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SUSTAINABILITY OF WATER SUPPLY IN RURAL SUB-SAHARAN AFRICA

A Master's Thesis submitted for the degree of "Master of Science"

supervised by

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Vienna, September 13th 2010

Affidavit

I, **GREGOR VIKTOR KOFLER**, hereby declare

1. that I am the sole author of the present Master's Thesis, "SUSTAINABILITY OF WATER SUPPLY IN RURAL SUB-SAHARAN AFRICA", 109 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

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Signature

ABSTRACT

About half of the population in rural areas of sub-Saharan Africa lacks access to safe drinking water. Consequently the population's healthy development is gravely endangered by water borne diseases, to which young children are extremely vulnerable. The highest under-five-mortality-rate worldwide attests the seriousness of the situation in sub-Saharan Africa and calls for strong commitment. Despite all efforts in the field of water supply many projects fail to function in a sustainable way. Therefore this master thesis aims at contributing to an urgently required investigation into the factors producing sustainable results. The objectives of this work are to present the experience and thoughts concerning sustainability of experts in the field of water supply to the reader and, on the other hand, to develop a demonstrative concept of the interrelation of necessary elements for achieving sustainability. In this context the author identifies emotions as the foundation on which all other elements can be built up to finally achieve the desired sustainable results. Although emotions are substantial determinants of human interaction and thus of every project, they are underestimated in the scientific discourse. The concept of a sustainability pyramid, presented in this paper, is to visualise the fundamental role of emotions at a glance and encourage experts and field practitioners to consider, challenge or implement this approach in their water supply projects.

Key words: sustainability, water supply, rural sub-Saharan Africa, operation and maintenance, water borne diseases, emotions;

Dedicated with love to Zita, Leo and Laurin

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I. INTRODUCTION

I.1. SITUATION

Sustainable access to safe drinking water, which is the focus of this work and improved sanitation are key-prerequisites for reducing waterborne diseases, improving health, living conditions and happiness of the population as well as development in general.

A joint WHO and UNICEF monitoring report[1] recently confirmed that still 53% of the population in rural areas of sub-Saharan Africa have no access to improved drinking water.

There has always been the attempt to increase access to safe water supply, but despite all efforts, the evidence that many projects failed to function sustainably is also confirmed by studies. Only 35–80% of water systems in rural areas of 11 sub-Saharan countries are functioning (Sutton, 2004), in South Africa even 70% of the boreholes in the Eastern Cape were not functional (Mackintosh and Colvin, 2003), a survey of 7,000 wells in Tanzania showed that in total only 45% were in operation and only 10% of wells being 25 years old or older were still working (Haysom, 2006). Problematically many investments in water supply in sub-Saharan Africa turned out to be non-sustainable and even the sublime Millennium Development Goal's[2] (MDG) target to (rapidly) improve access to water supply and sanitation itself might involve the inherent risk of hasty implementation of projects resulting in a lack of sustainability. The drastic figures as shown above raise the following question, why do so many projects and investments fail to function sustainably and urge investigation in the factors

[1] Progress on Sanitation and Drinking-water: 2010 Update; WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation; page55; ISBN 978 92 4 156395 6; World Health Organization and UNICEF 2010;

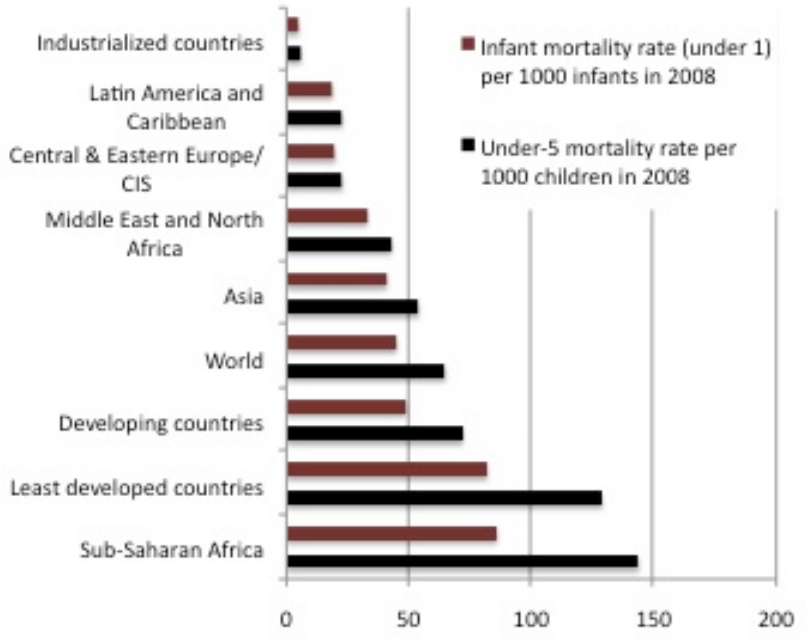
[2] UN Millennium Development Goal 7-Target 3: Halve by 2015 the proportion of the population without sustainable access to safe drinking water and basic sanitation.

and reasons determining sustainability of water supply projects.

I.2. RELEVANCE AND MOTIVATION

Graph I.2.1 clearly depicts the dramatic differences in infant and child mortality worldwide. In sub-Saharan Africa the situation is worst with 86 infant (one year of age or younger) deaths and 144 children under 5 years deaths per 1000 live births. According to UNICEF 39 among the 50 countries with the highest estimated under-5-mortality-rate for 2007 are sub-Saharan African countries.

graph I.2.1[3]



Small children aged below five years are very vulnerable to sudden loss of body fluids and subsequent dehydration and electrolyte imbalances originating from diarrhoea-diseases. Diarrhoea is estimated to have caused about 1.5 million deaths of children under 5 years in 2009 worldwide and constitutes as the second largest (16%) lethal cause after pneumonia (18%) killing more children than AIDS, malaria and measles combined. Diarrhoea is a symptom of

[3] graph generated by the author from UNICEF data, Table1.-Basic Indicators, Summary Indicators;http://www.unicef.org/rightsite/sowc/statistics.php, accessed on 3rd of August 2010;

gastrointestinal infections induced by manifold pathogens such as bacteria, viruses, protozoa and also parasites. Cases of childhood diarrhoea are predominantly caused by Rotavirus, virus Vibro cholerae, bacterial pathogens like Escherichia coli, Shigella, Campylobacter and protozoans like Cryptosporidium.[4] Bacterial infections can be treated with antibiotics and all symptoms of diarrhoea require oral rehydration therapy (ORT), which consists of drinking a special solution of salts and sugar in water continuously to avoid severe dehydration. Despite the simplicity of these interventions less than one third of under-fives with diarrhoea in sub-Saharan Africa receive ORT and antibiotics.[5] Small children living in remote rural areas far from any basic health care infrastructure are especially exposed to lethal threats by diarrhoea. The more so are (AIDS) orphans who mostly depend on their own.

As many infections are waterborne the dramatic death rates correlate to lacking access to safe drinking water and improved sanitation as well as unsafe recreational surface waters. Picture I.2 illustrates that access to safe drinking water is not achieved at all in sub–Saharan Africa where 327[6] million people are still drinking from unimproved sources.

In addition mainly women and children have to carry the burden of walking longer than 30 minutes to access their source of water. Sustainable access to safe drinking water is therefore also the key-prerequisite for reducing infant and child mortality.

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[4] World Health Organization, The Global Burden of Disease: 2004 update, WHO, Geneva, 2008; http://www.childinfo.org/diarrhoea.html accessed in July 2010;
[5] THE STATE OF THE WORLD'S CHILDREN-SPECIAL EDITION, United Nations Children's Fund (UNICEF) November 2009, page 17, ISBN: 978-92-806-4442-5;
[6] Progress on Sanitation and Drinking-water: 2010 Update. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation.

picture I.2.1

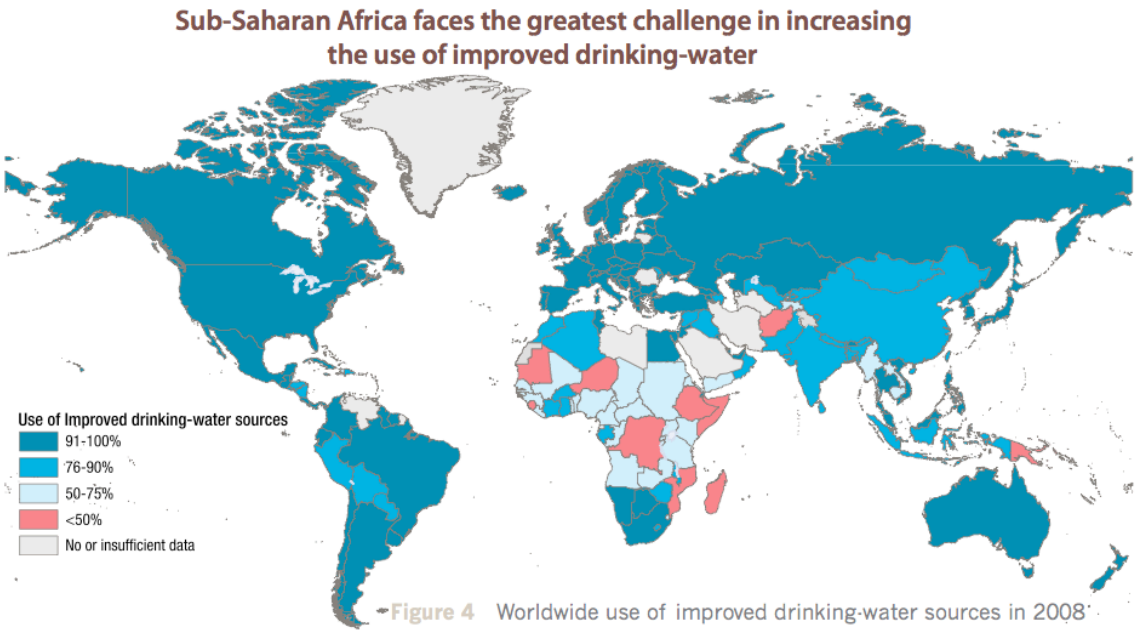

Figure 4 Worldwide use of improved drinking-water sources in 2008

I.3. OBJECTIVE

The objective of this work is to investigate the sustainability of water supply projects in rural sub-Saharan Africa in order to distil its determining elements and factors by analysing directly accessed information such as interviews of key-informants and a sample of questionnaires distributed among the rural population of a sub-Saharan country. The presentation of interview summaries of various experts in the field of water and development projects itself shall provide exchange of personal experience, views and relevant insights among experts, project managers and practitioners engaged in the field.

The main research question will focus on distilling the foundational factors triggering sustainability from practical information gained through direct enquiry of experts with ample practical experience and stakeholder. A sub-question will be if and to which extent the directly accessed information does confirm the foundational components and factors for sustainability defined by Montgomery

at al. (2009)[7] as listed below:

"Necessary and universal sustainability factors for rural water and sanitation supplies extracted from existing literature:

- *Effective community demand*
- *Local financing and cost recovery*
- *Dynamic operation and maintenance"*

I.4. HYPOTHESIS

These "universal sustainability factors" extracted from existing literature by Montgomery at al. (2009) are logically structured and convincing but do not adequately consider that emotions especially in rural communities are the key to acceptance, identification, ownership and finally sustainability.

From an academic point of view it might seem diffuse to state emotions as the central cause of a chain of effects determining sustainability. Emotions are an uneasy subject of scientific reflection as they can hardly be scientifically proven, defined, counted, evaluated or otherwise scholarly tackled. On the other hand when looking at them from a perspective of common sense and experience of life it might even appear as a commonplace that emotions determine pretty much everything in human interaction and thus projects.

There are endless natural, technical, economic and socio-cultural factors which have to be considered to develop and design a water supply project that is likely to achieve sustainable results. The most essential determinants though are people's emotional relation to all facets of a project and its connotation, because emotions are the central element or even the starting point of a chain of elements leading to sustainability that -unlike other necessary elements-

[7] Montgomery M.A., Bartram J. and Elimelech M. (2009): Perspective: Increasing Functional Sustainability of Water and Sanitation Supplies in Rural Sub-Saharan Africa. ENVIRONMENTAL ENGINEERING SCIENCE Volume 26, Number 5, p1017f, 2009

cannot be substituted by other means. Therefore the author's hypothesis is that scientific discourse focuses too much on factors lending themselves to be scholarly examined and loose sight of peoples' emotions which essentially determine their personal relation to and perception of a water supply project and thus its sustainability.

I.5. STRUCTURE

The next chapter (Chapter II) of this thesis will deliver brief background information such as the definitions of sustainability, sustainable development and development cooperation principles and further relevant aspects. The methodological approach of the thesis will be outlined in Chapter III. After presenting how data was accessed (Chapter IV), Chapter V will introduce and analyse the acquired data. In the conclusion (Chapter VI) the findings of the data analysis will be discussed and synthesised. All acquired results will be summarised in order to easily access the most relevant information at a glance. The references will be given at the end of this work together with an appendix containing the questionnaire forms and a choice of full texts.

II. BACKGROUND INFORMATION

II.1. RELEVANCE OF WATER SUPPLY

As stated above lacking access to safe water supply endangers health, life and development as well as causes high child mortality and can be therefore considered a severe threat to human security. Furthermore the United Nations (UN) has recently declared access to clean water and sanitation a fundamental human right emphasising its importance. The resolution was passed on 28th July 2010 declaring "the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of the right to life"[8]. The Assembly, moreover, expressed their concern that about 884 million people lack access to safe drinking water and warned the international community that yearly 1.5 million children under five years old die because of water- and sanitation-related diseases, affirming that safe, clean drinking water and sanitation were prerequisites for the realization of all human rights.

II.2. SUSTAINABLE DEVELOPMENT

In general, sustainable development can be regarded as the combined concern for scarce resources, the ecosystem and social challenges faced by mankind. It is seen as a pattern of resource use that meets human needs while preserving the environment as a prerequisite to satisfy the need of future generations. An often cited definition of sustainable development is the one of development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" and was defined in the report "Our Common Future"[9] penned by the United Nations World Commission on Environment and Development (WCED) in 1987 commonly known as

[8] http://www.un.org/waterforlifedecade/newsarchive.html#ga_hr; accessed 2010-09-04;
[9] Our Common Future (1987), Oxford: Oxford University Press. ISBN 0-19-282080-X

Brundtland Commission named after its chairwoman the former Norwegian Prime Minister Gro Harlem Brundtland. This report became the basis for the Earth Summit in 1992 and the adoption of Agenda 21 and the Rio Declaration.

Its number referring to the 21st century “agenda 21” is a programme of the United Nations (UN) concerning sustainable development and a plan of actions to be taken locally, nationally and globally by organizations of the UN and governments. Summits on the implementation of Agenda 21, which remained basically voluntary for the Member States, are prepared by the “Commission on Sustainable Development” which also acts as a high level forum on sustainable development. Agenda 21 identifies information, integration and participation as keys to achieve development recognising these interdependent pillars. It emphasises that in sustainable development everyone is a provider and a user of information and underlines the importance to change from sector-centred approaches of doing business to cross-sectoral coordination and integration of environmental and social concerns into all development processes. Public participation in decision-making is also identified by Agenda 21 as an essential prerequisite for achieving sustainable development.

The Rio Declaration on Environment and Development established 27 principles which should guide and facilitate sustainable development around the globe. The declaration clarifies in the beginning that “human beings are at the centre of concern for sustainable development” (principle 1), calls for reduction of unsustainable patterns of production and consumption (principle 8) and emphasises the importance of capacity building for sustainable development by knowledge and technology exchange between the states (principle 9).

The UN World Summit outcome report of 2005 lists three "interdependent and mutually reinforcing pillars" of sustainable development as economic development, social development, and environmental protection. Indigenous groups though had raised arguments in various international forums for the existence of a fourth, a cultural pillar of sustainable development. UNESCO’s

Universal Declaration on Cultural Diversity (2001) carries the concept further by declaring that "...cultural diversity is as necessary for humankind as biodiversity is for nature". Development is therefore not restricted to economic growth but also "a means to achieve a more satisfactory intellectual, emotional, moral and spiritual existence". According to this vision, cultural diversity is the fourth area of sustainable development.

Sustainability as an evolving process developing all aspects of human life affecting sustenance implies solving conflicts between various competing aims to simultaneously enhance environmental quality, economic prosperity and social equity (Hasna 2007)[10].

II.3. FUNCTIONAL SUSTAINABILITY

Agenda 21 generally states that ''sustainability is the integration of environmental and development concerns for the fulfilment of basic needs and improved living standards for all'' (UN, 1993).

To address the inadequacy of operation and maintenance in water projects a more function-oriented definition of sustainability is given by Carter et al. (1999): "sustainability is constancy in water and sanitation services which may be achieved through evolving and adaptive mechanisms." Thus functional sustainability focuses on long-term functionality and reliability of services.

A study of the manifold confirmed sustainable results of the Kigezi Diocese Water and Sanitation Programme (KDWSP) in the Kigezi Diocese of Uganda (Carter et al., 2006) detect three factors that account for the Programme's sustainable services:

[10] Hasna, A. M. (2007). "Dimensions of sustainability". Journal of Engineering for Sustainable Development: Energy, Environment, and Health 2 (1): 47–57.

"• Taking seriously the principles of community-based development learned over several decades, and to which many other programmes pay lip-service;

• Processes, both internal to the programme and outward facing (how the programme operates) [or how things are done, not just what is done.]

• The underlying values and ethos of the programme which provide the foundation for the entire edifice.

…Weaknesses in any one of the three factors threaten to undermine success and sustainability." [11]

Montgomery et al. (2009) give a survey of manifold frameworks and factors for sustainability described in literature concluding that "there lacks a concise, practical basis for improving sustainability of rural water … supplies." They therefore propose that there are 3 universal and necessary sustainability components and subsidiary enabling factors:

"• *EFFECTIVE COMMUNITY DEMAND:*

Participatory planning

Appropriate technology choice

Social marketing

• *LOCAL FINANCING AND COST RECOVERY:*

Local borrowing and savings scheme

Financial planning

Community cross-subsidies

• *DYNAMIC OPERATION AND MAINTENANCE:*

Clear management responsibilities

[11] Dr. Carter R. and Rwamwanja E.: "Keys to functional sustainability in Community Water and Sanitation Programmes" March 2006

Accessible spare parts and technical expertise

Monitoring and evaluation

Ongoing outreach and support"

II.4 DEVELOPMENT PRINCIPLES & AID EFFECTIVENESS

As many aid agencies and donor countries realised that their very diverse aid related approaches and requirements were causing burdens and costs for developing countries, which finally makes aid less effective, they started cooperation on how to harmonise their work in order to increase aid effectiveness. In 2000 the Millennium Development Goals, a set of targets which aims at halving world's poverty by 2015, was agreed on by 192 countries and a new paradigm of aid as a bidirectional partnership between donor and recipient was evolving. The aid effectiveness movement gained importance at the International Conference on Financing for Development in Monterrey, Mexico in 2002. The then established Monterrey Consensus was to increase funding for development but also to acknowledge that more financial resources were not the sole solution.

During the gathering of aid officials and state representatives in Rome in the High Level Forum on Harmonization in 2003 donor agencies committed themselves to improve coordination of their work with developing countries and streamline activities on country level, as well as monitor concrete progress.

In February 2005, the international community came together at the Paris High Level Forum on Aid Effectiveness organised by the OECD. Its result, the Paris Declaration on Aid Effectiveness is a comprehensive attempt to change the relationship between donor and developing countries and their way of cooperation based on principles of partnership. Since then aid processes were still strongly led by donor priorities and their administration hindering developing countries to take the lead. Furthermore, aid was too uncoordinated,

unpredictable and non-transparent. The declaration sets five mutually reinforcing principles of aid effectiveness:

- Ownership: Partner countries exercise effective leadership over their development policies and strategies, and coordinate development actions;
- Alignment: Donors base their overall support on partner countries' national development strategies, institutions, and procedures;
- Harmonization: Donors' actions are more harmonized, transparent, and collectively effective;
- Managing for results: Managing resources and improving decision making for development results.
- Mutual accountability: Donors and partners are accountable for development results.

Micro and macro levels of ownership

Ownership is defined as a state or fact of exclusive rights and control over property, which may be an object, land/real estate, intellectual property or a right.

Feelings of ownership are essentially determining human behaviour and therefore the principle of ownership shall be briefly looked at in basic sense and a more holistic context than the Paris Declaration. Feelings determine ownership: If somebody feels as an owner he assumes ownership of a certain good or right and exercises his rights and duties accordingly. Uncountable and increasing cases of proceedings before courts of civil law in western societies give evidence that both parties can have a feeling of ownership of a good or right and therefore started to dispute about it, despite the fact that often only

one party can truly exercise the rights and duties on a legal basis. Lawyers can tell stories how often people fight for their sensed right emotionally even if it is a waste of time and money and thus irrational. This common example shall underline the fact that feelings, in practise are the essential basis for constituting ownership rather than contracts, vouchers or anything else. This implies that one does not have to completely use own money for acquiring a good and still can develop a strong feeling of ownership. Subsequently a developing country can achieve a feeling of ownership on the macro level for development policies, strategies and campaigns predominantly financed from abroad meanwhile a community or an individual can emotionally connect to a project of water supply on the micro level developing a sense of ownership. Without ownership nobody would feel responsible for exercising the duties of ownership such as trying hard to monitor and improve policies and efficiency of development strategies on the macro level or to carefully operate and maintain wells on the micro level for example. Some main pillars facilitating the development of feelings of ownership can be spotted and will be presented later on, but emotional processes are too complex to completely unveil the causes of rising feelings of ownership or even predict related interactions.

Ownership is a key building block for truly sustainable development and donors therefore should support the recipients in building up their capacities and leadership by strengthening local individuals, communities, institutions and governments in order to enable them to tackle future problems themselves. Developing countries have to lead their own development policies and strategies, and manage their own development work on the ground to fully realise ownership. The Paris Declaration set the target for three-quarters of developing countries to have their own national development strategies by 2010.

III. METHODOLOGICAL APPROACH

III.1. DIRECTLY ACCESSED DATA

It was the aim of this work to use directly accessed information as a source for investigating the factors determining sustainability of water supply projects in rural sub-Saharan Africa. Extensive literature reviews and analysis of data e.g. from reports published by international organisations are often based on the same sources, which are trusted and then replicated by many publications. Especially theses have limited resources and often solely rely on literature and data without questioning their reliability. This work therefore chooses a different approach by gathering new information directly from stakeholders and experienced experts.

Scientific studies tend to omit content which cannot be proven or scholarly tackled or does not fit the conventions of discourse within a given scientific community.

In life everyone has to make mistakes, one can learn from it in order to progress and succeed. Consequently errors are an interesting subject of investigation, which help to reveal related causes and effects much more than examining success stories. Organisations depending on donations have difficulties to present their failures in official documents, which would alienate donors. They therefore follow public relation strategies tending to conceal less successful aspects of their work. Even if humble organisations are trying hard to learn from set-backs internally they will be very reluctant to publish them bluntly, but embellish their self-portrayal.

Direct communication to people as the source for this thesis creates new data, which the author has personally acquired and therefore can assure its authenticity and reliability. Individuals when directly approached are much less reluctant to give their personal views, experience and assessment of complex

processes bluntly.

According to the author's trade off, the advantages of directly accessed information prevail over the disadvantage that their acquisition is more time consuming.

III.2. KEY-INFORMANT INTERVIEWS

In dialogue people tend to be more open-minded and discuss their personal views and set-backs more openly than in written documents. A variety of experts and field practitioners were selected as key-informant interview partners to transfer their knowledge and experiences. The interviewed experts with ample experience were expected to bring relevant information to the point and it was assumed that they will not hesitate to address problems they encountered in their work as experts in the sector. In the course of the interview, they automatically preselected information according to the relevance as the memories coming first to one's mind are predominantly the most relevant or most impressive ones. Apart from that, emotions as a relevant factor determining sustainability can be better discussed in personal interviews than in written form assuming that the interviewee is not a professional writer.

In short the interviews were expected to provide condensed relevant information of experts having acquired an overview during their professional experience as well as personal views.

III.3. QUESTIONNAIRES TO ACCESS DATA FROM THE LOCAL POPULATION

The most important stakeholder is the local population using the water supply. Apart from interviewing a respected key informant who can also speak in the name of the rural population of Itete and Ifakara, Morogoro region of Tanzania, the author wanted to access additional information from the local population of

Itete and Ifakara to emphasise their important role and to accomplish and countercheck the information given by key-informants. The method of interviews is not applicable to big groups, consequently the population had to be contacted and inquired in a feasible way by distributing standardised questionnaires. As the most relevant of all stakeholders, they are also important informants but given the very limited resources of a master thesis without funding, the best thing was to send questionnaires to Tanzania, which were distributed and recollected by generous support of a field interviewer Herbert Kiennast. By that it was possible to get information not only from experts but also from a focused sample of the rural population contributing with their expression of daily living conditions, their personal needs and comments on the subject in general.

IV. DATA ACQUISITION

IV.1. WIDE RANGE OF INTERVIEW PARTNERS

The selection of the interview partners was aimed at covering a wide range of experienced professionals, who can contribute with relevant information on sustainability of water supply from various perspectives in order to complement each other and draw together a holistic picture.

Categories covered by the interview partners:

Organisation:	individuals, small NGOs, globally active aid organisations, international organisations
Occupations:	practitioner, academic, manager, NGO leader, clergyman
Provenances:	inhabitant of a big city of a sub-Saharan country, inhabitant of a small village of a sub-Saharan country, foreigners from Europe having worked and lived in rural sub-Saharan areas,
Projects:	construction of water supplies, repair of existing water supplies, other water related projects, local NGO dedicated to basic health care, orphanage, education and other support, convent and community representative, scientific research on development,

The interview partners and their field of experience will be introduced in the respective sub-sections. The author is thankful for the generous support of the interviewees, who gave their valuable time to transfer their experience even at short notice.

IV.2. CONCEPT AND DESIGN OF QUESTIONNAIRES

The aim of the questionnaires was to gather background information from the rural population and to acquire personal comments of their status and needs, as well as on the issues of water supply and sanitation in general. Although this work focuses on water supply only, the questionnaires also asked for the interlinked topic of sanitation to get a complete picture.

The format of the questionnaire was chosen to fit on a folded DIN-A3 sheet of paper providing four pages of DIN-A4. Most questions were to be ticked, some asked for further specification and the last question asked for a personal comment providing the frame for a detailed individual comment. It was foreseen that the last question is especially important allowing the participants to give their views, comments and to express themselves in a way offering more possibilities than ticking answers. The questionnaires were written in English and then translated into Swahili by the generous support of Mr Alfred Sungi, a native Swahili speaker and an experienced language teacher.

The questionnaires were distributed in a small focused sample in and around Ifakara and Itete, Morogoro region, Tanzania. It was anticipated that the information acquired should accomplish and also countercheck the information provided by two key-informant interview partners working in the same area.

It seemed of highest importance to make clear to the participants that their filling in of the questionnaires is a contribution to research, which will not directly improve their water supply and living conditions. Otherwise there could have been misunderstandings leading to false hope and subsequent frustration with negative effects on future projects or research, which could even negatively affect the sustainability of future projects.

V. DATA PRESENTATION AND ANALYSIS

V.1. ANALYSIS OF QUESTIONNAIRES

V.1.1. Analysis of standardised answers

PREFACE

The questionnaires were used as a tool to access direct information from the local population of a rural area, far from big cities. This was made possible by the voluntary and generous support of Mr Herbert Kiennast who brought the questionnaires to Tanzania, distributed and recollected them in the small town of Ifakara, the village of Itete and its surrounding in the province of Morogoro. Within the given constraints, a small but focused sample of 50 completed questionnaires were delivered to be analysed as a valuable contribution to the understanding of the local problems, needs, thinking and also differences in communication. International, governmental and NGO reports follow a certain language and communication pattern, which could make the reader believe that there is one generally understood way to communicate worldwide. This is definitely not the case when directly approaching people from different parts of the word at their homes in rural areas.

SUMMARY

Oral report of Mr Kiennast that people were interested in the administered questionnaires and returned all of them, as well as the evidence that many questionnaires were filled in with extensive use of additional individual comments, testified the outstanding interest and participation of the respondents. This interest is also a sign for the people's general desire for education, which could be noticed. For example the respondent of questionnaire 37 (Q.37) placed a comment and highlighted it by writing it in

English whereas throughout the whole questionnaire Kiswahili was used: “educate people about the good use of safe water supply”. Generally the respondents showed interest by patiently answering the questions and making a lot of individual remarks and comments, which usually cannot be expected in western countries.

On the other hand people did not seem to be used to the format of expressing their opinion via a questionnaire, as some questions including the most basic and simple ones were skipped, be it due to a lack of concentration or other reasons. As they did not seem to be used to fill out forms, respondents were not fully acquainted to a system of ticking and additional commenting. The logic of combined answering by ticking and filling in additional information such as years, distances or time was sometimes not understood indicating the author’s wrong assumption that these patterns of western communication logic would be understood elsewhere.

Some questions referred to constructed water supply and sanitation only. Respondents who use natural water sources such as surface waters, rivers or an open spring were given the choice to skip these questions or report of their experience with constructed facilities they know. This design was obviously difficult to understand as some respondents who stated that they use manmade and therefore constructed facilities did not answer the subsequent questions.

The simple but reliable ballpoint pen every informant received as a give-away was very much appreciated and proved to be both a decent and thus not distorting present as well as a useful gift to the people.

As reported orally from Mr Kiennast students aged from 15 to 20 years were strongly represented within all participants. One could argue that these youngsters might lack the experience and knowledge of an adult to answer the more difficult questions, but to fetch water in rural Africa is mainly the duty of women and children, who therefore are well aware of and in contact with all the practical problems concerned.

Males were over-represented, females showed a tendency to answer less questions than their male fellows.

One general conclusion drawn from the experience of designing and receiving back questionnaires is that it would be preferable to have the final design and wording of a questionnaire laid down by local people at site, even though the questionnaires were translated by a professional language teacher and native speaker of Swahili. The author is not fully convinced if all the technical terms and expressions especially used for toilet types were fully understood or commonly used language in Swahili. As English is used at secondary school and universities in Tanzania it might not be very common to use short differentiated technical terms in the field of water supply and sanitation.

From the 50 distributed and completed questionnaires 4 were filled in English and 46 in Swahili.

ANALYSIS

Note: percentages refer to the total number of respondents (50 or less) and not the total number of questionnaires (50) that were administered. If the sum of the percentages is below 100%, rarely given options of answers are not presented.

QUESTION 1 Please give basic information about yourself.

Age	75%	between 15 and 20 years	
	10%	between 20 and 30 years:	
	15%	above 30 years:	
Sex:	67% were male;		33% female
Religion:	81% were Christians,		19% Muslims
Residence	45%	city like Ifakara	17% small city
	38%	village	

QUESTION 2 From which source do you get your daily drinking water?

total answers- most common sources of daily drinking water:

32% from a closed well with pump

24% from a self- dug hole in the ground

16% from public taps or standpipes

8% from natural open spring

answers in villages - most common sources of daily drinking water:

37% from a closed well with pump

25 % from a self- dug hole in the ground

13% open dug well with bucket

no public taps or standpipes

6% from natural open spring

answers in cities - most common sources of daily drinking water in:

32 % from a closed well with pump

16 % from a self- dug hole in the ground

21 % from public taps or standpipes

10 % from natural open spring

In all three settings more or less than a third get their water from closed well with pumps. In cities, standpipes are the second most important source (21%) whereas they do not exist in villages, where self- dug holes in the ground are 2nd most relevant (25%). All in all, the differences between cities and villages are not extreme because the cities concerned like Ifakara are cities with a rural appearance and a low density of population.

QUESTION 3 How far is the water source located from your home?

49% water supply directly beside their homes

31% water supply inside their homes (incl. courtyards)

20 % have to walk up to 2 km to get water

QUESTION 4 Are you satisfied with the quality of your water/ -supply?

in total	55% are not satisfied,	45% are satisfied
in villages	63% are not satisfied,	27% are satisfied

reason for dissatisfaction:

25% specific pollution

22% shortage of water

11% dirty look

6% turbidity

More than half of the participants or almost two thirds of villagers state that they are not satisfied with the quality of water supply, mostly due to pollution and shortage.

QUESTION 5 How do you treat your water before drinking it?

45% boil it before drinking

25% drink it without any treatment

14% let the sediments settle down to reduce turbidity

4% use a filter

QUESTION 6 Who initiated and established the water supply you use?

26% me, my family or close friends

21% a private company

16% the local community

10% I do not know

8% central or federal authorities

8% another constructor

5% neighbours

3% local church or a church related local organisation

3% regional authorities

QUESTION 7 How long is the total operation period of your water supply so far?

47% since .. / a period of time

33% many years, namely: (on average 4,2 years)

13% less than half a year

7% between half a year and one year

Percentages refer to the total number of answered questions, but 40% of all participants did not answer the question at all. Many did tick “since: ____” but did not mention a specific period of time as a matter of misunderstanding. On the other hand maybe the participants were too young to overview and know the period of how long a certain water supply is in function. What was deduced is that 20% use rather new water supply aged one year or less.

QUESTION 8 Have you experienced any interruptions of the water supply so far? 75% Yes 25% No

Which problem caused the interruption?

36% spare parts were not available to repair the water supply

21% there was no professional person to repair it

15% I do not know

15% another problem

12% the water was contaminated

Three fourths experienced interruption of their water supply mainly caused by lacking spare parts and skilled labour.

QUESTION 9 Did you demand the water supply before it was constructed?

44% yes 56% no

Consequently the majority of water supplies did not show demand-responsive approaches.

QUESTION 10 In which way have you been involved in the construction of the water supply?

- 8% I was not informed about the project beforehand
- 25% I was not informed and not involved
- 25% I was asked for comments (ideas, concerns..)
- 8% I was asked if I would need it
- 11% I contributed during construction
- 3% my comments were considered
- 6% I was involved in operation and maintenance
- 8% I was involved in repair works
- 5% other involvement

Two thirds were asked or somehow involved in the course of the project.

QUESTION 11 Did the water supply improve your living conditions?

89% yes 11% no

QUESTION 12 Why, do you think the water supply was constructed?

- 2% the project initiators wanted it to be done
- 5% the authorities wanted it to be done.
- 5% inhabitants needed this facility, although they did not demand it
- 73% inhabitants demanded and needed this facility

In contradiction to question 9 (44%), 73% demanded the water supply.

QUESTION 13 Who financed the construction costs of the water supply?

- 24% inhabitants

5% foreign donors

14% the project initiators

16% I do not know

3% local organisations

27% the local community

At least 54% of the implemented water supplies seem to be locally financed.

QUESTION 14 Do you have to pay for using the supply? If yes, do you consider the price adequate?

50% yes 50% no

The price is 0% low 38% adequate 62% high

One half states, that they have to pay for water supply of which 38% think that the price is adequate, a remarkably high value for rural population with very low income.

QUESTION 15 Who is responsible for operation and maintenance?

10% local authorities

10% central authorities

3% donors

15% the project initiators

8% inhabitants/user

25% local community

13% local organisations

8% I do not know

8% other

Clear responsibilities are essential for maintenance and sustainability. More than half (56%) of the supplies are operated and maintained by locals (local authorities, community, inhabitants user, local organisations), the rest is quite

similarly distributed among the alternative answers, implying that responsibility is widely distributed or giving reason to speculate if the responsibilities are not clearly defined.

QUESTION 16 Who is responsible for repair works?

8%	local authorities
8%	central authorities
24%	the project initiators
18%	inhabitants/user
21%	local community
0%	nobody
8%	local organisations
13%	I do not know

The majority (added up to: 39%) answered that the responsibility lies in the hand of locals (inhabitants, user or the local community). In contrast it is problematic that roughly a quarter stated that project initiators are in charge of repairs because they are suspected to live or not permanently in this rural community and does indicated that these water users have not accordingly connected to the supply to an extent to take over responsibility for repair work organisation. The minor but still significant percentage of 13% who do not know who might be responsible underline the unclear responsibility of repair work.

QUESTION 17 How often has the water supply been repaired so far?

14%	not once
3%	once
23%	2-3 times
17%	about 5 times
43%	often (> 5 times), [average of answers:10 times]

As almost two thirds announce that their water supply has been repaired five times or more often repair works takes place and seems to be successful. On the other hand if a malfunctioning well does not get repaired it is abandoned, not longer used and thus might not be presented in the answers.

QUESTION 18 Do you know that dirty and contaminated drinking water can cause severe sickness?

94% yes 4% slightly 2% no

People seem to be fully aware that drinking water determines health, which confirms Mr Baumeler's information that health aspects are taught in primary school in Tanzania.

The questionnaires were designed with a broader approach asking about water supply and also sanitation. As this thesis focuses on water supply the answers to questions 19 to 40 are shortly presented without comment for the sake of completeness:

QUESTION 19 Which sort of toilet-facility do you use for everyday life?

53% a flush water toilet

8% a toilet without flush

4% a pit without slab

6% pit with slab

20% an open pit in the ground

2% the bank of a river or lake

6% another type

QUESTION 20 Does your family share this toilet facility with other households or people?

60% yes 40% no

QUESTION 21 Do you consider sharing your toilet with non-relatives a problem?

76% big problem 14% minor problem 10% no problem

QUESTION 22 Do you face any problem or inconvenience when using your toilet facility? 39% no 61% yes

QUESTION 23 What posture would you prefer while using a toilet facility?
44% squatting 54% sitting 2% standing

QUESTION 24 Which cleansing method would you prefer?
89% washing 11% wiping

QUESTION 25 How far is your toilet facility away from your home?
46% inside my home 54% directly beside my home

QUESTION 26 What happens to the excreta afterwards?

6% it is transferred to a composting pile

20% it is transferred by a piped sewer system

13% it is buried/ stored underground

2% a tree is planted on it once the pit is full

35% it is collected and dumped elsewhere

20% once full the pit is covered with soil

4% other

QUESTION 27 Which feature of your toilet facility should be improved?
33% Nothing, I am completely satisfied

6% it is too far from home

33% too many people are using it

11% it is often blocked or over stuffed

11% it is poorly ventilated

6% other problems

QUESTION 28 Who initiated and established the toilet facility you use?

68% me, my family or close friends

5,3% local authorities

5,3% local church / a church related local organisation

5,3% a private company

16% I do not know

QUESTION 29 How long has your toilet facility been in operation so far?

15% less than half a year

5% between half a year and one year

45% many years [on average 12,4 years]

35% since/period of time

QUESTION 30 Did you demand the toilet facility before it was constructed?

74% Yes 26% No

QUESTION 31 In which way have you been involved in the construction of your toilet facility?

17% I was not informed and not involved

5% I was informed about the project beforehand

17% I was asked for comments (ideas, concerns..)

39% My expressed comments were taken into consideration

5% I contributed during construction

17% I am involved in operation and maintenance

QUESTION 32 Did the toilet facility improve your living conditions?

72% Yes 28% No

QUESTION 33 Why, do you think the toilet facility was constructed?

Because

6% the project initiators wanted it to be done

12% the authorities wanted it to be done.

18% inhabitants needed this facility, although they did'nt demand it

35% inhabitants demanded and needed this facility

29% of other reasons

QUESTION 34 Who financed the construction costs of the toilet facility?

13,5% inhabitants

7% foreign donors

33% the project initiators

13,5% I do not know

33% other

QUESTION 35 Do you have to pay for using the toilet facility? If yes, do you consider the price to be adequate?

15% yes 85% no

The price is 50% low 25% adequate 25% high

QUESTION 36 Who is responsible for operation of the toilet facilities?

7% local authorities

7% central authorities

7% the project initiators

20% inhabitants/user

20% nobody

26% I do not know

13% other

QUESTION 37 Who is responsible for (major) repair works?

14% the project initiators

21,5% inhabitants/user

7% local community

7% nobody

29% I do not know

21,5% other

QUESTION 38 How often has the toilet facility been repaired so far?

53% not once

17,5% once

17,5% 2-3 times

12% often

QUESTION 39 Who takes care of reconstruction of a pit or disposal of excreta?

23% me

6% local authorities

47% inhabitants and users

6% local community

12% private enterprise

6% other

QUESTION 40 Who takes care of maintenance of the toilet facility?

31% me

63% inhabitants and users

6% local community

QUESTION 41 Are you aware that inappropriate sanitation management can contaminate your drinking water?

I am 83% strongly aware

11% slightly aware

6% not aware at all

An overview excel chart of the questionnaire's data is given as in the appendix.

V.1.2. Analysis of questionnaire's comments

The last query of the questionnaire asked for a personal statement in the following phrase:

"Question 42

Please tell us what you consider important concerning water supply, sanitation and their possible improvement, tell us your need or simply comment on these issues:"

General aspects

Most significantly the number of personal comments given was extraordinarily high, namely 47 out of 50 questionnaires and in most cases statements were very detailed (see appendix for all comments in full text). As stated above all completed questionnaires were randomly numbered in order to handle and referred to them more easily during analysis.

Language and translation

Five of 47 comments were answered in English the rest in Swahili. These answers were firstly translated into German by the native-speaker and Swahili-teacher Alfred Sungi and afterwards transferred into English by the author. Mr Sungi explained some of the difficulties he faced: Swahili is a paraphrasing language, complicated or specific terms therefore often have to be circumscribed which happens in many individual ways. The persons answering the questionnaires were able to read and write, many of them received even secondary education but still made significant orthographic mistakes, which made the translation more challenging. In addition and like elsewhere laypersons are not used to express themselves in a professional language and do not know all significant technical terms.

During the translation into English the author tried to stick close to the first

German interpretation even if the resulting English texts do not sound proper, but the author gave priority to avoiding further redrafting, which might have led to additional deviations from the original text in Swahili.

ANALYSIS

It is reasonable to analyse such a small but focused sample of individual texts only on a qualitative basis aiming at gathering an understanding of the actual problems, needs and the state of knowledge of the respondents expressed by their comments. Furthermore, their awareness of waterborne problems and related health effects can be deducted as well as their attitudes on how to tackle problems and suggestions on how to solve them.

The high share of participants (94%) giving a personal and mostly elaborated statement seems to reflect the perceived importance of the topic, the interest in expressing oneself and contributing to these issues. Participants seem to have appreciated this statement-like, interactive question rather than ticking given answers. Even one of the simplest ones, asking for the sex of the participant had a lower answering rate (80%) than this time consuming text based question. Whereas the high number of comments implicitly confirms the vital importance of water and sanitation, this was done explicitly throughout the comments: Most comments affirm that there is actually a lack of access to improved water and sanitation, demonstrate awareness that proper water supply and sanitation determine human health and therefore a vital basis for healthy living.

Apart from that the main message which can be distilled from the comments is the clear call for education: roughly 30% were suggesting and demanding explicitly further education in the field of water supply and sanitation, especially for the population of small villages in rural areas. They were not solely asking for information on drinking water use and treatment, but for further education to become a skilled professional in this field who would be able to establish, operate, maintain and repair water distribution and supply systems. The desire

to be empowered by education in order to tackle water related problems themselves could be impressively noticed.

The striving ambition for education can be underlined by a vivid example: the respondent of questionnaire 37 placed a spontaneous comment in the middle of the questionnaire between two questions and highlighted it by writing it in English whereas throughout the whole questionnaire Kiswahili was used: “educate people about the good use of safe water supply!”

The call for education and therefore the empowerment of the rural population was much stronger than the call for help from governmental or private organisations. Many request the government politely to establish and maintain water supply infrastructure, as well as sanitary infrastructures such as sewers and waste water treatment. Repeatedly comments also lay emphasis on the quality and hygiene of the respective instruments and pipes and the way they are installed.

People claim that the state should be responsible to offer basic infrastructure but they sometimes also address private companies and foreign donors to help them improving their access to safe water supply and sanitation. The majority formulated their request to the authorities politely, but a minority harshly criticised the responsible officials: they would “eat” the money they are paying as water fees and they even would peculate maintenance funds, resulting in corroded pipes and broken-down infrastructure. This critique is congruent with Brother Samuel’s view expressed in the respective interview.

Be it due to a lack of trust in the government’s ambitions or capabilities or not, people addressed also private companies to engage in building up water supply infrastructure. Surprisingly nobody stated that water should be free of charge, but someone asked private companies to establish water supply at a fair price offered equally to all people of the region. This reflects the awareness that improvement of and investment in water supply will realistically not be free of charge.

Numerous respondents were very self-critical addressing the waste and pollution of water by the population, as well as the lack of awareness that water might be contaminated. In questionnaire 8 was expressed: “This is still a huge problem for the population in Tanzania, because we have become water-polluters ourselves, and we do not even watch out where the water comes from and also how we should use the water properly. Water is not used properly in everyday’s misery neither are sanitary facilities.” People are claimed to do not care enough if the water is safe, their sanitary behaviour can be improved and they are not sufficiently educated in this field.

The respondents demonstrate their awareness that proper water supply and sanitation determine human health in detail by stressing the causality to epidemic diseases, by calling for drinking water treatment and disinfection and by expressing the importance of establishing proper wastewater management with sewers, channels, safe pits and wastewater treatment.

The following statement from questionnaire No 6 indicates that people are moreover aware that water and sanitation as a basis for health and happiness can also facilitate development: “… safe and clean (drinking) water and clean sanitary facilities even strengthen the local population to lead the nation. …”

To summarise, the comments attest that access to improved drinking water is insufficient and therefore a burdensome problem to the participants or their respective neighbours as they are well aware of the negative health effects. Nevertheless many respondents remark that average rural population is still lacking water and sanitation related knowledge and awareness and are therefore calling for education programmes in this field. Addressing primarily the government but also private companies, they demand investment in proper water supply and distribution structure as well as sanitary facilities. Respondents seem to have a very proactive attitude identifying education as the key to tackle problems themselves. Participants appear to proudly strive for education and self-determination. Despite their hardship and miserable conditions they do not stress attitudes of victimhood at all.

V.2. ANALYSIS OF KEY INFORMANT INTERVIEWS

V.2.1. Analysis of the Key-Informant Interview with Brother Samuel Mparange

PREFACE

In 1989 the "Nazareth Fraternity of St. Francis" settled down in the village of Itete, province of Morogoro, Tanzania and took care of many AIDS-orphans. They are dedicated to increase the local awareness of the danger of the HI-virus and offer help, accommodation and education to orphans. Having started with primary education they now offer also a secondary education programme to many pupils and host about 60 orphans permanently. The leader of this congregation, Brother Samuel Mparangethe is also the founder of a local NGO, called "Better Life Foundation". His expert knowledge, his experience of life acquired in highly responsible positions and his understanding of local needs and problems qualify this highly respected person to contribute as a valuable key-informant.

SUMMARY

Brother Samuel Mparangethe (BS) clearly confirms that water is the No1 priority as the basis for life and development: "... water is the first thing in our life, we use it for everything even for your development this material is concerned." BS stresses the importance to preserve water resources comprehensively: to secure water from pollution all the way down from the spring to consumption as well as to protect the headwaters and surrounding environment of the water source. Wasting this precious resource has to be avoided and the proper use of sanitation should prevent pollution and subsequent waterborne health threats like cholera, dysentery and other diarrhoea diseases. He emphasises that especially people living remote from basic medical care, the so-called

medical dispensaries are exposed to lethal health risks arising even from easily curable illnesses.

Water supply projects observed by BS during the last decades were often not sustainable because the local stakeholders were not sufficiently involved by top-down organised projects.

Respect for religious feelings and traditional views are essential prerequisites to achieve acceptance by the stakeholders. Their feelings, views, codes of behaviour have to be thoroughly considered to avoid affronts, broken taboos and subsequent rejection by the users. BS gives an example in which water pipes passing a graveyard were causing complete rejection of that project by not using its water at all. Places used for rituals or areas with connotation to religion should be respected and not used for water supply infrastructure, otherwise the project won't be accepted. Therefore, future users of water supply facilities should be asked beforehand which locations they would prefer or spare.

BS recapitulates his negative experience with unsustainable water projects in the Ulanga and Kilombero districts of Tanzania mentioning the cause: "…they did not involve the people, so that they don't see that they are the owner of that well or pipes or taps or boreholes." Lacking or insufficient involvement of the population is the main reason for deficient identification, acceptance and care. What does "involvement" imply and include? BS suggests to enter a dialogue asking for their needs and preferences, what kind of support they would appreciate, but also to encourage them to present their own strengths, their experience and approaches dealing with certain problems. It is of highest importance to involve local labour and professionals to create income for them. This will connect them and their families to the project, which is a prerequisite for future maintenance works to be carried out by local workers. If people get educated or practically trained during the project they will also identify with it and possibly care for it in the future. Project initiators have to make sure that

people connect and own the project, as if it was their initiative from the very beginning.

The theoretical “principle of ownership” becomes very practical when people who cannot affiliate themselves with the project show limited acceptance and no will to take responsibility after the project phase to operate, maintain and repair it. Project teams coming from technological or organisational professions might overvalue rationality and underestimate emotions, which are essential for personal connection to the project and the feeling of ownership as prerequisites for sustainability. BS reports a project, which was maintained only half-heartedly: “So at the end of the day, they asked the people to nominate other people how to take care for these pipes and pumps and the tanks. They agreed but their heart was not fully in harmony with this project.”

Project initiators have been mainly public institutions so far, because in the past private persons or companies were not allowed to engage in this field on a large scale. Private initiators could act only through the authorities. Subsequently organisations dedicated to development cooperation gave financial resources to local, regional or national governments. These resources were often misused for political campaigning or at least for demonstrative promotions of the government. According to the logic of these campaigns stressing the benevolence of the governments they are organised in a top down structure lacking involvement of the population. People realise that these water projects are done for campaigning and not to empower them. They, therefore, feel betrayed and do not connect to these projects, which is a hindrance to participation in future maintenance work. As political motivation and electoral campaigning is short-term orientated, these projects are unsustainable even on a purely technical level: people complained that shallow wells were built delivering water only for a year or less.

The technical equipment used locally in rural areas of the province of Morogoro is often very poor: simple spades are used to dig wells. More sophisticated

technology and work involves companies from the big and remote cities and is therefore very costly apart from the exclusion of local labour.

BS explains that recipients participating in microcredit projects often lack economic knowledge and training to use the credit efficiently and therefore fail in creating their sustainable income. Many people of Morogoro don't really believe in the microcredit system because they associate failed projects of the past with it. The very few successful microcredit projects of the region started with training rather than the distribution of money. Once all leaders and participants involved in the microcredit project were trained and have acquired background knowledge to judge whether an investment is feasible or not, they received the money and succeeded in creating sustainable income. Microcredit projects require comprehensive education to successfully enhance development and to avoid the danger of debt traps.

Intention and motivation is always determining success, but even more so if acceptance is its trigger, which is rather determined by emotions than rationality. People empathise with each other and feel other people's intentions. If a project team is delivering their good (e.g. well) or service (information and education) without believing in its importance and without being personally motivated, their recipients will neither take it serious nor trust it.

BS indicates that project teams should try to avoid being received as preachers when communicating to the people, but involve them from the beginning, listen to them and ask them for their needs and potential participation. Education is the key to empower people, to improve their life and to become more self-sufficient and independent. BS states it this way: "So I looked at that guy, I said, you know what you are sensing in your brain, is it good love you have personally for the people, to whom you are sending the knowledge. If you don't love them it is better to stop to spend the money for just cheating you are giving them knowledge while it is not [note: the case]."

BS gives his view on how a project initiator engaging in building wells should develop his project in Tanzania:

> 1) come to the country and select an area where to implement the project;
>
> 2) investigate this place and its factors;
>
> 3) look for local development key-persons;
>
> 4) acquire general information from these key-persons, ask them how to enter, approach and involve the community in order to get to know the problems and needs and potentials of the population;
>
> 5) develop a solution in cooperation with and appreciated by the community;
>
> 6) the population involved in the dialogue, education and work will feel that they own this project
>
> 7) by owning the project they will be willing and prepared to operate and maintain it properly assuring sustainability;

BS affirms the importance of involving respected and experienced local middlemen or key-persons for development as he states it in the very beginning of the process. These intermediaries should know how to address and involve the local population they better communicate project information to the community and exchange knowledge with them. If a foreigner tries to communicate alone with the locals he might not be trusted or taken serious: “But if you go alone they will just hear you and say: “Who are you? We have other problems, not water! Probably, the water will come after talking for a long time, (…) you will come to understand that water is the first priority then the [medical] dispensary. This [note: approach] through key-persons people, they will tell you how to enter the community.”

BS specifies the amount of monthly water fees, which have to be paid in Itete, Tanzania (April 2010): individuals who fetch water from the water kiosk have to pay a flat rate of 1500 Tanzanian Shillings per month (equivalent to € 0,78 or US$ 1,00); schools, convents and institutes have to pay 5000 Tanzanian Shillings per month (€ 2,60 or US$ 2,35). BS complains that water supply is often run dry for weeks or even a whole month. Water fees are collected but the money is not used properly for maintenance but is misapplied due to corruption of the village authority. That is the main reason why maintenance and repair does not function properly. Blocking by sand and broken pipes are frequent technical reasons why water supply is interrupted.

To prevent corruption user and professionals responsible for administration, maintenance and repair should be interlinked and organised locally by water user committees.

ANALYSIS

According to BS, insufficient or non-involvement of the local population is the major reason why water supply projects are not sustainable. Furthermore, the technical equipment used for construction is often very poor.

Even a Tanzanian citizen from the big cities or an experienced ethnologist cannot exhaust all relevant socio-cultural factors of a specific rural village. Therefore, the importance of finding a competent and locally trusted key person for development is underlined by BS several times. These intermediaries are able to provide a quick insight into the community and facilitate the implementation of a project by:

a) delivering relevant factual information quickly, which enhances acceptance: such as which places have certain connotations that imply to spare them (e.g. places used for rituals and so on)

b) enhancing the involvement of the population by making suggestions how to enter the dialogue with the community and how to involve them by

exchange education and participation in construction works, which all together intensify the feeling of ownership.

Emotions are the key to develop the feeling of ownership and for achieving acceptance of a project by the local community as the basic prerequisites for sustainability. Scientists, technicians and project managers are altogether trained and used to reduce complex and diffuse processes to significant factual points. But laypersons do not decide purely on rationality. They sense other people's emotions and intentions and judge them on an emotional basis. When BS speaks of love as a requirement for carrying out projects, it should not be considered solely as a solemn appeal by a clergyman, but as a profound understanding of human interactions based on emotions.

V.2.2. Analysis of the Key-Informant Interview with Professor Benedict MONGULA, Institute for Development at the University of Dar es Salaam, Tanzania

SUMMARY OF THE INTERVIEW AND ANALYSIS

Being asked, how development projects could be made sustainable, Prof. Mongula clarifies the terminology of “sustainable projects” in the way that projects are temporary by themself and only their intended results can be sustained over time. He then gives his personal definition that a project would be “sustainable”, if all the intended results are achieved for all people and can be sustained over time.

In the following Prof. Mongula explicates what he considers essential for projects to achieve sustainable results:

- Proper conception of the project:

  Firstly the project has to be conceived properly. The wide range of factors that could determine or impede the project has to be considered thoroughly, possible obstacles should be taken into account and corresponding countermeasures should be prepared.

- Detection of existing factors and determination of project priorities:

  Only a field survey with an examination of all relevant existing factors can enable the project team to set the right priorities and to target properly.

- Investigate possible implications of the project:

  Which groups or communities want and need new water supply most urgently? Which area will be supplied by the project? Examine the possible impacts of new projects on the surrounding environment and communities of the target group. In which way could the project

imbalance established (social) structures of neighbouring communities. If one group is supplied but others lack water, the rising gap between those neighbouring communities could create conflicts. If neighbouring communities are not considered, they could counteract on their own account by illegally tapping a pipeline running through their territory for example and therefore disrupt the supply of the target group. In order to assure access for the target group one also has to consider all surrounding communities.

- Local water management:

  Water as a common good should be managed by a local organisation representing the users and their interests. An individual concept of a water users association or any kind of other water management organisation appropriate for the target community has to be developed ensuring that this organisation is able to manage the resource effectively, competent and reliable.

- Participation of all groups of the community and settlement of their conflicting interests:

  Participatory activities are not an end in itself neither for amusement but to involve people with diverging interests from all spheres of the community. It is essential that they come together, negotiate and settle their conflicting interests otherwise a sword of Damocles will hang over the project. Involvement is further the key to get to know the project and connect to it. If participants see that their contributions were respectfully considered and implemented they will trust the project.

- Sound financing of the project:

  In order to deliver the desired results projects depend on adequate financial resources.

- Local leadership and administration of integrity:

Corruption is always a dangerous obstacle to projects. Local leadership and administration should show integrity and take responsibility for the sake of the people rather than pursuing their self-interest. They should efficiently exercise their duties, act in the interest of the population and do not tolerate corruption.

- Project integration into local administration structures:

  As projects are temporary they depend in principle on permanent administrative structures to keep its results sustained. A project should be integrated into the local administrative and governmental institutions from the very beginning to ensure cooperation and therefore continuance of the project after its implementation phase.

V.2.3. Analysis of the Key-Informant Interview with Mr Michael BAUMELER, Private Water Supply Project Initiator in Tanzania

PREFACE

Mr Baumeler's main profession is that of an experienced teacher of primary education in the Principality of Liechtenstein. He also addressed himself to further training in therapeutic pedagogy at the Academy of Luzern, Switzerland. In his diploma thesis he examined the status of Tanzania's education system concerning the integration or separation of handicapped children. Mr Baumeler (in the following abbreviated as Mr B.) had first come to Tanzania in 1991. He lived one year permanently in the rural town of Ifakara, to which he travels ever since at least once a year. Since 2002 he had initiated a fund raising and construction programme of wells for the population in and around the rural settlement of Ifakara. By the end of 2010 he would have initiated water supply of about 60 wells in total. His insights in life and water related problems of this rural area around Ifakara, his knowledge and analysis of the educational system in Tanzania and his extensive and remarkable experience as a private water supply project initiator qualify Mr B. to be an inestimable valuable key informant.

Firstly, the author considers it relevant to give information of the project environment in which Mr B. operates the programme. The city of Ifakara is a rural town in the Kilombero district, part of Tanzania's Morogoro province. Its roughly 80,000 inhabitants are spread over a huge area resulting in a rather rural appearance of this settlement. Located near the Tanzania-Zambia Railway line it is the headquarter town for district administration and a trading centre for two districts. Close to the Kilombero valley, a vast swampland flooded by the stream Kilombero, Ifakara's terrain is flat and groundwater can be found mostly at a depth of 8 to 12 metres.

SUMMARY

The telephone interview of a length of 1 hour 35 minutes was given on August 13th in 2010 and was audio recorded. In the following summary only a condensed selection of the content of this interview was presented in a structured manner:

Project reacted to expressed local demand

Most relevantly the project started as a reaction to the demand expressed by people from the local community. Mr B.'s school organised an exchange programme inviting also a group of people from Ifakara to Liechtenstein. Being asked how people from Liechtenstein could help their friends from Ifakara they expressed that they would consider it most helpful to be supported by the construction of wells.

Local connection and permanent monitoring

A man from this group who is a professional carpenter and permanently living in Ifakara became an employed well programme supervisor earning additional income and supervising the programme locally.

Choosing the site

Living in this area the local supervisor was well aware of the most urgent demand and chose the first sites where to build wells. In the meanwhile many communities heard of the project and contacted him to express their demand of a well. Many wrote letters but also mayors or local community councils came to the carpenter's house in person to submit their request. As requests exceed the programmes capacity the local employee investigated which community would be a prioritised target according to the urgency of their demand and the distance to the next existing well. Mr B. clearly stated that a foreigner can acquire enough insight to judge where the next well should be built. Therefore,

the local supervisor who was equipped with a small motorbike had to check the requests and choose the prioritised sites, as well as investigated the surrounding rural areas for other urgent demand. A simple test is to ask inhabitants of a small settlement for some water to drink and wash one's hands. Their answer will indicate the distance and safety of the next available water supply. Checks like this should also prevent people from concealing the existence of a relatively near and safe water supply in order to receive an even closer well for comfort. In rural areas outside Ifakara, it can happen that the next well is 3-4 km far from the settlement.

Drilling technology

Soil and geology around Ifakara allow for drilling wells by hand. As no heavy and sophisticated machinery has to be rented and transported from bigger cities, drilling costs are low and local labour can be involved. The local well supervisor hired a team of local craftsmen who had gained experience in drilling wells in previous projects of other organisations such as the Swiss Helvetas[12] and are experienced enough to determine the specific spot of the chosen site where drilling for ground water is likely to be successful. But it still can take up to six drills until groundwater can be found and tapped. Two men are manually turning a T-piece, which drives the auger underground. Continuous assembling of extension parts to the auger is required as it drills deeper and subsequent disassembling when the auger has to be lifted again, which makes the work labour intensive. As labour is abundant, the costs for sounding and drilling account for less than 7% of the total construction costs of a well. Mr B. lists all details and gives the total costs of one well with 1,795,700 Tanzanian Shillings (TZS) which is currently equivalent to € 918 or US$ 1181[13] on his website[14].

[12] http://www.helvetas.ch/
[13] according to http://coinmill.com/TZS_calculator.html#TZS=1795700.00, accessed on August 18th 2010;
[14] http://www.meik.ch/Tanzania/Brunnen.asp, accessed on August 18th 2010;

Pumping technology

The manually driven pumps are bought from a manufacturer[15] in the homonymous capital of the Morogoro province, which is located roughly 200 km from Ifakara. Although most inner parts are produced in Dar es Salaam or even imported from Europe, welding of the outer metal body and the assembling of the pump takes place locally in Morogoro. The hand driven lever pump type works perfectly until it reaches a depth of 14m. With a share of 67% of the total costs, the pump is the most expensive part of the well (1.200.000,- TZS or € 613.-). Apart from the well's socket of bricks and concrete the pump is also the heaviest part of the well and the users confirmed that its robust design proved to be more resistant to failure than other pump types. Mr B. was told by locals that wells built by another respected organisation did not last for long, because their pumps were not sufficiently robust. Therefore, no significant changes seemed necessary between Mr B.'s first well and the recent ones, but proficiency and the knowledge of the course of action during construction increased with experience.

Institutions and corruption

Mr B. reports that authorities have never hindered nor supported the project. He was never asked for a permission to drill wells nor did he seek contact with regional or national authorities. Local authorities were always involved and village governments proactively applied for getting a new well constructed by Mr B. The authorities theoretically responsible to provide water supply do not seem to take a significant initiative to build wells in this region. Consequently there are only few wells directly constructed by the authorities in rural areas. They possibly might speculate that foreign NGOs will provide the countryside with wells. To a certain degree the attitude of speculating that they will receive development aid is seen by Mr B. as a general problem in sub-Saharan Africa.

[15] Tanzania Wells Service & Supply Co. Ltd., Morogoro

Mr B reports of the idea to register all existing wells including GPS-data of the region in order to design a map which would visualise the inventory of wells and allow for future systematic water supply coverage of that area.

Asked about corruption, he did not face any and is aware that blunt corruption is generally not tolerated in Tanzania, but hidden and indirect corruption might often take place.

From his experience generally a "boss" is required in Tanzania to take or communicate decisions. For example he experienced that people receiving a well did not believe his employee's statement concerning a self-contribution issue but wanted him to personally confirm the statement. They possibly feared cheating or hidden corruption by his employee and wanted to make sure that everything is carried out in accordance with the boss.

Education and information

In general, Tanzania has a significantly better education system than most sub-Saharan countries, which is confirmed by a higher literacy rate of adults (69,4%) compared to the sub-Saharan average (59,7%).[16] People are aware of the health effects of unsafe drinking water, because health knowledge is taught in primary schools in Tanzania. Mr B. even reports of demonstrative teaching material getting across the importance of "*usafi na maji*" [Swahili: the cleanness of water]. Therefore, it might not seem necessary to provide the population with information of drinking water treatment and related health effects as part of the wells project. But users of a new well often showed Mr B. the muddy water holes where they had fetched the water before. The users of the almost 60 wells reported that the water is safe, but it was never bacteriologically checked. As a precautionary measure Mr B uses an additional ceramic filter to remove potential pathogens when drinking water in Tanzania.

[16] UNESCO's education for all - Global Monitoring Report 2006, Data from 2000-2004, http://unesdoc.unesco.org/images/0014/001497/149776E.pdf, acessed on August 18th 2010;

Asked if the future users showed interest to learn how to drill a well by themselves, as the required technology seems relatively simple, Mr B clarified that he did not experience this kind of interest. People are willing to contribute as explained below, they are happy to receive a safe water supply. They even show appropriate operation strategies but no interest in replicating the project by themselves. Maybe they are scared off by the relatively high costs.

Costs

People ask about the construction costs of the well and are impressed by its sum of 1,795,700 TZS (2008) equivalent to € 918 or US$ 1,181 (August 2010). If compared to Tanzania's GDP per capita in 2008 of US$ 1,353 according to purchasing power parity or of nominal US$ 519.-[17], it becomes evident that it is hardly affordable for a family to build their own well with pump, which is the most expensive part as stated above. But it becomes even more difficult for rural families who earn much less than the statistical average of GDP per capita. Mr B. gives an example of a peak salary earned by a cook in a luxury hotel in the touristic hotspot of Zanzibar who receives 90,000 (TZS) a month, thus 1,080,000 TZS or US$ 710 a year. Therefore, people might feel discouraged by the high costs to develop interest in constructing a closed well with pump on their own.

Personal contribution, cost sharing, ownership

After the construction of the very first wells which were totally free for the recipients a Swiss nun from the congregation of Baldegger[18] who was living in Tanzania for fifty years recommended Mr B. to ask for small mandatory personal contributions from the future users of the well in order to avoid that

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[17] http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/weorept.aspx?sy=2007&ey=2010&scsm=1&ssd=1&sort=country&ds=.&br=1&c=738&s=NGDPD%2CNGDPDPC%2CPPPGDP%2CPPPPC%2CLP&grp=0&a=&pr.x=86&pr.y=14

[18] http://www.baldeggerschwestern.ch/index.php?id=252, the congregation is engaged in Tanzania since 1921;

people misvalue the well because they received it for free. A personal contribution can raise the awareness for the value and costs of the well and helps to achieve a feeling of ownership. People accepted that and usually contribute by supplying sand, gravel, cement and bricks, which are all together required to construct the socket of the well. In figures these personal contributions account for about 3-5% of the total costs of the well.

Inauguration celebrations, ownership

When the well is first put into operation its users celebrate an inauguration-party including ceremonies and decoration. Mr B reports that from the character and intensity of these celebrations one can deduct the real importance the well has for each particular community. If Mr B was not at site when the well was finished the users often invite him for an additional second celebration when he is paying a visit next time.

Maintenance and lifetime of the wells

According to Mr B., it happened only twice so far that the new well was constructed near to an old broken well. Asked what could have caused the break down of these old wells he supposes that they were probably blocked and ran dry without anyone cleaning them or paying for maintenance. After a long period of negligence they became completely corroded. If a well is blocked it has to be maintained in the way that the pump has to be removed from the top and the pipes have to be taken out and disassembled in order to clean them and remove all blocking material from the pipes, valves and other parts. From time to time also O-ring seals and other minor wear parts have to be replaced. Although maintenance involves primarily disassembling and cleaning, which could be done by everyone with technical experience or sense, most people are not able to do it themselves and often cannot afford to pay a "*fundi*" [Swahili: craftsman] for maintenance work. Mr B remembers the maintenance cycles of his private well in Tanzania which is constructed in the same way as

all others, that within 13 years it was required 2-3 times to carry out maintenance works. As a rule of thumb, one could deduct that cleaning work is necessary to be done every 3-5 years depending on the geology and the subsequent probability of blocking.

Self organised operation and maintenance

The group of users mostly between 50 and 100 people who are often from the same clan, tribe or extended family constitute a well community and individually organise a well committee which collects fees from all users in order to provide financial means to pay for future maintenance and repair works. Mr B. explicates that mode and degree of strictness vary from each individual group. Sometimes a well committee or a single well-chief who is often the "*mwenyekiti*" [Swahili: chairperson] of the settlement is responsible for the well. As they are well aware that it is in their own responsibility to maintain and repair the well in the future they build up repair funds. Less strict groups let others participate for free. Most charge a lump sum of 0,70 -1,40 € a year for repeated use of the well, others even collect money according to each bucket of consumption. Cleaning and maintenance work costs about 10,000-20,000 TZS (currently equivalent to 5-10€ or 6,50-13US$). The well community decides on their own how to collect well fees. Mr B heard of conflicts that arose if some people refuse to pay and observed that some well caretaker or attendant add a chain to the lever of the well to prevent pumping during night-time without contributing to the repair fund.

Important factors to achieve sustainability

Being asked what he considers important to achieve sustainable results of water supply projects Mr B. points out that the personal commitment and cost sharing during construction contributes to develop a feeling of ownership. Mr B. sees it as a good sign that people individually manage operation and maintenance and care by locking the well with a chain to prevent pumping

without contribution. Responsibility is also expressed by establishing a well attendant who organises fees, the repair fund and looks after the well in general.

Communication to donors

Most donors are individuals or private companies who personally know Mr B. and enjoy contributing to drinking water supply in Tanzania. All pumps have to be painted to protect them against weathering. It was the idea of the local well supervisor to paint them in different colours and firstly with the coat of arms of the Principality of Liechtenstein. Having the pumps painted in different colours and sometimes with logos or characters enables the donors abroad to distinguish between the pumps and to realise to which specific well their contribution has gone to. Individually painted pumps making the whole well specifiable proved to be very much appreciated by donors. Mr B. observed that the user of the well do not care at all in which colours their well is painted and subsequently the painting does not conflict with their sense of ownership. The individual colours and design of the painting can be seen as an important tool to communicate to the donors that their contribution became manifest in a specifiable well which helps the local people and can be shown on photographs. Mr B. further reports that donors connect that closely to the project that some of them travel with him to Tanzania to visit the wells. To be optically distinguishable on photographs facilitates also checking and monitoring the existing wells.

Surprising experiences

Asked if he remembers any surprising significant experience Mr B. told that when arriving at a site where a secondary school had demanded a well, they were surprised by the lack of a school building at that moment. They were told that the well was needed beforehand to deliver water for construction and the workers who then erect the secondary school. When Mr B. returned to Tanzania the next time the school building did already exist and was populated

by many pupils. This story underlines the importance of water supply as the basis for any kind of development.

ANALYSIS

- Local expertise and local middleman
- Demand mainly expressed by receivers not by initiators
- Personal contribution facilitating ownership
- Inauguration celebrations facilitating ownership
- People self organise a well-chief who is responsible for the operation and maintenance fund and seem to be able to cover repair costs
- Cost efficient wells construction, drilling without big machinery,
- Robust pump manufactured in the region and local labour
- No information campaign on health issues but Tanzania has an education system much better than the sub-Saharan average teaching health and water related issues in primary school
- People are not encouraged to learn to build wells themselves
- Government and people speculate that they will receive development aid, which is a general problem.

V.2.4. Analysis of the Key-Informant Interview with Mr Karl EISENHARDT, Programme Manager, Department of International Cooperation, CARITAS Austria

PREFACE

Mr Karl Eisenhardt (Mr E.) is working as programme manager responsible for the Democratic Republic of Congo (DRC) in the department of international cooperation of CARITAS Austria. The project "Wassertropfen" [German: waterdrop] aims at repairing those 200 wells, which were drilled by CARITAS Austria during the early 90ies in the diocese of Kilwa-Kasenga in the Province of Katanga in the DRC. The rural province of Katanga with a low population density of 8.3 people per km² lies in the southeast of the country and was especially ravaged by the Second Congo War (1998 - 2003). Even after the peace accords in 2003, violence went on till the arrest of the last warlords in 2006. As almost halve of the pumps were out of order after wartime, many women and girls were forced to fetch water from distant rivers, causing long and burdensome transport of heavy water canisters, the outspread of waterborne diseases and subsequent diarrhoea to which children are especially vulnerable. This project was awarded the Austrian Water-prize "Neptun"[19] in 2009.

SUMMARY

The personal interview of a length of 1hour 15 minutes was audio recorded on August 13th in 2010. In the following summary the most relevant content of this interview was condensed and presented in a structured manner:

[19] http://www.wasserpreis.info/projekte/2009.php

Education and awareness of health effects

The education system in the DRC deteriorated dramatically due to warfare. In 1990, two third of all children were attending primary school whereas in 2001 only every second child had access to primary education. In the movie-report[20] of the project a mother speculates that their small children who drink water from the river might suffer from a waterborne disease because they were crying all night long. Mr E. was asked if people are not fully aware of the dangerous health effect of unsafe river water or if the next working pump is simply out of reach? According to his experience both factors come into play. On the one hand if the only pump of a small village breaks down the next working pump in a neighbouring village might be significantly more distant (e.g. 5-8km) than the next river (e.g. 3km). It is therefore too burdensome to fetch drinking water every day from a remote village and people subsequently go to the river. Secondly, people are used to fetching water from the river and if the water is seasonally less or not so much polluted with pathogens they might not fall ill immediately but become victims of deceptive trust. If the concentration of pathogens or pollution later on increases epidemic diseases like Cholera can spread out abruptly. Reciprocally areas with an increase in diseases indicate that there is a lack of functioning safe water supply.

It is essential to intensively raise awareness of the importance of drinking water issues and pollution prevention of the rivers in order to avoid water borne diseases. Massive education and campaigning is an obligation of the responsible ministry but requires huge financial resources.

Project repairing wells built in the 90ies:

About 40-50 units of the 15-20 year-old malfunctioning pumps are repaired every year. Starting with repairing those pumps that can be easily put into

[20] http://www.wassertropfen.at/wasser_tropfen/page/464063495855144511_0_660491824443316500.de.html

operation again by maintenance work and spare parts ensures quick increase in safe water supply. Later on those wells which need to be deeper drilled will be tackled all together efficiently as the project's next step. After all existing pumps will have been repaired the midterm goal is to invest in drilling new boreholes and in education and training.

Destructive warfare and lacking investment left the transportation infrastructure in extremely bad shape, many bridges are still destroyed and roads are damaged or not existent. Under such obstacles, it takes up to 25 hours for a new jeep to cover 300 kilometres and for a lorry transport significantly longer.

Continuity

Mr E. points out that continuity is especially characteristic for this project. Firstly activities of CARITAS Austria in Kilwa-Kasenga started with the construction of more than 200 wells in the early 90ies and the current project is aiming at the continuity of water supply by repairing these wells and secondly this project is a long-term engagement financed by a permanent sponsor, the Austrian Water Supply Company WDL[21], which will donate one Euro for each 1,000 m^3 of water consumed by their customers, providing yearly donations of € 30,000-40,000 over many years.

Concept of the project installing more than 200 wells in the 90ies

The first well construction project of the 90ies was thoroughly planned and systematically aiming at sustainable results. In the following account, an overview of the main pillars of the project's concept is given:

• A European water expert analysed the area and determined the sites and positions where to drill for ground water.

[21] Wasserdienstleistungs GmbH part of Energie AG Wasser GmbH, http://www.wdl.at/eag_at/page/439536842916381561_0_0,de.html

• A second local delegate being permanently at site initiated the establishment of water committees in each village responsible for the management of the new well.

• Members of the water committee were trained to collect low fees for each canister approximately equivalent to the value of a matchbox. The fees should be put aside to build up a maintenance fund in order to pay technicians for future repair works.

• Awareness raising campaigns were undertaken to convince the population that safe water is the basis for health and thus a valuable scarce resource. The new wells are essential to provide safe drinking water supply and consumption fees are necessary to cover maintenance expenses in order to guarantee reliable and safe water supply.

• Teams of technicians were built and trained who should be responsible for a distinct region within a radius of about 50-70km.

• A proven and tested pump type was chosen covering hydraulic heights up to 20 metres. The pump "DUBA Tropic 7"[22] which is manufactured in the Netherlands is easily driven by a fly-wheel. Most boreholes are between 6-12m deep. Some go down to 18m. To avoid dependence on electricity supply one purely manually driven pump type was chosen. It was still capable to cover a wide range of depths in order to simplify coordination, maintenance works and spare part delivery.

• Material depots of the most important wear and spare parts of the pump were built up to cover a maintenance period of 20 years.

Why is it, despite the comprehensive and foresighted concept of this project then necessary to intervene again by a follow-up aid project to repair the wells? And why was the local population not able to repair the wells themselves with technical and financial means? The answer to these key-questions can be

[22] http://www.duba.be/page.asp?DocID=40682&From=List&langue=EN

predominantly seen in the destructive effects of the "Second Congo War" from 1997 to 2003, which was the world's most deadliest conflict since World War II, killing 5.4 million[23] people. In the province of Katanga violence lasted even longer until the last arrests of warlords in 2006. Katanga as a permanent war zone was an especially war ravaged province where many people had to flee, got killed or died of diseases and starvation, so that many water committees did not exist any more and the spare part depots got raided. But war alone does not answer why 50-60% of the original wells are still working while the remaining ones are not. In Kasenga for example, a town with about 50,000 inhabitants many pumps were installed. Different committees each responsible for one specific pump, performed completely different although each operated under comparable circumstances. Some committees managed to repair their well despite all difficulties such as plundered depots while others did not.

Committees

The mentality, character and capability of the individuals constituting the committee are crucial for sustainable management of the well. Some committee leaders, capable and conscientious personalities acting in the interest of the community, succeeded in organising spare parts and repairing the wells themselves even during wartimes and their pumps are still working. How to find the right people for a good composition of the water committee? Mr E. explicated how committees are constituted: It proved helpful if a respected member of the village such as the parish priest or a member of the parish council for example is in the committee. Furthermore, women should be included and at least one technician or home constructor with a feeling for mechanics has to be a member of the committee. It is essential that the local partner initiate a good constitution and mixture of the water committee and local organisations such as parish councils have an overview of the human resources of the parish and can decide who to nominate. Mr E. experienced

[23] http://en.wikipedia.org/wiki/Second_Congo_War;

that many committee members can discuss a certain problem but only people with technical competence can bring the discussion to the point and develop solutions to problems. As part of the project in the 90ies all water committees received economic and organisational training to manage the well and collect fees for its maintenance, but only some of them succeeded in maintaining their well. Mr E. experienced that some people or certain villages have more the mentality of “harvesting without seeding”, possibly based on local traditions of moving to the next piece of fertile land when necessary without making preparations for the future.

To the question if and in which way the water committee is restricting, monitoring the water consumption of a well and reacting to possible misuse, Mr E. replied that usually somebody from the water committee lives near the well and observes water consumption to collect the water fees accordingly. But as people in rural villages are mostly relatives from the same extended family or friends, fees are often not charged consequently according to the prevailing mentality. If awareness would be sufficient that precaution is necessary and funds have to be build up to cope with future repairs and investments to maintain the well, fees would be collected more strictly, but awareness raising needs steady efforts and constant campaigns to change the consciousness of people, which can take decades like convincing people in Europe that smoking has severe adverse health effects.

Awareness raising campaigns

Coming from an economic background as a controller, Mr E. was first sceptical of the efficiency of investing in education and information activities but experienced very soon while working for CARITAS that accompanying awareness raising campaigns are the key for most projects. Because campaigns have to raise awareness among the population to realise why something is necessary and important for their life at first, only after that effective measures can be taken, added Mr E. The wells project is

accompanied by information and awareness raising activities conducted by local teachers in the villages.

Asked who operates awareness raising campaigns, Mr E. informed that if available and capable CARITAS principally uses local partners for cooperation and campaigning. Being rooted in charity activities of local parishes CARITAS has a global network of local partners but also local congregations or secular NGOs can become the local partner who is essential for achieving sustainable results. An experienced local partner is aware of the interface partners and the stakeholders. It is always recommended and helpful to cooperate also with regional academic institutions and coordinate projects with the responsible ministry or authorities.

Cooperation with local institutions and government

The local partner is always contacted first because he knows all institutions, authorities and officials relevant for the project who are then directly contacted. Since February 2007, with the new ambitious Governor Moise Katumbi Chapwe in office, a positive development in the province of Katanga started, which also improved good cooperation with the authorities.

Repair and maintenance works

50-60% of the original wells of the 90ies are still working. Newly checked and maintained wells are expected to work for another 5-10 years without major repair works. Caritas Katanga as the local partner built up a competent team of technicians, for which they were lucky to find a senior technician who had been already involved in the early 90ies and can now transfer his knowledge to two younger colleagues.

Asked if it would be feasible to train people as apprentices during the ongoing repair works Mr E. illustrated that the two younger people in the team of technicians get training by the old chief, but service intervals of at least five

years are a long period. After all wells in the region will have been repaired, it might take too long until the next well breaks down and creates income for those technicians. If you therefore train people it is not guaranteed that they will stay five years in the region as they might have to look for a job elsewhere. In general life is much more changing in Katanga for many reasons. Especially the war killed and drove away many people destroying the human resources and thus the sustainability of the old wells project in many cases.

In order to get to know which wells are malfunctioning a team drove to all sites which were mapped in detail during the project in the 90ies and made a pre-assessment noting which pump is not working and the technician's first impression of the possible cause. Based on the pre-assessment, the repair work is organised and carried out. As these pumps are set in concrete, the concrete cover has to be broken up to remove the pump and disassemble its parts in order to determine the problem and repair it. Most wear parts are carried with the car others have to be ordered from the district town or even from Europe. Beforehand spare parts were ordered from Europe to build up a depot in the district town of Lubumbashi whose stock is monitored to make reorders automatically in time. The total average repair cost per well amount to very roughly € 1,000 including material, loans, fuel and all side costs. Investment in repair works at first is, therefore, more efficient for achieving safe water supply than the construction of new wells, which would be 5 -10 times more expensive. The water committee does not get special training during repair but watches ongoing works and can autonomously exchange knowledge as they are hosting the technician team for some days. During repair works of the pumps many children watch the spectacle, some villagers ask the technicians questions and discuss, so there is evidence that a certain exchange of knowledge takes place but the extent of which cannot be determined.

Generally, extensive training and education of the population would be meaningful as it took place in the 90ies and it is a mid-term goal of the ongoing

project to invest in training, but at the moment the limited financial resources are focused on repairing all wells.

In the rural area of Kilwa-Kasenga, people's living depends on subsistence agriculture without hardly any businesses or crafts. The population mostly consists of farmers supplying their family by planting a range of crops and small-scale livestock breeding. In case of a very good harvest they can sell their surpluses on the small local market. Asked if a local technician could earn a living from repairing wells, Mr E. responded that there might not be enough wells to be repaired regularly even in a wider area to earn a living, but it could be seen as an additional sideline income enabling a family to send their children to school or buy medication for them. Thus contributing enormously to their health and quality of life.

Ownership

The author asked Mr E. if the population developed a sense of ownership, if they are somehow emotionally connected to the wells or if they take responsibility for the wells and their maintenance. In general, the water committee is an important structure to connect the well to the village. When wells are newly built an inauguration ceremony as a community event takes place, in case of repair works the water committee signs an approval form confirming that the well was put into satisfying operation again. Mr E. experienced that after repair works of a pump which a valve was broken and which pipe was corroded, people were pumping for quite some time until the first splash of dirty water came out followed by clean water later on. He saw that people were watching joyfully and connected, because it is a big relief for them to have safe and easily accessible water without carrying a 20 kg canister for more kilometres. Furthermore, Mr E. has the impression that cooperating with local partners and local water committees facilitates that people accept the wells with a sense of ownership.

The feeling of ownership might be principally best achieved if an individual person or a family owns something, whereas if the whole community is the owner, things get more complicated, but the local committee representing the community is helpful to put individuals who feel responsible in charge of operation and maintenance again, otherwise it would not work.

Asked if the community supported by wells projects have to make obligatory personal contributions, Mr E. clarified that communities have to provide accommodation and catering for the technicians team, commitment by digging the well (in other projects) or delivery of construction material such as self made bricks for the socket of the well and unskilled labour contributions like manual transport of pipes and material. There are no financial contributions requested from the villagers because these rural communities of the war ravaged province would not be able to pay even a very small share of the costs.

Being asked what else could contribute to acceptance and ownership from his experience or knowledge, Mr E. explicates that sustainability is the key issue and the central question of all water supply projects, many other organisations he was in contact with experience the same: some water committees work and others do not succeed in saving money for repairs. There might not be a single solution to reach sustainable results, one can only try to optimise some parameters but achieving sustainability remains the challenge of all projects. The question if all efforts, training, considerations and preparations succeeded in making a project sustainable can only be answered after a certain period of about four years. Sensitisation and awareness raising campaigns should be part of all projects but with very restricted financial means big campaigns are often not affordable, that is why investment in educative measures is significantly restricted.

To select the best local partners for cooperation who know the local situation, problems, habits and ways to address and involve the people is the most important factor to achieve sustainability. A good team at site with experienced, local persons can attract and convince people emotionally by using their

language, proverbs and traditions whereas a white man might be perceived as the one who gives but can not involved the locals so much. A further positive effect of using local partners is that the know-how and management capacity developed during a project stays there with the local partners as an asset for future projects in the region.

Most impressive project related personal experiences

Describing it as a personally very impressive project related experience, Mr E. told of being at a riverbank during dawn and seeing how women and teenagers were suddenly appearing in droves from all directions with canisters to fetch water from the river. He could hardly imagine carrying such a heavy canister of more than 20kg for kilometres on ones head. In hot climates one immediately realises how human beings depend on access to water and can observe that locals are use drinking water very carefully and sparing, washing their body and clothes only in the river. In contradiction to that it is hard to understand why villagers do not care much more about their wells and the prevention of surface water pollution. The lack of a functioning state and administration makes it extremely difficult to tackle upstream pollution. Asked if he had observed contamination of wells caused by nearby pits, Mr E. did not detect any pits close to wells nor related contamination. People normally defecate in the open in a certain distance from the settlement. But virulent problems originate from the river where personal hygiene, washing of clothes, filling the canister, washing manioc roots, defecating of animals and humans happen at the same time causing manifold diseases.

Mr. E reported how the construction of a new well for a school including shelter with a generator to supply the electrically driven pump changed everyday life of the pupils. Without well children often bought small bags of sickly sweet lemonade or expensive coke cans to satisfy their thirst. However, with the well in operation it was nice and rewarding to watch the students joyfully drinking

from the new refreshing water supply, saving money and avoiding sweet beverages, which might even increase the thirst.

ANALYSIS

• War is the most destructive setback to sustainability.

• Continuity: Continuous interventions by CARITAS (awareness raising and training - well construction - well repair- further awareness raising and training) try to ease the destructive effects of warfare and compensate hindrances to sustainability thus upholding safe access to drinking water.

• Awareness raising campaigns should precede and accompany most projects. To raise awareness for water and health issues or to even change problematic habits and mentalities continuous campaigning and education is required over many years, which can only be conducted by the responsible ministry of the government. Awareness raising campaigns as part of a project should be coordinated with this governmental educative framework in order to fill missing gaps or facilitate the project. E.g. awareness raising for consequent charging of water fees as a preparation for the future in order to maintain water supply in the interest of all users.

• Cooperation with best available local partners: a good team at site with experienced, local staff can attract and convince people emotionally by using their language, proverbs and traditions. They should know other key partners, all stakeholders and the way to address and involve the local population. Expertise of local partners gained during a project stays in the region as an asset for the future.

• Cooperation with regional academic institutions, local administration and government;

• Water committee: connects community to the wells. Although the well is owned by the community, the water committee puts individuals in charge of

operation and maintenance achieving a personal sense of responsibility. A balanced composition of the committee and the right choice of its individual members representing the community interests are essential for sustainability. At least one person with technical understanding has to be part of the committee.

• Contact, participation and communication of the wells committee and population with the technicians during installation and repair works is important.

• Feeling of ownership is facilitated by contributions during construction or repair and inauguration celebrations.

• Mapping and evaluation of all existing wells is essential for sustaining the project. Data set should be linked and accomplished with data of other organisations and the government to picture safe water supply of a region for further analysis.

• One can try to constantly enhance projects and to optimise their different parameters, but achieving sustainability will remain the challenge.

V.2.5. Analysis of the Key-Informant Interview with a UNIDO staff member, Water Management Unit, Environmental Management Branch

PREFACE

Being part of the "Environmental Management Branch" UNIDO's Water Management Unit operates a lot of water related projects in sub-Saharan Africa. Though focussing on industrial development, UNIDO is also devoted to small-scale industrial processes like artisan gold mining undertaken by small farmers to increase their income to a degree they can live on. UNIDO is furthermore engaged in supporting the pollution reduction of effluents of companies and hotels. They treat drinking water contaminated with Arsenic and ensure safe water supply for domestic use as a sideline. During an interview, a UNIDO staff member gave insights in his ample experience of water related projects in sub-Saharan Africa.

SUMMARY AND ANALYSIS

In the very beginning of every project UNIDO calls on the international partnership in the specific field to see which experts or organisations have experience in that country and to check which experts or NGOs are permanently operating on site. All network partners share their experience with local NGOs whose performance is evaluated after each project, giving an incentive to NGOs to work reliable.

If necessary, an international expert trains the staff of NGO- and local government on the issue of transferring the knowledge to bodies which stay permanently in the field to apply and replicate it in the region. The NGO needs to stay in the field keeping links to the community to maintain the project, which cannot be organised from abroad.

As a pre-phase of some projects UNIDO starts by doing a social survey. Then local partners, experts or NGOs are selected taking into consideration the recommendations of partners in the network of international specialists. These local partners have to have on ground experience and direct contact to the target group knowing how to approach the community and being aware of their specific sensitivities. Often awareness raising campaigns are built in the projects to convince people on the importance of the projects benefits or related health effects. Campaigns have to use appropriate communication methods using local traditional stories and codes to approach the people. For example instead of chemical charts indicating the adverse health effects of mercury, a theatre company was demonstrating the dangers to health for a UNIDO project in Zimbabwe. In Sudan cartoons were used to communicate with the kids. Specially adapted communication processes like these and a lot of time are required to raise awareness of an issue in the rural population.

Communication to and interaction with the stakeholders are key prerequisites to achieve accepted and sustainable results. Therefore, the project design has to remain flexible to adaptation according to local needs and sensitivities. The poor rural population often has very limited access to education and consequently people rely less on economic sense and rationality but more on their traditions and feelings when judging on the benefits of a project. People can only be emotionally convinced when they see, that the project team takes time to listen to them and reacts according to their ideas, concerns and preferences. Authentic and consistent behaviour are prerequisites to be trusted by the stakeholders. Practically one has to get his hands dirty, to drink the same water from the local well and adapt to a certain degree to their life to be taken serious and to be trusted. Time to build up a trustful relationship to the people is the basis, but active participation of the stakeholders is required to achieve sustainability:

The workshops organised by UNIDO for artisanal gold miners in Mozambique and other sub-Saharan countries in which the small-scale sideline miners

produce their own equipment are given as examples of how ownership can be promoted.

If all the equipment would be given for free to stakeholders, ownership will not be achieved. Poor people cannot pay for it, but they can invest their time and skills to build equipment or contribute to related construction work. By doing so, they personally connect to the project and will develop a feeling of ownership guaranteeing future use and maintenance. Just delivered equipment from abroad will be used rarely or at maximum until it breaks. Workshops to build and maintain a certain technology foster therefore acceptance and sustainability. According to the complexity of a project a certain period of its operation should be accompanied by experts to monitor and improve its application.

Another example for participation of the local population in construction work was given in Bangladesh, where UNIDO tested wells and removed Arsenic from the drinking water establishing safe water supply for 20 villages and further 1500 additional households. A building company from the capital organised the construction of large filters hiring villagers, who invested their time and energy connecting to the project and developing a sentiment of ownership. These filters are owned by community leaders who were involved during construction and trained to maintain them in the future. Community leaders combine two advantageous characteristics: they are clearly responsible as a single individual but also representing the community and its interests.

Asked if UNIDO experienced surprising problems or even rejection of the stakeholders, the staff member replied that sometimes difficulties with local governments are encountered. Upon request he clarified that corruption is not the issue, because international organisations are relatively well protected and have a lot of safeguard measures compared to private companies. But changes of governments, important officials or its policies might imply reappraisal of the project even during its implementation. If the new authorities do not support this type of project or the region where it should be carried out

the project team has to undertake all efforts to achieve compromise, showing the project's benefits for the country. This becomes easier if government staff has received extensive information of the project and its progress and can access the history of given information of the project even if the government changes. Also in this respect continuous dialogue to all people in the chain proves its importance. First a focal point within the local government should be identified to which continuous information will be delivered, but in a diversified way and not to a single official only. The government has to be informed regularly and not only when problems occur.

The staff member also pointed to the problematic interlinkage of industrial and domestic water use. A major problem is that water consumption for industrial use is mostly for free in developing countries. In some countries, industrial wells are taxed by a lump sum not related to the actual consumption. Therefore, no economic incentives for companies to improve their water efficiency can take effect. The industry wasting vital resources might put further pressure on the population who often faces scarcity of water. UNIDO therefore tries to improve water efficiency and effluent quality of companies with its TEST-programme (Transfer of Environmental Sound Technology) for industries with significant water consumption.

From his personal experience the staff member explains what is triggering sustainable results of a project:

- Awareness-raising is part of every project to communicate its benefits;
- Flexibility and openness to adapt a project to local conditions and stakeholder preferences;
- Train local people in rural areas with local assistants and trainers;
- Organiser's ideas of how the solution should be might not be the best, take the ideas of the locals into account to achieve an optimal project design;

- A project or technology becomes a success when local people autonomously adapt and improve it over time;

“The keyword is to be flexible and opened and always communicate with your stakeholders!”

Whereas companies and educated people can be approached in a purely rational way based on relevant factors, people in rural areas with very limited access to education have to rely on their traditions and emotions to judge on a project. Therefore they have to be approached in a comprehensive and emotional way. The use of traditional communication patterns, proverbs, stories, fairy tales in the communication strategy is helpful to approach and convince people who rely on their feelings.

VI. CONCLUSION

Before presenting the author's conclusion from the directly accessed data of questionnaires and interviews in a graphical concept, the most significant inputs shall be consecutively reviewed in a summary providing an overview to the reader for his own interpretation.

VI.1. SUMMARY OF THE MOST IMPORTANT INPUTS DETERMINING SUSTAINABILITY

VI.1.1. Inputs from questionnaires

Inputs from standardised answers

• Outstanding interest and participation of respondents reflect general desire for education;

• Participants showed one's own initiative, 26% established their water supply by themselves or by relatives and close friends.

• At least 54% of the implemented water supplies are locally financed.

• Half of the participants state, that they have to pay for water supply, the price of which is considered to be adequate by 38%, a remarkably high value for a rural population with very low income.

• Three quarters of the participants already experienced interruption of their water supply, mainly caused by lack of spare parts and skilled labour;

• 56% did not demand the water supply before it was established;

• Two thirds were asked or somehow involved in the course of the project establishing their water supply; 25% was asked for comments, ideas and concerns, but only 3% stated that their comments were considered;

• More than half (56%) of the supplies are operated and maintained by locals; speculation that other responsibilities are not clearly defined;

• The majority (39%) answered that repair is in the responsibility of locals. Problematically, a quarter states that project initiators are in charge of repairs because they are suspected to live not or not permanently in this rural community and does indicated that these water users have not sufficiently connected to the supply in order to take over responsibility for repair work. A minor but still significant share of 13% does not know who is responsible underlining that responsibility of repair work in general seems not clearly defined.

• Almost two thirds announce that their water supply has been repaired five times or more, documenting that repair works take place successfully. On the other hand if a malfunctioning well does not get repaired, it is abandoned and not longer used and would therefore not be presented in the answers.

• People seem to be fully (94%) aware that drinking water determines health, which confirms Mr Baumeler's information that health aspects are taught at primary schools in Tanzania.

Inputs from questionnaires' comments

• Confirmation that access to improved drinking water is insufficient and its lack a burdensome problem;

• People are aware of the negative health effects of improper water supply and sanitation. Safe water is seen as the basis for health and development.

• Respondents remark that average rural population lacks water and sanitation related knowledge and call for education programmes in this field.

• Striving ambition for education and call for empowerment of the rural population was much stronger than the call for help from governmental or private organisations!

• Respondents show proactive attitude identifying education as the key to tackle problems themselves. Despite their hardship they do not stress attitudes of victimhood, but express interest in becoming trained as a professional able to establish, operate, maintain and repair water distribution and supply systems.

• Self-critical attitude that people do not care enough if the water is safe and act as polluters.

• Water pricing awareness that improvement and investment in water supply involve costs. Nobody stated that water should be free of charge, but postulate a fair price equally offered to all people of the region.

VI.1.2. Inputs from interviews

Key informant interview with Br. S. MPARANGE

• Insufficient involvement of local stakeholders and top-down organised projects are hindrances to sustainable project results. Deficient or non-involvement of the population is the main reason for deficient identification, acceptance, feeling of ownership and care.

• Respect of religious feelings, taboos and traditions is essential to achieve acceptance by the stakeholders.

• Suggestions of “involvement”: enter a dialogue, ask for needs and preferences, encourage them to present their own strengths, experience and knowledge concerning the issue; involve local professionals to create income for their families who get then connected to the project (prerequisite for future maintenance works by them), provide education and training for the population,

in general project team should facilitate that people connect and own this project;

• Basic economic knowledge and training required

• Emotional relation required: people who do not emotionally affiliate with the project will not take responsibility to operate, maintain and repair it after the project phase. Their hearts need to be "… fully in harmony with this project."

• People feel the true intention of a project or a campaign: if they realise that that the true intention is not to empower them, they feel betrayed and do not connect to the projects which is a hindrance to participation in future maintenance work and thus sustainability.

• Intention and motivation of the project team are prerequisites for acceptance, which is determined by emotions; People empathise with each other and feel other people's intentions. Doing a project without believing in its importance and without being personally motivated, the recipients will neither take it serious nor trust it. "... is it good love you have personally for the people, to whom you are sending the knowledge?"

• Project teams should avoid to be received as preachers when communicating to the people, but truly enter a dialogue.

• Project development:

1) Come to the country and select an area where to implement the project;

2) Investigate this place and its factors;

3) Look for local development key-persons;

4) Acquire general information from these key-persons, ask them how to enter, approach and involve the community in order to get to know the problems and needs and potentials of the population;

5) Develop a solution in cooperation with and appreciated by the community;

6) The population involved in the dialogue, education and work will feel that they own this project

7) By owning the project they will be willing and prepared to operate and maintain it properly assuring sustainability;

• Importance of finding a local trusted key person for development to deliver insider information and enhance the communication and involvement of the population.

• Proper water fee collection and upright management of fund

• Emotions are the key to develop a feeling of ownership and for achieving acceptance of a project by the local community as basic prerequisites for sustainability.

Key informant interview with Prof. MONGULA

• Proper conception of the project: The wide range of factors that could determine or impede the project has to be considered thoroughly;

• Detection of existing factors and determination of project priorities at site by doing a field survey;

• Investigate possible implications of the project: In which way could the project imbalance established (social) structures of neighbouring communities.

• Project participation and discussion by all groups of the community and settlement of their conflicting interests;

• Sound financing of the project

• Local leadership and administration of integrity, water management done locally;

• Project integration into local administration structures to ensure cooperation and therefore continuity of the project after its implementation phase;

Key informant interview with M. BAUMELER

• Project should react to expressed local demand

• Local expertise, project team and local middleman

• Continuing local monitoring of the project

• Decisions of the project team should be taken at site

• Use of simple technology is cost efficient and fosters involvement of local labour and products.

• Personal contributions and cost sharing promote a feeling of ownership

• Inauguration celebrations facilitate a feeling ownership

• Self-organised operation and maintenance by establishing a well attendant who organises fees, the repair fund and looks after the well in general.

• Personal commitment and cost sharing during construction contributes to develop a feeling of ownership

• Personal impression of problems: people have no courage to learn how to build wells themselves, government and people might speculate that they will receive development aid;

Key informant interview with Mr EISENHARDT, CARITAS

• War is the most destructive setback to sustainability.

• Continuity: Continuous interventions and engagement by CARITAS ease the destructive effects of warfare and compensate hindrances to sustainability thus upholding safe access to drinking water.

• Education and accompanying awareness raising campaigns on health effects are the key for most projects; Awareness raising campaigns as part of a project should be coordinated with this governmental educative framework in order to fill missing gaps or facilitate the project most efficiently;

• Establishment of water committees in each village connects community to the wells. They are responsible for the management of the new well, collecting fees to build up a maintenance fund for future repair works;

• The mentality, character and capability of the individuals constituting the committee are crucial for sustainable management of the well.

• Training team building of technicians to repair the wells;

• Establishing material depots to secure reliable supply of spare parts;

• Cooperation with local partners for campaigning

• Cooperation with local institutions and government

• A feeling of ownership might be principally best achieved if an individual person or a family is the owner. If a group or community is the owner a responsible individual representing the interests of the community should be selected to be in charge of operation and maintenance.

• Commitments facilitate ownership: e.g. communities have to provide accommodation and catering for the technicians team, construction work or delivery of construction material;

• Select the best local partners for cooperation who know the local situation, problems, habits and ways to address and involve the people is the most important factor for trying to achieve sustainability. Expertise of local partners gained during a project stays in the region as an asset for the future.

• Emotional communication will convince the people by using their language, proverbs and traditions, which should be done by best available local partners.

• Cooperation with regional academic institutions, local administration and government;

• Feeling of ownership is facilitated by contributions during construction or repair and inauguration celebrations.

• Mapping and evaluation of all existing wells is essential for the sustaining the project. Data set should be linked and accomplished with data of other organisations and the government to picture safe water supply of a region for further analysis.

• Although projects are constantly enhanced and their parameters are optimised, achieving sustainability will remain the challenge.

Key informant interview with UNIDO staff member

• Cooperation with constantly evaluated local NGOs and sharing experience in with them network;

• Built-in awareness raising campaigns: appropriate communication methods using local traditional stories and codes to approach the people

• Workshops to build and maintain certain technologies foster acceptance and ownership and therefore sustainability.

• Taking time for communication, as well as authentic and consistent behaviour of the project team are prerequisites to build up a trustful with the stakeholders.

• Stakeholders will be convinced emotionally when they see, that the project team takes time to listen to them and reacts according to their ideas, concerns and preferences.

• Focus responsibility on community leaders who combine two advantageous characteristics: they are clearly responsible as a single individual but also representing the community and its interests.

• Continuous dialogue to all people in the chain is important. Keep the local government regularly and in a diversified way informed, not only if problems occur.

• A project or technology becomes a success when local people autonomously adapt and improve it over time;

• Flexibility and openness to adapt and enhance a project and its design to local conditions and stakeholder preferences as well as continuous communication with stakeholders are the keys.

VI.2. DISCUSSION OF HYPOTHESIS

Are the "*necessary and universal sustainability factors"* by Montgomery at al. (2009) " as cited below, reflected in the acquired data?

"• *EFFECTIVE COMMUNITY DEMAND:*

Participatory planning

Appropriate technology choice

Social marketing

• *LOCAL FINANCING AND COST RECOVERY:*

Local borrowing and savings scheme

Financial planning

Community cross-subsidies

- *DYNAMIC OPERATION AND MAINTENANCE:*

  Clear management responsibilities

  Accessible spare parts and technical expertise

  Monitoring and evaluation

  Ongoing outreach and support"[24]

Nearly all sustainability components and their respective enabling factors as above are reflected by the interviews and played a role in the cited projects. The term "*social marketing*" comprises long term awareness raising, educational campaigns, training and its importance was also highlighted by the interviews and confirmed. The enabling factor of "*participatory planning*" was not fully achieved by all reported projects, but its importance was not challenged. *From the element of "LOCAL FINANCING AND COST RECOVERY*" only the enabling factor of "*Financial planning* (revenue collection)" was realised in reported projects by collecting water fees and saving them to finance future repair works. The other factors of "*Local borrowing and savings scheme* (access to local capital and savings)" and "*Community cross-subsidies*" were not put into practise by the described projects, but this does not challenge their importance.

Three Components of sustainability in practise as listed by Montgomery et al. (2009) are therefore mostly confirmed by the acquired data of this work and where they are not reflected in the practical experience of the interview partners, they are still comprehensible and convincing. These components and factors are based on evidence of scientific studies presented in literature and are rationally traceable, but do not consider that emotions are the more fundamental underlying components, which affect the "*universal sustainability factors"*.

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[24] Montgomery M.A., Bartram J. and Elimelech M. (2009): Perspective: Increasing Functional Sustainability of Water and Sanitation Supplies in Rural Sub-Saharan Africa. ENVIRONMENTAL ENGINEERING SCIENCE Volume 26, Number 5, p1017f, 2009

For example "*Effective community demand*" as a component for achieving sustainable results implies that communities prioritise their needs and project should respond according to the expressed priority. One can intuitively comprehend that a project responding to the community's priority No3 and not No1 will face problems possibly undermining its sustainability. But it cannot rationally explained why this should be the case. From a purely rational perspective it is still a contribution very valuable to tackle priority No3, even if No1 would have been more urgent and important for the community. But in reality of human life it might strongly hinder sustainable results of this and future projects, because emotions come into play. Local stakeholders might feel personally ignored or even taken for a ride, when they experience that their expressed demand has not been considered accordingly. They will feel angry, disrespected and helpless as their priorities did not trigger the outcome. They might not accept the factual benefits of the project responding to priority No3 and will not contribute to sustain its results, because the emotional connotation is negative. The project tackling priority No3 will not be emotionally associated with its benefits but with the disregard of priority No1. Furthermore, people might lose trust also in other projects and will abstain from expressing their demand and from active involvement in the future. Their self-esteem and self-assurance might also suffer. This hypothetical example shall demonstrate that emotions related to oneself, others and the project are the underlying foundation required to achieve the component of "*Effective community demand*".

Therefore, the author does not dispute the relevance of the "*necessary and universal sustainability factors*", but would like to add to these factors that the underlying emotional relations and emotions should be focused on.

Before presenting his concept of emotional foundation the author will give his interpretation of the most important factual elements and means directly drawn from the accessed data: The following is most crucial to achieve the essential elements of acceptance, identification and ownership as prerequisites for

maintenance and consequently sustainability.

Means to achieve essential elements of sustainability:

- Self-expressed demand and demand responsive approach of water supply implementation;
- Project involvement and participation, development of design & technology;
- Commitments during project implementation (cost contribution, material, labour contribution..)
- Culturally adapted information, education and dialogue
- Empowerment via respectful dialogue, training and education
- flexibility of the project to be adopted to local needs, preferences and ideas;

These means among others contribute to reach a sufficient level of acceptance and ownership, which is required to make a project work and functionally sustained over time. But to focus only on these functional elements and factors helping to achieve sustainable results, could be an investigation too superficial as they are not the starting points in the whole process.

By identifying insufficient financial planning and lack of spare part suppliers as the two major barriers to dynamic operation and maintenance (Harvey and Reed, 2004) for example, only two effects of deeply rooted causes are addressed. It is a valuable contribution to have scientific evidence about the lack of certain effects but to consider underlying causes or even the very foundation of all further causes and effects, which are emotions according to the author's hypothesis, is more fundamental.

Scientists, technicians and project managers are altogether trained and used to reduce complex and diffuse processes to significant factual points. But laypersons do not decide purely rational, they sense other people's emotions and intentions and judge on an emotional basis. When BS speaks of love as a requirement for carrying out projects, it should not be solely considered as a solemn appeal by a clergyman, but as a profound understanding of human interactions based on emotions.

Whereas companies and educated people can be approached in a purely rational way based on relevant factors, people in rural areas with very limited access to education have to rely on their traditions and emotions to judge on a project. Therefore they have to be approached in a comprehensive and emotional way. The use of traditional communication patterns, proverbs, stories, fairy tales in your communication strategy is helpful to approach and convince people who rely on their feelings.

From the author's perspective all interview partners stress that emotional factors, processes and relations are essential determinants in the very beginning of each project. Emotions playing an important role for acceptance, ownership and subsequent sustainability are the first element of a chain that connects people with the project, on which all other successive chain links in the chain to sustainability adhere to. Emotions can be seen as the anchorage point in a chain leading to personal responsibility, enduring maintenance and finally sustainability:

• emotions (personal connection to the project, emotional connotation of the project, self reflection in the project, identification with the project, emotions of the community, motives of project team, ...) → acceptance → feeling of ownership → responsibility → adequate operation and maintenance → sustainability

The deducted concept of emotions as a starting point or foundation of necessary elements for sustainability supports the author's hypothesis, that

emotions are not given reasonable attention to by the scientific discourse. Functional factors map important aspects in the process to sustainability but do not represent their emotional basis as the key to acceptance, identification, ownership and finally sustainability. Emotions become even more determining the human interaction with the project in rural areas where people have only restricted access to education and have to therefore rely more strongly on their emotions when judging on a project. As people are empathic beings emotions are also more easily transferred and replicated within a community than rational arguments.

VI.3. PRESENTATION OF SYSTAINABILITY CONCEPT

The author developed a simplified graphical concept to describe the interrelation of emotional causes and further effects and means to achieve sustainable results in the field of water supply projects. On the foundation of emotions building blocks are put together culminating in sustainability as the desired peak of a project. The pyramid of sustainability is a graphical simplification to intuitively visualise at a glance how effects and means are set together as building blocks on the foundation of emotions in order to reach sustainability.

Emotional relation

In order to structure and define the blurry field of emotions, which constitute the foundation of the pyramid more clearly into pillars, one has to think of an adequate sub-division system. Emotions do not exist per se but are related to subjects and object, which can be taken as categories.

For presenting relations and their respective emotions in the chart of the "Sustainability Pyramid", emotional relations are categorised and simplified as follows:

Emotional relation to:

• oneself	the way we one feels about and perceives himself is determines his abilities and actions;
• project participation	personal contact with the project and self-reflection in the project;
• the project as such	its concept, benefits, results, influence on daily life;

- insiders-community — local group or community, insiders in the sense that they have a similar relation to the project and are in an equal situation of life;
- outsiders-project team — project team -even if locals- have a different relation to the project and are in a different position;

Related emotions, actions and processes

- Oneself

emotions

self-esteem, self-assurance, helplessness or competence, being respected, being listened to, being empowered, …

action & processes

take time to build up a trustful relationship and to be listened to, taken serious, to be treated as an appreciated partner of a dialogue and not as a suppliant, encourage people to trust their abilities, ...;

Shaw's theatre play "Pygmalion" (G. Bernhard Shaw, 1912) can tell of education, respect, self-confidence and the effects caused by how people are treated. The story is about a professor of phonetics who makes an experiment by intensively educating a simple London flower girl to talk like a real lady and be perceived by others as duchess. As Prof. Higgins keeps on treating her harshly and does not show the deserving respect to her as a Lady, the former flower girl Liza complains and reflects that it is not the education but the treatment by others which would make her a Lady:

Act V: Liza: " … You see, really and truly, apart from the things anyone can pick

up (the dressing and the proper way of speaking, and so on), the difference between a lady and a flower girl is not how she behaves, but how she's treated. I shall always be a flower girl to Professor Higgins, because he always treats me as a flower girl, and always will; but I know I can be a lady to you, because you always treat me as a lady, and always will."[25] So all the education seems worthless without the respect of others.

It is therefore necessary for implementing agencies to boost the self-respect, self-reliance and capacity of the people and the community by a respectful approach in order to empower them. People without self-assurance have great difficulties to participate with engagement in a project nor will they succeed in maintaining the result of a project self-reliantly.

- project participation

emotions

feeling familiar with the project (the unknown often causes feelings of distance or fear), feeling involved, feeling connected to a project, feeling of self-reflection in the project, feeling confident and empowered by successful participation, feeling that oneself can have influence on the project and thus importance (increasing self-esteem), feel that own contributions are esteemed by others, feel encouraged, feel supported by training and empowered, one's own contribution becomes part of the project and project becomes part of one's life, people invest their time, skills, emotions and start to connect to the project, by proper education & training people feel prepared for future operation & maintenance, ..;

[25] Pygmalion: A Romance in Five Acts (1912) is a play by Irish playwright George Bernard Shaw; http://www.gutenberg.org/files/3825/3825.txt, accessed Sept 11th 2010;

action & processes

using local middlemen to culturally adequately approach the community entering a dialogue, providing information, education, training, campaigning activities on the related issues, induce involvement, people's ideas, concerns and comments contribute to enhance the project, flexibility of the project, ;

Flexible project organisation and design is a requirement for substantial involvement in order to give people influence on the project and let them adapt the project according to their inputs.

- Project as such

emotions

feeling that the project and its result will be beneficial for personal life, expect future support and empowerment by the project's results, feel supported because the project's concept reacts to actual needs, feel appreciated and empowered by seeing that the project reacts to expressed demand realising that their expression of demand did matter and initiate things, …;

action & processes

demand responsive project approach to ensure that the project is appreciated, make sure that project meets the actual needs prioritised by the locals, mature project concept, design and implementation management, proper project design according to expressed needs and preferences, choosing adequate and graspable technology, …;

- insider: community

emotions

sensing the emotional perception of the project by the community and its influence on one's own perception, feel empathy with others concerning the project

action & processes

ensuring participation of all interest groups in the project and settlement of diverging interest, consider effects of the projects on established social structures - avoid imbalances provoking conflicts, local respected key person for development can act as intermediary to facilitate that positive emotions are shared among the community and to lull negative feelings resulting from misperceptions, community discussion, events and celebrations,

Individual's or community's attitudes and emotions concerning the project are shared among empathic group members, passed on and thus replicated.

• outsider: project team

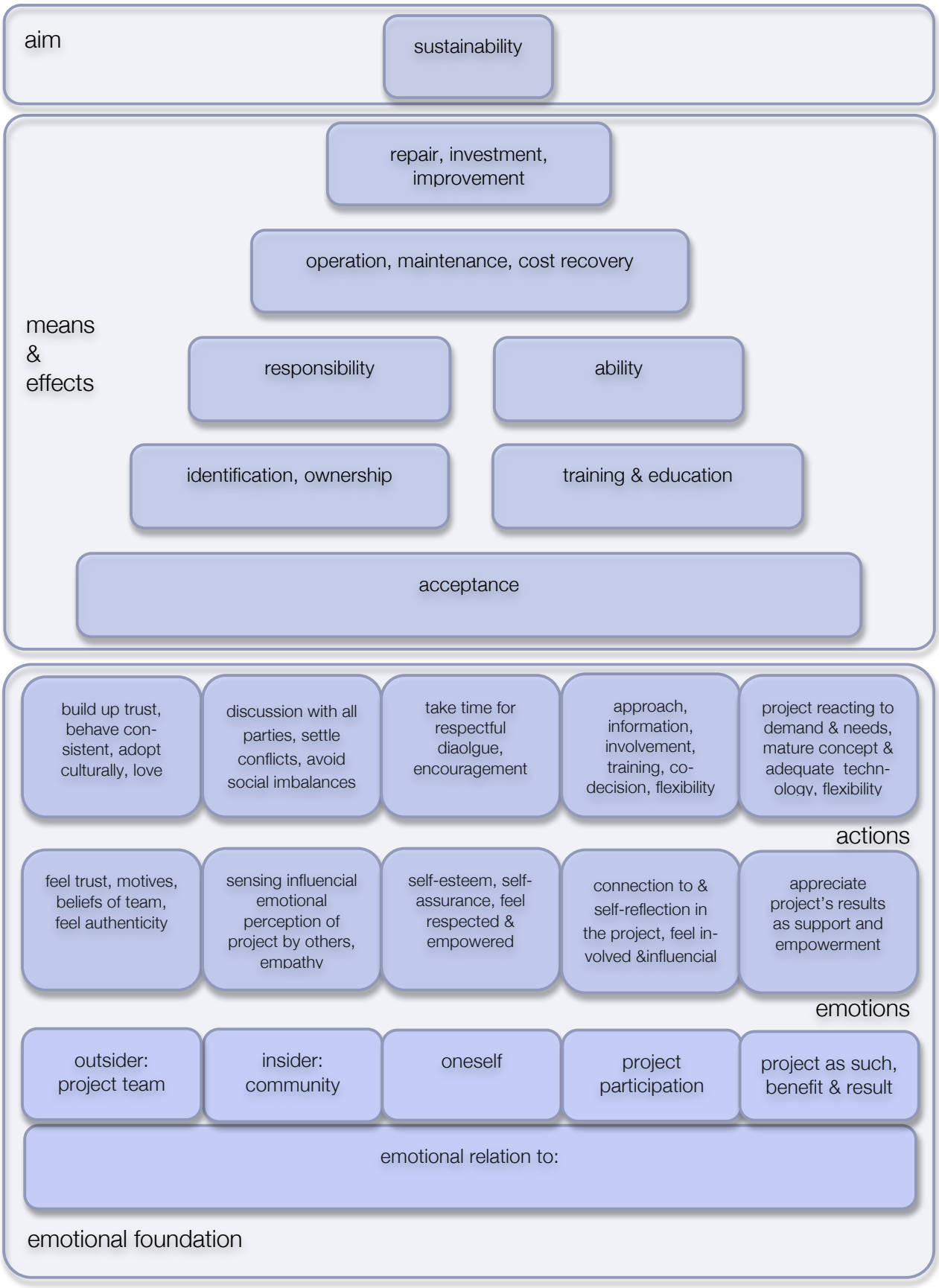
emotions

feeling of trust, sense the motives of the project team, general empathy, feel charisma and authenticity of the project team members, feel if project team believes in the project, …;

action & processes

build up a trustful relationship, project team members should ask themselves if they really fully support the project without disbeliefs and if necessary adopt the project or leave the team, show credibility by consistent action, show certain adoption to local lifestyle, cultural empathy, show love for the target group as fellow human beings;

VI.4. GRAPHIC CHART OF SUSTAINABILITY PYRIAMID



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http://www.helvetas.ch/; accessed August 25th 2010;

http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/weorept.aspx?sy=2007&ey=2010&scsm=1&ssd=1&sort=country&ds=.&br=1&c=738&s=NGDPD%2CNGDPDPC%2CPPPGDP%2CPPPPC%2CLP&grp=0&a=&pr.x=86&pr.y=14; accessed on August 10th 2010;

http://www.meik.ch/Tanzania/Brunnen.asp; accessed on August 18th 2010;

http://www.unicef.org/rightsite/sowc/statistics.php; accessed August 3rd 2010;

http://www.un.org/waterforlifedecade/newsarchive.html#ga_hr; August 24th 2010;

http://www.wdl.at/eag_at/page/439536842916381561_0_0,de.html; accessed on August 16th 2010;

http://www.wasserpreis.info/projekte/2009.php; accessed on August 16th 2010;

http://www.wassertropfen.at/wasser_tropfen/page/464063495855144511_0_660491824443316500,de.html; accessed on August 16th 2010;

LIST OF FURTHER RELEVANT WEBSITES

http://www.afdb.org

http://www.africanwaterfacility.org/en/

http://www.netwas.org;

http://www.unesco-ihe.org

http://www.sandec.ch

http://wedc.lboro.ac.uk/knowledge/know.html

http://www.who.int/water_sanitation_health/en/

http://www.wsp.org

LIST OF TABLES / FIGURES

APPENDIX

FULL TEXTS OF QUESTIONNAIRES' COMMENTS

The author decided to add the full texts of the questionnaires' comments made by the rural population around Ifakara to the appendix as a sign of respect and thankfulness for their contribution. Unlike the key-informants whose interviews are not given in full text, the participants of the rural population cannot easily express their opinions in publications and therefore they are presented in the following to make their individual comments accessible to the reader.

Question 42: Please tell us what you consider important concerning water supply, sanitation and their possible improvement, tell us your need or simply comment on these issues:

Questionnaire 1 (comment given in English)

Government should ensure that the water supply and uses of water should be preserved properly while the society must use their toilets properly and to make sure that they don't make water to be dirty.

Questionnaire 2 (comment given in English)

My idea of water supply in the societies the pipe which used to separate the water must be have enough quality in order to avoid some diseases which caused by the bacteria who are internally in the earth surface where the pipe kept.

Questionnaire 3 - no comment given;

Questionnaire 4 (comment given in English)

I can say that if there are some helps from other countries they may bring to us

to add to wells and other taps in our community.

Questionnaire 5 (comment given in English)

The clean and save water has to be well preserved in a tank to which disinfecting agents should be added from time to time in order to kill bacteria.

Questionnaire 6 (translation from Swahili to English)

Dirty water and bad practise of sanitation can cause harmful diseases. If the drinking water contains a lot of sediments it might lead to appendicitis. Safe and clean (drinking) water and clean sanitary facilities even strengthen the local population to lead the nation. Therefore the state should offer education for proper practise of sanitation and good drinking water. Furthermore disinfectants should be provided to obtain safe water.

Questionnaire 7 (translation from Swahili to English)

In my opinion the government should inform the rural population about the usage of sanitation and drinking water supply as well as how to construct pits. The local population is requested to use only clean and safe water from pipes or wells. Wastewater should flow off in sewers in a way it does not endanger the health of the population.

Questionnaire 8 (translation from Swahili to English)

This is still a huge problem for the population in Tanzania, because we have become water-polluters ourselves, and we do not even watch out where the water comes from and also how we should use the water properly. Water is not used properly in everyday's misery neither are sanitary facilities.

Questionnaire 9 (translation from Swahili to English)

Safe water supply and sanitation help us to prevent several diseases. We ask for having a possibility to discharge and treat wastewater properly. We need a shower facility because of the dirty (surface) water in order to remain unharmed

by diseases.

Questionnaire 10 (translation from Swahili to English)

Clean and safe drinking water supply is good and facilitates a better life for us. Wastewater is dangerous for our lives. The more so wastewater from toilets is dangerous for our health. Clean and safe water supply secures that people do not get ill.

Questionnaire 11 (translation from Swahili to English)

There should be some private companies to manage clean and safe water supply and to sell it at a good price to the local population in order to enable them to improve their lives. This price-offer should apply to all inhabitants of the province of Morogoro.

Questionnaire 12 (translation from Swahili to English)

This help by piped water distribution has not reached us yet. We beg that this water supply will also come to us. We also need help concerning water from wells in our region.

Questionnaire 13 (translation from Swahili to English)

We beg for this water distribution system arriving also at our place like it really should be.

Questionnaire 14 (translation from Swahili to English)

I think, that these issues of safe water supply together with sanitation will help us to reduce the velocity of the spread out of epidemic diseases like cholera. But I also think that wastewater from sanitary facilities can cause outbreak of diseases.

Questionnaire 15 (translation from Swahili to English)

To my mind it is an important affair to have clean and safe water supply and

good sanitary facilities as a basis to improve the population's health and our environment.

Questionnaire 16 (translation from Swahili to English)

These issues of water supply are beautiful for the whole society, because they bring us an advantage, but the heads of government are bad, they are corrupt and "eat" the money while the water pipes have been damaged and corroded since a long time, but they do not repair them. They are only concerned with wasting the whole amount of money.

Questionnaire 17 (translation from Swahili to English)

These issues of water supply are beautiful for the whole society. There are some leading officials that peculate the whole fund for maintenance of water supply infrastructure.

Questionnaire 18 (translation from Swahili to English)

My advice is, that the instruments used for water supply should be good, clean and safe in order to protect our health. We have to be also careful with wastewater of sanitary facilities, when discharging faecal wastewater or letting it weather/dry.

Questionnaire 19 (translation from Swahili to English)

I would like to have asked to get he water supply close to our houses or even directly into our house if possible, in order to have clean and safe water. And I would have also asked to get sanitary facilities built, so that we have good conditions for our health and that diseases can be stopped.

Questionnaire 20 (translation from Swahili to English)

Concerning these water supply facilities, we the local people, ask the government to give us more information in order to be empowered to solve small occurring problems by ourselves. And we ask the government and the

officials responsible for sanitation to lead us out of these problems.

Questionnaire 21 (translation from Swahili to English)

I would like to give the advice that instruments of water supply should be good and safe in order to protect our health. Also the wastewater of sanitary facilities should be discharged with care and always be treated. Thank you, I am very thankful!

Questionnaire 22 (translation from Swahili to English)

I ask the government to offer education to local communities concerning the use of toilets and sanitary facilities. Local people should be advised to use clean water and to build safe and stable toilets, which can be used without problems for a long time.

Questionnaire 23 (translation from Swahili to English)

I ask the government for education to local people in the proper use of water, I also ask the government to support local communities, which use surface-water from lakes or rivers and to build toilets and to offer good education. I think that is what can help us local people.

Questionnaire 24 (translation from Swahili to English)

The local people should know about their responsibility and realise the importance of water supply and sanitary facilities. Even in villages- I would ask the government to educate the inhabitants of villages, so that they know about the importance and the ways to maintain the water source.

Questionnaire 25 (translation from Swahili to English)

Concerning the plan of safe water supply and sanitation I would like to advise the government to provide more education primarily in villages. I would also like to thank the government for these matters, because it helped us a lot to reduce diseases.

Questionnaire 26 (translation from Swahili to English)

In my opinion it is still a major problem for the local population who lives here a normal life [note: without piped water supply]. Due to the lack of water supply life is not satisfying any more and also toilets and wastewater have become a severe problem causing many people to get diseases like Cholera.

Questionnaire 27 (translation from Swahili to English)

According to my first thought education should be offered to all people on how sanitary facilities should be used and means/chemicals should be provided to clean these sanitary facilities and to treat or disinfect drinking water. If we manage to do so, we will reduce all the strange diseases like cholera, diarrhoea and cystitis.

Questionnaire 28 (translation from Swahili to English)

The facilities of safe water supply together with sanitation will help to reduce the velocity of outspreading diseases like cholera. But on the other side also wastewater like the one from sanitary facilities can bring many harmful diseases.

Questionnaire 29 (translation from Swahili to English)

Safe water supply, sanitation and wastewater (facilities) are very poor here, because many water pipes are in bad shape and pass through places, which are not safe. These pipes are poorly installed like above the road or beside the toilets or other very dirty places.

Questionnaire 30 (translation from Swahili to English)

I ask the government or private companies which deal with water supply and sanitation to make an effort to offer education to the local population, primarily those living in small villages, how to operate, administer and maintain water supply infrastructure, how to treat water before drinking and also about the

importance of sanitation and its proper application.

Questionnaire 31, 32 - no comments given;

Questionnaire 33 (translation from Swahili to English)

Clean and safe water supply in the community is not that beautiful and the use of sanitary facilities is very bad, they bring mostly sudden [note: epidemic] diseases. Therefore education should be offered to the people in the methods and art (of dealing with water and sanitation).

Questionnaire 34 (translation from Swahili to English)

The government should develop concepts and regulations for the local population in order to prevent the misuse of water and to demonstrate that water is scarce and precious.

Questionnaire 35 (translation from Swahili to English)

The government is requested to inform and educate the local population in safe water supply so that they do not destroy [note: pollute and waste] water and also in sanitation, in order to use and maintain sanitary facilities properly.

Questionnaire 36 (translation from Swahili to English)

Wastewater can cause epidemic diseases like cholera and others.

Questionnaire 37 (comment given in English)

By advising people to be co-operating in society so as to make good supply of water and building wells ... which will help them in getting purer water so as to avoid themselves from diseases when obtain from unsafe water supply.

Questionnaire 38 (translation from Swahili to English)

I advise to [establish] a water supply in clean conditions, so that our health remains safely conserved. Furthermore we should build sanitary facilities and

discharge the wastewater from showers into a real sewer system in order to protect us from diseases. Channels should be dug to discharge wastewater.

Questionnaire 39 (translation from Swahili to English)

I think that if water will be distributed in a safe state and sanitary facilities will be used properly, there would be no epidemic any more. Also wastewater coming from toilets should be discharged through a piped system into a sewer in order to reduce diseases.

Questionnaire 40 (translation from Swahili to English)

Water should be distributed in a clean and safe state, much cleaner in order to prevent diarrhoea diseases. Also sanitary facilities should be built and wastewater should be discharged to an appropriate and safe place.

Questionnaire 41 (translation from Swahili to English)

In my opinion there should be facilities for water supply, and they should be clean and safe in order to conserve our health properly. We also have to discharge the wastewater from sanitary facilities, which is dirty, very carefully.

Questionnaire 42 (translation from Swahili to English)

Wastewater like from the shower is dangerous for our health that is why we should dig a pit, which stores the wastewater safely.

Questionnaire 43 (translation from Swahili to English)

My advice is, that several companies co-operating with the government should make an effort to provide us with clean water and sanitary facilities. As example: to build a well, to build piped water distribution systems in villages; Doing so can reduce the water-problems. This problem also concerns sanitation.

Questionnaire 44 (translation from Swahili to English)

Safe water is important for human health in order to escape from diseases like diarrhoea.

Questionnaire 45 (translation from Swahili to English)

Water is an important basis for human life. If there is no possibility to find, preserve and properly use drinking water, we will then perish.

Questionnaire 46 (translation from Swahili to English)

I think there should be facilities and services for clean water supply, sanitation and wastewater treatment, and they should be well constructed. And channels should be built for wastewater, which would be a sufficient protection.

Questionnaire 47 (translation from Swahili to English)

Health affairs concern everybody individually, but if the government contributes by offering health related education and if this is really carried out with attention, there will be safe and clean water as well as good sanitary facilities.

Questionnaire 48 (translation from Swahili to English)

From my point of view it would be beautiful to discharge wastewater like those from showers into sewer systems like channels and then into a septic tank. If this is not done so, there is danger to human life and it will be the beginning of an epidemic.

Questionnaire 49 (translation from Swahili to English)

[Water supply] is beautiful because it helps to escape from rapidly spreading diseases: diarrhoea, severe cough, fever. It would be also very good if water supply projects would be supported by private companies and initiators.

Questionnaire 50 (translation from Swahili to English)

If water from the pipes runs dry, it will trigger several epidemic diseases and cause major problems.

QUESTIONNAIRES IN ENGLISH AND SWAHILI

TECHNISCHE UNIVERSITÄT WIEN
VIENNA UNIVERSITY OF TECHNOLOGY

UHOJAJI

Na Gregor V. KOFLER
Tafsiri ya kiswahili na Alfred SUNGI

kwa wananchi na wenye madaraka katika mkona wa Morogoro , Tanzania, kuhusu maji salama ya kunywa, maliwato na na vyoo, pia kuyatunza. Jibu maswali yafuatayo kutumia alama za mkasi [kama o]. Kama majibu mengi yanahusiana pia tumia alama hii kila jibu. Pia andika maoni yako binafsi.

Wathaminiwa washiriki,
Majibu yako ya uhojaji huu, unatusaidia kazi yetu ya kuchunguza na ambayo inajaribu kutoa mchango wa kupata maji salama ya kunywa, maliwato na vyoo, kusaidia katika nchi kadhaa Afrika. Lakini uhojaji huu peke yake hauwezi kubadilisha hali ya maji salama kwa mara moja. Tunakushukuru sana kwa msaada wako wa thamani.

USAMBAZAJI WA MAJI SALAMA

Swali 1 **Taarifa hizi zitahifadhiwa kwa siri.**

Jibu
Umri o 7-14 o 15-20 o 20-30 o zeidi ya miaka 30
o mwanamke o mwanamme
Dini o Mkristo o Muisilamu o Zinginezo _____
Ninaishi o Mjini o Mji mdogo o Kijijini o Makao katika shamba la kujitenga
o Taja mahali unapoishi _____

Swali 2 **Kutoka wapi unapata maji salama kila siku?**

Jibu
Kutoka o bomba la maji toka shambani o kuvuta kwa mrija
o maji ya mvua o maji ya kununua kwenye chupa
o maji ya kuletwa kwa lori o maji yaliyokusanywa kwa mvua na kutunzwa
o kisima cha kuchimba binafsi o mto au ziwa
o kisima cha kutumia ndoo o shimo la kuchimba kutumia mrija
o kisima cha pampu o maji ya kutunza kwa birika kubwa la wananchi
o mto wa asili o maji ya kuzia na boma
o uwekano mwingine wa maji _____

Swali 3 **Unapata maji salama umbali gani kutoka unapoishi?**

Jibu
ni o ndani ya nyumba yangu o kando ya nyumba yangu
o ____ umbali/kilomita, kutoka nyumbani na lazima nitembee kwa mda
____ dakika/masaa kufika hapo

Swali 4 **Unaridhika na maji yako safi?**

Jibu o ndiyo yanaonekana kuwa masafi na salama o hapana

Swali **kama jibu lako hapana, kwanini huridhiki?**

Jibu
o ni machafu o yana matope o yananuka o yananifanya kuwa mgonjwa
o yamechafuliwa na _____ o kuna upungufu wa maji
o sababu zingine: _____

Swali 5 **Unayaandaa maji vipi kabla ya kuyatumia au kunywa?**

Jibu
o nakunywa bila ya kuyaandaa o nayachemsha kabla ya kuyanywa
o ninaacha uchafu uanguke chini o natumia kichujio:_____
o nayaweka ndani ya chupa ya plastiki na kuyaacha juani kwa siku nzima
o maandalizi mengine: _____

Maswali yafuatayo yanahusu maji ya kutengenezwa tu. Kama unatumia maji ya asili kama vile mto au ziwa, unaweza pia kutoa habari ya maji uliyotumia siku za nyuma. Kama ulitumia maji ya mto au ziwa, bahari siku zote, unaweza kuruka na kujibu maswali kuanzia swali la 18!

Swali 6 **Nani alijenga au alitengeneza na kufanya usambazaji wa maji unayotumia?**

Jibu
o mimi, familia yangu au rafiki o wananchi
o mweyekiti o amri ya mkoa o serika au wanachama
o jimbo la kanisa au chama cha kanisa o shirika la binafsi
o mgeni o sijui
o mtu mwingine au shirika _____ o majirani

Swali 7 **Usambazaji wa maji huu unapatikana tangu lini?**

Jibu
o chini ya nusu mwaka o kati ya nusu mwaka na mwaka
o miaka kamili _____ o mda _____

Swali 8 **Umewahi kupatwa na ukame wa maji?**

Jibu o ndiyo o hapana

Swali **Ukame ulisababishwa na nini?**

Jibu o maji yalichafuliwa
o spea za kurepea mitambo ya maji zilikosekana
o kulikuwa hakuna fundi
o sijui o shida zingine _____

Swali 9 **Ulimwuliza mtu yeyote kuhusu usambazaji wa maji kabla ya kujengwa au kisima kuchimbwa?**

Jibu o ndiyo o hapana

Swali 10 **Uliwajibika vipi katika shughuli za kujenga usambazaji wa maji?**

Jibu o sikujulishwa kuhusu shauri hilo kabla ya kutengenezwa
o sikutaarifiwa na sikushughulika
o niliulizwa kutoa ushauri wangu (maarifa, kushiriki..)
o niliulizwa kama ningehitaji maji o nilitoa mchango
o ushauri wangu ulikubaliwa o ninahusika na kazi za matengenezo
o nilihusika na kazi za marekebisho
o kazi zingine kama: _____

Swali 11 **Usambazaji wa maji huo umenufaisha maisha yako?**

Jibu o ndiyo o hapana

Swali **Toa sababu kwanini usambazaji huo wa maji haukunufaisha sana maisha yako?**

Jibu o haikusaidia kwasababu _____
o ushauri ufuatao unaweza kusaidia: _____

Swali 12 **Kwanini, unafikiri usambazaji wa maji ulitengenezwa?**

Jibu kwasababu o mtu wmenye nia alitaka tu maji yasambazwe
o viongozi wa mkoa walitaka iwe hivyo
o wananch walihitaji lakini hawakumwuliza mtu
o wananch walihitaji na walitaka kupata
o sababu zingine: _____

Swali 13 **Nani alilipa bili za utengenezaji wa usambazaji wa maji?**

Jibu o wanakijiji o mwenyeki, balozi o viongozi
o wagen wasaidizi o aliyejenga o wanachama wasaidizi
o sijui o makampuni ya nchi o wananch
o mwingine:_____

Swali 14 **Unalipia usambazaji wa maji? Kama ndiyo, unaridhika na malipo ?**

Jibu o ndiyo o hapana

bei o rahisi o inaridhisha o ghali

Swali 15 **Nani anahusika na kazi na matunzo ya mitambo ya usambazaji?**

Jibu o mwenyekiti o viongozi o msaidizi o mwanzishaji
o wanakijiji o wananchi o hakuna mtu o makampuni ya nchi
o sijui o mwingine: nani?_____

Swali 16 **Nani anahusika na shughuli za marekebisho?**

Jibu o mwenyekiti o viongozi o msaidizi o mwanzishaji
o wanakijiji o wananchi o hakuna mtu o makampuni ya nchi
o sijui o mwingine: nani?_____

Swali 17 **Mara ngapi mitambo ya usambazaji maji iliharibika na kurebishwa?**

Jibu o hata mara moja o mara moja o mara 2-3 o kama mara 5 hivi
o mara nyingi kama mara _____ hivi

Swali 18 **Unafikiri maji haya ya kunywa machafu na yaliyochafuliwa yanaweza kusababisha magonjwa mbalimbali?**

Jibu o ndiyo o kidogo o hapana

MATENGENEZO YA VYOMBO VYOTE NA MAARIFA YA KUTIA AFYA

Swali 19 **Ni vyoo vya namna gani unatumia kila siku?**

Jibu
- o choo cha kusukuma na maji
- o choo si cha kusukuma na maji
- o choo kisicho na kifuniko cha kukaa
- o choo cha kukaa
- o shimo la kuchimba
- o vyoo viwili vya kukausha baada ya kingine kujaa
- o kutumia ndoo
- o shamba la kujitenga
- o mto mkavu au bonde
- o vyo vya aina nyingine kama:_____

Swali 20 **Familia yako inatumia sehemu hiyo ya kujisaidia na wapangaji au watu wengine?**

Jibu o ndiyo o hapana

Swali 21 **Unafikiri kuchangia choo na watu ambao huwafahamu ni tatizo?**

Jibu o shida kubwa o tatizo dogo o hapana, hakuna tatizo hata kidogo

Swali 22 **Kuna shida yeyote au usumbufu wakati wa kuvitumia vyoo?**

Jibu o hapana o ndiyo: _____

Swali 23 **Ni choo cha namna gani ungependelea kutumia?**

Jibu o kuchuchumaa o kukaa o kusimama

Swali 24 **Namna gani ungependa kutumia?**

Jibu o maji o pangusa

Swali 25 **Choo kipo umbali gani kutoka nyumbani?**

Jibu ni o ni umbali wa kilomita____ na lazima nitembee kwa mda wa ___ dakika/masaa mpaka kufika o ndani ya nyumba o kando ya nyumba

Swali 26 **Baada ya vyo kujaa halafu inakuwaje kuhusu vinyesi?**

Jibu
- o vinakusanywa na kukauschwa
- o yanasafirishwa na bomba
- o mavi yanafukiwa chini
- o shimo likijaa miti inapandwa
- o yanakusanywa na kufanyiwa kazi
- o yanakusanywa kupelekwa mahali pamoja
- o shimo linafukiwa na udongo
- o namna ingine:_____

Maswali yafuatayo ni kama mtu anatumia vyoo vya kujenga, kuchimba, na kama mtu anatumia vyoo vya asili kama mto mkavu, Pori, shamba la kujitenga, basi ruka maswali na jibu moja kwa moja kuanzia swali 41!

Swali 27 **Ni kitu gani kingerekebishwa katika choo chako?**

Jibu
- o hakuna, mimi ninaridhika
- o choo kipo mbali na mahali naishi
- o watu wengi wanakitumia
- o kila mara kimejaa na kimeziba
- o hakina madirisha ya hewa
- o shida zingine: _____

Swali 28 **Nani alitoa wazo la choo chako na alijenga?**

Jibu
- o mimi, familia yangu au rafiki
- o wananchi
- o mweyekiti
- o amri ya mkoa
- o serika au wanachama
- o jimbo la kanisa au chama cha kanisa
- o shirika la binafsi
- o mgeni
- o sijui
- o mtu mwingine au shirika _____
- o majirani

Swali 29 **Tangu lini choo chako kinafanya kazi ?**

Jibu
- o chini ya nusu mwaka
- o kati ya nusu mwaka na mwaka
- o miaka kamili _____
- o mda _____

Swali 30 **Ulimwuliza mtu yeyote kuhusu ujenzi wa choo kabla ya kujengwa au kuchimbwa?**

Jibu o ndiyo o hapana

Swali 31 **Uliwajibika vipi katika shughuli za kujenga vyoo?**

Jibu
- o sikutaarifiwa na sikushughulika
- o nilijulishwa kuhusu shauri hilo kabla ya kutengenezwa
- o niliulizwa kama ningehitaji choo
- o niliulizwa kutoa ushauri wangu (maarifa, kushiriki..)
- o ushauri wangu ulikubaliwa
- o nilitoa mchango
- o nilihusika na kazi za marekebisho
- o ninahusika na kazi za matengenezo
- o kazi zingine kama: _____

Swali 32 **Ujenzi huo wa vyoo umenufaisha maisha yako?**

Jibu o ndiyo o hapana

Swali **Toa sababu kwanini ujengaji wa vyoo huo haukunufaisha sana maisha yako?**

Jibu o haikusaidia kwasababu _____

o ushauri ufuatao unaweza kusaidia: _____

Swali 33 **Kwanini, unafikiri vyoo vilijengwa?**

Jibu kwasababu o mtu wmenye nia alitaka tu maji yasambazwe
o viongozi wa mkoa walitaka iwe hivyo
o wananch walihitaji lakini hawakumwuliza mtu
o wananch walihitaji na walitaka kupata
o sababu zingine: _____

Swali 34 **Nani alilipa bili za ujenzi wa vyoo?**

Jibu

o wanakijiji	o mwenyeki, balozi	o viongozi
o wagen wasaidizi	o aliyejenga	o wanachama wasaidizi
o sijui	o makampuni ya nchi	o wananch

o mwingine:_____

Swali 35 **Unalipia vyoo hivyo? Kama ndiyo, unaridhika na malipo ?**

Jibu o ndiyo o hapana

Swali bei o rahisi o inaridhisha o ghali

Swali 36 **Nani anasimamia shughuli za malipo ya vyoo?**

Jibu

o mwenyekiti	o viongozi	o msaidizi	o mwanzishaji
o wanakijiji	o wananchi	o hakuna mtu	o makampuni ya nchi
o sijui	o mwingine: nani?_____		

Swali 37 **Nani anahusika na shughuli za kurepea?**

Jibu

o mwenyekiti	o viongozi	o msaidizi	o mwanzishaji
o wanakijiji	o wananchi	o hakuna mtu	o makampuni ya nchi
o sijui	o mwingine: nani?_____		

Swali 38 **Ni mara ngapi choo kiliharibika na kutengenezwa?**

Jibu o hata mara moja o mara moja o mara 2-3

o mara nyingi kama mara _____ hivi

Swali 39 **Nani anahusika na kazi za kuchimba mashimo mapya ya vyoo, mabomba ya vinyesi na maji machafu?**

Jibu

o mimi	o viongozi wa serikali	o wananch/watumiaji
o jimbo	o kampuni ya bifsi	o mtu mwingine:_____

Swali 40 **Nani anafanya kazi za usafi, marakebisho madogo?**

Jibu

o mimi	o viongozi wa serikali	o wananch/watumiaji
o jimbo	o kampuni ya bifsi	o mtu mwingine:_____

Swali 41 **Unafahamu kwamba vyoo vilivyojengwa vibaya, kuvitumia vibaya na kuyatumia maji vibaya inatia sumu maji yako salama?**

Jibu o ninafahamu o ninajua kidogo o sifahamu

Swali 42 **Unafikiri nini kuhusu mambo ya usambazaji wa maji salama,vyoo na maji machafu kama ya bafuni? Tafadhali toa au andika maoni yako au mawaidha yako!**

Jibu _____

_____

_____

_____

_____

Asante sana kwa kujibu maswali!

TECHNISCHE UNIVERSITÄT WIEN
VIENNA UNIVERSITY OF TECHNOLOGY

QUESTIONNAIRE

by Gregor V. KOFLER
translation to Swahili by Alfred SUNGI

to all stakeholders of the region of Moragoro, Tanzania on the access to water supply and sanitation facilities and their respective sustainability; Please answer the questions by marking your choice [like this: x]. Whenever applicable you can choose multiple answers and give additional handwritten information.

Dear Participants,
By filling in this form you will support research, which can help to improve access to safe drinking water and sanitation in rural sub-Saharan Africa. However this research alone will not directly improve your actual situation.
Thank you for your contribution!

ON DRINKING WATER SUPPLY

Question 1 **This questionnaire is anonymous. Please give basic information about yourself.**

Answer
Age o 7-14 o 15-20 o 20-30 o over 30 years
Sex o female o male
Religion o Christian o Muslim o other _____
I am living in a o city(like Ifakara) o small city o village o an isolated rural dwelling
o name the community in which you live: _____

Question 2 **From which source do you get your daily drinking water?**

Answer
From o piped water inside the dwelling o public tap or standpipes
o rainfall o bottled water
o tank lorry delivery o rain water collection and storage
o a self-dug hole in the ground o a river or a lake
o an open dug well with bucket o a borehole with pump
o a closed well with pump o a water storage tank of the community
o a natural open spring o a protected enclosed spring
o another source: _____

Question 3 **How far is the water source located from your home?**

Answer
It is o inside my home o directly beside my home
o ____ metres/ kilometres away from home and I have to walk for ____ minutes/hours to arrive there.

Question 4 **Are you satisfied with the quality of your water?**

Answer o Yes, it seems to be clean and safe o No

Subquestion **If your answer is no, why are you not satisfied?**

Answer
o it looks dirty o it is turbid o it is smelly o it makes me sick
o it is polluted with _____ o there is shortage of it
o other reasons: _____

Question 5 **How do you treat the water from your source before drinking it?**

Answer
o I drink it without any treatment o I boil it before drinking
o I let the sediments settle down to reduce turbidity o I use filter: _____
o I fill it in transparent plastic bottles and expose them to intense sunlight for a day
o other treatment: _____

The following questions concern constructed water supplies only. If you are using water from a natural source like a river you can also give information on a constructed supply you have used in the past. If you have always used natural water sources you can skip these questions and continue from question Nr. 18 !

Question 6 **Who initiated and established the water supply you use?**

Answer
o me, my family or close friends o the local community
o local authorities o regional authorities o central or federal authorities
o local church / a church related local organisation o a private company
o a foreign person o I do not know
o another constructor: _____ o neighbours

Question 7 **How long is the total operation period of your water supply so far?**

Answer
o less than half a year o between half a year and one year
o many years, namely ____ . o since: _____

Question 8 **Have you experienced any interruptions of the water supply so far?**

Answer o yes o no

Subquestion **Which problem caused the interruption?**

Answer
o the water was contaminated
o spare parts were not available to repair the water supply
o there was no professional person to repair the water supply
o I do not know o another problem: _____

Question 9 **Did you demand the water supply before it was constructed?**

Answer o yes o no

Question 10 **In which way have you been involved in the construction of the water supply?**

Answer
o I was not informed about the project beforehand
o I was not informed and not involved
o I was asked for comments (ideas, concerns..)
o I was asked if I would need it o I contributed during construction
o My comments were considered o I was involved in operation and maintenance
o I was involved in repair works
o other involvement: _____

Question 11 **Did the water supply improve your living conditions?**

Answer o yes o no

Subquestion **Give reasons why the water supply did not improve your life (so much).**

Answer
o It did not help, because: _____
o following improvement could help: _____

Question 12 **Why, do you think the water supply was constructed?**

Answer Because
o the project initiators wanted it to be done
o the authorities wanted it to be done.
o inhabitants needed this facility, although they did not demand it
o inhabitants demanded and needed this facility
o other: _____

Question 13 **Who financed the construction costs of the water supply?**

Answer
o inhabitants o local authorities o central authorities
o foreign donors o the project initiators o local donors
o I do not know o local organisations o the local community
o other: _____

Question 14 **Do you have to pay for using the supply? If yes, do you consider the price adequate?**

Answer o yes o no

The price is o low o adequate o high

Question 15 **Who is responsible for operation and maintenance?**

Answer
o local authorities o central authorities o donors o the project initiators
o inhabitants/user o local community o nobody o local organisations
o I do not know o other: _____

Question 16 **Who is responsible for repair works?**

Answer
o local authorities o central authorities o donors o the project initiators
o inhabitants/user o local community o nobody o local organisations
o I do not know o other: _____

Question 17 **How often has the water supply been repaired so far?**

Answer
o not once o once o 2-3 times o about 5 times
o often, namely _____ times

Question18 **Do you know that dirty and contaminated drinking water can cause severe sickness?**

Answer o yes o slightly o no

ON SANITATION

Question 19 **Which sort of toilet-facility do you use for everyday life?**

Answer
o a flush water toilet o a toilet without flush
o a pit without slab o pit with slab
o an open pit in the ground o one enclosed pit of two alternating pits
o a bucket o a spot outside (field, bush, tree,..) o the bank of a river or lake
o another type: _____

Question 20 **Does your family share this toilet facility with other households or people?**

Answer o yes o no

Question 21 **Do you consider sharing your toilet with non-relatives a problem?**

Answer o a big problem o a minor problem o no, not a problem at all

Question 22 **Do you face any problem or inconvenience when using your toilet facility?**

Answer o no o yes: _____

Question 23 **What posture would you prefer while using a toilet facility?**

Answer o squatting o sitting o standing

Question 24 **Which cleansing method would you prefer?**

Answer o washing o wiping

Question 25 **How far is your toilet facility away from your home?**

Answer It is o ____ metres/ kilometres far from my home and I have to walk for ____ minutes/hours to arrive there. o inside my home o directly beside my home

Question 26 **What happens to the excreta afterwards?**

Answer
o it is transferred to a composting pile o it is transferred by a piped sewer system
o it is burried/ stored underground o a tree is planted on it once the pit is full
o it is collected and treated elsewhere o it is collected and dumped elsewhere
o once full the pit is covered with soil o other: _____

The following questions concern constructed toilet facilities only. If you are not using constructed toilet facilities you can also give information on constructed toilets you have used in the past. Otherwise you can skip these questions continuing with question Nr. 41 !

Question 27 **Which feature of your toilet facility should be improved?**

Answer
o Nothing, I am completely satisfied o it is too far from home
o too many people are using it o it is often blocked or over stuffed
o it is poorly ventillated o other problems: _____

Question 28 **Who initiated and established the toilet facility you use?**

Answer
o me, my family or close friends o the local community
o local authorities o regional authorities o central or federal authorities
o local church / a church related local organisation o a private company
o a foreign person o I do not know
o another constructor: _____ o neighbours

Question 29 **How long has your toilet facility been in operation so far?**

Answer
o less than half a year o between half a year and one year
o many years, namely ____ . o since: _____

Question 30 **Did you demand the toilet facility before it was constructed?**

Answer o yes o no

Question 31 **In which way have you been involved in the construction of your toilet facility?**

Answer
o I was not informed and not involved o I was informed about the project beforehand
o I was asked if I would need it o I was asked for comments (ideas, concerns..)
o My expressed comments were taken into consideration
o I contributed during construction o I am involved in repair works
o I am involved in operation and maintenance
o other involvement: _____

Question 32 **Did the toilet facility improve your living conditions?**

Answer o yes o no

Subquestion **Give reasons why the toilet facility did not improve your life (so much).**

Answer o It did not help, because: _____

o following improvement could help: _____

Question 33 **Why, do you think the toilet facility was constructed?**

Answer Because o the project initiators wanted it to be done
o the authorities wanted it to be done.
o inhabitants needed this facility, although they did not demand it
o inhabitants demanded and needed this facility
o of other reasons: _____

Question 34 **Who financed the construction costs of the toilet facility?**

Answer

o inhabitants	o local authorities	o central authorities
o foreign donors	o the project initiators	o local donors
o I do not know	o local organisations	o the local community

o other: _____

Question 35 **Do you have to pay for using the toilet facility? If yes, do you consider the price to be adequate?**

Answer o yes o no

The price is o low o adequate o high

Question 36 **Who is responsible for operation of the toilet facilities?**

Answer

o local authorities	o central authorities	o donors	o the project initiators
o inhabitants/user	o local community	o nobody	o local organisations
o I do not know	o other: _____		

Question 37 **Who is responsible for (major) repair works?**

Answer

o local authorities	o central authorities	o donors	o the project initiators
o inhabitants/user	o local community	o nobody	o local organisations
o I do not know	o other: _____		

Question 38 **How often has the toilet facility been repaired so far?**

Answer o not once o once o 2-3 times

o often ,namely _____ times

Question 39 **Who takes care of reconstruction of a pit or disposal of excreta?**

Answer

o me	o local authorities	o inhabitants and users
o local community	o private enterprise	o other: _____

Question 40 **Who takes care of maintenance of the toilet facility?**

Answer

o me	o local authorities	o inhabitants and users
o local community	o private enterprise	o other: _____

Question 41 **Are you aware that inappropriate sanitation management can contaminate your drinking water?**

Answer I am o strongly aware o slightly aware o not aware at all

Question 42 **Please tell us what you consider important concerning water supply, sanitation and their possible improvement, tell us your need or simply comment on theses issues:**

_____

_____

_____

_____

_____

Thank you very much for answering these questions !