

IR 7

## Field Survey in Iringa Municipal for Identification Sensitization and Selection of Potential CW Adopters

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VLIR UOS South Initiatives 2011-2013  
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## Dissemination of the Sustainable Wastewater Technology of Constructed Wetlands in Tanzania

Knowledge Network Present

### Field Survey in Iringa Municipal for Identification Sensitization and Selection of Potential CW Adopters



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## **AGENDA and ENVICON**

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## **ABSTRACT**

This report focuses on the identification of possible schools that were willing to adopt the CW technology in Iringa Region. A field survey was conducted by AGENDA, ENVICON and WWS staff to Iringa Region schools for the identification and selection of possible adopters. During the survey, the sanitary and hygienic situations of the visited schools were observed, recorded and they act as the determined factors for CW technology adoption. The criterion for selection of visited schools relied on the type of schools whether it was Boarding or Day school, and priority were given to boarding school due to the number of students available and amount of wastewater generated (since wastewater was our main target)

Out of the schools visited, Lugalo High School and Iringa girls secondary school showed the willingness to adopt the CW technology, the push for immediately need for CW technology from these schools was due to the sanitary and hygienic problems phasing them and the high cost of dealing with these problems due to frequently emptying. In Lugalo secondary school the sanitary problems were due to exhaustive and overloading of wastewater management system, the amount of wastewater generated is greater in comparison to system capacity, whereas in Iringa girls secondary school the sanitary problems were due the presence of high amount of wastewater than the system capacity hence caused overloading, overflowing and frequently emptying. Both schools had enough land area for construction of CW

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## ACRONYMS

AGENDA	AGENDA for Environmental and Responsible Development
CDTI	Community Development Training Institute
CW	Constructed Wetland
ESS	Ebeneza Seminary School
EfSS	Efatha Secondary School
CGSS	Cagliari Girls High School
IGSS	Iringa Girls Secondary School
IR	Intermediate Result
IRUWASA	Iringa Urban Water and Sewerage Authority
LSS	Lugalo Secondary School
NGO	Non Government Organization
WWS	WWS Design and Development Co Ltd

## **CHAPTER ONE**

### **1.0 Introduction**

#### **1.1 General Introduction**

The “Dissemination of the Sustainable Wastewater Technology of Constructed Wetlands in Tanzania” is the project that is considered as part of a wider project with the overall goal to formulate evidence based holistic sanitation service chains in low income countries that will be easy to understand and use. This project will offer the opportunity to gain experience in a methodology also suited for other sanitation service chains in developing countries like Tanzania. The two Tanzanian NGOs, AGENDA for Environmental and Responsible Development (AGENDA) and ENVICON are the main implementing partners of Immediate Results number 7 (IR7) activities/tasks of the project under the leadership of Dr. Annes Mahenge. The tasks involved in IR7 include the following: Inventory of CW adopters - Stakeholder analysis; Develop guidelines for sanitation service chains; Preparation of dissemination materials; Publication of papers and articles and Updating project websites; Organize Stakeholders workshop in Iringa and Reporting. As part of implementing their tasks, the two NGOs conducted a field survey in Iringa Municipal on 5<sup>th</sup> to 7<sup>th</sup> December 2012 for sensitizing prospecting users of CW particularly selected schools on CW technology and to conduct an inventory of potential CW adopter including identification of school (s) which will be willing to adopt and install the CW facility at the cost sharing (self help) basis. The main deliverable from this survey is the detailed particulars of the identified and visited school(s) that are likely to adopt, install and use CW. The information gathered during the survey will be also used to facilitate the process of stakeholder analysis which is currently underway. During the field survey, the two NGOs were accompanied by one representative from WWS Design and Development Co Ltd who was responsible to provide CW technical backstopping. The company is also responsible in assisting the school(s) to be selected to establish new CWs as demonstration sites under IR4.

#### **1.2 Constructed Wetland Technology in Iringa**

Iringa region is in the Southern Highlands of Tanzania. This region borders the dry belt of central Tanzania in the north and south bordered by Lake Nyasa. Iringa Region has rolled out between latitudes 7 ° 05 ° 32’ and 12 south, and longitude 33 ° 47 ° 32’ to 36 east of Meridian. Iringa region is contiguous with the Dodoma and Singida regions in the north, Mbeya Region to the west, Morogoro Region in the East and Region in the south. Lake Nyasa separates Iringa Region and country of Malawi in the south-western Tanzania. Iringa Region has the largest total area of km<sup>2</sup> 58 936. An average of 74 percent of this area may be suitable for agricultural activities which is similar to km<sup>2</sup> 43,953 Remains an area of km<sup>2</sup> 15 001 is the area of water, conservation parks, hills and forests.

The constructed wetland technology is not new in Iringa region. Currently there are 3 known CW built in Iringa Municipal namely:

- Ruaha Secondary School Constructed Wetland;
- Kreluu Teacher's College Constructed Wetland; and
- IRUWASA Free Surface Constructed Wetland

### **1.3 Objectives**

The objectives of this field survey in Iringa Municipal were:

- i. To sensitize selected schools in Iringa Municipal on CW technology; and
- ii. To identify school (s) that will be voluntarily to adopt and install CW facility on self helps approach.

## CHAPTER TWO

### 2.0 Methodology

Three staff, one from each ENVICON, AGENDA and WWS involved in this field survey. The survey tools (questionnaires/guidelines) were developed and used. On the first day the field team met with Iringa Municipal Director (Ms. Theresia Mahongo), Environmental Health and Sanitation Engineer (Eng. Kapinga) and Head of Education Dept for project briefing including enlightening the objective of the visit. The list of schools situated with Iringa municipal was obtained and visited schools were selected based on some criteria set. The list of all schools found in Iringa Municipal was provided as shown in Table 2.1. Field survey to scanned/selected schools to sensitize on CW technology and identify schools which will adopt CW was conducted. Some critical information for the design purpose was recorded in order to estimate the construction costs if the school will be ready to adopt the technology. The target stakeholder of the visited schools was headmaster, headmistress and school maintenance teachers and other teachers who are responsible for School hygiene and sanitation. Success story from Ruaha Secondary School's CW was used to sensitize other schools.



**Figure 2.1:** Meeting with IGSS management

## CHAPTER THREE

### 3.0 Results of Field Visit

#### 3.1 List of Secondary Schools in Iringa Municipal

Iringa Secondary schools database was obtained from the Iringa Municipal Office. The schools are listed in the following table.

**Table 3.1:** List of Secondary Schools in Iringa Municipal

S.No.	Name of School	Status
1	Mkwawa Secondary School	Day
2	Mlamke Secondary School	Day
3	Spring Valley Secondary School	Boarding
4	Mawelewele Secondary school	Day
5	Mlandewe Secondary School	Day
6	Kwakilosa Secondary School	Day
7	Kitwiru Secondary School	Boarding
8	Consolata Secondary School	Boarding
9	Kilimani Secondary School	Day
10	Mtwivila Secondary School	Day
11	Kihesa Secondary School	Day
12	Iringa girls Secondary School	Boarding
13	Ebeneza Secondary School	Boarding
14	Lugalo Secondary School	Day/ Boarding
15	Highlands Secondary School	Day
16	Cagirielo Secondary School	Boarding
17	Ipogolo Secondary School	Day
18	Efatha Secondary School	Boarding
19	Ruaha Secondary School	Boarding
20	Mwembetogwa Secondary school	Day

### **3.2 Procedures for Selection of Visited Schools**

The procedures of Schools screening was mainly based on the following information:

- Complain received to Municipal health office about wastewater from schools
- Availability of enough water supply
- Condition of schools (Day or Boarding)
- Status of toilets (Pit or flush toilets)
- History of existing wastewater management challenges/ problems

Based on mentioned criteria, 5 out of 26 schools were selected and visited for the purpose of sensitize the use of constructed wetland for wastewater. The selected and visited schools include Iringa Girl Secondary School; Lugalo Secondary School; Ebeneza Seminary School; Efatha Secondary School; and Gagliero Girls High School. Also the Ruaha Community Development Training Institute (Ruaha CDTI) was selected and visited for the same purpose. The sensitizing procedure was in line with the willingness of the school to adopt the technology. To observe existing situation, which was including quantify the problem of wastewater how critical was, the existing infrastructure of wastewater including septic tanks, soak way pits and if there are any wastewater reuse.

### **3.3 Iringa Girls Secondary School**

Iringa Girls Secondary School is a government schools with 800 boarding students. It is one of schools with known wastewater management challenges in Iringa Municipal. According to the Health officer, several complain has been reported to her office due to overflowing of septic tanks. Owing to these reason the school was selected and visited. Wastewater Management in IGSS is very critical. Despite of the increase of number of school since 1960 when it was constructed, the wastewater infrastructure has remained the same up to now. The infrastructure is very old to fail to accommodate all wastewater generated. The emptying of the soak way pit is done frequently leading to high cost of managing wastewater in the school compasses.

However to solve the problem, the school constructed another septic tank, where they directed the grey water from bath room. This was the temporary solution, since they only reduced the emptying frequency and not wastewater generation. Therefore the school now has two soak away pits which are over flooding frequently. The main contribution of the overflowing of the septic tanks and soak way pit has been contributed by bad use of toilets. According the head mistress the students has been using the toilets for bathing therefore increasing the volume of wastewater to the soak way pits. Although the school management thought that by separation of bathwater and toilet could solve the existing situation.

### 3.3.1 Infrastructure of Wastewater

The main infrastructure of wastewater observed in IGSS included the soak away pit, septic tanks, inspection chamber and sewers. The main problem was encountered at the septic tanks and soak way pit as described in the following sections.

#### 3.3.1.1 Soak Away Pits

There is exist of two soak away pits at IGSS, the old and the new soak away pit. Before constructed the new soak away pit the problem of overflowing was very critical. The emptying was relatively high resulting to high operation costs. Owing to this reason, the school management decided to construct the new soak away pit with the expectation of cutting off the overflowing problems. In line with the soak away pit the school decided to separate the grey water from the bathroom and those from the toilets. The old septic tanks were receiving the effluents from the toilets and the new soak away pit was receiving the effluents from bathroom.

Despite of the effort made to solve the problem, the condition of the soak away pit still remained unsolved. The situation became worse since the student uses the toilets for bathing which overloaded the old septic tanks. Therefore the old soak away pit was failed to retain wastewater, due to the leakage from the wall of the soak way pit (Figure 3.1 (a) and (b)). The wastewater scattering all over the soak away pit implies the saturated of the soil and high water table within the area.



(a)The existing soak away pit



(a)Failure of a soak way pit

**Figure 1.1 (a) and (b):** Situation of soak away pit at IGSS

### 3.3.1.2 Inspection Chambers

The school has considerable number of chambers, of which most of them are still in a good condition and 4-5 chambers have been added to one of the dormitory.



(a) Inspection chamber receiving water from washrooms of the dormitory at IGSS (b) Overflowing of chamber after bathing at IGSS

**Figure 3.2 (a) and (b):** Situation of chambers during inspection at IGSS

### 3.3.1.3 Septic Tanks

The school has three septic tanks in total which receive grey water from dormitories. Unfortunately, these septic tanks were not effectively working due to the overloading of wastewater generation. The overflowing of wastewater has been reported frequently. The condition is said to be critical during the morning and evening activities where the generation of wastewater is very high. The situation is mainly contributed to the students who use the toilets for bathing. According to observation made, the traps in the dormitories are frequently blocked leading to extremely flooding within the area of dormitories.

### 3.3.2 The Need of Reuse of the Effluent from CW

The school has a vegetable garden which is located very close to the soak away pit. Despite of the huge amount of wastewater generated, the school still consumes the IRUWASA water supply for irrigation (Figure 3.4). This implies that the school incurs double payments, first they incur a cost of emptying their soak away pit frequently and second they incur extra cost of paying water supply for irrigation. Therefore, there is a need of treating wastewater, and then reuse for



irrigating their vegetables garden. The innovative project of constructed wetland is expected to be a heartbeat for reducing the expenses but also will enhance the quantity and quality vegetables through the irrigation practices.



**Figure 3.4:** Vegetables irrigated by IRUWASA water supply at IGSS

### **3.3.3 Sensitized of Using the CW Technology**

The sensitized of the using the constructed technology draw the attention of headmistress of IGSS. The Headmistress admitted the critical problem of wastewater management to the school and she was curious to know the initial cost for constructed the system if it is affordable. The headmistress expresses her interest to take up the technology with high expectation of cutting off the existing problem. However, the headmistress agreed positively to use the constructed wetland technology, she assisted to meet with the school committee for the final decision.

### **3.4 Lugalo Secondary School**

Lugalo Secondary School (LSS) is located within Iringa Municipal. It is among of the oldest schools in Iringa Municipal. The school was established since 1945 with few numbers of students. However, recently the number of students has been increasing rapidly up to 1128 which include 350 boarding students and 778 day students. There is some few staff living around the school compasses although they are not connected to school sanitation.

#### **3.4.1 Existing Situation of Wastewater Management**

The rapidly increase of students at Lugalo secondary school has posed a remarkable problem of wastewater management. Despite of the large wastewater generated due to the increase of students, the infrastructure of the wastewater management has remained the same and no repair has been done since 1945. Therefore the infrastructure is generally too old to be used for

wastewater collection (Figure 3.5). The overflowing of septic tanks is common at LSC. Each of these infrastructures is explained in details in the following sections.



**Figure 3.5:** The old infrastructure of wastewater collection in toilets of LSS

### 3.4.1.1 Septic Tanks

Lugalo Secondary Schools use septic tanks and soak away pits for wastewater treatments and disposal. There are three soak away pit systems located at A level dormitories and O level dormitories. These systems are receiving only wastewater from toilets. Other water such as washing water and bathroom water is drained directly to the existing stream.



(a)Septic Tanks at A'level dormitory

**Figure 3.6 (a) and (b):** Septic Tank at LSS

### **3.4.1.2 Soak Away Pits**

The School has three soak away pits which work separately, receiving the effluents from the septic tanks at O’level and A’ level dormitories. According to the interview held by the head teacher Mr. Kabungo, the overflowing of the soak away pit is common which resulting to high frequency of emptying the soak away pit. The empty of the soak away pit generally occurred 1 to 5 times per month. These imply the high cost of maintaining the septic and soak away pit systems at Lugalo secondary School.



(a) Overflowing Soak away pit

**Figure 3.7 (a) and (b):** Overflowing soak away pit and new soak away pit respectively at LSS

### **3.4.1.3 Storm Drainage Systems**

Lugalo Secondary School is also equipped with the storm drainages. However the drainage currently has been used for draining washing water to the nearby stream. Activities like washing clothes in the student dormitories generating wastewater which are drained by storm waters

### **3.4.2 The need of CW Technology at LSS**

The constructed wetland technology is highly needed to solve the existing situation LSS. The school is willing to take up the technology; however the headmaster was worrying about the cost of establishing the technology. According to the headmaster, currently the school committee has prioritized the repair and maintenance of the wastewater systems due to the oldness of the system and the rapid expansion of the number of students. Therefore, the construction of wetland can provide a solution and the reuse of effluents for cultivating maize and vegetables.

### **3.5 Ebeneza Seminary School**

Ebeneza Seminary School (ESS) is located in Nduli Ward about 25 km from Iringa municipal centre. It is a private school own by Assemblies of God Church. The school has about 450 boarding students. Currently the school has insufficiency of water supply for domestic uses. The main sources of water supply are shallow well and rain water. According to the headmasters interview during the dry season the school incur the cost of buying water.

#### **3.5.1 Wastewater Management**

Due to the lack of water supply, the school is using pit latrines. The school has constructed enough pit latrines to accommodate all students. Although currently, the sanitation is not a problem but in future it can be. The school has planned to increase the sources of water supply and therefore it is expected to be connected to the IRUWASA water supply project.

The wastewater generated by washing activities like washing clothes and bathing is used for irrigating the flower within the school compasses (Figure 3.9)



**Figure 3.9:** The compasses of ESS

### 3.5.2 The Need of CW at ESS

The management of wastewater is not a priority at the ESS. Despite the interest expressed by head teacher on taking up the constructed wetland technology, the limitation of water supply was a main reason leading them to little consideration of adoption of the CWs technology. Therefore the constructed wetland cannot be constructed by now, may in future depending on the availability of water supply.

### 3.6 Efatha Secondary School

Efatha Secondary School (EfSS) is a private school with capacity of enrolling 70 boarding students and 600 day students. The school has been established recently which is located in relative dry area. The main source of water supply is a tap water from IRUWASA.

#### 3.6.1 Wastewater Management at EfSS

The wastewater treatment/sanitation facility which is used at Efatha Secondary School (ESS) is the combination of septic tank and soak away pit (Figure 3.10). Recently the wastewater management is not a problem at ESS, but the toilet has been flushed manually which may cause the blockage of the pipeline due to the low pressure of water to convey the sewage into the septic tanks. The school compasses is very dry no any agricultural activities has been carried out. The school management however they are planning a project of growing shadow trees within the school compasses. This implies the reuse of the wastewater generated for irrigation.



(a) Septic Tanks and Soak away Pit



(b) Bathroom and Toilets

**Figure 3.10 (a) and (b):** Septic tanks and soak away pit; and bathroom and toilet at EfSS

### **3.6.2 The Need of CW Technology at EfSS**

The ESS management is willing to adopt the technology although currently there is no any problem of waste management. They are positively to use the technology since they can be very potential in future.

## **3.7 Cagliari Girls High School**

Cagliari Girls High School (CGSS) is a private school and it is owned and managed by Roman Catholic (RC) church. The school has the capacity of enrolling 400 boarding students. There is sufficient water supply for domestic uses at the school mainly supplied by IRUWASA.

### **3.7.1 Wastewater Management at CGSS**

The sanitation facilities that were currently used at CGSS were flush toilets and wastewater management system which was used in the combination of septic tanks and soaks away pits. There was no reported case of overflowing of the system rather than history of relative high frequency of pits emptying due to significant huge amount of wastewater generated. The school management had recently decided and built a new and big soak away pit in order to minimize the rate of emptying soak away pits. Therefore there was no sanitation/wastewater management problem at CGSS.

### **3.7.2 The Need of CW Technology at CGSS**

The management of the school has not decided on the possibility of adopting CW at the time being. The school has established horticulture activities which are irrigated by water supplied by IRUWASA. This implies that there is a potential for reuse of the wastewater generated at the school for irrigation activities if properly treated by CW. It is potential CW adopter in the future time.



(a) Collection point of wastewater in CGSS



(b) Agriculture activities at CGSS using IRUWASA water supply

**Figure 3.11 (a) and (b):** Wastewater collection points and Agriculture activities respectively at CGSS

### **3.8 Ruaha Community Development Training Institute (Ruaha CDTI)**

The Institute is located in Ruaha Ward in Iringa Municipal. It is government owned institution with about 1,200 registered students, out of whom 200 students are accommodated within the institute campus. There is sufficient water supply for domestic uses.

#### **3.8.1 Wastewater Management at Ruaha CDTI**

The septic tanks and local soak away pits are the only technologies used to manage wastewater generated at the institute. The wastewater management systems were old enough which were built in 1980's when the institute was established with minimum number of students/users accommodated. Currently the existing systems were not enough to accommodate the number of students/users which increased significantly in recent years. The sanitation system was reported to overflow several times and relative high rate of pit emptying.

#### **3.8.2 The Need of CW Technology at Ruaha CDTI**

Based on the field survey and interview conducted with the institute's staff, it is noted that there is a sanitation/wastewater management challenge at the area and therefore there is a need of CW to be built at the institute in order to improve its sanitation status. The institute has ample area space for construction of CW. The issue of willingness to adopt the CW was not discussed since the institute's authorized staff (e.g. Principal) was not available at the office during the visit.

### 3.9 Summary of the Results/Findings

**Table 3.2:** The summary of the findings of visited secondary school in Iringa Municipal

S/No	School	Willingness	Need of CWs	Favorable Conditions (Water and land)
1	Iringa girls	positive	Highly needed	Favorable
2	Lugalo	positive	Highly needed	Favorable
3	Efatha	positive	Needed	Not favorable
4	Cagrielo	Not decided	needed	Favorable
5	Ebenezar	positive	No need	Not favorable
6	Ruaha CDTI			

## CHAPTER FOUR

### 4.0 Conclusion and Recommendation

#### 4.1 Conclusion

The field visit to Iringa municipal to sensitize schools on CW technology and to identify school (s) that will be voluntarily to adopt and install CW facility on self helps approach have been successful conducted. The field visit reveals that there is a number of potential CW adopter in the area provided that they are furnished with adequate information i.e. technical, financial and benefits regarding CW technology. The field visit and detailed interviews conducted with management/ representatives of visited schools reveal that Lugalo High School and Iringa Girls Secondary School have willingness to adopt the CW technology. The push for immediately need for CW technology to these schools are due to the sanitation and hygienic problems facing them and the high cost incurred to deal with management of wastewater generated due to frequently emptying of soak away pits. Both schools have enough land area for construction of CW.



#### **4.2 Recommendation**

Since result of field visit survey indicates Iringa Girls Secondary School and Lugalo High Schools are immediately potential CW adopters, therefore it is recommended that, the cost estimate of the CW for each school has to be developed and submitted the respective school in order to facilitate the high level of schools management to make the final decision on the adoption of the CW technology.



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