

TAMK University of Applied Sciences
Degree programme in Environmental Engineering
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Final Thesis

**A SANITATION DEVELOPMENT PROJECT IN RURAL ZAMBIA;
MANAGEMENT, RECOMMENDATIONS AND INSTRUCTIONS**

TAMK
Supervisor
Commissioned by
Tampere 05/2009

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A sanitation development project in rural Zambia; management, recommendations and instructions

51 pages + 6 appendixes

May 2009

Thesis supervisor: Senior lecturer Eeva – Liisa Viskari

Commissioned by: Global Dry Toilet Association of Finland (Käymäläseura Huussi Ry)

ABSTRACT

Insufficient sanitation can cause a series of problems in societies, and this in fact is a harsh reality in many developing countries in especially in Africa, Asia and South America. The Global Dry Toilet Association of Finland (GDTF) is a non-governmental organization founded in 2002, with a vision of the future in which dry toilets are an essential part of sustainable development in the world. The association began a project in Zambia in 2006, to improve sanitation in the rural areas of the country, specifically in the Masaiti District on the Copperbelt Province of Zambia. The project is a part of Finnish foreign aid program, and the funding is granted for three year periods at a time. During this time GDTF will build dry toilets to the project area, improve sanitation and provide public education on the importance of sanitation and good hygiene, as well as promote the benefits of dry toilets to the local population. While there is a great need for improved sanitation, and as the prices of food and industrial fertilizers are rising, the dry toilets are offering improvements to both of the problems. It is hoped that through the public education and building of dry toilets, as well as promoting benefits of dry toilets, the local population will become motivated enough about the concept, to help the formation of an independently sustained dry toilet culture. The objective of this thesis is to gather the information and lessons learned during the three-year project, into an information package that will be found helpful to anyone planning to establish a similar project. To establish this objective, this paper will proceed in the chronological order of basic project management steps, which are collecting baseline studies, project planning, project implementation and project appraisal.

Key words
management

dry toilet, sanitation, project

Tampereen Ammattikorkeakoulu

Environmental Engineering

Ville Juusela

Sambian maaseudun kehitysyhteistyöhanke: ohjeita ja suosituksia hankkeen hallintaan.

51 sivua + 6 liitesivua

Toukokuu 2009

Työn valvoja: Lehtori Eeva – Liisa Viskari

Työn teettäjä: Käymäläseura Huussi Ry, Projektikoordinaattori Sari
Huuhtanen

TIIVISTELMÄ

Puutteellinen sanitaatio voi aiheuttaa monenlaisia ongelmia yhteiskunnassa. Tämä on karua todellisuutta monessa kehitysmaassa erityisesti Afrikassa, Aasiassa ja Etelä – Amerikassa. Käymäläseura Huussi Ry on kansalaisjärjestö jonka visiona on maailma, missä kuivakäymälät ovat olennainen osa kestävästä kehitystä., Parantaakseen sanitaatiota ja terveyttä maaseutu alueella Kalokossa, Masaitin alueella Copperbeltin maakunnassa Sambian keskiosassa, yhdistys aloitti ulkoministeriön tukeman kehitysapuprojektin Sambiassa vuonna 2006. Sambia -hanke on Suomen ulkoasiainministeriön tukema kolmivuotinen projekti, jossa Käymäläseura Huussi Ry rakentaa alueelle kuivakäymälöitä, tarjoaa kansalaisvalistusta sanitaation ja hygienian tärkeydestä, sekä kuivakäymälöiden hyödyistä ja mahdollisuuksista maanviljelyssä. Teollisten lannoitteiden hintojen nousun myötä, kuivakäymälöiden käyttöönotto hyödyttää alueen köyhiä maanviljelijäyhteisöitä, joilla on myös tarvetta sanitaation parantamiseen. Käymäläseura Huussi Ry:n toive onkin, että kuivakäymälöiden rakentamisen ja valistustyön myötä alueelle kehittyisi motivaatiota ja kykyä hoitaa sanitaatio kuivakäymälöiden avulla. Tämän tutkimuksen tarkoituksena on yhdistää kolmivuotisen hankkeen aikana kerättyä tietoa ja opittuja asioita tietopaketsiksi siten, että samanlaista hanketta suunnittelevat voisivat hyötyä siitä oman hankkeensa suunnittelu – , toteutus – tai arviointivaiheessa. Tämä tutkimus etenee projektinhallintaan liittyviä perusaskeleita seuraten, alkaen taustatiedon keräämisestä hankkeen suunniteluun ja toteutukseen ja lopulta hankkeen arviointiin.

Avainsanat:
hallinta

kuivakäymälä, sanitaatio, projektin

FOREWORD

I wish to thank the Global Dry Toilet Association and project coordinator Mrs. Sari Huuhtanen for offering me the chance to do this as my thesis, as well as giving me the opportunity to conduct the final evaluation of the project related, as it is relevant to this thesis. During the field research in Zambia, Kaloko Trust Zambia kindly provided accommodation and transportation to conduct the evaluation, and I am grateful to the director Mr. Lewis Jere for this. I am also grateful to Ms. Michelo Katambo and Mr. Raven Ng'uni who participated in the evaluation and helped me to collect information.

I want to express my gratitude to all the environmental engineering – program staff in TAMK University of Applied Sciences, especially senior lecturer Eeva – Liisa Viskari and head of the program Marjukka Dyer.

Tampere May 2009.

Ville Juusela

LIST OF ABBREVIATIONS

| | |
|-------------|---|
| GDTF | Global Dry Toilet Association of Finland |
| ZASP | Dry sanitation improvement program for Zambia |
| KTZ | Kaloko Trust Zambia |
| NGO | Non Governmental Organization |
| WHO | World Health Organization |
| WBS | Work Breakdown Structure |
| VIP | Ventilation Improved Latrine |
| CFU | Colony forming units |
| DT | Dry toilet |

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1 Introduction

According to different estimations, there are approximately 2.6 – 3 billion people without proper sanitation in the world. Proper sanitation is concerned with the means of handling and treating people's urine and excreta in a hygienic way, so that it does not endanger the health of people or the environment. In conditions where sanitation solutions are insufficient or nonexistent, people are in fact often forced to make choices which cause environmental damage or diseases to spread. Insufficient sanitation is a common problem in third world countries, where there is a lack of money, water supply or proper sewerage. Water sources can become contaminated in the lack of sanitation, which in turn advances spreading of disease. Without proper sanitation people are much more susceptible to sickness, which affects their lives in a various ways. For example if there is not enough money to treat the illness, children may have to drop out of school or they cannot participate in daily chores such as fetching water. The sanitation problem is of course relevant to adults as well, although children are more easily affected by illnesses. By improving sanitation, the quality of life is enhanced directly and indirectly, bringing significant life improvements to people in need.

The Dry Toilet Association of Finland (GDTF) has worked on sanitation projects in Africa, since the year 2006. The projects have concentrated mainly on building of composting dry toilets, giving public education on building and maintenance of the toilets, utilization of the manure and urine as fertilizer, as well as general hygiene and health. Through the years of working on the projects, GDTF has gained experience and gathered information about working on such a project. Inevitably problems and challenges have come up, and solutions have been discovered.

This paper attempts to collect information received from this project, in a way which should be useful in planning or implementing a similar project. Basic project management steps are collecting baseline studies, project planning, project implementing and project appraisal, and this same chronologic order is being followed and used in this paper when presenting the information. Presenting the appraisal of the project is based on the final evaluation of the project, which I personally conducted and evaluated over November – December 2008.

2 Location & background information

Before starting the project, it is of course important to understand the relevant features of the project area, such as population, demographics, level of education, culture, resources available from behalf of cooperation partners etc. Under this topic, some of the project specific features will be presented.

2.1 Location, local population and culture

The specific location of the project is the Kaloko area in Zambia. Kaloko is located in the north of Zambia, in the Copperbelt province. It has an area of 260 km², a population of roughly 10 000 people and there are 11 main villages. Within the project area there are three large schools, a health clinic, an educational center, and several smaller village schools.

As a general description the project area is a poor rural African agricultural community site. There is richness in religion and beliefs in the project area, and indeed there are taboos and stigma against a concept like dry toilets and its fertilizers. The education level is low and many of the people are illiterate, which in turn is a challenge when trying to educate and communicate the benefits to them. It is a harsh reality and a significant factor affecting the project, and understanding this is essential to such a project.

The level of education and culture affect the people's sense of powerlessness to drive change. Poverty, oppression or cast systems like conditions are the root causes for this mentality that decisions and development policies are done by people somewhere else, and that the regular people can not affect it. This sense of powerlessness that also exists in the Kaloko area, is common in poor rural areas of Africa. The GDTF project in Kaloko aims at being able to eventually leave the project, having stimulated the formation of locally sustained dry toilet culture, with all its benefits. But achieving this can be challenging in an environment where people may not believe in ability to change things. *Participatory methods* which involve the local people in the planning and implementation, has been the core of the approach towards the project. The idea is that by educating and involving the local population in everything, they will begin to feel ownership over the toilets, gardens, DT – fertilizers and the project itself, as they will understand the benefits and as they have participated in the management of the project.

Although participatory methods can be recommended to stimulate public participation in such conditions, organizing public events such as planning sessions or educational sessions is not so easily done though. Planning – or educational sessions for example would need to be planned and conducted using methods suitable to the local people and the environment, meaning that the for instance the level of education or cultural factors can easily become problems, unless they are considered beforehand. The discussion section will deal with some of these issues.

The sanitation situation in the project area certainly has room for improvement. Nearly 60% of the population in the project area does not have access to a toilet. Some of the schools in the project area for instance, do not have any kind of toilet facilities or they may be in bad condition. As people then need to go do their business in open grounds, diseases spread quickly and create favorable conditions for parasites. Having to “hold back the need to go”, it also causes difficulties of many kinds. For instance children may face difficulties when attending school, if it is not possible to go relief themselves during the day. Also urinary tract infections can be caused by holding back the need to go.

Despite the poor sanitation situation, a “foreign” concept such as this GDTF dry sanitation project is offering to the local population will not be easily accepted. As mentioned there is prejudice and stigma against the concept, which is mainly due to the involvement of human waste and using it as a fertilizer. Although the human waste factor could initially be considered a problem for developing the project, it can easily become a great prospect if the economical benefits are well promoted. This has been clearly noticed in the Zambia project, as the price of synthetic fertilizers has gone up in the project area. In poor agricultural areas in Zambia, seeking to gain economical benefits is deep rooted within the population and could be said to be a “cultural norm”.

Issues such as discussed above, can be learned from personal experience, communication with a local cooperation partner or by conducting *baseline studies*. Baseline studies will be discussed in more detail in topic 4, and baseline studies made for the Zambia project will be presented.

2.2 Operative parties of the project

2.2.1 Global Dry Toilet Association of Finland

The *Global Dry Toilet Association of Finland* is a non-governmental organization which was founded in 2002, having a vision of the future in which dry sanitation is an essential part of sustainable development by protecting the environment and water sources for future generations to enjoy.

GDTF promotes the dry sanitation concept by informing people, making research, taking part in events, giving statements and lectures and so on. The Zambia project begun in 2006, being funded by the Finnish Ministry of Foreign Affairs, it was the first foreign aid project of GDTF.

2.2.2 Kaloko Trust Zambia

The funding of the project has been granted by the Finnish Ministry of Foreign Affairs, as NGO to NGO development aid funding. The local cooperation partner for the project also comes from Kaloko, namely the Kaloko Trust Zambia (KTZ). Kaloko Trust Zambia is a charity organization based in the United Kingdom, working to improve the livelihood of people in rural areas of Zambia. KTZ aims to establish improvements in agriculture, income generation, healthcare and the water situation, as well as to encourage sustainable development.

In the project KTZ provides crucial help by providing knowledge, and a sort of infrastructure for implementation, meaning things like transportation, working equipment, office spaces, accommodation, etc.

2.2.3 Zambia Sanitation Improvement Program

The *Zambian Sanitation Improvement Program (ZASP)* is an organ that was established specifically for carrying out the field work. ZASP was a joint implementation of GDTF and KTZ. The field work of ZASP is mainly carried out by the field coordinator Ms. Michelo Katambo, and the work to be done is decided together with the project coordinator and the field coordinator. Also the local village communities possess a certain level of power over the decisions made by ZASP, because of the participatory approach of the project. This in turn means that ZASP wishes the local communities to communicate their needs to ZASP, which then makes the decisions of what will be done according to a variety of factors (i.e. monetary resources, time, transportation abilities etc).

The work of ZASP is funded by the project, including basically all costs, such as material purchases, labor contractors, transportation costs and communication costs.

2.3 Project management & administration structure

As mentioned, ZASP is the organ which carries out all the field level work of the project. ZASP is managed by a three – level management structure.

The responsibilities did need to be restructured, as in the early stages of the project there was some level of unclearness in the responsibility distribution. Eventually these issues did find their place, and below the final form of responsibility distribution is explained.

2.3.1 Highest level of management

The supreme administrative level is the GDTF board, which provides ZASP with policy direction and is responsible for overall administration of the entire project. The board also has the final say to project decisions and expenditure.

Within the GDTF board, the International Group (IG) meets on regular basis to discuss the proceedings and issues concerning the project, and then resolve problems if they have occurred. The people in IG have experience in working on international development projects. IG also gives technical and practical assistance and advice.

2.3.2 Middle management

The middle management consists of leaders for the ground level work. There are no official classifications on the importance of each leader, but on a practical level there is an order of reporting from bottom up. The leaders and their responsibilities are presented below, in a *top – down* order.

1. Project coordinator; Mrs. Sari Huuhtanen

The project coordinator works for GDTF in Finland, and her work tasks in GDTF mainly revolve around the “Zambia – project”.

The responsibility of the highest level of implementation decisions falls on the project coordinator, although those decisions are guided by the GDTF board or the IG. The project coordinator is also responsible for monitoring the development of the project, and reporting about it back to the GDTF board.

The project coordinator also gives approvals to expenditures before they are implemented, and she also reports them to GDTF board and the Finnish Ministry of Foreign Affairs.

The project coordinator is also the ZASP contact person in Finland.

2. Director of Kaloko Trust Zambia; Mr. Lewis Jere

The director of KTZ is responsible for reporting project developments and possible problems to the project coordinator, as soon as they come up. The KTZ director also prepares the official project reports to the coordinator.

The KTZ director is also responsible for making sure the local project groups are informed about new decisions and planned actions concerning the project. Mr. Jere is also the ZASP contact person in Zambia.

3. Field coordinator; Ms. Michelo Katambo

In March 2007, a field coordinator was engaged to the project, to add efficiency to the implementation of the project, as well as to fill in some coordination and communication gaps which had been identified.

The field coordinator's tasks are to coordinate project implementation including sanitation training, public education and research. She also prepares reports on progress and project activity in the villages. She then reports to the project coordinator.

2.3.3 Lowest level of management

The lowest level of management is situated at the village level. Each of the villages in the project area is represented by a project assistant and sanitation club members, who communicates the needs, wishes, problems and suggestions of the village community, to the field coordinator. The field coordinator then communicates those needs forward to the project coordinator.

Sanitation club members and village assistants were "promoted" from the regular village people, to be a part of the project management, planning and implementation at all stages throughout the project. The nature of participatory methods always involves the local population in decision making. The sanitation club members also work actively on the project by assisting other community members in sanitation-, hygiene-, health- and urine and compost application issues. Some degree of responsibility can and

should be cast on the sanitation clubs in different villages, especially when it comes to educational and motivational improvements within the villages.

3 Participatory method

The *participatory method* was selected to be the core policy of the project. Participatory methods are such that aim at getting the local population to be a part of the decision making, as well as to be actively involved in the field work. The method was used in the attempt to establish sustainability and continuity for the project. The idea is that through being involved in everything in the project, it will help the local population to establish a sense of power and responsibility of the project, as well as a sense of ownership over the toilets. Achieving these goals is combined to the promotion of benefits of the dry sanitation concept, and to providing the local population with skill needed to continue the project independently.

A participatory diagram for involving the local population at different stages of the project is shown below.

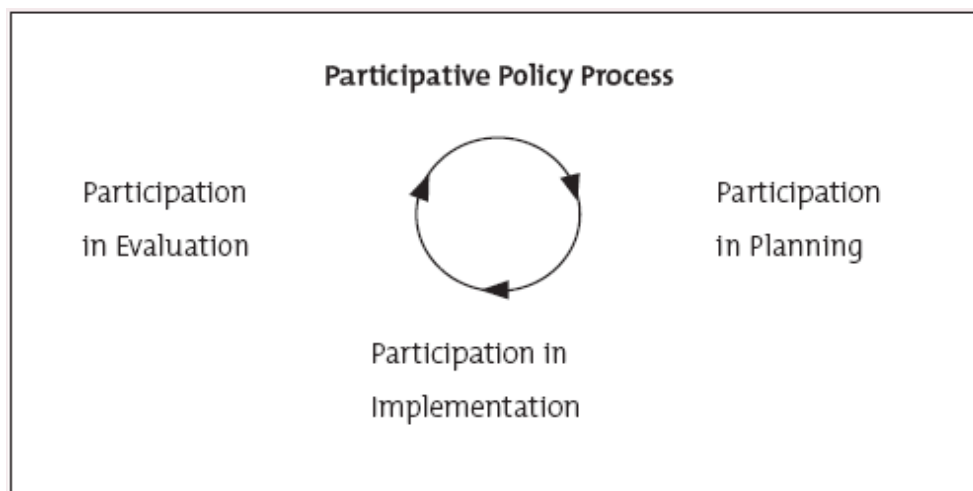


Diagram 1. Public participation in the project. /2/

In the project planning stage, the participatory approach requires a wide perspective to the matter, because there are more stages and details to it than there is in implementation. In the Zambia project, the participatory approach was used at all stages of the project planning process, and its application in the plan is described in a 7 – step diagram below.

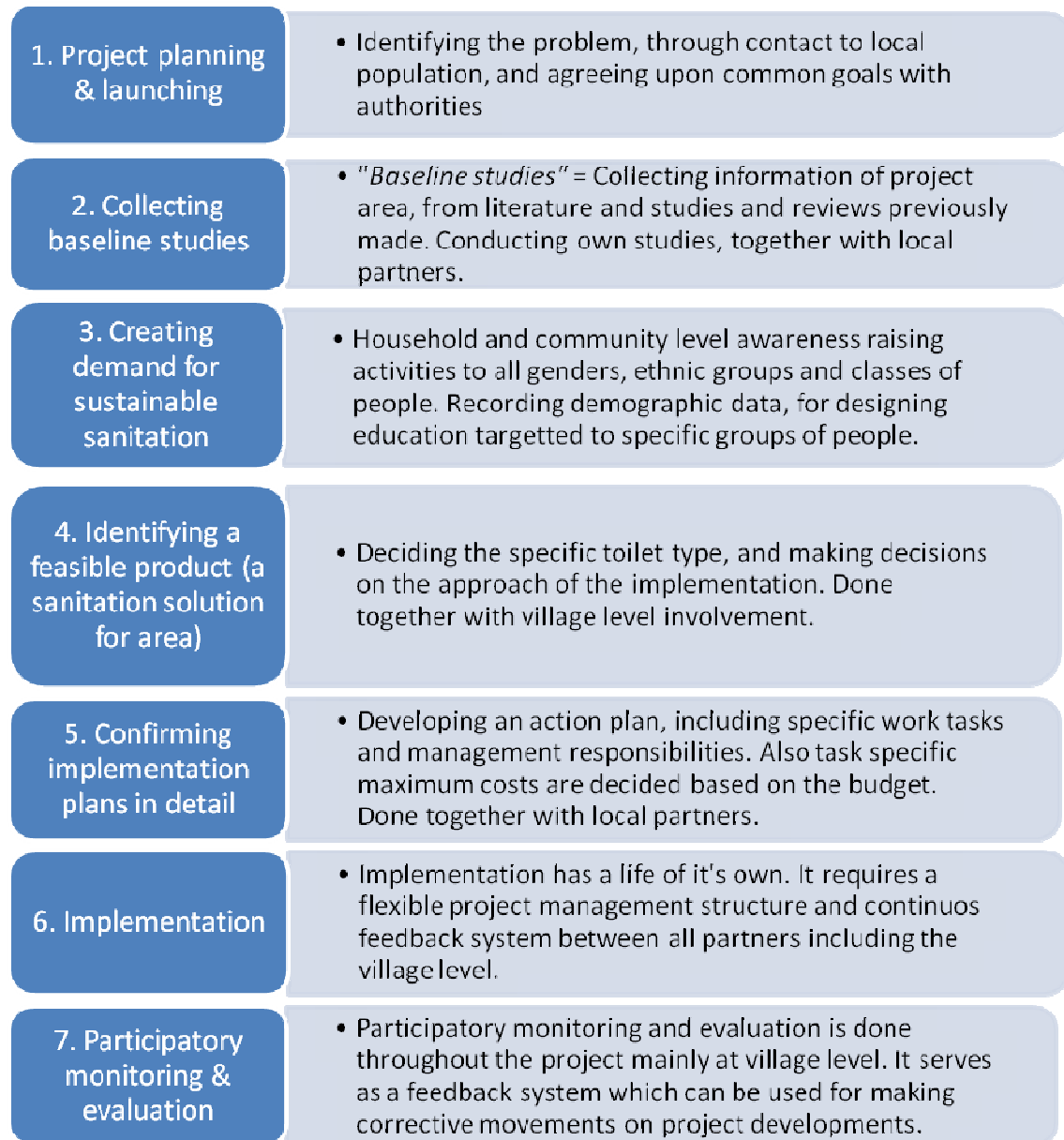


Diagram 1. Participatory method steps /11/

4 Baseline studies

In the beginning of any project, information needs to be gathered to gain knowledge about issues that are relevant to the topic. In project management theory, studies which are collected for this purpose are called *baseline studies*. As for any project that is being planned, baseline studies should always be conducted before starting the actual field work of the project. Baseline studies are cross – sectional surveys which mostly provide quantitative information on project related topics. Although qualitative information can be provided in baseline studies, they essentially aim at quantifying information, which can be used as point of comparison for later evaluation of the project. The

systematically collected and presented data should clearly describe situations in terms of: What? Who? Where? When? Why? How? Conducting baseline studies is crucial to a project, in terms of being able to make a project plan based on known factors rather than based on what is believed to be the situation. The quantitative and qualitative indicators and measuring of a project will be discussed later on (*7.1 Quantitative and Qualitative indicators*) /1/

In the planning stages of the Zambia project, information was gathered about issues relevant to the project, measuring variables such as knowledge, attitudes, awareness, common hygiene practices, state of sanitation, water quality in the area and general health.

A baseline study can be done by sampling or by having used complete data. For instance there are a certain number of wells at a certain time in the project area, and those wells and their water quality could be covered in a baseline study, in which case the study would have used a complete set of data. In case the baseline study concerned data which can be gathered only by interviewing people, it would be nearly a practical impossibility to interview every person of the project area. In such cases the baseline study covers samples of the population.

Conducting baseline studies should be done systematically, in order to receive reliable and measurable data. There are three basic sampling methods, systematic random sampling, stratified random sampling and cluster sampling, which can be used in conducting research studies. Often a less favorable option, the simple random sampling method needs to be used though, as it may be difficult to even hold meetings in general.

- Simple random sampling

Simple random sampling is a method which is purely based on chance, which is undesirable due to the unsystematic nature and the degree of uncertainty related to it. But as mentioned, it is often the only realistic method in conditions such as the Zambia project.

- Systematic random sampling

Systematic random sampling is based on number intervals. A number interval is selected, and is then used to pick individuals into the sample. For instance if there was 50 communities in an area, and the number interval was 5, then every

5th community of the total of 50 would have been selected to represent the consensus.

The weakness of the method is that it can be used only when the total sample is homogenous, for example all individuals are part of the same group such as same gender or age.

- Stratified random sampling

A stratified random sampling method divides the total group into smaller subgroups, according to specific features such as age or gender. Then systematic samples are taken from the subgroups.

When doing stratified random sampling, the subgroups need to be represented respectively according to their share of the total. For instance if within the total number of households, there is 30% female lead households and 70% male lead households, then samples of households should include 30% women lead and 70% male lead households.

- Cluster sampling

In cluster sampling, clusters or groups of a homogenous total group are taken into the sample, and the selected clusters are then divided into similar exclusive categories (enumeration units), out of which the sample data finally is derived from.

Applying these sampling methods can be very challenging in interview studies though, because for instance in the Zambia project even setting up meetings can be challenging, and the number of people in interview sessions may keep changing throughout the session, making it difficult to establish a clear picture of the whole population. In case the entire population is covered by the baseline study, it is called a *consensus*. /1/

Some of the baseline studies and their main findings have been derived to be presented below. As was mentioned, the information presented is segments of the complete studies, which are available as a whole through contact. (See references)

4.2 State of sanitation, hygiene and spreading of disease

A study “*State of Sanitation, Hygiene and Spreading of Disease*” was conducted over November 2006 as a joint effort with Mrs. Sari Huuhtanen, ZASP and KTZ. The sanitation solutions of each village were observed and analyzed, and the users were met in organized village meetings during which an interview / questionnaire type study was

conducted. The sampling method used was simple random sampling, which is often the only possible method to be used, because it can be difficult to conduct structured interviews to large groups of people, as committing and controlling a busy crowd is a challenge in itself in the project area. The purpose of this study was to establish an overview of certain issues such as toilet types being used, hygiene practices of people, known spreading routes of diseases and other issues which need to be known, when planning the hygiene educations for the people. /8/

4.2.1 Demographic distribution of respondents

The table 2 below presents the number of people who participated in the questionnaire study in each village. The intention was that from each village at least 10 people would take part in the questionnaire. This was achieved everywhere, except in the Chisapa village.

Table 1. Number of participants/village /8/

| Village area | Number of answers | % |
|--------------|-------------------|----|
| Chisapa | 9 | 6 |
| Kaloko | 12 | 8 |
| Kandulwe | 14 | 9 |
| Kantolo | 10 | 7 |
| Kasamwa | 10 | 7 |
| Kwasha | 13 | 9 |
| Luampesa | 10 | 7 |
| Luansobe | 12 | 8 |
| Luesanga | 23 | 15 |
| Lwiimba | 11 | 7 |
| Mwaitwa | 12 | 8 |
| Serenje | 14 | 9 |
| Total | 150 | |

The data after having stratifying according to gender and age distribution, can be seen in the tables 2 and 3 below.

Table 2. Gender distribution of respondents /8/

| Gender | Number of answers | % |
|-----------|-------------------|----|
| F | 70 | 47 |
| M | 73 | 49 |
| No answer | 7 | 5 |

Table 3. Age distribution of respondents /8/

| Age | Number of answers | % |
|-----------|-------------------|----|
| 13-20 | 17 | 11 |
| 21-30 | 22 | 15 |
| 31-40 | 42 | 28 |
| 41-50 | 31 | 21 |
| 51-60 | 31 | 21 |
| 61-70 | 3 | 2 |
| 71-80 | 1 | 1 |
| no answer | 3 | 2 |

4.2.2 State of sanitation

Nearly a 100% of the respondents said they do use a toilet, meaning that there are toilet facilities available close to their homes. Since people do move around though, it is good to remember that surely 100% of the people also use the bushes occasionally for the toilet needs. The definition of a toilet in this case was some place which has been continuously used by one or more people, for relieving themselves.

Indeed the pit toilet, which is simply a small hole dug in the ground, is the most common type of toilet used by the locals. The improved version, the *ventilation improved pit toilets* (VIP – toilets) are not common in the area. The distribution of the answers on the toilet types being used, are presented in the table 4 below.

Table 4. Toilet types used /8/

| Toilet type | | % |
|-------------|-----|-------|
| Pit | 137 | 91,33 |
| VIP | 9 | 6,00 |
| no answer | 4 | 2,67 |

In the absence of a proper toilet, it is common that people simply go to the bushes to relieve themselves, and perhaps they might somehow cover the leavings. Thus the figures are only generally applicable, and they do not reflect the absolute reality of the sanitation solutions used by the people.

All the toilets around, are also shared facilities among other family or community members. The distribution on how many people share the same toilet, are presented below in the table 5.

Table 5. Number of people sharing toilets. /8/

| People | answers | % |
|-------------|-------------|-------|
| 1-5 | 33 | 22,00 |
| 6-10 | 61 | 40,67 |
| 11-20 | 19 | 12,67 |
| 20-50 | 2 | 1,33 |
| over 50 | 1 | 0,67 |
| n/a | 34 | 22,67 |
| Mean | 7,95 | |

4.2.3 Hygiene & health

The hygiene behavior of people and the infrastructure for maintaining good hygiene was examined by the use of the questionnaire.

Only 11% of the respondents said, that there is an opportunity to wash their hands after having used the toilet. Usually the place they can go to wash their hands, is a river or a water basin close to the toilet. Most of the people go to their homes to wash their hands. The results concerning the washing of hands are presented in the table 6 below.

Table 6. Possibility of washing hands, after toilet. /8/

| | answers | % |
|---------|---------|-------|
| yes | 17 | 11,33 |
| no | 8 | 5,33 |
| at home | 123 | 82,00 |
| other | 2 | 1,33 |

The people were also asked about the spreading of diseases. They seemed to know quite a lot about the spreading routes of diseases, which can be seen in the tables 7 and 8 below.

Table 7. Respondent knew excreta spreads disease/8/

| | answers | % |
|-------|---------|-------|
| no | 2 | 1,33 |
| yes | 145 | 96,67 |
| empty | 3 | 2 |

Table 8. Known spreading routes of diseases /8/

| | answers | % |
|------------------|---------|------|
| Flies | 122 | 83,0 |
| Diarrhoea | 49 | 33,3 |
| Cholera | 33 | 22,4 |
| Dirt | 18 | 12,2 |
| Hands | 18 | 12,2 |
| Uncovered food | 11 | 7,5 |
| Water | 10 | 6,8 |
| Bacteria | 4 | 2,7 |
| Uncovered toilet | 1 | 0,7 |
| Dirty toilets | 1 | 0,7 |
| Toilet near well | 1 | 0,7 |

As clean water sources are important concerning one's health, the available water sources were also asked about. The places where people go to draw water, varied between streams, wells with and without protective fixtures, boreholes and dams. The table 9 below shows the distribution.

Table 9. Water sources used by people. /8/

| Water source | Answers | % |
|------------------------------------|---------|----|
| Well | 85 | 57 |
| Stream | 32 | 21 |
| Borehole | 31 | 21 |
| Dam | 1 | 1 |
| Wells of which protected mentioned | 5 | 3 |

As mentioned, another water and health connected issue is how clean the water is.

Water sources can be contaminated, if unprotected “toilets” such as pit toilets or bushes are used close to the water drawing source. Thus the people were also asked, whether there are toilets close to their water sources, and the results are presented in the table 10 below.

Table 10. Toilets near water sources. /8/

| | answers | % |
|-------|---------|----|
| no | 120 | 80 |
| yes | 2 | 1 |
| empty | 28 | 19 |

The results are rather pleasing, since 80% responded that there are no toilets near their water sources. It does not mean though, that the water sources are necessarily clean and safe to drink.

As the people were asked about problems related to their water drawing source, the answers were as follows in the table 11 below.

Table 11. Main problems concerning water sources. /8/

| Main problems with water | Answers | % |
|----------------------------------|---------|----|
| No problems | 55 | 30 |
| Diseases | 27 | 15 |
| Germs | 18 | 10 |
| Dirty water/ buckets | 17 | 9 |
| Frogs, snakes, rats | 16 | 9 |
| Distance | 10 | 5 |
| Rust | 8 | 4 |
| Water source is drying up | 8 | 4 |
| Unprotected well | 7 | 4 |
| Not enough water | 5 | 3 |
| Smell | 5 | 3 |
| Animals are using the same place | 3 | 2 |
| Bacteria | 3 | 2 |
| Bad taste, too warm water | 2 | 1 |
| Pollution | 2 | 1 |

As can be seen, only 30% of the respondents said that they do not feel there are problems related to their water. Some of those people said though, that they do disinfect the water by chlorinating it. The remaining 70%, who have felt there are problems with the water, listed several types of reasons for being cautious towards their water source.

4.3 Bacteriological study on well water quality

Mr. Ilkka Pulkkinen conducted a bacteriological water quality study of water in wells and streams in the Kaloko area.

The sampling was done in two different rounds. The first round of sampling took place during the end of the dry season between 05.12 – 22.12.2006; whereas the second round of sampling took place during the rainy season between 06.02 – 10.02.2007. Total coliforms and E.coli were analyzed using chromogenic count plates, namely

Compact Dry EC, manufactured by NISSUI Pharmaceutical CO LTD. Also physiochemical parameters such as pH and temperature were also determined from the samples, using a portable electronic thermometer and a Hanna Instruments Hanna Checker 1 tester (for pH). /9/

The idea was to produce 2 homogenous count plates from each sample, by using a 1ml Pasteur pipette to transfer the water onto the count plates, which were then incubated in a variable temperature between 25 – 35 °C for 48 hours. The bacterial colonies were counted twice during incubation, first time after 24 hours and second time after 48 hours. The mean value of the Coliform colony count was multiplied by 100, to achieve the WHO general reporting form of bacteria as CFu/100ml (although written as col/100ml in the study, result is the same). Although contamination risk was minimized by wearing clean vinyl gloves when taking the sample, the actual sample was collected by using exact same methods as locals do when drawing drinking water. /9/



Figure 1. Inside the incubation box /9/

Figure 2. Incubation box /9/

The water samples were collected from *modernized wells (MW)*, *traditional wells (TW)*, *boreholes (BH)*, *water pits (WP)* and *streams*. All of these sources are being used by the locals, for drawing their water. The modernized wells had been built by the Zambian government during the project, but the other water sources were either natural or built by the locals, and they could be rather poor quality constructions. For instance, the traditional wells were not designed to protect the water inside, from runoff water entering the well from outside, having not molded a concrete “ring” around the top end of the well hole. /9/

The results for all the locations and type of water sources, are presented in the tables 12 and 13 below.

Table 12. Results from the first sampling during dry season. /9/

| Parameters | Units | Types and Locations | | | | | | | | | | | |
|----------------------|--------------|---------------------|---------|----------------|---------|---------|--------|----------|---------|---------|----------|----------|--|
| | | BH | | MW | | | TW | | | | WP | Streams | |
| | | Kaloko | Chisapa | Chief's Palace | Mwaitwa | Serenje | Kwasha | Kandulwe | Kasamwa | Lumbowe | Luampesa | Luankuni | |
| Temperature air | (°C) | 28,9 | 29,3 | 22,3 | 24,7 | 22,0 | 30,2 | 31,3 | 25,7 | 31,2 | 27,1 | 25,0 | |
| Temperature sample | (°C) | 24,6 | 24,3 | 24,3 | 23,5 | 23,0 | 22,2 | 23,5 | 23,8 | 27,0 | 21,1 | 22,6 | |
| pH | | 6,67 | 6,52 | 6,13 | 6,20 | 6,80 | 6,32 | 6,12 | 5,60 | 6,47 | 6,82 | 6,87 | |
| Total coliforms | (col/100 ml) | 900 | 50 | 1100 | 3550 | 28400 | 14400 | 10350 | 7350 | 17200 | 14250 | 31700 | |
| E.coli | (col/100 ml) | - | - | - | 150 | 300 | 350 | 50 | 50 | 350 | 1000 | 1700 | |
| of which E.coli 0157 | (col/100 ml) | - | - | - | - | - | - | - | 50 | 150 | 400 | 350 | |

Table 13. Results from the second sampling during rainy season. /9/

| Parameters | Units | Types and Locations | | | | | | | | | | | |
|----------------------|--------------|---------------------|---------|----------------|---------|---------|--------|----------|---------|---------|----------|----------|--|
| | | BH | | MW | | | TW | | | | WP | Streams | |
| | | Kaloko | Chisapa | Chief's Palace | Mwaitwa | Serenje | Kwasha | Kandulwe | Kasamwa | Lumbowe | Luampesa | Luankuni | |
| Temperature air | (°C) | - | 28,2 | 28,8 | 28,2 | 26,6 | 31,5 | 30,2 | 29,9 | 29,4 | 30,8 | 30,0 | |
| Temperature sample | (°C) | - | 24,7 | 25,1 | 23,9 | 23,3 | 23,5 | 23,5 | 24,7 | 26,8 | 23,5 | 22,8 | |
| pH | | - | 6,54 | 5,82 | 5,38 | 6,60 | 6,37 | 6,37 | 5,20 | 6,28 | 6,67 | 6,80 | |
| Total coliforms | (col/100 ml) | - | 200 | 300 | 26950 | 16300 | 18650 | 4000 | 18500 | 8300 | 17700 | 18000 | |
| E.coli | (col/100 ml) | - | - | - | 1100 | 450 | 150 | 50 | 200 | 300 | 700 | 200 | |
| of which E.coli 0157 | (col/100 ml) | - | - | - | 1000 | 450 | 50 | 50 | 200 | 300 | 250 | - | |

The results from the study show that the water used by the households, is rather widespread in quality, depending on the location.

The modernized wells can be said to have good or excellent water quality, but the traditional wells, water pits and streams all showed bacterial contamination. Of course the quantity is as much of an issue, as the quality.

The pH can be said to be satisfactory level all around the different locations.

The water quality did also change between the dry and the rainy season, but it was not either a constant change for better or worse, but the changes varied. For instance, the quality of the water in the Luankuni stream improved remarkably during the rainy

season, but on the other hand the total coliform and E.coli concentration grew eight fold. /9/

Some pictures of the sample sites are presented below.



Figure 3. Traditional well (Kasamwa) /9/ Figure 4. Water pit (Lumombwe) /9/

5 Project planning & implementation

The planning and implementation of the project plan will be discussed in this topic. Basic elements related to project management theory will be included, such as defining terms such as *scope*, *work breakdown structure* and *resources*.

The first stage of the project planning process is to determine the *scope* of the project, meaning the specific definition of its products, requirements and features to achieve the final objectives of the project. After having determined the scope, the individual tasks are given timeframes to complete the work within schedule. /3/

The scope of the Zambia project was determined mainly over a couple years before launching the project. The project was initially divided into two main stages, first of which concentrates on making written agreements, establishing the baseline studies and preparing for the second stage, during which the building of dry toilets begins as well as giving education on the concept, health and hygiene. The stages and the most significant features of the project are shown in the table 14, which is a section of the actual project plan, which was sent to the Finnish Ministry of Foreign Affairs when applying for grants.

Table 14. Project plan application / Stages 1 & 2, 5.2006 – 12.2008

| |
|---|
| <p>5.4 Describe the activities by which the results and immediate objectives are to be accomplished. If possible, please also give a rough timetable (by year) of project implementation.</p> |
| <p>1.5.2006-31.12.2006: Stage 1, the development of the operation model and background studies.</p> <p>Negotiation of the measures, responsibilities and authority with the local partner. Written agreements with the local partner. (5-6/2006)</p> <p>Choosing the local project assistants and their education. The Finnish project person collects English education material. The material can later be used in similar education in other projects and be given into use of other organisations. The Finnish project person gives education in Zambia. (5-7/2006)</p> <p>Interview study and collecting background information in the project area. The written part of the study is made by Finnish workers in cooperation with the local partner. The local partner and project assistants carry out the inquiry in the area, maybe with the help of a Finnish student. If it is possible, the Finns make an interview database to the Internet. If this is possible, it would be easier to analyse the interviews and there would be no need to send papers to Finland. (5-7/2006)</p> <p>Other background studies, literature reports and finding new project partners: Finnish project person. (5-10/2006)</p> <p>Dry Toilet Conference in Finland. Finnish workers introduce the project in a Finnish seminar and a project poster is presented in the Conference venue. The manager of the Zambian partner will be present in the conference. Project planning in Finland. (8/2006)</p> <p>Assessment of the results of the inquiry and local chartings and drawing conclusions.. (9-10/2006)</p> <p>Planning and preparing of stage 2, mainly in Finland but in cooperation with the local partner. Finnish project person in Zambia if necessary (10-12/2006)</p> <p>1.1.2007- 31.12.2008 (stage 2, building and researching)</p> <p>Education/general discussion meetings with villagers. First the education/discussions will be arranged to all, later to divided groups of men, women and children, if necessary. If necessary, the use of a theatre group to make people commit to the project. (1-6/2007)</p> <p>Building (2-3/2007) of the functional and safe toilets, at first 2-3 pilots to get experiences from how they function in the local conditions. The project progress is followed and the costs, material, labour and possible problems are written down. The functionality (8-12/2007) of the composting process is researched. The toilet models to be built are chosen with the local users. However, at least one of the models should be a composting toilet so that the composting process can be tested in the local conditions. Toilets in schools and clinics are the first on the list, after that, private toilets.</p> <p>Small evaluation of the project findings so far. (11-12/2007)</p> <p>The use of composted toilet waste is tested in a test plantation. Test columns (e.g. 10m x 10m) are established for plant tests. On different columns the same plant is grown without fertiliser, with chemical fertiliser and with the composted end product. This way the nutrient effect of the composted toilet waste can be easily compared. The benefits of use of</p> |

composting toilets can be shown to the inhabitants. (3-12/2008)

Based on the experiences received from the test columns, use of toilet waste can be transferred to the local people's gardens and plantations. This hopefully improves the food supplies and/or the economy of families by giving them bigger harvest to sell.

Building up more toilets and their follow-up. (12/2007- 10/2008)

If necessary, education, advice and guidance are given and open discussion sessions are arranged in the villages.

Final evaluation (10-12/2008).

Based on the information from the project plan application, common project management tool called *Work Breakdown Structure* (WBS) can be applied. It is a chart which organizes the various tasks and their elements in a manner which helps in the defining the project and summarizes the scope of the project. Examples of the WBS made of the stages 1 and 2 for the GDTF project in Zambia, are presented in figures 5 and 6.

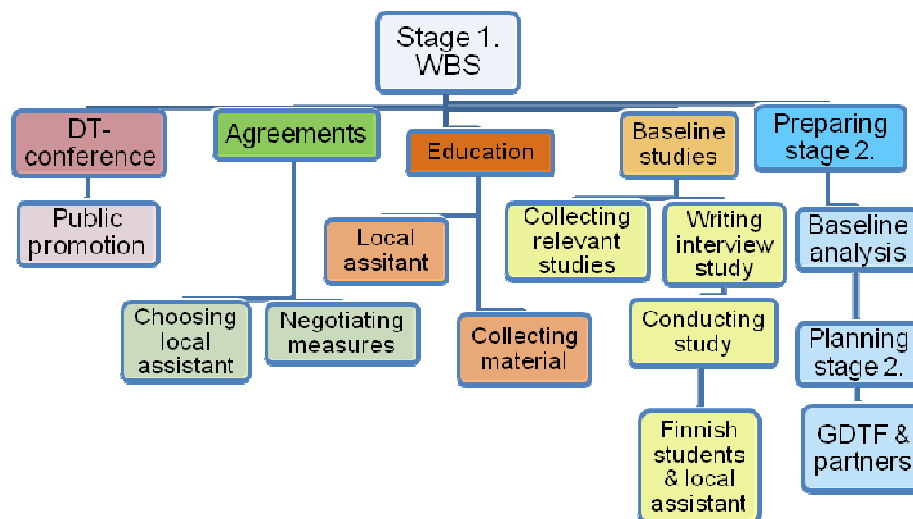


Figure 5. Work breakdown structure of stage 1.

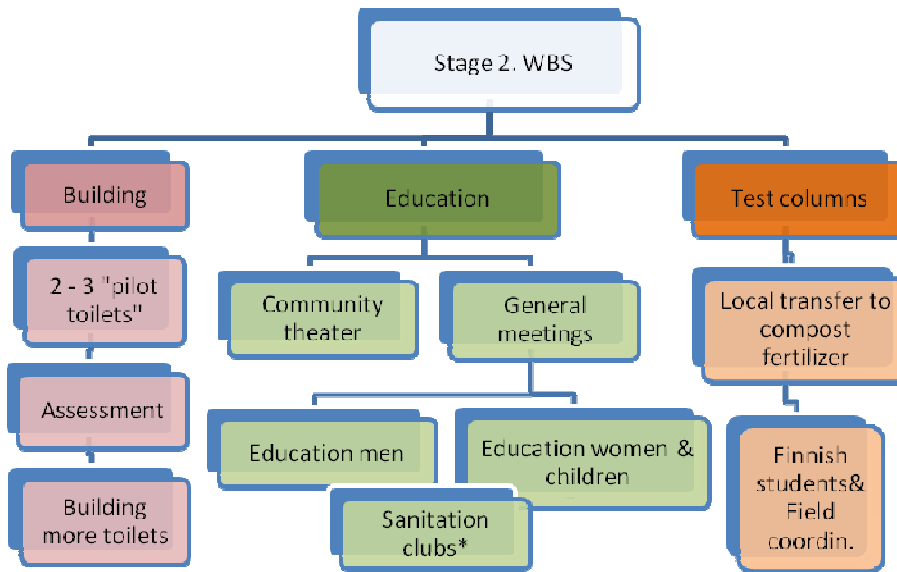


Figure 6. Work breakdown structure of stage 2.

*Sanitation clubs: Although the sanitation clubs were not mentioned in the project plan, but they became a significant part of the project in January 2008, after gaps in community participation had been identified during the mid – term evaluation.

Following the step where specific tasks and their timeframes are determined, the resources need to be divided between the tasks.

5.2 Writing agreements

The project coordinator attended a course on agreement writing in 2005, at the Service Center for Development Cooperation (KEPA) of Finland. The course dealt with issues such as what is good partnership, why are written agreements necessary for projects, what should be included in the agreements, what are the parties committing into as they sign the terms of the agreements.

Surely projects can face different types of obstacles depending on a variety of factors, such as the political or cultural sphere of the county. It must be said though, that GDTF did not face any problems in agreeing upon terms or writing of the agreements.

As was done in the Zambia project, and given as a recommendation by the project coordinator, it is a good idea to first make an agreement covering the general terms of the project, leaving out detailed issues such as hiring of workforce. Further on, the detailed issues such as the hiring of workforce can be done later on in separate

agreements. This method provides more leeway for conducting specific tasks during the project, and establishes a certain degree of flexibility for the implementation.

5.2 Education

The project coordinator was rather familiar with the project area before the launch of the project, and therefore collecting suitable material for the general awareness raising sessions was not a challenge. Good material should be simple and visualizing, because many people are illiterate, and simplicity was said to be effective by other actors in the area, such as the Kaloko clinic staff and KTZ.

A method which proved to be exceptionally successful in raising general awareness was the use of a Zambian drama group called Kamoto Community Arts (KCA). They were given a brief education on the concept, the project and its goals, after which they designed their own performances mixing dancing, singing and theater acts into a performance, which promotes the dry sanitation concept. The local population showed a lot of interest in coming to see the group, and people showed up in large numbers everywhere they went. This does not happen so easily when a white person comes wanting to show educational papers to people. Kamoto Community Arts delivered the message in a cost effective way, considering the amount of people who came to the shows. Additionally joint educational sessions have been arranged together with the Kaloko clinic.

After the general awareness raising, more detailed workshops were arranged for the local population. The workshops sometimes targeted specific groups of people, for example dividing up men, women, construction workers, sanitation clubs or sanitation experts. The contact to the local population has been maintained by the field coordinator, who actively discusses the importance of hygiene, sanitation and the concept of dry sanitation, with members from different communities.

The workshops, their activities, purposes and possible divisions of people are presented in the table 15 below.

Table 15. Descriptions of each workshop provided in the project area.

| Work shop | Time | Purpose | Activities | Divisions |
|-----------------------|-------------|--|--|------------------|
| Sanitation expert | 2006 | Select contact persons for villages (sanitation experts) | Discussion sessions on the concept and hygiene. | Men, women |
| Kamoto community Arts | 2007 | General awareness raising. | Educational drama, discussion sessions on hygiene and the concept. | Men, women |
| PHAST | 2007 | Hygiene education, DT construction education. | PHAST material education, DT constructions. | |
| Leadership | 2008 | Community leadership capacity building, establishing sanitation clubs. | Discussions and exercises designed to improve leadership skills. | |
| Hygiene | 2008 | Hygiene education. | Discussion sessions on hygiene. | |
| Constructor's | 2009 | Selecting a new DT constructor. | Building another DT. | |

The project coordinator commented on the education, pointing out that in general the educations and workshops have been good considering their contents, although the PHAST material might have been a little too simple. In her opinion, the only hindrance considering the education has been problems in transportation, and reaching the local people in the villages has been difficult at times. Additionally, she would wish to receive more detailed documentation about what has been taught in during the trainings, from the field coordinator.

5.3 Sanitation clubs

The midterm evaluation in 2007 gave recommendations for improving efficiency in village level implementation. This was established by the engagement and training of the field coordinator, as well as by forming sanitation clubs to each village. By the formation of the sanitation clubs, the project attempts to build capacity among village leaders to enable them to acquire skills for community mobilization and project management. /12/

The sanitation clubs were formed based on workshop offered to interested members from all the villages included in the project. Each village was asked to select a group of participants to the workshops, during which a meal would be provided every day. A total of 31 participants attended the five day workshop, and members from every village came.

The objectives of the workshops were enlisted as follows;

- To deepen participants' understanding of leadership.
- To deepen participants' understanding on the duties and responsibilities of key community leadership positions.
- To facilitate the formation of community based clubs for ZASP.
- To conduct an in-house training for the ZASP Field Coordinator on Report writing
- To produce material (handouts) and report on the training contents and proceedings.

The participants were engaged in exercises on defining leadership and the qualities of it, as well as defining the tasks and responsibilities of the different leadership positions, namely the chairman, secretary, treasurer and committee members. Following the exercises those leadership positions were assigned to the participants, thus forming the sanitation clubs of each village. /12/

Following this, further exercises were given to each individual sanitation club, in which they were to form an action plan for improving dry sanitation in their village, including specific tasks and timetables. The action plans produced by the club members included tasks such as finishing the construction of the dry toilet, and establishing the organic farming test fields. Those parts of the action plans that were acceptable to GDTF, were financed to the clubs whose treasurer would record the purchases.

The sanitation club members have been highly committed, and are nowadays a significant supporter and actor of the project.

5.4 Construction of toilets

The construction of toilets was started from the year 2007 onwards. At first 2 – 3 pilot toilets were to be built, after which user experiences would be collected to determine if any problems or ideas for improvements would come up, to see if any changes would be made to the rest of the toilets that would be built. The user experiences were good, and no changes were required to be made.

The pilot toilets were squatting model toilets, which had two separate composting cisterns. The blueprint of the toilet, as well as a complete list of construction materials with cost estimation can be found in the appendixes 1 and 2. The idea of double composting cisterns was that one of the cisterns would be used at a time, while the other would be kept for composting. After the cistern in use would be filled up, the other cistern would be then emptied and taken into use. At the present moment, no cisterns have required emptying yet. When the time comes though, it will be evaluated whether or not further composting will need to be done.

There were some issues, which hindered the building process significantly. A significant setback came up related to the participatory method when it was implemented in the constructions. The initial intention was that the construction of the toilets would be a community effort, so that the local people would be involved in the constructions together with a professional builder. The professional builder Mr. Isaac Chisenga was hired by ZASP, and therefore was paid for his work. After the local people involved in the constructions as volunteers learned that Mr. Chisenga gets paid, they demanded to be paid as well. Obviously this is not possible due to financial limitations, and as a result the local population quit construction efforts entirely. The community involvement practically vanished, and the constructions therefore relied on Mr. Chisenga and occasional practical trainees from Finland.

It would have been ideal that community members would have been involved, because it would have helped the sense of ownership of the toilets to grow, therefore improving the sustainability of the project.

Another hindrance considering the constructions was the problems faced with transportation. The local cooperation partner KTZ had only a single vehicle, which was not possible to be always provided for construction purposes. The limitations in the availability of the vehicle ended up also causing friction between the KTZ coordinator, field coordinator and the builder. As a result of these transportation problems, GDTF begun considering to purchase a vehicle of their own, which could be used for project purposes only. At this point of the project when three years have passed though, the project coordinator thought it would be too late. But if the transportation problems could have been foreseen, the situation would be different.

5.5 Establishing organic farming test fields

The pilot cultivation test fields were established over the period of February – May of 2008, by Mr. Antti Hannila. The site was established at the largest village of the project area, where most people would see it and be aware of it. The village was the Kaloko village.

The test field at Kaloko was such that it had different columns, for using different fertilizers on each column. There were 4 columns, one of which used no fertilizers at all, one of which used only diluted urine for the column, one of which used cow manure, and one of which used synthetic fertilizer. Such a set up provided a good example of the effectiveness between the different fertilizers, for the local people to see the differences. The diluted urine yielded almost as good of a harvest as the synthetic fertilizer did. Needless to say the column where no fertilizer was used did not yield a very good harvest.

Later on the sanitation club members were encouraged to establish organic test fields in their own communities, with the assistance of the field coordinator. Similar results can be expected to be achieved at those fields. By the end of the year 2008, 6 out of 11 villages had already established their own organic gardens, but no harvests had been collected yet. /5/

5.6 Practical trainees & final thesis

The project has provided practical training and final thesis opportunities to several students, already over the first 3 year period. Through the efforts of the students, the project has been able to bring more know – how into the field work, improving total quality in different areas. Some of the contributions of students for the project, from the three universities in Tampere are presented below.

5.6.1 Survey and recommendations on Zambia Dry Sanitation Programme

This was a final thesis topic for Mr. Toni Paju. The aim of the final thesis was to determine whether or not there is a relationship between the level of knowledge people have about dry toilets, and the adaption of the dry toilets from behalf of the local population.

The study was able to provide clear indications of the importance of education, and it is available on the GDTF website. (See references 4)

5.6.2 Evaluation of urine as fertilizer for maize and cabbage production in Kaloko village, Zambia

This was a final thesis topic for Mr. Antti Hannila. The aim of the final thesis was to establish a garden to the village of Kaloko, and divide it into sections where maize and cabbage would be grown, using no fertilizer, synthetic fertilizer and diluted urine as fertilizer.

The test field gave a very clear and practical example to the local population, about the effectiveness of urine as fertilizer. It was an important demonstration, and it was important for motivating the local dry toilet users to do the same. The study is available in the GDTF website. (See references 5)

5.6.3 The challenges of the sanitation sector in Zambia

This was a final thesis topic for Mrs. Mia O'Neill. The aim of the research was to identify the main challenges of Zambian sanitation sector and the actors within the sanitation sector. Furthermore, the research aims at finding a way how to move from pilots to long term sanitation projects.

The study is available in the Tampere University thesis collection site.(See references 6)

6 Final evaluation

As mentioned, appraisal is one of the basic steps of project management. In appraisal the project is being scrutinized for measuring the success of achieving the goals set out in the project plan. Besides estimating the achievement of objectives, the project can be evaluated on other factors such as matching the schedule, matching planned expenditure, institutional spreading etc.

6.1 Method of evaluation

The project has got 4 important features, which have been set as primary goals in the project plan, or they can be considered essential in achieving the ultimate goal of the project. The ultimate goal being able to establish a sufficient base for know-how, motivation and inspiration within the local population, which in turn causes the local population to create their own, self sustained dry toilet culture. The 4 objectives as mentioned are:

1. Construction of functional dry toilets within communities of the project area.

2. Increasing public awareness on the concept of dry sanitation, hygiene, personal and environmental health issues.
3. Improving health, and reducing illnesses.
4. Establishing openness towards the concept, and ability to run the system independently.

The purpose of the evaluation was to assess how well those 4 objectives have been achieved, by interviewing the inhabitants of the project area and key members of the project management, as well as making field visits to the toilets and organic gardens established by the local agricultural communities.

As an evaluation of this extent requires the existence of an evaluation team, assistance in writing, counting and translation was available throughout the village interview sessions arranged in the different agricultural communities of the project area. By the help of this assistance, the interviewer could concentrate on the essential matters, such as asking questions and discussing the issues with the local people. The members of the evaluation team and their tasks are shown in the table 14 below.

Table 16. Members of the evaluation team, their professional occupation and tasks.

| Name | Professional occupation | Task in evaluation |
|----------------------|-----------------------------------|--|
| Mr. Ville Juusela | Student / evaluator & interviewer | -Asking the questions preset for the interview sessions. Conducting and provoking discussions in the meetings. |
| Mr. Raven Ng'uni | Teacher of Kaloko middle – school | -Translating the questions asked by the interviewer, as well as translating the answers given by the people of the communities back to the interviewer and Mrs.Huuhtanen. |
| Mrs. Sari Huuhtanen | Project coordinator GDTF | -Counting and making a note of raised hands in questions, which ask “how many of you...” -Making notes of opinions and comments raised in the interviews and discussions. |
| Mrs. Michelo Katambo | Field coordinator ZASP | -Making notes of opinions and comments raised in the interviews and discussions. |

The interview sessions were arranged as follows in table 15, and the field visits to the toilet sites was done during the same visit, as well as the field visit to the organic gardens if such had been established

Table 17. Village and field visit schedule

| Date | Community | Field visit: dry toilet | Field visit: cultivation test field |
|------------|-----------|-------------------------|-------------------------------------|
| 26.11.2008 | Kantolo | Yes | Yes |
| 27.11.2008 | Luanpesa | Yes | No |
| 27.11.2008 | Lumombwe | Yes | Yes |
| 28.11.2008 | Kasamwa | Yes | No |
| 28.11.2008 | Mwaitwa | Yes | No |
| 29.11.2008 | Chisapa | Yes | No |
| 29.11.2008 | Kwasha | Yes | Yes |
| 01.12.2008 | Kandulwe | Yes | Yes |
| 02.12.2008 | Kaloko | Yes | Yes |

The nature of the interview sessions was mainly conversational. A specific list of questions was prepared for the meetings, and the questions were designed to reflect the knowledge and understanding of the following; importance of proper sanitation and good hygiene, ability to maintain and use the dry toilets correctly, ability to utilize the urine and composted manure correctly and the openness towards the concept of dry sanitation. The list of questions can be found in the *Project Evaluation Activity Plan* report prepared for the evaluation trip, and it is available through contact (See references 10). The change in knowledge and in opinions can be done by comparing the results of this evaluation, to the water and sanitation survey made in the beginning of the project.

When conducting the interview sessions the local people were much encouraged to participate in open discussion, and it was also attempted to encourage all groups of people (men, women, elderly, young etc.) to state their opinions. This participatory method was considered to be effective for the sake of free opinion sharing, hence providing a realistic image of the project. Some degree of leading the conversation was used when considered necessary or useful, but always in a manner which did not influence the opinion of the replier/s. When visiting the Lumombwe community there was some uncertainty among the community members when they were asked: "Who is/should be responsible for the maintenance of the dry toilet?" Then due to this uncertainty among the community members, it was decided that it might be helpful to

them to order their thoughts and opinions on the matter by asking a follow up question; “who are the owners of the dry toilet”. Indeed this method yielded a much clearer response, although the answer remained essentially similar to the original response.

Visual aids were used in the form of a drawing board, for listing positive and negative issues surrounding dry toilets and the concept. The board was held visible to everyone, to add effectiveness to the “exercise”.

Field visits to the dry toilets were made at all sites. The toilets were assessed by observing and discussing the practical use and maintenance of the toilet. The site was evaluated on functionality and cleanliness. If any nonconformities or RFIs (room for improvement) were found, they were noted and photographed.

Field visits to the cultivation fields were made in those communities, where they had been established. The garden sites were assessed by observing and discussing the plans and proceedings of the future. The sites were also photographed for later reference.

Also the key personnel involved in the project were interviewed, for determining the problems and successes experienced in the project, as well as to determine the future outlooks of the project. Besides interviewing the project coordinator Mrs. Sari Huuhtanen, the director of Kaloko Trust Zambia Mr. Lewis Jere and the ZASP field coordinator Ms. Michelo Katambo, they were also given the opportunity for free speech and commenting opinions.

The project was also evaluated on how well the objectives stated in the project plan were achieved within the given timeframes, because this reflects the effectiveness of the execution of the project, as well as how realistically the objectives were set. Evaluating the accomplishing of the objectives was done by making field visits and interviewing the project coordinator.

Over the course of the evaluation period, some limitations hindering the evaluation process were faced. For example there were a couple occasions when visited communities were not expecting the evaluation team. This was due to poor communication, when the person sent to deliver the message about the meeting to the community, did not deliver the message correctly or at all as was in one case. Despite the setback, some village members were always managed to gather up for the interview session. On the other hand, on some such occasions only sanitation club members came

to the interviews, and those opinions can be expected to be coming from people who are more enthusiastic about the concept. No further limitations occurred, and the schedule was carried out flawlessly thanks to good transportation.

6.2 Evaluation results compressed

The number of people reached in each village, varied quite a lot between the different villages. In some cases the number of people taking part to the interview session kept changing throughout the session, when for instance people came late to the interview, or had to leave to attend other duties during the session. However, in those cases the average number of participants was estimated. These changes in the numbers have been taken into consideration while analyzing the data derived from the interview sessions. The complete list of villages and interview participants is presented in the table 16 below. /8/

Table 18. Number of interview participants in villages.

| Community | Male | Female | Total | # club members |
|------------------|-------------|---------------|--------------|-----------------------|
| Kantolo | 4 | 20 | 24 | 3 |
| Luanpesa | 9 | 6 | 15 | 3 |
| Lumombwe | 8 | 4 | 12 | 4 |
| Kasamwa | 3 | 0 | 3 | 3 |
| Mwaitwa | 3 | 2 | 5 | 4 |
| Chisapa | 15 | 17 | 32 | 7 |
| Kwasha | 3 | 2 | 5 | 5 |
| Kandulwe | 3 | 2 | 5 | 3 |
| Kaloko* | 1* | 3 | 3* | 0 |
| TOTAL | 49 | 56 | 104 | 32 |
| PERCENT | 46,7 | 53,3 | 100 | 30,8 |

Kaloko* = The only male person interviewed in Kaloko was Mr.Ng'uni, who was the interpreter for the interview sessions. His interview did not follow the usual format or ask the regular questions, and his interview is not included in the numerical data analysis.

The dry toilets were visited at all 9 sites. At the sites in Kaloko, Kasamwa, Kwasha, Kandulwe and Mwaitwa communities the toilets were already in use, and in the other locations (Kantolo, Luanpesa, Lumombwe, & Chisapa) the toilets were still under construction, although they were also very close to being finished.

Generally, it could be said that the dry toilets were in good condition, clean and well maintained. The complete list of comments, RFI's and nonconformities found at the dry toilet sites is presented below in the table 17.

Table 19. Field visit results to different communities

| Date | Community | Comments | RFI's | Non - conformity |
|------------|-----------|---|---|---|
| 26.11.2008 | Kantolo | -Toilet still under construction, though nearly finished. -Clean and tidy. | -Casting of urine hole was weak, because concrete was mixed with molasses, instead of water. -Casing for urine container is weak and detached from toilet. | -None |
| 27.11.2008 | Luanpesa | -Toilets still under construction, though nearly finished. -Door, urine tubes and their fittings missing. -Steps have cracks. | -A little untidy -Toilet had been used already. | -None |
| 27.11.2008 | Lumombwe | -Toilet still under construction, though nearly finished. -Urine tubes and their fittings still missing. | -None | -None |
| 28.11.2008 | Kasamwa | -Toilet in use. -Cleaning equipment & bulking material present inside. -Clean and tidy. | -None | -Door does not close, because of a broken hinge. |
| 28.11.2008 | Mwaitwa | -Toilet in use. -Cleaning equipment & bulking material present inside. -Clean and tidy. | -One of the urine tubes is missing (kept out of reach of thieves). | -None |
| 29.11.2008 | Chisapa | -Toilet still under construction, though nearly finished. -Clean and tidy. | -None | -None |
| 29.11.2008 | Kwesha | -Toilet in use -Bulking material present inside. -Clean and tidy. | -Toilet lid had a 20 liter container on it (too heavy for children or elderly to remove). | -Toilet door was locked, and lock would be opened when asked for. |
| 01.12.2008 | Kandulwe | -Toilet in use. -Bulking material present inside. -Clean and tidy. | - Lid over the fecal and urine hole was not on. -Small gap between the urine tube and the container's cap. | -None |
| 02.12.2008 | Kaloko | -Toilet in use. | -Little untidy. | -No bulking material present. |

Based on the interviews conducted during the final evaluation, nearly 70% of the community members where dry toilets had been built, had attended some sort of trainings or educational sessions. More women had participated in such events, which could be due to men having more work away from home than women. The distribution of all training/educational session participants excluding the village of Chisapa, is shown as a percentage below. /8/

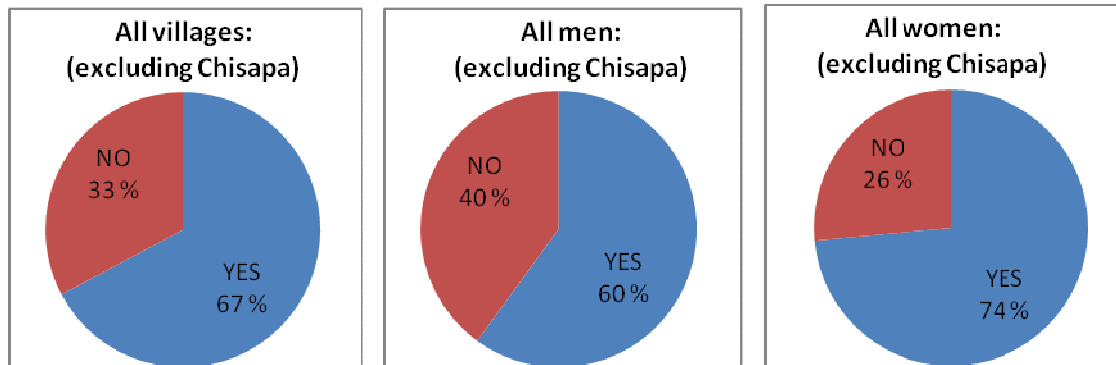


Figure 7. Number of participants in training or educational sessions during the project.

Getting people to attend trainings or educational sessions is very important, since through that it is possible to affect the negative stigma surrounding the concept of dry sanitation in the project area. The affect of education on how useful a solution dry toilets are compared to existing sanitation solutions, can be seen from the figure 7 which is derived from the final thesis of Mr. Toni Paju. In the Chi – square test people who had and had not attended trainings, were asked to set their opinion on the usefulness of dry toilets into given categories, comparing to traditionally used pit latrines. The figure illustrates the differences in people’s opinions.

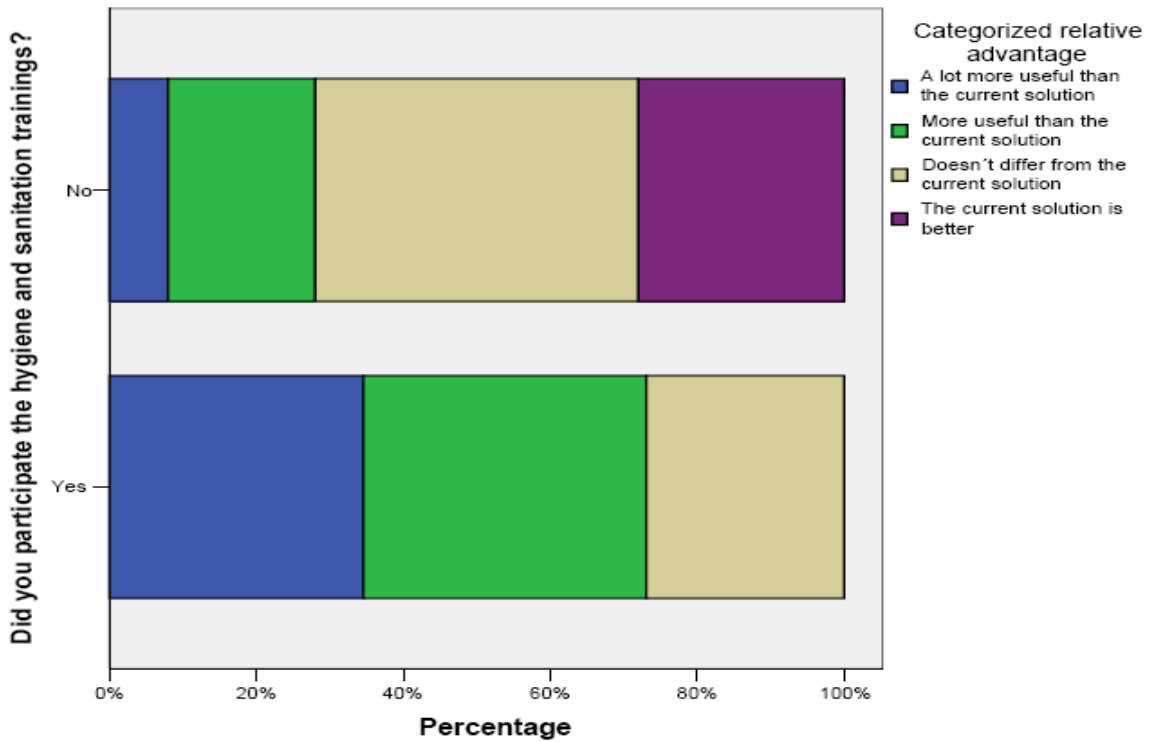


Figure 8. Effect of sanitation training on perception towards dry toilets compared to traditional pit latrine option. /4/

Despite the culturally bound stigma towards using human feces and urea as fertilizers, the education of the population has managed to shift that attitude very well. During the project evaluation, it was asked from people attending the interviews if in their opinion using compost waste and urea as fertilizers is acceptable. The division of opinions between all respondents, excluding the village of Kaloko, is shown below. /8/

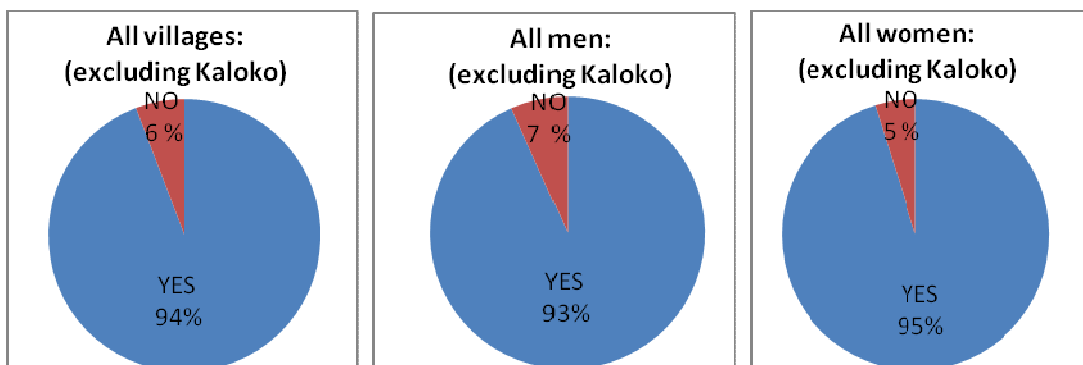


Figure 9. Share (%) of people's opinions about acceptability of using composted manure and diluted urine in agriculture.

Questions testing the technical knowledge of the people were also asked, some of which are presented below. Technical knowledge on urine storage and application on

fields, are crucial because it determines how successfully people will be able to run the system by themselves, and how good harvests people will get.

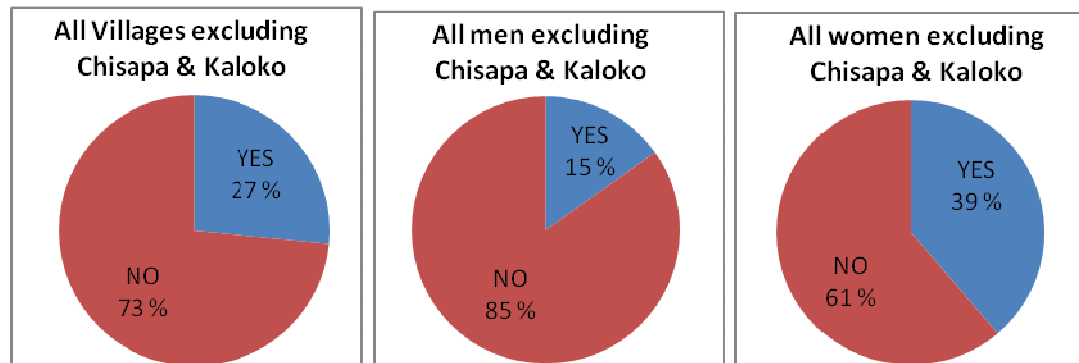


Figure 10. Share (%) of people who claimed to know the dilution ratio of urine to water, which was taught in trainings.

There were some inconsistencies in the answers. Some people who claimed to know the dilution ration, but when it was later asked what the ratio is, some answers were not quite correct. The correct ratio of 1 part urine and 3 parts water came up in every village interview, but also some other ratios were suggested as well, for example ratios like 1:4, 1:5 and 1:10. This suggests there is uncertainty in the matter. /8/

The storage of urine is a matter of safety since there can be bacteria in the urea, but over a three month storage time in a well sealed container, the bacteria will die. The question about the correct way of storing the urine was one which people seemed to be hesitant to answer (especially women for some reason), and often only parts of the correct storing were mentioned when answering the question. It is also worth noting, that this question was also asked in Chisapa, where there had not been educational sessions or workshops. Nonetheless, we managed to get a picture of the people's knowledge on the matter. The results are presented below.

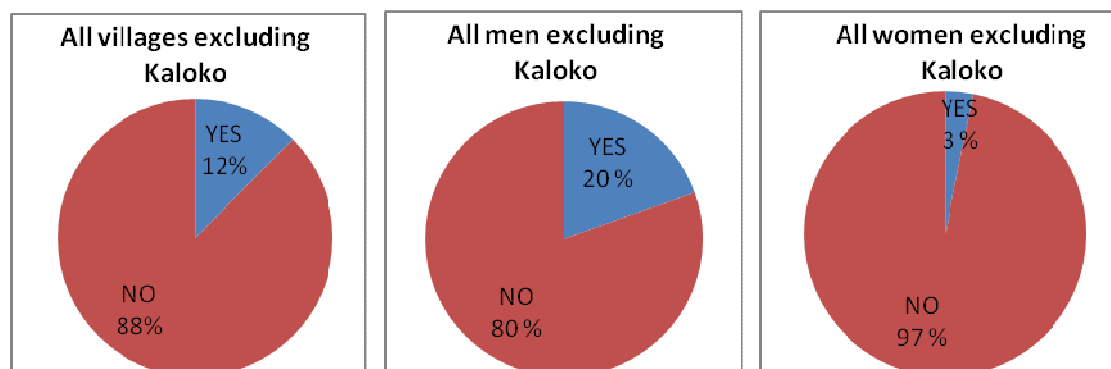


Figure 11. Share (%) of people claiming to know how urine should be stored.

The correct application of composted manure was also inquired in the interview sessions. It can be said that there was only a couple occasions, when someone dared to use common sense and raised their hand, to say that the composted manure should be mixed with the soil so that it is a mixture of fertile and less fertile soil. People did not seem to know how to apply the composted manure, or were perhaps thinking there would be clear specifications on using it. /8/

The model of exemplary toilets built by GDTF is too expensive for local people, and the idea of the exemplary dry toilets was merely to introduce the concept. Therefore to make it affordable, the local population would need to build dry toilets of another model. In the villages of Luanpesa, Kasamwa and Kwesha, it was asked if the people feel that they could build a different model dry toilet, by using materials which they could provide by themselves.

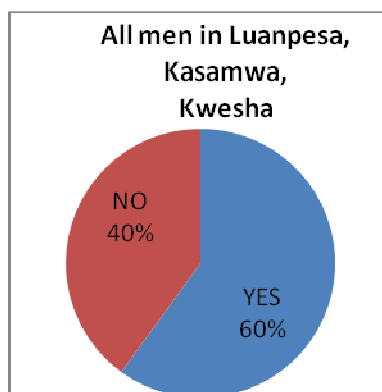


Figure 12. Share of people, who said they would be able to build a dry toilet using their own materials.

It is likely to be due to cultural issues, that women did not answer this question at all. Therefore the results are only presented for men.

The questions concerning the correct application of urine and composted manure, as well as the question concerning ability to build a dry toilet using locally selected materials, are questions that were designed to indicate the local population's ability to carry the project on independently from outside assistance. Although sufficient motivation seems to exist within the local population and generally the people seem to understand the benefits of the project, it became evident during the final evaluation that the local population is not quite ready to continue the project by themselves yet. The local communities still need a little more guidance and advice in the right use of the

toilets, and especially they need further guidance in the correct application of the fertilizers.

7 Discussion

For the first three year grant period of the project, the Finnish foreign ministry required an evaluation of the project to be done. The results presented in this section are based on the final evaluation conducted over 23.11.2008 – 5.12.2008, during which village interviews were conducted in the project area, attempting to evaluate the state of the project. The evaluation team consisted of the project coordinator, field assistant, an interpreter and me. My duty was to be the actual project evaluator, and the project coordinator and field coordinator acted as on scene experts and recorders. The findings of the evaluation were reported after the evaluation visit to the project site.

In this section open discussion about the project is and its state is discussed, as well as any other issues which are considered significant.

7.2 Quantitative and qualitative indicators

Evaluating the success of a project can be difficult, when there are not easily determined indicators for the goals to be achieved. Such problems can be related to non – numerical data, such as shifts in opinions or attitudes. For instance the Zambia project needed to establish a shift in attitudes towards the concept, so that through improved knowledge on sanitation, the benefits of dry toilets as well as hygiene - and health education, the concept would become more welcomed by the local population. Although it is crucial to be able to create openness towards the concept, it can be difficult to measure how well this has been achieved.

One way to measure this type of qualitative indicators is to conduct strictly methodized studies measuring for instance openness towards the concept in the beginning of the project, and then repeating the exact same study later on, asking the exact same questions and following the exact same methods. The results may provide clear indications of opinion shifts, through resulting with clearly different results for the exactly same questions as before. In such a case the resulting answers poses value as indicators of opinion change, meaning that the work (i.e. awareness raising, education, organic test fields...) done to achieve the goal has been effective.

Indicator value can also be established by conducting studies focusing specifically on some certain question, such as was shown in Mr. Toni Paju's thesis that there is a clear correlation between the public education and attitudes. Despite the clear indicative value this type of studies poses, they are very focused on specific questions, and therefore they cannot provide such a wide perspective to measuring project success. Another problem is that this type of studies cannot provide a point of comparison from the beginning of the project compared to a later stage, as the nature of project indicators usually requires.

Quantitative indicators can be done more easily selected, as it can be anything numerical. In the Zambia project such numeric data can be for instance the number of toilets built, bacteriological concentrations in water or health records of the people affected by the project. In order to be able to measure quantitative values, a point of comparison needs to exist. In case the initial value is not known, it needs to be measured.

An example of indicator values and their monitoring is presented in the figure 13 below, in which the development of diarrhea cases reported to the Kaloko clinic over the years 2006 – 2007. Since the first toilet was built in Kaloko in July 2007, the improved health effect of hygiene education, dry toilets, and everything that will be done by the end of 2008, cannot be expected to be seen in this graph yet. But nonetheless the information of the graph is significant in pointing out the number and development of diarrhea cases in Kaloko, as one of the main objectives of the project is to improve general health of the local population.

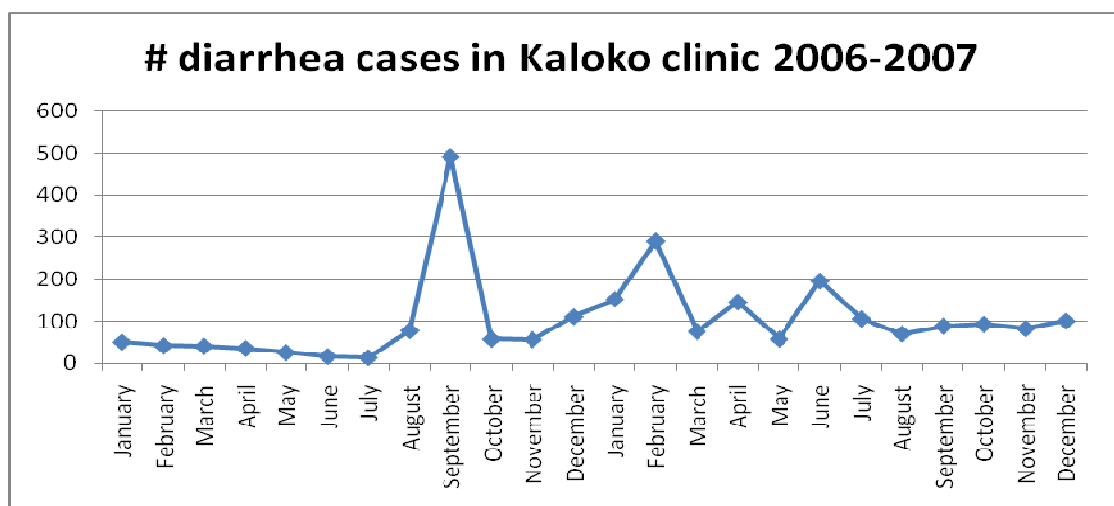


Figure 13. Diarrhea cases reported to Kaloko clinic over 2006 – 2007.

For the sake of being able to make quantitative or qualitative measurements of the project, it is important to set the methods for measuring at an early stage of the project. This is especially important for qualitative measures, because as was said, there needs to be a clear approach of how to measure them. It should be determined before the project starts, because changing the measurement methods later on, interferes with its credibility.

7.2 Participatory method & education

The midterm evaluation of the project established that the project was suffering from low community participation. This was especially true for the construction of the dry toilets. GDTF took the recommended action to improve village level involvement by training the field coordinator more and establishing sanitation clubs, which were designed to “spearhead” implementation. The sanitation clubs and their members did indeed begin to be involved in implementation by helping with constructions, educating their communities and preparing organic cultivation test fields, as they were granted the finance to make improvements. The main failure considering the participatory method was that the local population stopped working on the construction of the dry toilets, after which the project had nothing to support the village level involvement.

By the end of the year 2008, the final evaluation revealed that there now exists a relatively strong sense of ownership towards the project within the local population. Whenever it was asked “who are the owners of the dry toilets” in any of the villages visited, the answer was always that they (community) own the dry toilets. Also the village populations are aware of the benefits of the project, and are anxious to receive results (mainly expecting agricultural improvements). The sanitation clubs have especially adopted the project as their own. All the sanitation club members seemed very enthusiastic about the concept, and serious about their own roles in it. This is significant considering that the dry toilets will eventually be left to the communities to care for.

In an environment where many people are illiterate, visualizing and participatory education methods are recommendable. For general awareness raising purposes, the method of delivering the message by the means of drama performances done by a Zambian drama group called Kamoto Community Arts, was found to be very effective. Visualizing teaching material such as pictures and drawing boards were also used.

Encouraging the people for open discussions with each other in the trainings and in general, can be recommended as well. Separate discussion sessions for sanitation club members were also arranged to improve their knowledge base on sanitation, hygiene and the dry sanitation concept, which they now seem to understand very well.

The biggest gap in the knowledge base of the people is concerning the application of urine and composted manure in agriculture, which is due to insufficient education of the population, and the lack of educational material on the application procedures. Besides the lack of such educational material, the material should also be translated into a form which can be easily understood. It is especially important to be successful in the application of the urine and composted manure, because the “free fertilizers” are one of the most significant driving forces of the project, and the local people are highly attracted to the idea. Failing in this could be disastrous for the future of the project.

7.3 Institutional friction

During the implementation of the project, the relationships between operative parties (GDTF – KTZ – ZASP – work force) have experienced highs and lows, which of course can have significant impacts on the proceedings of the project. In project management theory, the variation in the relationships between parties is commonly referred to as *institutional friction*.

Generally said, it became very clear during the final evaluation, that the communication between all parties by the end of 2008 was very open and effective. Any matters that would require communication between parties, was done immediately and openly, resulting in decisions which all parties could agree upon. This level of open and honest communication is extremely important for a project, since effective feedback systems are a lifeline during implementation. Achieving such good communication between parties, people need be familiar and trust each other. If this does not happen, there is a chance for instance that in the face of problems; the problems are not reported with complete honesty, as workers might fear losing their positions.

In the past some disputes have risen though. There has been tension between the ZASP field coordinator and the director of KTZ, and the tension has been caused by issues relating to transportation and working methods.

Transportation is the responsibility of KTZ, but since there is only a single vehicle which is needed by a lot of other people as well, problems can easily arise due to bad mobility. Over the course of the project, two “solutions” to this problem have become clear. Firstly, the GDTF has considered purchasing a vehicle solely for the needs of the project (discussed further in *Conclusions & Recommendations*). The second “solution” is mere patience.

As mentioned, working habits also caused friction between the field coordinator and the director of KTZ. The situation was that while working in the KTZ premises, the director of KTZ was eager to overlook the reports being prepared by the field coordinator, occasionally even changing some parts of the reports. The dispute led to the field coordinator threatening to quit, and finally she moved to work at home. The solution to the matter came through good communication between all parties, as over time and discussions everyone managed to talk it through and leave the dispute in the past.

8 Conclusions & recommendations

The hygiene and sanitation educations seem to have been successful for the most part. The local population is aware of the importance of good hygiene, and the majority of people claimed to have begun using better hygiene practices. Certain things people seem to have learned very well, such as the correct use of the dry toilet, as well as understanding the concept. Due to the education, the cultural prejudice toward the concept does not seem to be much of a problem anymore. This can be said at least for the people who have taken part in some of the educational sessions (*workshops, sanitation/hygiene educations, educational drama performances*) provided by the project. /8/

Issues which would still need to be worked on, could be to improve the knowledge of the correct application of urine and composted manure in agriculture. Based on the interview results, there does not seem to be sufficient technical knowledge on the fertilizer issues. On the other hand, the people are also expecting to see results of the urine and composted manure in agriculture, to truly embrace the concept. Proving the effectiveness of dry toilet waste as fertilizer should be granted significance, because economical benefits are a major motivator in the local culture, and it will be essential for the future of the project. /8/

Suggestions:

- Provide more educational sessions giving focus on the correct application of urine and composted manure in agriculture.
- Provide KTZ with detailed manuals of the correct urine and composted manure application in agriculture.
- Provide help for existing organic gardens in villages, to successfully use and apply the urine and composted manure in their fields. Help could come in form of assisting in the application of urine and composted manure, providing application manuals and returning to the sites to do a follow up of the progress.
- Increase fertilizer capacity for the fields, to promote the effectiveness of urine and composted manure in agricultural applications. This could be done for instance by encouraging more people to use the dry toilets instead of the pit latrines or bushes, or by building more dry toilets.

If the effectiveness of dry toilet waste is successfully proven, there should be an increased interest in building *self supported dry toilets* by the local population. At this point, an ability to build dry toilets should exist within the population. Although the majority of men thought they could build a dry toilet by using their own materials, the project should consider ways of preparing the population for “tapping into” the potential of dry toilets. /8/

Suggestions:

- If considered reasonable according to circumstances (budget, time, strategy etc...), design and build a cheaper model of a dry toilet, to present an alternative to the more expensive models.
- Provide trainings for building dry toilets to increase know – how and motivation for building dry toilets.

NOTE: In the village of Kandulwe, one interviewed lady suggested that if they were given the materials for a dry toilet, they could go around trying to sell the toilet to people (individuals or groups), for the price of the construction materials. They would then construct the toilet for free by themselves, or together with the buyer of the dry toilet. This might work especially for a cheaper model of a dry toilet.

The sanitation clubs could be considered as a supporting force for the project, and the club members are well trusted by the other villagers. The club members are also expected to take on certain responsibilities in issues concerning the dry toilets, such as in maintaining the dry toilets and educating people about them. The trust towards sanitation clubs was expressed from behalf of the local population and project personnel. /8/

Educational leaflets have also been left to some of the dry toilets, to inform the people about the correct use of the toilet. Unfortunately, those leaflets have been used for toilet paper or stolen, leaving the toilet free of instructions. /8/

Suggestions:

- Provide education separately to sanitation club members to increase their capacity in all issues involved with dry toilets, such as constructions, organic agriculture, sanitation and hygiene.
- Providing permanent toilet using instructions to local people. For instance painting the instructions on the toilet walls.

It is understandable that sharing a single light truck for everyone's needs is difficult, but in all honesty transportation is a daily challenge to the project, because the truck needs to be available for the project when there is work to be done in other villages than Kaloko. If another mean of transportation existed, then possibly some of the work outside Kaloko could be done without the truck. /8/

Suggestions:

- Fix bicycles which are available in KTZ.
- Fix motor cycle which is available in Kaloko, and work out an agreement for ZASP to use it when needed.
- Discuss between management members about the transportation needs as future plans are made, and agree upon specified dates for ZASP to use the truck if possible.

9 References

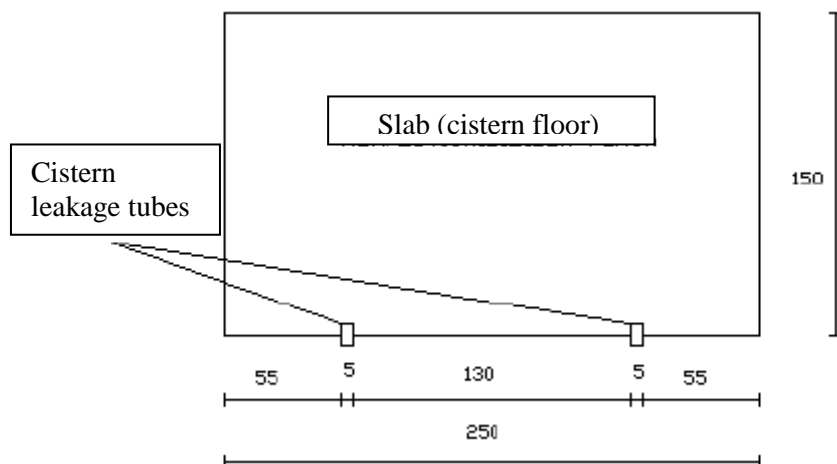
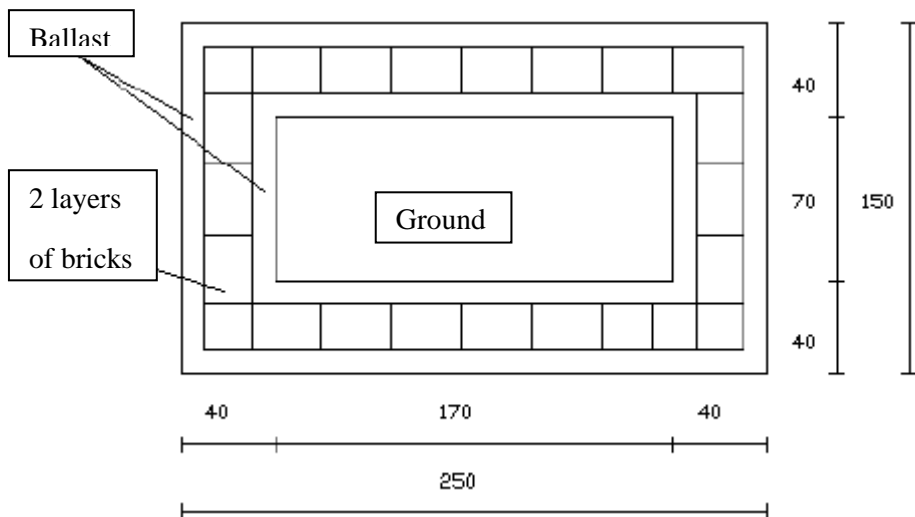
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APPENDIX 1: Dry toilet blueprint

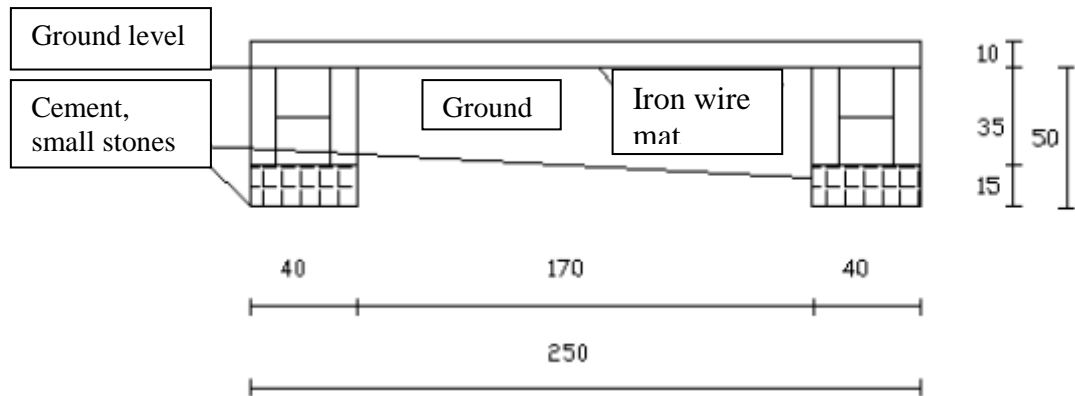
Foundation: /13/



Foundation above view:/13/



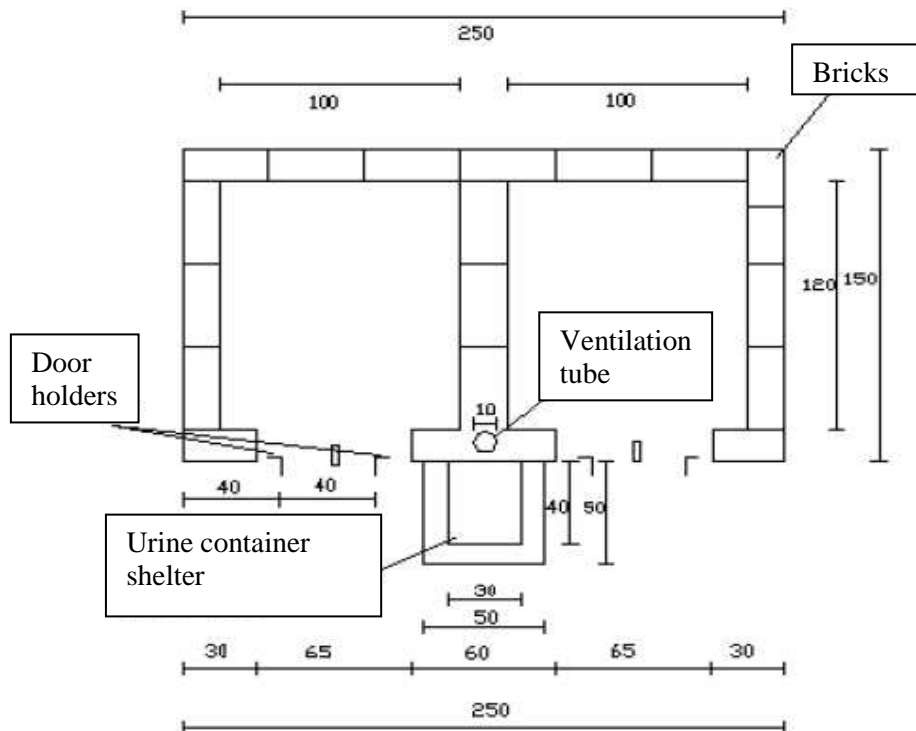
Foundation side view:/13/



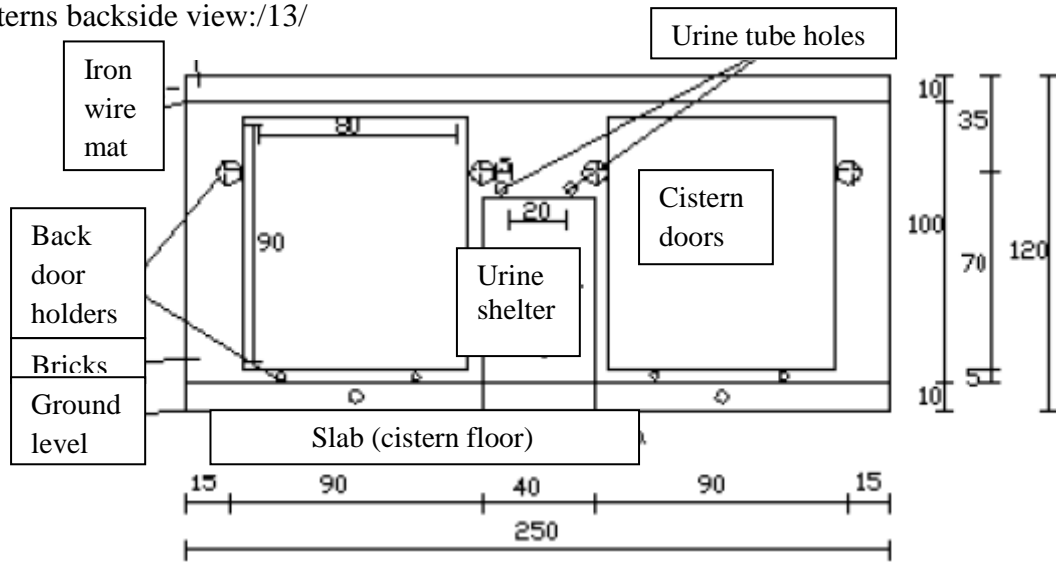
Composting cisterns:/13/



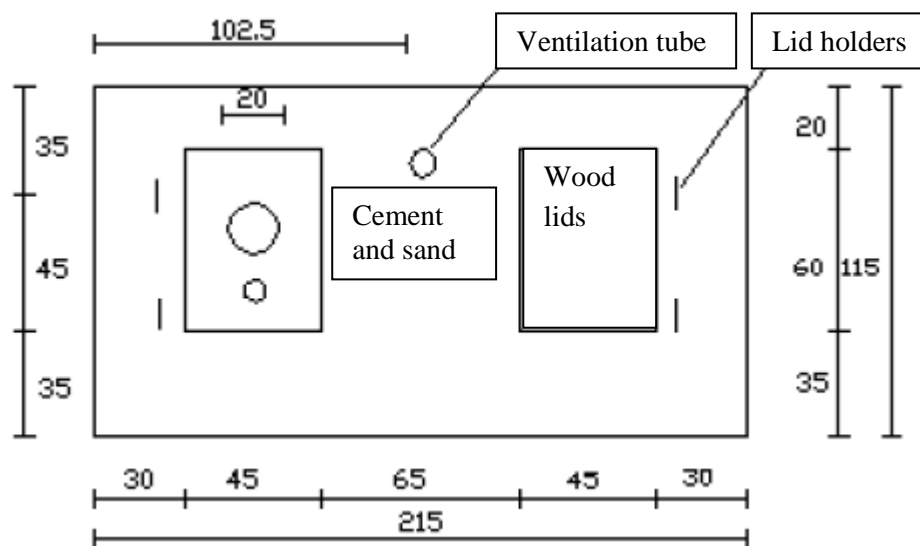
Cisterns above view:/13/



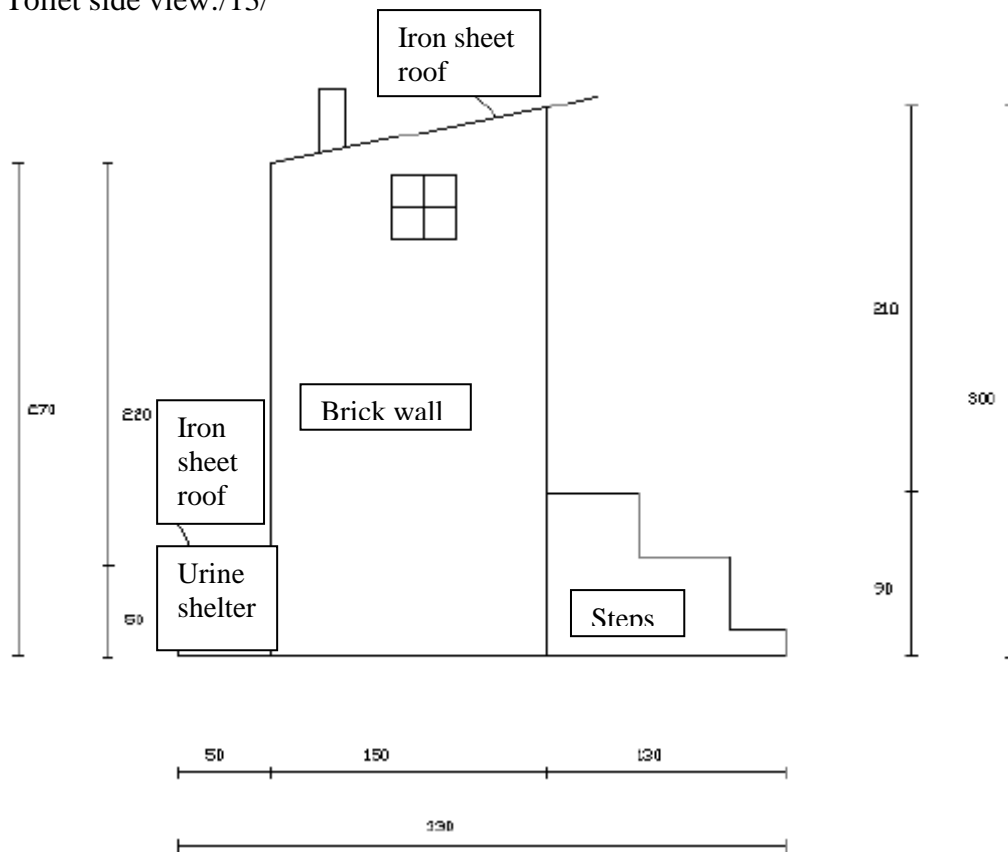
Cisterns backside view:/13/



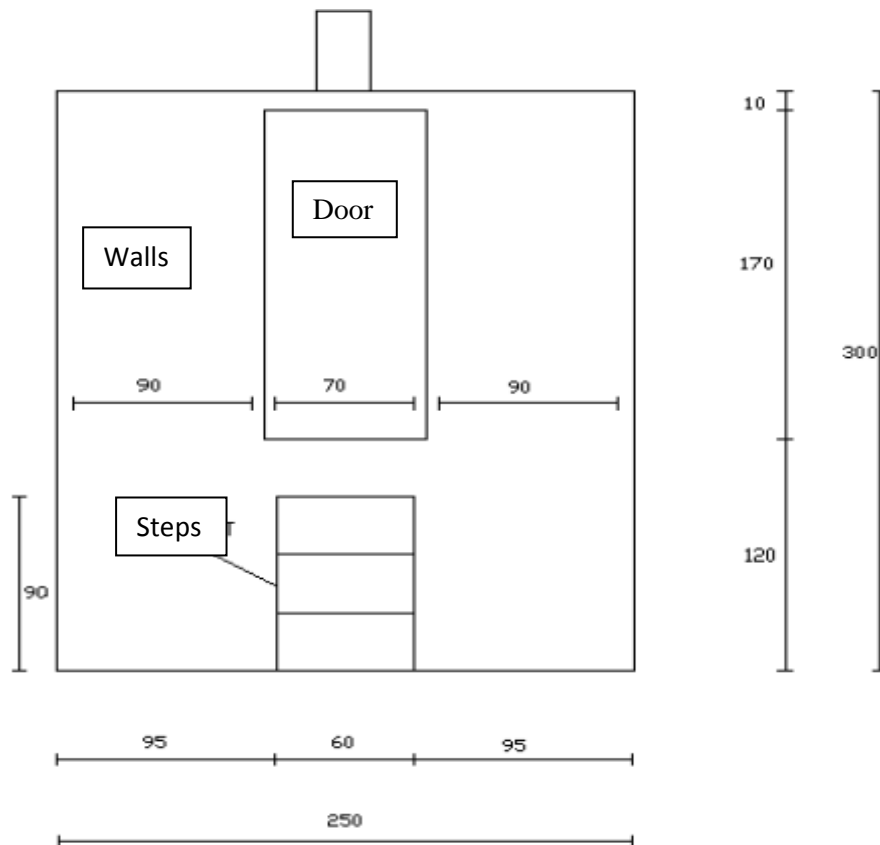
Toilet floor:/13/



Toilet side view:/13/



Toilet front view:/13/



APPENDIX 2: Dry toilet construction materials and cost list

| Material – and cost list | | Unit | Kwacha | Euro |
|--------------------------|---|----------|-----------|-------|
| Foundation | 2,5 cement bags | 75 000 | 187 500 | 37,5 |
| | 35,5 clay bricks | 700 | 24 850 | 5 |
| Slab | 2 cement bags | 75 000 | 150 000 | 30 |
| | Small piece of iron wire mat | | | |
| Cisterns | 2 short plastic tubes for cistern leakage fluids | | | |
| | 1 cement bag | 75 000 | 75 000 | 15 |
| | 84 clay bricks | 700 | 58 800 | 11,75 |
| | 2 short plastic tubes for urine collection | | | |
| Toilet floor | 8 short and reshaped iron bars for door holders | | | |
| | 1 cement bag for plastering | 75 000 | 75 000 | 15 |
| | 8 short wooden boards for moulding | | | |
| | 2 bags of cement | 75 000 | 150 000 | 30 |
| Walls | 4 short pieces of iron bar for urine tube support | | | |
| | 6 reshaped pieces of iron bars, for holding toilet lids | | | |
| | 0,5 cement bags for floor | 75 000 | 37 500 | 7,5 |
| | 211 clay bricks | 700 | 147 700 | 29,55 |
| Roof | 3 cement bags for brick laying | 75 000 | 225 000 | 45 |
| | 5 cement bags for plastering walls inside and outside | 75 000 | 375 000 | 75 |
| | 3 (25 x 200) wooden boards for framing | 1600 | 4800 | 1 |
| Entrance door | 1kg of iron wire | | 25 000/DT | 5/DT |
| | 4 iron sheets for roofing | 7500 | 30 000 | 6 |
| | 1kg of nails | | 3750 | 0,75 |
| Toilet lids | 2 atlases | 30 000 | 60 000 | 12 |
| | 3 (25 x 200) wooden boards for door frames | 1600 | 4800 | 1 |
| Cistern doors | 5 (50 x 100) wooden boards for the door | 700 | 3500 | 0,7 |
| | 4 (50 x 100) wooden boards | 700 | 3000 | 0,6 |
| Steps | 6 (50 x 100) wooden boards | 700 | 4000 | 0,8 |
| | 25 clay bricks | 700 | 17 500 | 3,5 |
| Urine tubes | 2,5 cement bags | 75 000 | 187 000 | 37,5 |
| | 4m plastic tubes (2m/cistern) | 11 500/m | 45000/DT | 9/DT |
| Urine canister shelter | 36 clay bricks | 700 | 25 200 | 5 |

| | | | | |
|-----------|-------------------------------|---------|----------|--------|
| | 2,5 cement bags | 75 000 | 187 000 | 37,5 |
| Painting | 20l blue paint (inside walls) | 480 000 | 480 000 | 96 |
| | 10l gray paint | 650 000 | 325 000 | 65 |
| | 20l white paint | 560 000 | 560 000 | 112 |
| | 10l black paint | 560 000 | 280 000 | 56 |
| Materials | Iron wire mesh (mat) | 560 000 | 560 000 | 112 |
| | Metal tube (4m) | 95 000 | 95 000 | 19 |
| | Ventilation tube | 143 000 | 143 000 | 28,6 |
| | Wood preservative (15l) | 60 000 | 60 000 | 12 |
| | Total | | 4 584900 | 917,25 |

Cost estimation based on exchange rate 1€ = 5000Kw/13/