry the dam.
- 6) wall to protect the whole dam facility (wall, basin, etc.) from possible landslides.

## From dam to pumping chamber

To produce energy, the water stored in the dam has to be channelled in the direction of the turbine. The **turbomachinery**, by exploiting the jump, collects the kinetic energy and the enthalpy of the fluid turning it into mechanical energy. The **turbine**, with the aid of a belt, then, transfers the mechanical energy to the pump that will be able to pump the fluid *in quota*.

Between these two points (dam and pumping chamber) there are other facilities, everyone essential for the good functioning of the pumping system.

Starting from the dam we find the **horizontal pipe**, a duct which brings water from dam to **piezometric well**. In the lowest position of this duct (but this is also for all the other ducts in the supply net) we find a **drain chamber**. The latter is useful in case we need to drain the pipe to clean it or in case of a fault on the line. The piezometric well, situated at the end of the horizontal pipe, has two main purposes: firstly it serves to storage water; secondly it's used to retain each type of material that can damage the turbine. From the piezometric well to the pumping chamber, the water is guided by **penstock**.



In the photo is clear the work for the construction of the horizontal pipe (at the top right) and the piezometric well.

From the Piezometric well to the pumping chamber (lower) it is visible the **penstock**.

*PHOTO: MAE PROJECT*

## Pumping chamber

In the pumping chamber are collocated both the **turbine** and **pump** and, at the same time, it is the meeting point of the two canalizations: the one we use to produce energy and the one with the potable water. As previously said the water coming from the dam system moves the turbine that transmit the rotary motion to pump that will push the potable water in quota to the **main tank**.

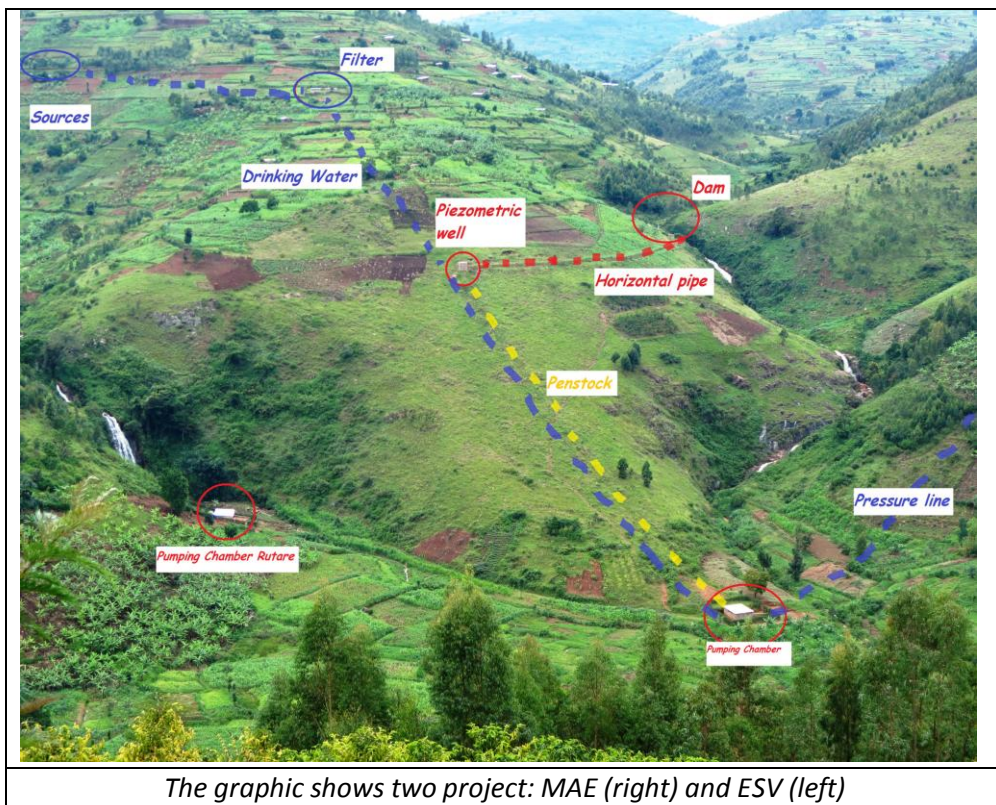


*PHOTO: PUMPING CHAMBER (ESV project)*

Water, once used to power the turbine, is released and can return to its natural course.

## Pressure Line, Main Tank and Gravitational Distribution

From the pumping chamber, water is pumped in quota to the **main tank**, flowing through the **pressure line**. This is the only **steel pipe** of the whole aqueduct and this is justified by the high pressures (that in our case can reach up to 50 atmospheres). To avoid and prevent the water hammer, every 12 metres the pressure line is provided with **cement anchor blocks**.



Once the potable water has reached the main tank, it will be dispensed by the gravitated system. The water supply net will bring water to beneficiaries, passing through other facilities such as:

- **secondary tanks:** usually situated at the top of hills on secondary distributions and nearby public structures;
- **drain chambers:** situated in the lowest part of pipes, useful to drain them in case we need to clean or repair a part of aqueduct.
- **vent valves:** to avoid the formation of air bubbles that can reduce the flow rate of the aqueduct;
- **chamber branch:** to contain valves;
- **balance chamber:** for the pressure control.

## Terminal Fountain

Each **fountain**, shown as **TF** (Terminal Fountain), is equipped with two taps in order to make it accessible to more than one person simultaneously. With this system it is possible to fill a tank (jerry can) of 20 liters in about 1 minute, making acceptable the average time to wait. The fitting is fully galvanized steel, with no filters or plastic seals. Given the high frequency of use, there is no stagnation of water in the structure that may generate a biofilm, ideal environment for bacterial growth. Inside there is a water meter, which is used by cooperatives to monitor consumed water and determine payments (small amounts in order to constitute a fund for maintaining and repairing the structure-cooperative managed).



*PHOTO: FOUNTAIN PROJECT (Bulimbi-Rebero)*

## Control of erosion and protection of the structures

Another important step to preserve the structures over time is to make sure that there are terracings avoiding soil erosion, therefore preventing soil collapse which will seriously damage the action.



*PHOTO: Terracings around the ESV dam*

*PHOTO: particular terracings around the ESV pumping chamber. They protect the chamber and, at the same time, allow to the rain to flow on the ground*



## Human component of the project

### *Capacity Building of local staff*

During the work, the staff employed (regardless of their position) acquires and improves knowledge and skills useful in the future; both for the project management and to become self-employed in the labour market. Some of them have hereafter created two cooperatives and one enterprise (PPP) responsible for the management of water supplies.



Mr Mathias Premis the turbine maker, directly arrived from Italy, is training future managers of the pumping system.

*PHOTO: MAE PROJECT*

In our projects, the workers build tanks in reinforced concrete unlike the traditional ones, made in brick or stone.

*PHOTO: BUILDING A CISTERN ( UE PROJECT)*





*Future administration (the PPP approach: District, MININFRA, WASAC, private enterprises and cooperatives)*

At the end of construction works, the project becomes ownership of the District and WASAC. In addition to facilities, the material used during construction and useful for future maintenance will be donated to the District. For management and maintenance, the aqueduct is assigned to a cooperative on the basis of a previous territorial division, and call for tenders. Three cooperatives and a private enterprise have been formed thanks to the expertise acquired by our workers: COGEP, KIBUNGO COOP and PAAK KAM. As a norm, during the first phase of the project (1<sup>st</sup> year approximately) we focus on the construction, but already from the second phase (2<sup>nd</sup> year approximately) a small part of the water distribution is operational. At this time the training of plumbers that will later be assumed by the cooperative management is a priority.

## **SOCIAL COMPONENT**

### **Social component of the project**

WASH (Water Sanitation and Hygiene) activities help to reach more than one of the MDGs (Millennium Development goals).

In fact the WASH programs contribute to the reduction of: child mortality, diseases linked to lack of hygiene, basic education, it plays a role of maintaining a sustainable environment, gender equality and poverty reduction.

Water supply and sanitation progress normally advance the MDGs target 7c: halving by 2015 the number of the population living without access to safe drinking water and basic sanitation services.

Building water and sanitation facilities is essential, but it's not enough if populations do not fully understand the benefits of it, or the correct use of it.

And results would have a small impact if people do not apply the correct behaviour in hygiene and treat well the sanitation facilities; either in domestic environment or in public areas, like schools.

Indeed not everybody knows that the simple act of washing hands with water, at “critical times” (like before preparing food, eating, breast-feeding an infant, cuddling a child and after having used a latrine) reduces diarrheal disease by over 40%!

Promoting hygiene and sanitation aims to show the importance of public health by providing knowledge about the correlation between disease and personal hygiene.

That is why AVSI / MLFM sets up an important component of promoting hygiene and sanitation through awareness campaigns. The latter are based on the knowledge of communities, culture, beliefs and hygiene habit. Risk perception, and the availability of infrastructure are also taken into account for a better understanding of the behaviour, and therefore have a substantial impact.

Behaviour change is crucial to the success of the project for durability matters, as a community learn of the risks related to poor hygiene which surely engage it more in the maintenance of infrastructure, proper use of water, and in behaving correctly which perpetuate the action.

## **Sensitization**

### *In public arena*

In collaboration with partner-schools of our intervention area, sensitizations days such as the "Green Days" and "Good action days" are performed directly in schools and in families of children identified at the school level as particularly vulnerable.

Awareness sessions are conducted in other public places such as trading centre or in occasion of the meetings held by local authorities and the population, or

during community service (Umuganda) as well as in water collection points. These sessions focus on the fight against diseases related to dirty water and lack of hygiene and sanitation. These awareness campaigns are organized together with Community Health Workers, members of hygiene and sanitation clubs and the Social Workers.

*Animations in schools via “Good Action Days” and “Green Days”*

School has an important role to play in conducting awareness sessions, since it occupies a central place in the community, and right after the family, it is the place of learning for children.

However schools are a place of development and transmission of disease. Therefore it is essential, with different methodologies, to encourage students to learn how to keep clean the school environment, and do the self hygiene. The collaboration of teachers and parents is required. Students appropriately sensitized, they are not only cleaner or ensure the cleanliness of their latrines, but they also become responsible, and this attitude will prevent the diseases related to poor hygiene.

- Green Days: in schools:

The Green Days are an opportunity to enhance children’s knowledge of changing the behavior to fight against diseases linked to dirty water and poor hygiene and sanitation, with a hint of environment respect and awareness. Green days are important because children are also vectors of knowledge transmission, transferring it to their community.

During these days, facilitators organize and perform activities related to the sanitation as cutting the bushes, planting flowers, cleaning toilet and the school. These practical activities are part of the awareness sessions made by Social Workers in collaboration with students of partner-schools which are members of Hygiene and Sanitation clubs.

It is also the opportunity to distribute materials useful for WASH activities, such as jerry cans, scrapers, brushes, watering cans, shovels, hoes, tridents, basins, water tanks to collect / gather rain water for hygiene school etc.

- Good action days: in households

Those days are similar to the Green Days but they take place in the vulnerable households identified with the help of schools.

Those are visited by student members of Hygiene and Sanitation clubs, throughout the day activities related to WASH are held. Equipment is provided for the practical activities and demonstrations that take place such as the plantation of gardens and vegetable or shelves to display plates and kitchen equipment, boil water to drink etc, waste treatment and compost, the hand washing system.

## **Follow up on sanitation**

### *Epidemiological monitoring in Health Centres*

In collaboration with our partner-Health centres, software has been designed for the storage to process cases of patients' data analysis of waterborne-diseases.

This database has enabled the production of regular reports identifying what and where problems related to hygiene and sanitation were. The immediate result is the chance to orient and target awareness activities. To facilitate this activity and the necessary use of computers, health centres have been equipped with solar panels and batteries. Training for Health workers has been provided.

Although these data base concerns all the target population of the Health Centre (compared to which the beneficiaries of the action are smaller in numbers), it is nonetheless useful in understanding and analyzing every minimum impact of our action on or-fecal diseases, by crossing the given data with other kind of data (MLFM/AVSI tools reports and database, cooperatives reports, information given by authorities).

### *Home visits in the most vulnerable households (hygiene and sanitation)*

In collaboration with Community Health Workers, home visits in the most vulnerable households were made. This is with the dual purpose of awareness, and to monitor the progress made by the latter, and see if people take ownership of the content.

A **tool to monitor and evaluate health and sanitation in households** was developed to measure the effects of awareness sessions on the behavior of recipients/beneficiaries. This tool helps to assuredly have a clear and precise picture of the household before/beginning the project and to ensure the progress made throughout the intervention.

## **Sanitation**

### *Construction of latrines in schools, public places and in the most vulnerable households*

- Construction of latrines for schools (public latrines):

As part of the promotion of hygiene and sanitation, and improvement of sanitation in the fight against water-borne diseases in schools, the introduction of proper latrines is essential. They must meet the hygienic and sanitary conditions to safeguard the health of children / students and all users of the school.

The type of ecological latrine are recommended , compared to others types of latrines, because besides the fact that they meet the health and hygiene standards, they allow the exploitation of waste (urine and hard waste) which are used as manure after a minimal period of storage (necessary for the elimination of bacteria's).

Moreover this method improves the productivity of vegetable gardens in schools through the use of the obtained manure.

- Construction of individual latrines (in the most vulnerable households):

As done in schools, the aim is to improve sanitary and health conditions of vulnerable households. In addition, using the same latrine system of schools, families also can improve the performance of their fields or vegetable gardens using waste as manure.



Ecological latrines.

This “green model” of latrines is designed to allow the separation of urine and droppings. The firsts are used as fertilizer: 1 liter of urine diluted with 5 liters of water; while the seconds, once dried, are used as fertilizer. This

system also allows the quick snapped feces.

*Training in hygiene and sanitation for the local authorities (health facilitator and hygiene and sanitation workers) and schools (hygiene and sanitation clubs)*

As far as capacity building of stakeholders’ Key Project is concerned, we work in close collaboration with experts in organizing training sessions on hygiene and sanitation. By participating to those sessions the beneficiaries (Community Health Workers, Health staff of HC) strengthen and improve knowledge in the fight against water-borne diseases as well as those related to poor hygiene. Mainly they learn to appropriately own and independently manage project activities once the action is finished. Their role is indeed to sensitize the communities and spread the word, on order to strengthen knowledge and increase good practices.

The beneficiaries of the training are trained on PHAST (*Participatory Hygiene and Sanitation Transformation*) method based on active participation in the sensitization.

PHAST is a communication methodology. Behaviour changing in WASH is the main goal of this approach. Every participant (different by age, gender, social status, employment, etc.) is called to pro-act and give a specific aspect to this method. It consists mainly in:

- Problem knowledge and sharing
- Problem analysis
- Identifying solutions
- Choice between different solutions identified
- Planning of new actions for behaviour changing
- Planning of evaluation activities
- General evaluation of achieved goals.

## **How to ensure sustainability?**

### *Future administration: the PPP*

A Technical Committee of District (Public Private Partnership) has the purpose of preparing the invitations to tenders and to represent beneficiaries, which in terms of social equity ensures the public access to water. Moreover it coordinates management's activities and actions carried out by a single person or a winning cooperative.

The committee is composed by:

- Executive Secretaries or Agronomists Sectors of intervention
- The responsible of infrastructure at the District level
- The Vice Mayor of Economic Affairs,
- The representative of Community Leaders (most influential)
- The representative of the Executive Secretaries of the villages in each sector of intervention.

## Capacity building

*Cooperatives/ infrastructure management companies (cooperatives organization, financial management and conflict management).*

The training of cooperative members and civil society organisations, has the goal to make them capable to monitor the activities of the project, after its implementation.

The topics to be addressed are:

- Organization of Cooperatives
- Financial management of Cooperatives
- Conflict management

*Training of Health Centres data managers*

As responsible of data entry of CS, data managers are trained to use data base, to write reports and to convey strategic information to the health facilitators as well as Water and Sanitation moderators.

*Management of the finished work*

In order to assure sustainability, we plan in the future to train communities and local authorities on how to keep, rehabilitate, and use infrastructure, in order to ensure the maximum recommended safe exploitation of utilities.

*Support of the new cooperatives for their legalization*

New management cooperatives are strengthened as mentioned above and supported until the legalization of their status.



# CROSS CUTTING ISSUES

## Gender and Child Protection

Water and sanitation projects ‘mainstream’ gender through two dimensions: the differences in needs and priorities of women, men, girls and boys that arise from their different activities and responsibilities; and the inequalities in access to and control over water resources and access to sanitation services. Women and children in developing countries bear most of the burden of carrying, using and protecting water.

Children often suffer from this burden and fetching water causes excessive labour that lessens school attendance and eventually, school dropout, especially during the rainy season, when the distance to access clean water is multiplied.

Moreover fetching water exposes women and children to protection issues, such as attacks and sexual aggressions. The health of children is also seriously put at stake by oro-fecal diseases due to poor hygienic conditions. The lack of safe, separate and private sanitation and washing facilities in schools is one of the main factors preventing girls from attending school, particularly when menstruating.

As for women, they have the most responsibility for environmental sanitation and home health. Caring for sick children adds to the already heavy workload of women and girls. Pregnant women have sanitation-related hookworm infections that pose a considerable health topic.

For all this reasons, Gender and Child Protection (CP) must be mainstreamed in our program. **Gender mainstreaming is the action aiming to achieve gender balance, such as more equitable task sharing. CP mainstreaming has the aim to protect children against violation of their rights (education, health, protection, low labour in domestic environment, etc).** An integrated approach to water and sanitation recognizes Gender differences and the disparate priorities they create for women, men and the youngest.

Given the present roles of women in water and sanitation, their active involvement and empowerment is needed for water and sanitation efforts to be successful – and without further adding to their burden.

The goals of MLFM/AVSI WASH projects cannot be met without the full participation of women. As managers at the household level, women also have a higher stake in the improvement of water and sanitation services and in sustaining facilities.

To promote the equal rights of women and to support their full participation in implementation of the project, MLFM/AVSI wants to consider Gender in all cycles of developing, planning, implementing and evaluating of the program. This effort begins by identifying the gender gaps met on the field, continues by an accurate check of gender balance in the selection of beneficiaries, and always considers the gender in the staff selection.

Gender engagement needs, in the implementation phase, continuous involvement of women within the communities, and strenuous attention to the respect of women and children rights (in fact, sensitizations on small children fetching water will be strengthened).

Achieving gender balance often calls for meeting the practical needs and interests of women and children more effectively - such as better access to water to reduce their workload - as well as meeting strategic gender needs and interests - such as including them in community decision-making, leading eventually to improved sustainability of the action.

## **Environnement**

Measures are taken to mitigate the impact of the projects over the environment, water sources and groundwater, as stabilization of the soil, tree plantation on hills, as well as water and sanitation.

# OUTCOMES

## Number of beneficiaries

The 3 project beneficiaries of water facility established in Gicumbi by the consortium of AVSI-MLFM are 82,374

## Sustainability Energy efficiency

Every aqueduct, especially the ones which use turbo machineries, has been designed in order to avoid waste and to guarantee an energy saving in time.

The table below shows how over the time the projects carried out on the basis of the model explained, they were able to serve a large number of beneficiaries and at the same time, allow to the community a substantial savings in terms of both energy and money.

Project	Beneficiary sectors	costs in €	Saving produced by turbo pumping system					Daily saving FRW	Monthly saving FRW	Annual saving FRW	beneficiaries with 20L per day
			year	Km	water pumped per day	energy produced in kW	WaSac costs for unit (kw) in				
Muhura	Muhura,	1.000.000	1.992	60	302.400	32	180	138.240	4.147.200	49.766.400	15.120
								-	-	-	-
UE	Nyamyaga, Ruvune, Rukomo	1.800.000	2.012	50	388.800	30	180	129.600	3.888.000	46.656.000	19.440
								-	-	-	-
MAE		1.300.000	2.012	50	345.600	35	180	151.200	4.536.000	54.432.000	17.280
								-	-	-	-
ESV	Rutare	650.000	2.013	37	259.200	33	180	142.560	4.276.800	51.321.600	12.960

# TESTIMONY

During the visit, the beneficiary family shared with us of their past which was full of desperation since they had no house materials and means of surviving, and they would feel the isolation due to the community ignorance of their own existence. Since no one was concerned of their matters, they thought that there was nobody else who would approach them. In such a situation the mother apparently had no mean of either bathing or taking care of herself and her children as well as her house in general; at home they used the water lake and would drink it without boiling it. In terms of hygiene, she explains; how the project helped her and how we found her. Today, her house is clean, the entire family shower and dishes are well clean and arranged. Their family no longer feel isolated or rejected by the society like before since their past hygienic was poor thus their stigmatization in the community.



aying a visit to the beneficiary family

The table to display the kitchen dishes



## Testimonies of beneficiaries

Dyna YANKURIJE is a young woman aged 23. She has been married for a year and three months now, but has no child. She lives in Nyamiyaga Sector in Gicumbi District. She is a unique child and lives with her mother. Her father abandoned them.

Dyna has not completed primary school because she had to stop in the sixth year for lack of financial means. She has looked at ways to live without result, for



three years. In 2008 when construction activities of a water supply by hydro

pumping funded by EU began in the region, Dyna was very interested in the project activities, including the construction of the dam.

And project managers first assigned her the task of making the reliever and it was her who was responsible for managing standpipes and check if they were built gradually and measuring them. Then, because of her awakened mind, she was fortunate to be hired to work as a mason for the construction of the water pumping station. She used to work before noon and in the



afternoon; she learned masonry performing other activities related to construction such as the roughcasting. Her ambition was to have more skills in construction trade to reach the status of regular mason. She achieved that and became mason afterwards. Since the month of June 2012, she was certified as a mason and got a contract with a higher salary.

Thanks to the project, today, Dyna lives two minutes far from the water fountain, while before she had to make a three hours round trip to fetch water, and the water was not clean.

In addition, through her work as mason, she was able to put money aside to develop personal projects. Thus, with her savings she was able to buy her first three goats and a cow after which has given birth to a calf. And when her husband was in peace mission outside the country, because he is a military, she was able to contribute to the construction of the house in which they live. Her contribution has been both financial and physical, in addition to knowledge and skills she gained on the job. Indeed, she is able to perform construction work by herself and she is the one who has made the paving of their house.

She also acquired the skills to maintain their health and taking care of the water used by preserving it from impurity and dirt to avoid catching diseases such as worms she used to catch when she went to draw the water to unprotected sources and drank dirty water. The next step in her life is to make a baby and raise her healthily.

Through her encounter with water projects developed by AVSI / MLFM, Dyna won a second chance in life. She became aware of herself, gaining self-esteem and confidence to be a useful person to herself, her family and to her community.

What she is today is not the result of a single act of charity, but of an active and reciprocal cooperation, and in respect of the value and the dignity of each person.

Dyna illustrates the implication we want to give to the sustainability of an intervention which has its foundation in human conscious of itself and resilient, and who in turn can share and spread what she won. As for us, when we return, it will not be to sign an employment contract but to sign partnership agreement with her. For her sisters, Dyna proves that nothing is impossible! From her status as a vulnerable child without education and abandoned by her father, she is now a proud and fulfilling woman, and an essential resource taken into consideration in society

### *To the final destination*

Mukandeze Beatrice is a woman aged 36 who lives in Gicumbi District, Rutare Sector. She is separated from her husband who abandoned her about 10 years ago to go back to Uganda where he came from. She is the mother of 6 children, whom the eldest just gave birth. Among her children, 3 are secondary school level which requires paying school fees.



Since her husband left her, she is the one in charge of the needs of the household of 8 people. She lived in harsh conditions and was considered a vulnerable person. She lived with the little money she earned by the cleanliness of the store fronts, and the general market - about 15,000 Rwf (+ / - € 19) per

month - which was not sufficient to meet the needs of his family. To help while preserving his dignity, COOGEP, the association of technicians working with AVSI/MLFM for the construction of water supply, intervened so that she can have extra work.

Another reason why Beatrice was chosen to manage the fountain is that as a person involved in the maintenance of cleanliness, she has a greater awareness of the importance of hygiene to maintain good health. And indeed, she never accepts to serve a customer who has a dirty jerrycan, without adequate cover (some people with jerrycan sealed with plastic bags or herbs pressed into the neck of the container) and she does not hesitate to give advice and lessons on hygiene and sanitation.

Since June 2012, she was assigned the task of making the recovery and management of the fountain which is at market Rutare. This fountain is among the 33 fountains, parts of the water supply restored in the project ESV, and which had already been rehabilitated by AVSI / MLFM as part of a project funded by the Italian Ministry of Foreign Affairs.

For this work, she is paid on a percentage basis calculated on the deposit made to the manager. This work has allowed her to meet some basic needs of her household: before it was difficult for her to pay school fees for the three children who are in high school, but now the problem is alleviated thanks to the income she generates from her work that increased the financial entries from Rwf 15,000/month for a minimum of 25,000 Rwf (32 Euro)/month as the minimum monthly deposit she does to the manager is amounted to 50,000 Rwf (+ / - 63 Euros)/month, on which she receives 20%.



## WAY FORWARD

Here below are listed some projects under development and in anticipation of necessary funding, in order to proceed to the implementation phase.

From the aqueducts of Rukomo, Kageyo and Murama - Bukure that require a pumping system to raise the water reservoir above the main distribution net, to gravitated aqueducts located in the area along Lake Muhazi.

<b>Name: rehabilitation aqueducts in the area of MUHAZI lake</b>
<b>Type of aqueduct:</b> gravitated & vertical pumping water supply.
<b>Description:</b> there is the need to rebuild and rehabilitate five aqueducts distribution located in the area of Lake Muhazi. For each aqueduct the existing deployment has already been studied the existing deployment in order to understand what is possible to rehabilitate and what we should re-build from scratch. We are currently analyzing the composition of the catchment area, how many schools, hospitals; farms are served by each project in order to estimate accurately the number of beneficiaries and the quality of the actions to be taken.
<b>Activities:</b> <b>1) Bukure-Karagali-Nyanza:</b> <ul style="list-style-type: none"><li>- Type of aqueduct: Gravitated System (rehabilitation);</li><li>- Extension: km 18;</li><li>- Budget: 213.770.000FRW;</li><li>- Duration: 12 months;</li></ul> <b>2) Karushya-Ruzizi:</b> <ul style="list-style-type: none"><li>- Type of aqueduct: Gravitated System (rehabilitation);</li><li>- Extension: km 11;</li><li>- Budget: 176.845.000FRW;</li><li>- Duration: 10 months;</li></ul> <b>3) Nyakagezi-Rwesero:</b> <ul style="list-style-type: none"><li>- Type of aqueduct: Gravitated System (rehabilitation);</li><li>- Extension: km 4,5;</li><li>- Budget: 70.667.000 FRW;</li><li>- Duration: 4 months;</li></ul> <b>4) Murama-Bukure:</b> <ul style="list-style-type: none"><li>- type of aqueduct: Vertical Pumping by Electric Energy (construction);</li><li>- Extension: km 65;</li><li>- Budget: 1.160.000 FRW</li></ul>

- Duration: 36 months

#### 5) Bureranyana-Ruzizi:

- type of aqueduct: Gravitated System;
- Extension: km 19,5;
- Budget: 222.989.000 FRW;
- Duration: 10 months;

#### **Name: Building aqueduct in Kageyo**

**Type of aqueduct:** vertical pumping water supply (By electric power)

**Description:** the following project is born from the need to create a distribution that can cover the daily requirement of water of refugees hosted in GIHEMBE REFUGEE CAMP and the population which lives in the vicinity.

Thanks to the initial proposal made by the ARC (*American Refugee Committee*) and by the close collaboration born from these first steps, we are currently finishing the final presentation of the design.

This aqueduct will supply 30000 direct beneficiaries: of these, 15000 are refugees who live in Gihembe Camp while the others are people who live in the surrounding villages. To these we have to add the 70000 inhabitants who live in Byumba: these suffer for the reduction of water due to the daily removal of large volumes of it destined to the camp.

#### **Activities:**

in this case the project involves the capture of the waters of the many sources located in the valley of Kageyo hill. Once filtered, the water source will be pumped at high altitude in two main tanks that serve the refugee camp (main reserve) and surrounding areas.

The entire pumping system will be made possible thanks to the extension of the power line located in the city of Byumba.

#### **Name: building aqueduct in Rukomo**

**Type of aqueduct:** vertical pumping water supply by hydraulic movement

**Description:** we are currently designing a project s the project for the construction of an aqueduct in the area of Rukomo, in which, there is a waterfall suitable to power the turbine for the pumping plant. This system would solve the serious problems of the local population who lives in the hill and that it doesn't have any kind of water supply: women and children are forced to get water from a source through contaminated swamp and hygienically unhealthy.

*Our intervention aims to create a healthy environment to the populations of our intervention zones. This is done through our partnership which, transmit to our beneficiaries habits to conduct a healthy life and give them the tools for it.*

*Now, according to our mission, and taking into account that:*

- We deeply believe that every single organization and individual has the added value that should be placed at the service of the most vulnerable communities*
- We look for challenges that can improve our professionalism and expertise.*

*We hope that trough these sharing of today, fruitful synergies bringing together every stakeholders as authorities, beneficiaries, donors, engineers... can take place to continue the path started and consolidate the results reached until now.*

**Space for notes.**















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